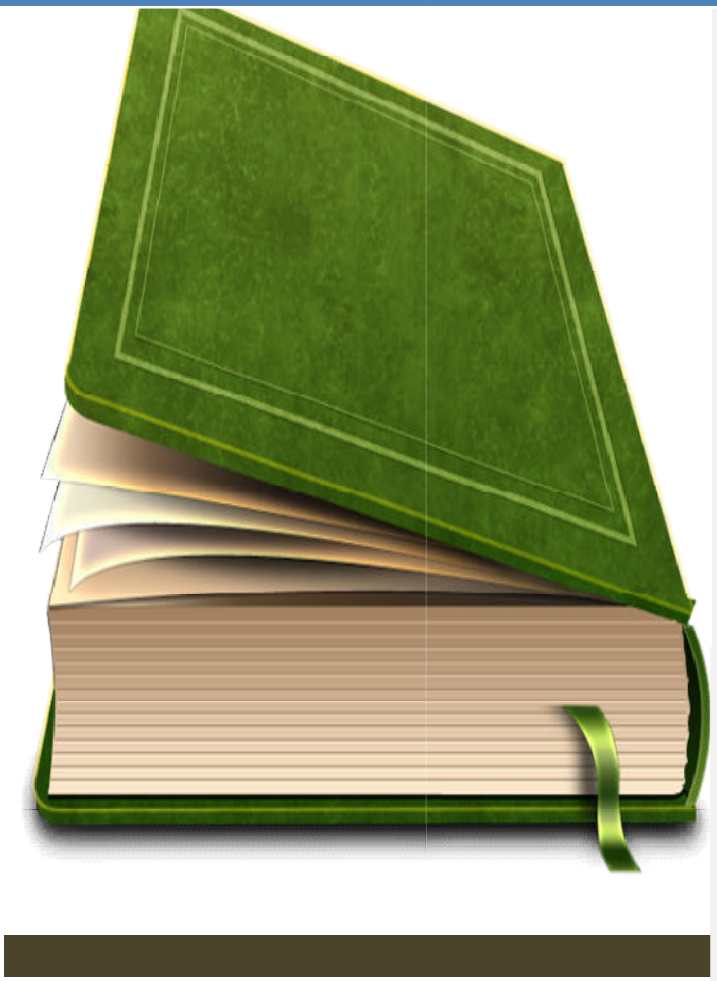
WBUHS

(2016-2020)

MS- PAPER – I -IV

Guide for Answering theory questions in MS Surgery



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THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2020

March, 2020

PAPER I

Time Allowed: 3 Hours **Full Marks: 100**

Attempt all questions

1. **a) Enumerate components of blood gas analysis and their significance in patients' management.**
   4+3+3
   b) Treatment of metabolic acidosis.
   c) Clinical features and management of hypokalemia.
2. **Write short notes on: 5+5**
   a) Anatomical limits of ilio-inguinal block dissection.
   b) Enumerate the complications of ilio-inguinal block dissection.
3. **Outline the preoperative pharmacological management of patient with pheochromocytoma. 10**
4. **Define and discuss subphrenic spaces and their surgical importance. 10**
5. **Composite mesh. 10**
6. **Myopectineal orifice of Fruchaud. 10**
7. **Discuss nutritional augmentation in surgical patients. 10**
8. **Role of NPWT (negative pressure wound therapy) in management of surgical wounds. 10**
9. **Write a short note on "surgical never events". 10**
10. **What are the physiologic effect of CO2 pneumoperitoneum? 10**

Answer.

1. **The components of an ABG analysis are PaO_2, SaO_2, hydrogen ion concentration (pH), $PaCO_2$, HCO_3^-, base excess, and serum levels of hemoglobin, lactate, glucose and electrolytes (sodium, potassium, calcium, and chloride).**

The following are normal ranges for results of a blood gas test: pH: 7.35–7.45. partial pressure of oxygen (PaO2): 80–100 millimeters of mercury (mmHg) partial pressure of carbon dioxide: 35–45 mmHg

The utilization of an ABG analysis becomes necessary in view of the following advantages:

- **Aids in establishing diagnosis.**
- **Guides treatment plan.**
- **Aids in ventilator management.**
- **Improvement in acid/base management; allows for optimal function of medications.**
- **Acid/base status may alter electrolyte levels critical to a patient's status.**

Rules for rapid clinical interpretation of ABG:

- **Look at pH - < 7.40 - Acidosis; > 7.40 - Alkalosis.**
- **If pH indicates acidosis, then look at $paCO_2$and HCO_3^-**
- **If $paCO_2$is ↑, then it is primary respiratory acidosis. ...**

- **If $paCO_2$↓ and HCO_3^- is also ↓→ primary metabolic acidosis. ...**
- **If $HCO_3^-$is ↓, then AG should be examined.**

- **Metabolic acidosis results from the accumulation of nonvolatile acids, reduction of renal acid excretion, or loss of alkali. The most common causes of metabolic acidosis are listed in Table 4-6. Metabolic acidosis has few specific signs. The appropriate diagnosis depends on the clinical setting and laboratory tests.**
    - **The anion gap (AG; normal = 12 ± 2 mmol/L) represents the anions, other than Cl^- and HCO_3^-, that are necessary to counterbalance Na^+ electrically:**

AG (mmol/L) = Na^+ (mmol/L) + [Cl (mmol/L) + HCO_3^- (mmol/L)]

It is useful diagnostically to classify metabolic acidosis into increased or normal AG metabolic acidosis.

Causes of Metabolic Acidosis

Increased anion gap	Normal anion gap (hyperchloremic)
a. Increased acid production	a. Renal tubular dysfunction
1. Ketoacidosis	1. Renal tubular acidosis
Diabetic	2. Hypoaldosteronism
Alcoholic	3. Potassium-sparing diuretics
Starvation	b. Loss of alkali
2. Lactic acidosis	1. Diarrhea
3.Toxic ingestion (salicylates, ethylene glycol, methanol)	2. Ureterosigmoidostomy
b. Renal failure	3. Carbonic anhydrase inhibitors
	c. Administration of HCl (ammonium chloride, cationic amino acids)

- **Treatment of metabolic acidosis must be directed primarily at the underlying cause of the acid-base disturbance. Bicarbonate therapy should be considered in patients with moderate to severe metabolic acidosis only after the primary cause has been addressed. The HCO_3^- deficit (mmol/L) can be estimated using the following equation:**

- **HCO_3^- deficit (mmol/L) = body weight (kg) × 0.4 × [(desired HCO_3^- [mmol/L]) - (measured HCO_3^- [mmol/L])]**
- **This equation serves to provide only a rough estimate of the deficit because the volume of HCO_3^- distribution and the rate of ongoing H^+ production are variable.**

Hypokalemia:

Clinical manifestations.:

- **Mild hypokalemia [K^+ >3 mmol/L is generally asymptomatic.**
- **The symptoms present with severe K^+ deficiency [K^+ <3 mmol/L (11.7 mg/dL)] and are primarily cardiovascular.**
- **Early electroencephalogram (ECG) manifestations include ectopy, T-wave depression, and prominent U waves.**
- **Severe depletion increases susceptibility to reentrant arrhythmias.**

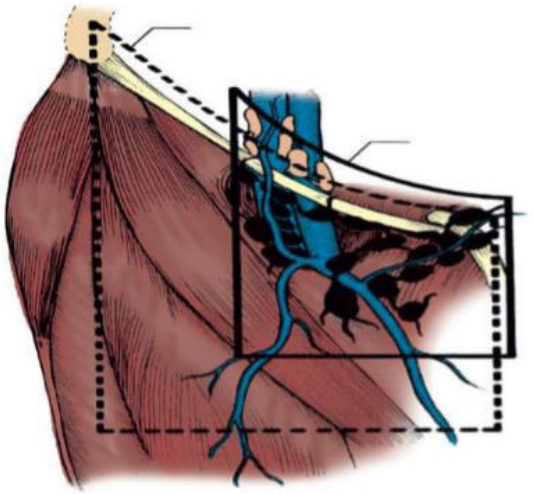
Treatment:

- **In mild hypokalemia, oral replacement is suitable. Typical daily therapy for the treatment of mild hypokalemia in the patient with intact renal function is 40 to 100 mmol KCl orally in single or divided doses.**
- **Parenteral therapy is indicated in the presence of severe depletion, significant symptoms, or oral intolerance. K^+ concentrations (administered as chloride, acetate, or phosphate) in peripherally administered intravenous fluids should not exceed 40 mmol/), and the rate of administration should not exceed 20 mmol (78 mg)/hour.**
- **However, higher K^+ concentrations [60 to 80 mmol/L (234 to 312 mg/dL)] administered more rapidly (with cardiac monitoring) are indicated in cases of severe hypokalemia, for cardiac arrhythmias, and in the management of diabetic ketoacidosis.**
- **Administration of high K^+ concentrations via subclavian, jugular, or right atrial catheters should be avoided because local K^+ concentrations may be cardiotoxic.**
- **Hypomagnesemia frequently accompanies hypokalemia and generally must be corrected to successfully replenish K^+.**

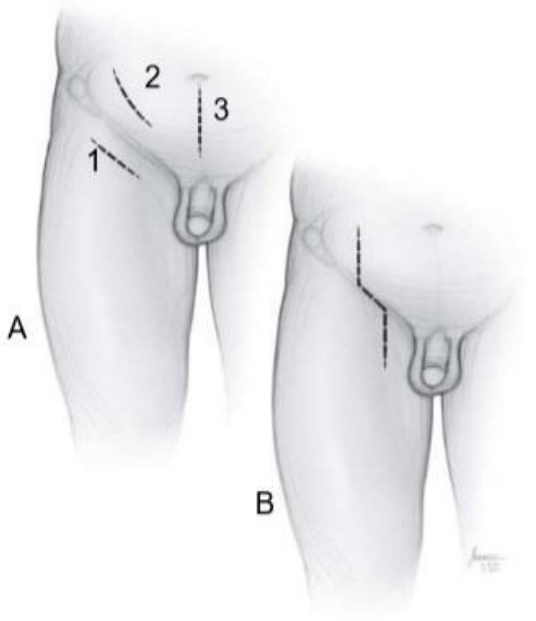
2. **Inguinal Anatomy: Inguinal LNs are divided into superficial & deep groups separated by fascia lata of thigh.**
   Superficial group composed of 4-25 LNs.
   Five anatomic group : 1) central nodes arnd SFJ 2) superolateral nodes arnd sup. Circumflex vein 3) inferolateral nodes around lat. Femoral cut. Vein 4) superomedial nodes around sup. Ext. pudendal vein 5) inferomedial nodes around great saphenous vein.

   Deep group :
   lie medial to Femoral Vein in femoral canal
   Node of Cloquet is most cephalad of the group
   External iliac LNs receive drainage from the deep inguinal,obturator and hypogastric groups and drain to common iliac and para-aortic nodes.

   The inguinofemoral dissection is designed to cover an area outlined superiorly by a line drawn from the superior margin of the external ring to the anterior superior iliac spine, laterally by a line drawn from the anterior superior iliac spine extending 20 cm inferiorly, and medially by a line drawn from the pubic tubercle 15 cm down the medial thigh.



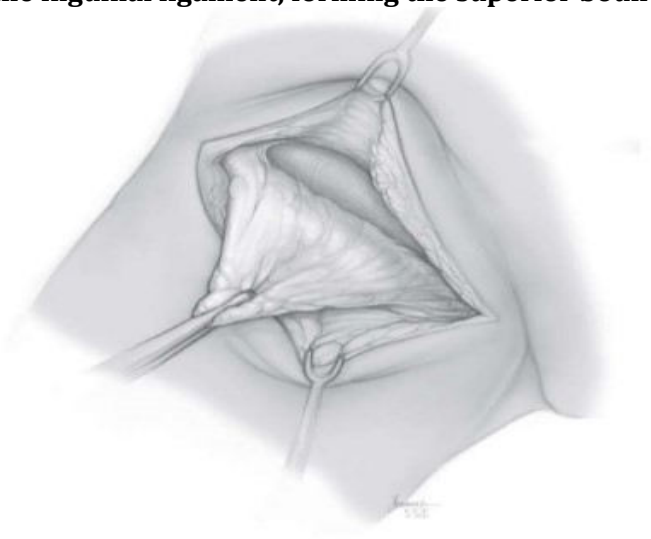
Limits of standard and modified groin dissection



Ilioinguinal lymph node dissection. **A**, Incisions for inguinofemoral lymph node dissection (1), unilateral pelvic lymph node dissection (2), and bilateral pelvic lymph node dissection (3). **B**, Single-incision approach for ilioinguinal lymph node dissection.

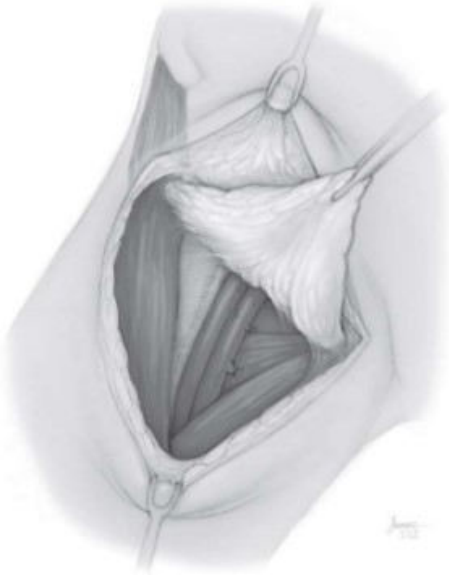
An oblique incision approximately 3 cm below and parallel to the inguinal ligament and extending from the lateral to the medial limit of the dissection
Superior and inferior skin flaps are developed in the plane just below the Scarpa fascia.
The superior flap is elevated cephalad to a point 4 cm above the inguinal ligament, and the inferior flap to the limit of the dissection.

The fat and areolar tissues are dissected from the external oblique aponeurosis and the spermatic cord to the inferior border of the inguinal ligament, forming the superior boundary of the lymph node packet



Initial dissection for radical inguinofemoral lymph node dissection with exposure of superior border defined by the external oblique fascia.

The inferior angle of the inguinofemoral exposure is at the apex of the femoral triangle, where the long saphenous vein is identified and divided
The saphenous vein is divided at the saphenofemoral junction, and the dissection is continued superiorly to include the deep inguinal nodes medial and lateral to the femoral vein until continuity with the pelvic dissection is attained at the femoral canal.



Inferior dissection during radical inguinofemoral lymph node dissection with removal of lymph node packet from the inferior border of the femoral triangle. After further lateral and medial dissection, the packet will remain in continuity with the pelvic dissection in the area of the femoral canal.

After the femoral triangle is dissected , the sartorius muscle is mobilized from its origin at the anterior superior iliac spine and either transposed or rolled 180 degrees medially to cover the femoral vessels.
The muscle is sutured to the inguinal ligament superiorly, and its margins are sutured to the muscles of the thigh immediately adjacent to the femoral vessels.
The femoral canal is closed, if necessary, by suturing the shelving edge of the inguinal ligament to the Cooper's ligament.
Closed-suction drains are placed under the subcutaneous tissue and brought out inferiorly.
During closure, the skin flaps are sutured to the surface of the exposed musculature to decrease dead space.
The skin is closed with absorbable subcutaneous sutures and staples.
The patient is maintained at bed rest for 2 or 3 days, and pneumatic compression stockings are used.
The drains are removed after 5 to 7 days, when drainage is less than 30 to 40 mL/day.
Compression stockings are recommended postoperatively.

Complications of ilio-inguinal block dissection:

- **Lymphedema – may be debilitating.**
- **Deep venous thrombosis (DVT),**
- **Wound infection,**
- **Skin flap necrosis – occurs in 5% - 21% patients,**
- **Lymphocele,**
- **Lymphorrhoea**
- **Seroma**
- **Temporary lower extremity oedema**
-

3. Answer. Preoperative pharmacological management of patient with pheochromocytoma:

Medical therapy is used for preoperative preparation prior to surgical resection, for acute hypertensive crises, and as primary therapy for patients with metastatic pheochromocytomas. Preoperative preparation requires combined alpha and beta blockade to control blood pressure and to prevent an intraoperative hypertensive crisis. Alpha-adrenergic blockade, in particular, is required to control blood pressure and prevent a hypertensive crisis. High circulating catecholamine levels stimulate alpha receptors on blood vessels and cause vasoconstriction.

Beta blockers are used if significant tachycardia occurs after alpha blockade. Beta blockers are not administered until adequate alpha blockade has been established, however, because unopposed alpha-adrenergic receptor stimulation can precipitate a hypertensive crisis. Noncardioselective beta blockers, such as propranolol or nadolol, are the usual choice; however, cardioselective agents, such as atenolol and metoprolol, also may be used.

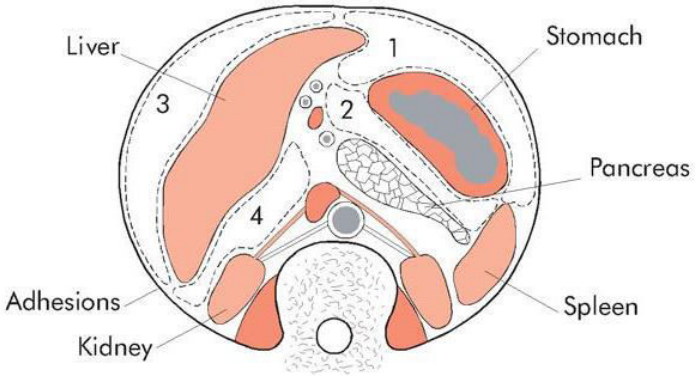
Labetalol is a noncardioselective beta-adrenergic blocker and selective alpha-adrenergic blocker that has been shown to be effective in controlling hypertension associated with pheochromocytoma. However, it has also been associated with paradoxic episodes of hypertension thought to be secondary to incomplete alpha blockade. Thus, its use in the preoperative treatment of patients with pheochromocytoma is controversial.

During surgery, intravenous phentolamine, a rapid-acting alpha-adrenergic antagonist, is used to control blood pressure. Rapid-acting intravenous beta blockers, such as esmolol, are also used to normalize blood pressure.

Selective alpha1 blocking agents, such as prazosin, terazosin, and doxazosin, have more favorable adverse effect profiles and are used when long-term therapy is required (metastatic pheochromocytoma). These medications are not used to prepare patients for surgery, because of their incomplete alpha blockade.

The patient with pheochromocytoma is invariably volume depleted. In other words, the chronically elevated adrenergic state characteristic of an untreated pheochromocytoma leads to near-total inhibition of renin-angiotensin activity, resulting in excessive fluid loss in the urine and thus reduced blood volume. Hence, once the pheochromocytoma has been resected, thereby removing the major source of circulating catecholamines, a situation arises where there is both very low sympathetic activity and volume depletion. This can result in profound hypotension. Therefore, it is usually advised to "salt load" pheochromocytoma patients before their surgery. This may consist of simple interventions such as consumption of high salt food pre-operatively, direct salt replacement or through the administration of intravenous saline solution.

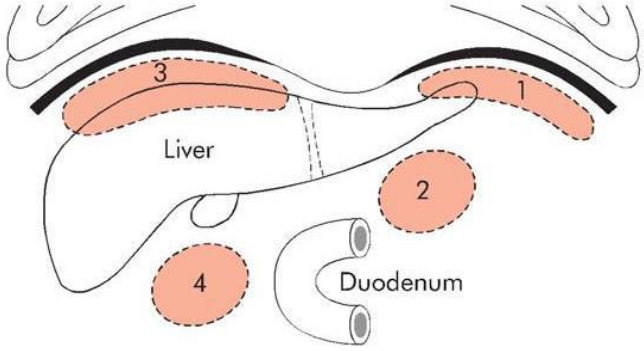
4. Introduction: The complicated arrangement of the peritoneum results in the formation of four intra peritoneal spaces in which pus may collect.



Intraperitoneal spaces on transverse section.

(1) The left subphrenic space; **(2) left subhepatic space/lesser sac;**

(3) right subphrenic space; **(4) right subhepatic space.**



Intraperitoneal spacses on sagittal section.

(1) Left subphrenic; **(2) left subhepatic/lesser sac;**

(3) right subphrenic; **(4) right subhepatic space.**

Left subphrenic space: This is bounded above by the diaphragm and behind by the left triangular ligament and the left lobe of the liver, the gastrohepatic omentum and the anterior surface of the stomach. To the right is the falciform ligament and to the left the spleen, gastrosplenic omentum and diaphragm.

The common cause of an abscess here is an operation on the stomach, the tail of thepancreas, the spleen or the splenic flexure of the colon.

Left subhepatic space/lesser sac:The commonest cause of infection here is complicated acute pancreatitis. In practice, a perforated gastric ulcer rarely causes a collection here because the potential space is obliterated by adhesions.

Right subphrenic space: This space lies between the right lobe of the liver and the diaphragm. It is limited posteriorly by the anterior layer of the coronary and the right triangular ligaments and to the left by the falciform ligament. Common causes of abscess here are perforating cholecystitis, a perforated duodenal ulcer, a duodenal cap 'blow-out' following gastrectomy and appendicitis.

Right subhepatic space:This lies transversely beneath the right lobe of the liver in Rutherford Morison's pouch. It is bounded on the right by the right lobe of the liver and the diaphragm. To the left is situated the foramen of Winslow and below this lies the duodenum. In front are the liver and the gall bladder and behind are the upper part of the right kidney and the diaphragm. The space is bounded above by the liver and below by the transverse colon and hepatic flexure. It is the deepest space of the four and the commonest site of a subphrenic abscess, which usually arises from appendicitis, cholecystitis, a perforated duodenal ulcer or following upper abdominal surgery.

Clinical features:

The symptoms and signs of subphrenic infection are frequently non-specific and it is well to remember the aphorism, 'pus somewhere, pus nowhere else, pus under the diaphragm'.

Symptoms: A common history is that, when some infective focus in the abdominal cavity has been dealt with, the condition of the patient improves temporarily but, after an interval of a few days or weeks, symptoms of toxaemia reappear. The condition of the patient steadily, and often rapidly, deteriorates. Sweating, wasting and anorexia are present. There is sometimes epigastric fullness and pain, or pain in the shoulder on the affected side, because of irritation of sensory fibres in the phrenic nerve, referred along the descending branches of the cervical plexus. Persistent hiccoughs may be a presenting symptom.

Signs: A swinging pyrexia is usually present. If the abscess is anterior, abdominal examination will reveal some tenderness, rigidity or even a palpable swelling. Sometimes the liver is displaced downwards but more often it is fixed by adhesions. Examination of the chest is important and, in the majority of cases, collapse of the lung or evidence of basal effusion or even an empyema is found.

Investigations:

A number of the following investigations may be helpful:

•Blood tests usually show a leucocytosis and raised C-reactiveprotein.

• A plain radiograph sometimes demonstrates the presence of gas or a pleural effusion. On screening, the diaphragm is often seen to be elevated (so called 'tented' diaphragm) and its movements impaired.

• Ultrasound or CT scanning is the investigation of choice and permits early detection of subphrenic collections.

• Radiolabelled white cell scanning may occasionally prove helpful when other imaging techniques have failed.

Differential diagnosis: Pyelonephritis, amoebic abscess, pulmonary collapse and pleural empyema may give rise to diagnostic difficulty.

Treatment: The clinical course of suspected cases is monitored, and blood tests and imaging investigations are carried out at suitable intervals. If suppuration seems probable, intervention is indicated. If skilled help is available it is usually possible to insert a percutaneous drainage tube under ultrasound or CT control. The same tube can be used to instill antibiotic solutions or irrigate the abscess cavity. To pass an aspirating needle at the bedside through the pleura and diaphragm invites potentially catastrophic spread of the infection into the pleural cavity. If an operative approach is necessary and a swelling can be detected in the subcostal region or in the loin, an incision is made over the site of maximum tenderness or over any area where oedema or redness is discovered.

If no swelling is apparent, the subphrenic spaces should be explored by either an anterior subcostal approach or from behind after removal of the outer part of the 12th rib according to the position of the abscess on imaging. With the posterior approach, the pleura must not be opened and, after the fibres of the diaphragm have been separated, a finger is inserted beneath the diaphragm so as to explore the adjacent area. The aim with all techniques of drainage is to avoid dissemination of pus into the peritoneal or pleural cavities. When the cavity is reached, all of the fibrinous loculi must be broken down with the finger and one or two drainage tubes must be fully inserted. These drains are withdrawn gradually during the next 10 days and the closure of the cavity is checked by sonograms or scanning. Appropriate antibiotics are also given.

5. Composite mesh:

Latest technical advances have now made available prosthetic materials, which prevent bowel adhesions.

- **Lightweight Composite Meshes without Adhesion Prevention "Barrier"**
  - **VYPRO II.**
- **ULTRAPRO.**
- **New Composite Meshes with Adhesion Prevention "Barrier": Repair of ventral and incisional hernia may be undertaken by minimal access surgery rather than the conventional open technique. To achieve this repair, intraperitoneal placement of mesh requires a material which has both high tissue ingrowth towards the abdominal wall and nonadhesiveness on the other side to prevent bowel adhesions.**

- **Absorbable barrier composite mesh:**
  - **Sepramesh: Sepramesh Biosurgical composite (Genzyme Biosurgery, Cambridge, USA) is a dual-component prosthetic biomaterial composed of macroporous polypropylene on one side, with bioresorbable, nonimmunogenic membrane of sodium hyaluronate and carboxymethyl cellulose on the other side. Seprafilm was designed to provide protection against intra-abdominal adhesion formation throughout the critical period of remesothelialization during the first postoperative week. The absorbable barrier turns to a gel in 48 h, remains on the mesh for ~7 days and is cleared from the body in 28 days. This antiadhesive material forms a physical barrier on damaged surfaces to prevent adherence or reduce viscosity between opposing tissues. The physical barrier should allow injured tissues to heal separately from each other. In addition, the sodium hyaluronate and carboxymethyl cellulose are anionic polyaccharides that form a membrane that is negatively charged, a molecular property that promotes the separation of healing tissues.**
  - **Parietex Composite Mesh and Parientene Composite Mesh*:* Parietex composite (Sofradim, France) is composed of multifilament polyester mesh with a purified, oxidized bovine atelocollagen type I coating covered by an absorbable, antiadhesion film of polyethylene glycol and glycerol. Polyethylene glycol is a hydrogel that decreases tissue adherence and glycerol is a hydrophobic lipid. The collagen coating functions to promote collagen ingrowth by increasing the hydrophilicity of the polyester mesh and decreasing the fibrous tissue reaction to the 'foreign' material (mesh). The collagen, polyethylene glycol and glycerol film are resorbed in ~3 weeks. Parientene composite mesh consists of the same antiadhesive barrier but coated to polypropylene.**

- **PROCEED Surgical Mesh: PROCEED surgical mesh (Johnson and Johnson, India) is a sterile multilayered, thin, flexible, laminate mesh comprised of an oxidized regenerated cellulose (ORC) fabric; and PROLENE soft mesh, a nonabsorbable polypropylene mesh which is encapsulated by a polydioxanne polymer. The polypropylene mesh side of the product allows for tissue ingrowth, while the ORC side provides a bioresorbable layer that physically separates the polypropylene mesh from underlying tissue and organ surfaces during the wound-healing period to minimize tissue attachment to the mesh. The polydioxanone provides a bond to the ORC layer.**

It has a lightweight macroporous mesh construction, leaves behind less residual foreign body, allows the fluid to flow through easily and does not harbor bacteria.

❖ **Non Absorbable barrier composite mesh:**

- **Bard Composix Mesh: This is a combination of polypropylene that has a thin coat of ePTFE on one side to prevent bowel adhesions. Introduction through a laparoscopic port is difficult because it cannot compress the mesh and hence requires a larger port (12 mm) for its introduction.**
- **GORE-TEX Dual Mesh: The Gore-Tex Dual mesh (W. L. Gore, USA) material has two surfaces; one is very smooth (micropores 3 mm) and the other is rough (micropores approximately about 22 mm). It is designed to be implanted with the smooth surface against the visceral organs - tissue to which no or minimal adhesion is desired - and the other surface against which tissue incorporation is desired. The Dual mesh comes in two choices: one is a solid sheet and the other is perforated to allow for greater tissue incorporation. A recent innovation is the incorporation of silver and chlorhexidine into the ePTFE. This results in a significant antimicrobial action.**

The use of novel absorbable and nonabsorbable barriers on composite meshes to reduce the incidence of adhesion and adhesion-related complications has been evaluated in animal models and a few clinical studies have been reported. The incidence of adhesions and tenacity of adhesions were reduced for all of the barrier meshes compared with the macroporous polyester mesh.

The development of new prosthetic biomaterials with the addition of absorbable and nonabsorbable barriers for adhesion prevention after intra-abdominal placement of mesh during open and laparoscopic hernia repair is potentially a significant advancement in the management of ventral and incisional hernias. Long-term follow-up is desirable to determine if Sepramesh, Parietex Composite, Parientene Composite, PROCEED surgical, Bard Composix and Gore-Tex Dual meshes will decrease the incidence of mesh-related complications compared to nonbarrier, macroporous meshes.

- **Answer. Myopectineal orifice of Fruchand.**

- **The term [myopectineal orifice] was coined originally by Dr. Henri Fruchaud, and refers to a "distinct area of weakness in the pelvic region". The term [myopectineal] arises from two root terms which are combined. The root term [-my-] means "muscle" and the term [-pect-] means "comb"or "pectinate". The word [pectineal] in this case refers to the pelvic bone area of origin of the pectinate muscle of the thigh.**
- **Fruchaud postulated that the anterior abdominal wall has an area that is inherently weak, and that this area is genetically determined. As such, hernias are part of human nature, or as he stated, "a healthy man is, unknown to himself, a hernia bearer".**
- **Fruchaud myopectineal orifice is an osseomyo- aponeurotic tunnel through which all the groin hernia comes out.**

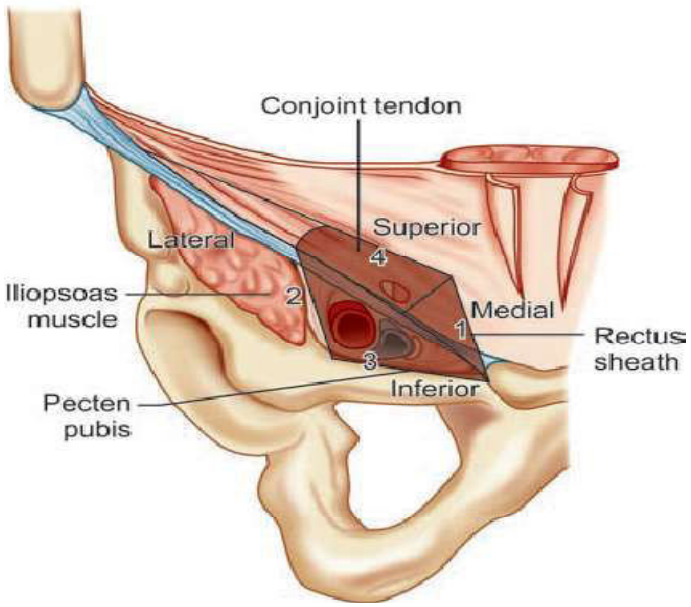
This orifice is bounded by:

Medially by the lateral border of the rectus sheath (1).

Laterally by the iliopsoas muscle (2).

Below by the pecten pubis and fascia covering it and the Cooper's ligament (3).

Above by the arched fibres of internal oblique, transversus abominis muscle and the conjoint tendon (4).



Schematic diagram of Fruchaud's myopectineal orifice

7. **Nutritional augmentation in surgical patients:**

   The surgical patient with established malnutrition should begin aggressive nutrition at least 7–10 days before surgery. Those patients in whom eating is not anticipated beyond the first 5 days following surgery should receive the benefits of early enteral or parenteral feeding depending on whether the gut can be used.

Table 1: Nutrition Risk Screening 2002 [23]

Nutritional Risk Scoring	Yes	No
Initial screening		
Is BMI<20.5?		
Has the patient lost weight within the last 3 months?		
Has the patient reduced dietary intake in the last week?		
Is the patient severely ill (e.g. in intensive therapy)?		
Yes: If the answer is 'Yes' to any question, the final screening is performed		
No: If the answer is 'No' to all questions, the patient is rescreened at weekly intervals. If the patient, for example, is scheduled for a major operation, a preventative nutritional care plan is considered to avoid the associated risk status		
Final screening		
Impaired nutritional status [severity of disease (≈increase in requirement)]		
Absent score 0	Normal nutritional status	Normal nutritional requirements
Mild score 1	Weight loss>5% in 3 months or food intake below 50–75% of normal requirement in preceding week	Hip fracture[a], chronic patients, in particular with acute complications: cirrhosis[a], chronic obstructive pulmonary disease[a], chronic hemodialysis, diabetes, oncology
Moderate score 2	Weight loss>5% in 2 months or BMI 18.5–20.5+ impaired general condition or food intake 25–60% of normal requirement in preceding week	Major abdominal surgery[a], stroke[a], severe pneumonia, hematologic malignancy
Severe score 3	Weight loss>5% in 1 month (>15% in 3 months) or BMI >18.5 +impaired general condition or food intake 0–25% of normal requirement in preceding week	Head injury[a], bone marrow transplantation[a], intensive care patients

Score≥3: The patient is nutritionally at-risk and a nutritional care plan is initiated. Score<3: Weekly rescreening of the patient. If the patient, for example, is scheduled for a major operation, a preventive nutritional care plan is considered to avoid the associated risk status. [a]A trial directly supports the categorization of patients with that diagnosis.

Nutritional Assessment

- Nutritional Risk Screening (NRS) 2002

Impaired Nutritional Status		Severity of Disease	
Absent 0	Normal Nutritional Status	Absent 0	Normal Nutritional Requirements
Mild 1	Weight loss > 5% in 3 months 50-75% of usual food intake over last week	Mild 1	Hip fracture Cirrhosis, DM, Benign Cx Hemodialysis, COPD
Mod 2	Weight loss > 5% in 2 months BMI 18.5-20.5 with impaired general condition 25-50% of usual food intake over last week	Mod 2	Major abdominal surgery Stroke, PNA, Malignancy
Severe 3	Weight loss of > 5% in 1 month Weight loss > 15% in 3 months BMI < 18.5 with impaired general condition 0-25% of usual food intake over last week	Severe 3	Head injury Bone marrow transplant ICU admission

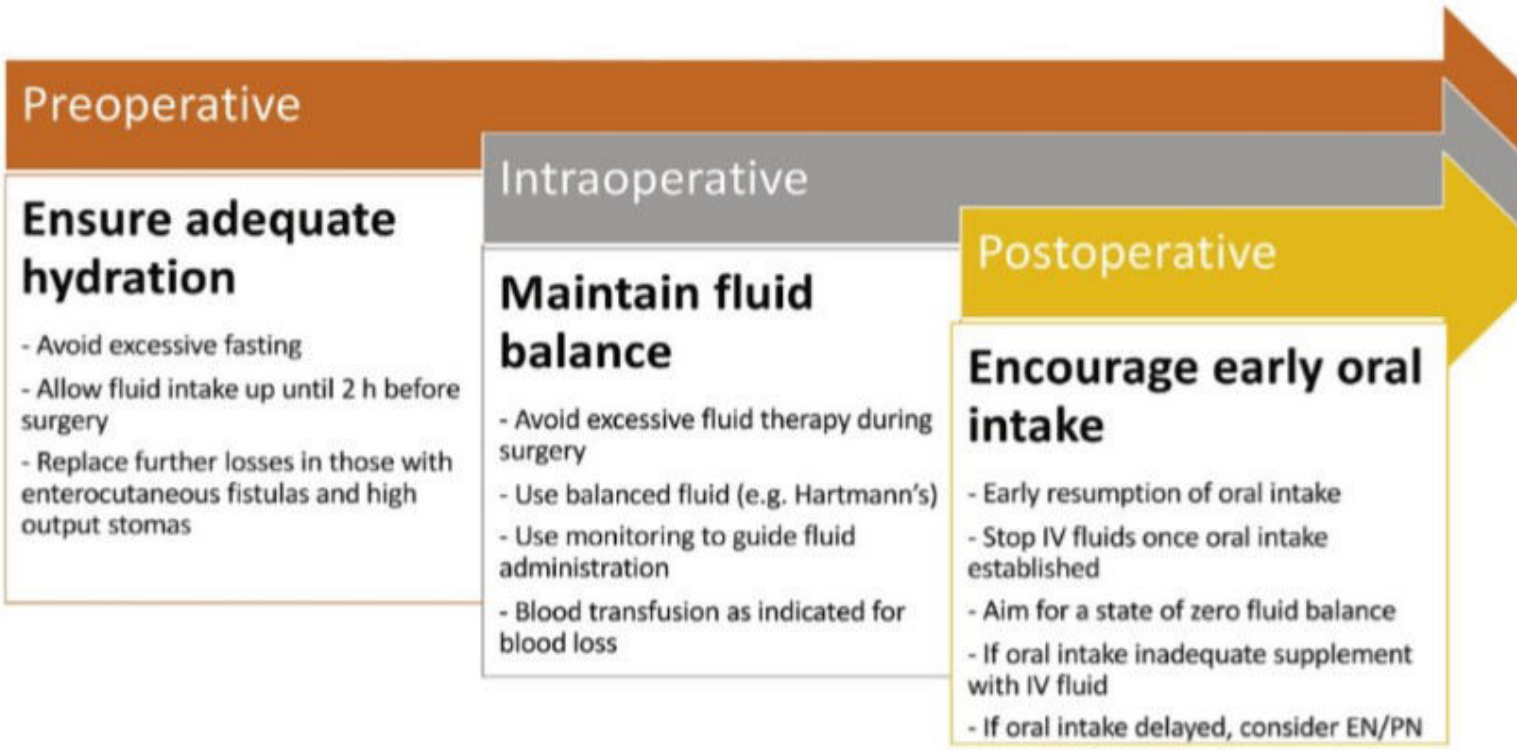
- Pre-operative serum albumin < 3.0 mg/dL

Pre-Operative Fasting: 8-12 hour fast depletes almost all glycogen stores

Carbohydrate loading: Surgical stress causes postoperative insulin resistance, immunosuppression, and increased patient discomfort . Patient outcomes may be improved by a shorter fasting period preceded by prescribed carbohydrate intake . Studies have reported that postoperative insulin sensitivity is preserved by carbohydrate drinks (100 g the night before surgery and 50 g 2 h before surgery)or intravenous glucose (5 mg/kg/min), possibly through suppression of fat and glucose oxidation and attenuation of pyruvate dehydrogenase kinase.

Preoperative nutritional support and immunonutrition

International guidelines recommend nutritional support for severely malnourished patients 7–14 days before elective major surgery. Severely malnourished patients have at least one of the following: weight loss more than 10–15% within 6 months; BMI less than 18.5 kg/m^2; or serum albumin below 30 g/l without hepatic or renal dysfunction.



- **Identification of malnourished patients and prehabilitation prior to surgery**
- **If the gut works, use it after 24 hours postop**
- **Enteral > Parenteral**

8. **NEGATIVE PRESSURE WOUND THERAPY (NPWT): NPWT is a recent technique which facilitates wound treatment utilizing sub atmospheric pressure. It consists of placing an open cell wound interface (eg. sponge,/gauze) directly on wound surface and covering it with occlusive film. Negative pressure is then applied to entire wound surface.**

Contents of NPWT dressing pack 1. Sterile open cell wound interface of small, medium and large sizes 2. Flexible vacuum tubing 3. Occlusive adhesive transparent dressing 4. Canister (collection chamber with connecting tubing) 5. Vacuum pump.

How NPWT works? 1. Provides a closed and moist wound healing environment 2. Decreases wound volume 3. Removes excess fluids that can inhibit wound healing 4. Helps remove interstitial fluid 5. Promotes granulation

Indications of NPWT:

- **Huge, clean and/or exudative wound while waiting for definitive wound closure**
- **Fixation of skin grafts (mesh-grafts) and tissue flaps**

Contraindications of NPWT

- **Clotting disorders (Risk of bleeding)**

- **Necrotic wound bed or eschar (barrier to new tissue growth)**
- **Untreated infection (Due to deep extension of potential infectious focus) •**
- **Neoplastic tissue in wound area.**

How to apply NPWT?

- **Cut wound interface to fit shape of wound**
- **Place wound interface on wound bed till flushed with edges**
- **Place vented end of flexible vacuum tubing**
- **Cover wound interface and tubing with occlusive adhesive dressing**
- **Ensure tight seal**
- **Connect open end of tubing to canister on vacuum pump.**
- **Program prescribed amount of pressure and suction interval**

Complications of NPWT:

- **Toxic shock syndrome**
- **Wound infection caused by anaerobes**
- **Loss of blood and fluid**

Side effects of NPWT:

- **Ingrowth of granulation tissue into foam**
- **Pain ass. with effects of suction and dressing changes**
- **Maceration and pressure damage to adjacent skin areas**
- **Reduction in perfusion caused by pressure on small vessels**

9. Never Events are patient safety incidents that are considered preventable when national guidance or safety recommendations that provide strong systemic protective barriers are implemented by healthcare providers. Things to be included:

- **How to create a receptive team culture during interventional procedures: one where questioning related to safety is welcomed, advice listened to and acted on, and all staff are encouraged to speak up when they have concerns.**
- **Reducing the risks and enhancing awareness of safety in situations where team members are unfamiliar with each other or with the environment, equipment or procedure**
- **Developing the use of safety checks, so that they are done because all those participating realise their importance, not because they have been mandated.**

Other areas with potential for improvement include:

- **Interruptions and distractions: these were described as leading to a loss of situational awareness in several cases – reducing these and recognising how they impact on concentration remain a challenge, despite what has been learned from research and from other industries.**
- **Site marking: more work is needed to identify the best way to mark surgical sites for: hand and foot surgery; angiograms that are side specific; dermatology; and pain injections.**
- **Reducing transcription errors: removing the need to copy information from one piece of paper to another or from paper to computer remains a challenge. Several cases highlighted that a transcription error may be copied onto all other records including the theatre list.**
- **Counting: following a Never Event many trusts have added items to their count policies,**
- **Equipment with covers or caps that come apart: several of the cases raised the question of how to handle covers and caps that are passed across the surgical field.**

- **Design: manufacturers of medical implants, components and devices need to add visual cues to clearly display side and size on their packaging and, if possible, the device itself. The medical device/implant industry should consider using a common size indicator and colour code for left and right labelling and packaging. Similarly, manufacturers need to consider designing visual cues for equipment and supplies that are wholly inserted into the surgical field, to help prevent retention of foreign objects.**
- **Reducing choice of implants and components: lack of familiarity with implants, equipment and consumables was the cause of some of the Never Events reviewed. Reducing the number of different types available would increase staff familiarity with what is being used, as well as reducing the training load.**
- **Size and side compatible components: where multiple components are used that need to be both size and side compatible, systems and procedures are needed to check compatibility before each component is used.**

Example Never Event: retained guide wire
A severely ill patient was admitted to the coronary care unit where their condition deteriorated rapidly. The doctor needed to administer emergency drugs by intravenous infusion. Accessing the patient's veins was difficult so the doctor inserted an emergency central line through a vein in the patient's leg using a technique that required a guide wire. The doctor was under pressure due to the patient's condition and wanted to check immediately that the sheath was in the femoral vein, so they quickly aspirated blood and then flushed the sheath ready for use – forgetting to remove the guide wire. The flush pushed the guide wire into the patient's vein and it travelled around their body and lodged near their heart. The fact that the guide wire had been retained was not noticed until three weeks later when the patient was transferred for heart surgery. The guide wire was removed successfully by a specialist team after two attempts.

Definitions and examples:

- **Wrong site surgery:**

This includes:
• "Wrong level spinal surgery and interventions that are considered surgical but may be done outside of a surgical environment, eg wrong site block (unless being undertaken as a pain control procedure), biopsy, interventional radiology procedures, cardiology procedures, drain insertion and line insertion, eg [peripherally inserted central catheter] PICC/Hickman lines."
But excludes:
• "Interventions where the wrong site is selected because of unknown/unexpected abnormalities in the patient's anatomy. This should be documented in the patient's notes.
• Incidents where the wrong site surgery is due to incorrect laboratory reports/results or incorrect referral letters."

- **Wrong implant/prosthesis**
- **Retained foreign objects after a surgical/invasive procedure**

The London protocol for classifying the contributory factors in healthcare adverse events (Taylor-Adams et al (2004)

Factor type	Influencing/contributory factors
Institutional context	Economic and regulatory context National guidelines and policies
Organisational and management factors	Trust financial resources and constraints Organisational structure Trust policy standards and goals Safety culture and priorities
Work environment factors	Staffing levels and skills mix Workload and shift patterns Design, availability and maintenance of equipment Design of the work space including noise levels
Team factors	Verbal communication Written communication Supervision and seeking help Team structure (congruence, consistency, leadership, etc)
Individual (staff) factors	Knowledge and skills Competence Physical and mental health
Task factors	Task design and clarity of structure Availability and use of protocols Availability and accuracy of test results
Patient factors	Condition (complexity and seriousness) Language and communication Personality and social factors

Definition of 'Never Events' declares it as an identifiable and preventable medical 'Error' resulting in serious consequences for patients. Literal meaning of an 'Error' according to advance English dictionary is a wrong action attributable to bad judgement or ignorance or attention. But when we look at the frequency, magnitude, and impact of this never event's 'Error' on the patient safety, it is difficult to digest it as a once in a while incidence pertaining to human error. It casts doubt on our system which just formally disposes off the case on the basis of anecdotal media coverage and then forgets it. Probably, this is the only reason that in spite of lot of action being taken against this problem in past decade, situation is not as good as it should be. There are so many much higher risky organisations, for example aviation industry, nuclear reactors, and sub marines, which have comparatively much better safety record than our health care delivery organisations. Reason for their better safety record is that they are always in anticipation mode, follow strict code of conduct and strong leadership with cohesive team work, and personality of organisation is much above than personality of individual. However, we cannot deny the fact that on a given day, even the best person can make the worst error, and we cannot make any action hundred percent free of error or free of accident. Also, the complex system of surgical management requiring multi-disciplinary approach with multiple level of intervention makes it more error prone. In such scenario, no magic pill can be expected to improve the patient safety but a comprehensive approach would only help to minimise this grave problem. Keeping in view of its magnitude and widespread universal root, strategic approach is required which can be applied right from institution to national and international level.

10. Carbon dioxide CO_2 pneumoperitoneum and increased intraabdominal pressure can induce many pathophysiologic disturbances, requiring the anesthesiologist to be well alert during the operation for necessary management.

Respiratory changes: The physiology of respiratory system is affected by pneumoperitoneum. With insufflation, causing an increase in intraabdominal pressure (IAP), the diaphragm is pushed upwards causing stiffness of the chest wall, causing the total volume of the lungs to be reduced. Hence the pulmonary compliance is decreased to 35–40% and also a non-negligible increase in the maximum respiratory system resistance Hypoxemia may occur from a ventilationperfusion mismatch and intrapulmonary shunting but is rare in healthy patients.

(Carbon dioxide is usually administered at a rate of 1–2 ml/min. Being a highly soluble gas, it is readily absorbed into the circulation through the peritoneum, causing hypercapnia and acidosis.)

Several studies have shown the effect of CO_2 pneumoperitoneum on the arterial partial pressure of CO_2 ($PaCO_2$) and end-tidal CO_2 ($ETCO_2$)Carbon dioxide is mainly excreted by the lungs, depending on alveolar and mixed venous CO_2 exchange rates, which are themselves controlled by the cardiac output, alveolar ventilation and respiratory quotient . Normal excretion of CO_2 is 100–200 mL/min and is increased by 14–48 mL/min when CO_2 is administered intraperitoneally. After a long laparoscopic operation, achieving a normal CO_2 value can take several hours after desufflation, since high use of peripheral storage capacity will lengthen the duration of increased $PaCO_2$.

- **Cardiovascular changes: Cardiovascular system effects during CO_2 pneumoperitoneum are caused mainly by hypercarbia followed by acidosis and increased intra-abdominal pressure. A euvolemic status is of great importance prior to surgery to reduce any cardiac depression via reduced preload caused by the pneumoperitoneum.**
  Hypercarbia has direct and indirect sympathoadrenal stimulating effects on cardiovascular functions. These effects are not pronounced with mild hypercarbia ($PaCO_2$ 45–50 mmHg), whereas moderate to severe hypercarbia affects cardiac function since it is then a myocardial depressant and has direct vasodilatary effect.
- **Renal changes: Oliguria is the most common renal effect of pneumoperitoneum. Different mechanisms are involved in the reduction of the urine amount during IAP. IAP also activates of the renin-angoitensin-aldosterone system following decreased renal perfusion, which results in renal cortical vasoconstriction.**

Level of ADH, renin, and aldosterone significantly increased during laparoscopic GBP. Renal blood flow has been measured during increasing IAP, and a gradual decrease in RBF up to 75% was observed upon reaching a pressure of 15 mmHg.those with maintenance fluid, whereas this change was not noticed in well-hydrated animals with adequate volume loading. Controversially, there are also studies that reported no RBF changes during pneumoperitoneum.

- **Splanchnic changes: The splanchnic circulation is also affected during raised IAP. Depending on intra-abdominal pressures, studies in animals have show decrease in splanchnic macro and micro-circulation. Signs of hepatocytic damage [38] were noticed, with increase of glutamic oxaloacetic transaminase and glutamic pyruvic transaminase. Impaired Kupffer cell function and gastric intramucosal pH drop were also noticed.**

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2019

March, 2019

PAPER I

Time Allowed: 3 Hours **Full Marks: 100**

1. **Radiotherapy in carcinoma breast. 10**
2. **Indications and techniques of supplementing nutrition in surgical patients. 10**
3. **Current status of immunotherapy in cancer patients. 10**
4. **Development and descent of testis. 10**
5. **Evaluation of a patient of obstructive jaundice. 10**
6. **Role of endoscopic ultrasound in diagnostic evaluation. 10**
7. **Metabolic changes and its management in gastric outlet obstruction. 10**
8. **Triage in disaster and principles of a polytrauma patient.10**
9. **Clinical approach to hyponatremia. 10**
10. **Role of sentinel node biopsy in common malignancy. 10**

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2019

March, 2019

PAPER I

Time Allowed: 3 Hours **Full Marks: 100**

1. Radiotherapy in carcinoma breast. 10

Answer. Radiation therapy for breast cancer may be delivered in two ways:

- External radiation.
- Internal radiation (brachytherapy)

❖ Radiation after lumpectomy

- ➢ After a lumpectomy for breast cancer, radiation therapy is typically used.
  - o External beam radiation of the whole breast. One of the most common types of radiation therapy after a lumpectomy is external beam radiation of the whole breast (whole-breast irradiation).
  - o Partial-breast irradiation. For some women with early-stage breast cancer, partial-breast radiation may be an option. The radiation therapy is directed to the area around where the tumor was removed, which is at highest risk of having any remaining cancer cells. This radiation can be delivered internally with brachytherapy or externally with X-rays (photons) or protons. Because a smaller area is treated, treatment schedules may be shorter, such as one to two treatments a day over three to five days.

❖ Radiation after mastectomy

- Removal of the entire breast (mastectomy) does not eliminate the risk of recurrence in the remaining tissues of the chest wall or lymph nodes. In many situations, the risk of recurrence is high enough that radiation is recommended after mastectomy. This type of radiation is called post-mastectomy radiation therapy and is typically administered five days a week for five to six weeks.
- Factors that may put you at a high enough risk of breast cancer recurrence in your chest wall or lymph nodes to warrant consideration of radiation after mastectomy include:
  - Lymph nodes with signs of breast cancer. Underarm (axillary) lymph nodes that test positive for cancer cells are an indication that some cancer cells have spread from the primary tumor.
  - Large tumor size. A tumor greater than about 2 inches (5 centimeters) generally carries a higher risk of recurrence than do smaller tumors.

- Tissue margins with signs of breast cancer. After breast tissue is removed, the margins of the tissue are examined for signs of cancer cells. Very narrow margins or margins that test positive for cancer cells are a risk factor for recurrence.

❖ Radiation for locally advanced breast cancer:

Radiation therapy can also be used to treat:

- Breast tumors that cannot be surgically removed.
- Inflammatory breast cancer, an aggressive type of cancer that spreads to the lymph channels of the skin covering the breast. People who have this type of cancer typically receive chemotherapy before a mastectomy, followed by radiation, to decrease the chance of recurrence.

❖ Radiation for managing metastatic breast cancer:

If breast cancer has spread to other parts of your body (metastasized) and a tumor is causing pain or some other symptom, radiation can be used to shrink the tumor and ease that symptom.

❖ Proton therapy

Proton therapy offers more precise radiation dose delivery to the treatment target and protection of nearby healthy tissue. This is because proton beams, unlike X-rays, do not travel beyond the target. Therefore, researchers hope that proton therapy will decrease the risk of serious long-term complications of radiation therapy. However, proton therapy still carries risk of side effects because the targeted area may contain skin, muscle, nerves and other important tissue.

Proton therapy is being researched in patients with early-stage and locally advanced breast cancer.

2. Indications and techniques of supplementing nutrition in surgical patients. 10

Answer. Indications:

- The patient's premorbid state (healthy or otherwise)
- Poor nutritional status (current oral intake meeting <50% of total energy needs)
- Significant weight loss (initial body weight less than usual body weight by 10% or more or a decrease in inpatient weight by more than 10% of the admission weight
- The duration of starvation (>7 days' inanition)
- An anticipated duration of artificial nutrition (particularly total parenteral nutrition [TPN]) of longer than 7 days
- The degree of the anticipated insult, surgical or otherwise
- A serum albumin value less than 3.0 g/dL measured in the absence of an inflammatory state

- A transferrin level of less than 200 mg/dL
- Anergy to injected antigens

Indications for Parenteral Nutrition

Primary Therapy

Efficacy shown

Gastrointestinal cutaneous fistulas

Renal failure (acute tubular necrosis)

Short-bowel syndrome

Acute burns

Hepatic failure (acute decompensation superimposed on cirrhosis)

Efficacy not shown

Crohn's disease

Anorexia nervosa

Supportive Therapy

Efficacy shown

Acute radiation enteritis

Acute chemotherapy toxicity

Prolonged ileus

Weight loss preliminary to major surgery

Efficacy not shown

Before cardiac surgery

Prolonged respiratory support

Large wound losses

Areas Under Intensive Study

Patients with cancer

Patients with sepsis

Techniques of Supplementation of nutrition:

- Routes for Administration of Enteral Feeding:
  - Nasoenteric and postpyloric feeding

- Gastrostomy
- Jejunostomy

➢ Routes of administration for TPN

- Peripheral (PPN) given via a medium calibre cannula in a peripheral vein. Maximum calorie input limited by the maximum osmolarity of the solution given into a peripheral vein. Avoids the risks of central venous cannulation. Usually used for short-term supplementation.
- Central (TPN) given into a central vein (SVC or brachiocephalic). May be via a dedicated tunnelled line (e.g. Hickman line), a conventional central venous cannula, or a peripherally inserted central venous catheter (PICC line). Maximum calorie input only limited by volume of fluid that can be infused. Carries risks of central venous catheterization.

- In general, the enteral route is preferred over the parenteral route.
- Enteral feeding is simple, physiologic, relatively inexpensive, and well tolerated by most patients. Enteral feeding maintains the GI tract cytoarchitecture and mucosal integrity (via trophic effects), absorptive function, and normal microbial flora.
- This results in less bacterial translocation and endotoxin release from the intestinal lumen into the bloodstream.
- Enteral feedings are indicated for patients who have a functional GI tract but are unable to sustain an adequate oral diet.
- Enteral feedings may be contraindicated in patients with an intestinal obstruction, ileus, GI bleeding, severe diarrhea, vomiting, enterocolitis, or a high-output enterocutaneous fistula.
- Feeding tubes: Nasogastric, nasojejunal (e.g., Dobhoff), gastrostomy, and jejunal tubes (feeding jejunostomy) are available for the administration of enteral feeds. Percutaneous gastrostomy tubes can be placed endoscopically or under fluoroscopy.
- Enteral feeding products. A variety of commercially available enteral formulas are available. Standard solutions provide 1 kcal/mL; calorically concentrated solutions (>1 kcal/mL) are available for patients who require volume restriction. The available dietary formulations for enteral feedings can be divided into polymeric (blenderized and nutritionally complete commercial formulas), chemically defined formulas (elemental diets), and modular formulas.
  - Blenderized tube feedings can contain any food that can be blenderized. Caloric distribution of these formulas should parallel that of a normal diet.
  - Nutritionally complete formulas (standard enteral diets) vary in protein, carbohydrate, and fat composition.
  - Chemically defined formulas (elemental diets). The nutrients are provided in predigested and readily absorbed form. They contain protein in the form of free amino acids or polypeptides. They are hyperosmolar, which may cause cramping and diarrhea. Elemental diets are efficiently absorbed in the presence of compromised gut function. However, they are costlier.
  - Modular formulations are designed for use in specific clinical situations (e.g., pulmonary, renal, or hepatic failure or immune dysfunction).
- Enteral feeding protocols. It is recommended to start with a full-strength formula at a slow rate, which is steadily advanced. This reduces the risk of microbial contamination and achieves goal intake earlier. This approach can also be used with high-osmolarity or elemental feeds. Conservative initiation and advancement are recommended for patients who are critically ill, those who have not been fed for some time, and those receiving a high-osmolarity or calorie-dense formula.

- Bolus feedings are reserved for patients with nasogastric or gastrostomy feeding tubes. Feedings are administered by gravity, begin at 50 to 100 mL every 4 hours, and are increased in 50-mL increments until goal intake is reached (usually 240 to 360 mL every 4 hours). Tracheobronchial aspiration is a potentially serious complication because feedings are prepyloric. To reduce the risk of aspiration, the patient's head and body should be elevated to 30 to 45 degrees during feeding and for 1 to 2 hours after each feeding. The gastric residual volume should be measured before administration of the feeding bolus. If this volume is greater than 50% of the previous bolus, the next feeding should be held. The feeding tube should be flushed with approximately 30 mL of water after each use. Free water volume can be adjusted as needed to treat hypo- or hypernatremia.
- Continuous infusion administered by a pump is generally required for nasojejunal, gastrojejunal, or jejunal tubes. Feedings are initiated at 20 mL/hour and increased in 10- to 20-mL/hour increments every 4 to 6 hours until the desired goal is reached. The feeding tube should be flushed with approximately 30 mL of water every 4 hours. Feedings should be held or advancement should be slowed if abdominal distension or pain develops.

For some patients, the entire day's feeding can be infused over 8 to 12 hours at night to allow the patient mobility free from the infusion pump during the day.

- Conversion to oral feeding. When indicated, an oral diet is resumed gradually. In an effort to stimulate appetite, enteral feeding can be modified by the following measures:
    - Providing fewer feedings.
    - Holding daytime feedings.
    - Decreasing the volume of feedings. When oral intake provides approximately 75% of the required calories, tube feedings can be stopped.
- Administration of medications. Many oral medications can be administered through feeding tubes. The elixir form is preferred but is not always available. Medications that are not suitable for administration through a feeding tube include the following:
    - Enteric-coated medications.
    - Drugs in gelatinous capsules.
    - Medications that are designed for sublingual use.
    - Most sustained-release medications.

Perenteral nutrition:

- TPN solutions must be administered through a central venous catheter. A dedicated single-lumen catheter or a multilumen catheter can be used. Catheters should be replaced for unexplained fever or bacteremia.

- Administration of TPN.

- Introduction of TPN should be gradual. For example, approximately 1,000 kcal is provided the first day. If there is metabolic stability (i.e., normoglycemia), this is increased to the caloric goal over 1 to 2 days.
- TPN solutions are delivered most commonly as a continuous infusion. A new 3-in-1 admixture bag of TPN is administered daily at a constant infusion rate over 24 hours. Additional maintenance intravenous fluids are unnecessary, and total infused volume should be kept constant while nutritional content is increased.

- Cyclic administration of TPN solutions may be useful for selected patients, including

  - Those who will be discharged from the hospital and subsequently receive home TPN,
  - Those with limited intravenous access who require administration of other medications,
  - Those who are metabolically stable and desire a period during the day when they can be free of an infusion pump.

  Cyclic TPN is administered for 8 to 16 hours, most commonly at night. This should not be done until metabolic stability has been demonstrated for patients on standard, continuous TPN infusions.

3. Current status of immunotherapy in cancer patients. 10

Answer.

Name of the drug	Mechanism of action	Others
Sorafenib	Sorafenib is a small inhibitor of several tyrosine protein kinases, such as VEGFR, PDGFR and Raf family kinases (more avidly C-Raf than B-Raf).	Used in Renal cell carcinoma
Sunitinib	Sunitinib is an oral, small-molecule, multi-targeted receptor tyrosine kinase (RTK)	Also used in imatinib-resistant gastrointestinal stromal tumor (GIST)

Name of the drug	Mechanism of action	Other
Temsirolimus	Temsirolimus works by blocking a cell protein known as *mTOR*, which normally helps cells grow and divide.	Used in renal cell carcinoma
Everolimus		It is used to treat advanced kidney cancers after other drugs such as sorafenib or sunitinib have been tried.

Name of the drug	Mechanism of action	Other
Bevacizumab	Targets VEGF-A Bevacizumab is in the angiogenesis inhibitor and monoclonal antibody families of medication. It works by slowing the growth of new blood vessels	It may help some people with kidney cancer when used with interferon-alfa. Used for colon cancer, lung cancer, glioblastoma, For age-related macular degeneration it is given by injection into the eye.

Name of the drugs	Mechanism of action	Other
Pazopanib	Pazopanib is a potent and selective multi-targeted receptor tyrosine kinase inhibitor that blocks tumour growth and inhibits angiogenesis	Also given in soft tissue sarcoma.

Name of the drugs	Mechanism of action	Other
Cabozantinib	Cabozantinib, is a small molecule inhibitor of the tyrosine kinases c-Met and VEGFR2, and has been shown to reduce tumor growth, metastasis, and angiogenesis.	Used in Renal cell carcinoma
Lenvatinib	It acts as a multiple kinase inhibitor against the VEGFR1, VEGFR2 and VEGFR3 kinases	Also used in thyroid cancer

- ❖ Patients with moderate- to high-grade disease often receive intravesical immunotherapy with a weakened, live bacterium, bacillus Calmette-Guérin (BCG). BCG was the first FDA-approved immunotherapy and helps reduce the risk of bladder cancer.
- ❖ **Brain tumour**
  - Bevacizumab (Avastin®): a monoclonal antibody that targets the VEGF/VEGFR pathway and inhibits tumor blood vessel growth; approved for advanced glioblastoma
  - Dinutuximab (Unituxin®): a monoclonal antibody that targets the GD2 pathway; approved for first-line treatment of high-risk pediatric neuroblastoma

❖ **Oesophageal cancer:**

- o Targeted Antibodies
- o Ramucirumab: a monoclonal antibody that targets the VEGF/VEGFR2 pathway and inhibits tumor blood vessel growth; approved for subsets of patients with advanced gastroesophageal cancer
- o Trastuzumab: a monoclonal antibody that targets the HER2 pathway; approved for subsets of patients with advanced, HER2-positive gastroesophageal cancer, including as a first-line therapy
- o Immunomodulators
  - Pembrolizumab (Keytruda®): a checkpoint inhibitor that targets the PD-1/PD-L1 pathway; approved for subsets of patients with advanced, PD-L1-positive gastroesophageal cancer

❖ Malignant melanoma:

- o Immunomodulators
  - Ipilimumab (Yervoy®): a checkpoint inhibitor that targets the CTLA-4 pathway; approved for subsets of patients with advanced melanoma, including as a first-line therapy
  - Nivolumab (Opdivo®): a checkpoint inhibitor that targets the PD-1/PD-L1 pathway; approved for subsets of patients with advanced melanoma
  - Pembrolizumab (Keytruda®): a checkpoint inhibitor that targets the PD-1/PD-L1 pathway; approved for subsets of patients with advanced melanoma, including in the adjuvant (pre-surgical) setting
  - The combination of nivolumab and ipilimumab, which target the PD-1/PD-L1 and the CTLA-4 pathways, respectively; approved for subsets of patients with advanced melanoma
  - Aldesleukin (Proleukin®): a cytokine that targets the IL-2/IL-2R pathway; approved for patients with advanced melanoma
  - Interferon alfa-2b (Intron A®): a cytokine that targets the IFNAR1/2 pathway; approved for subsets of patients with melanoma
  - Peginterferon alfa-2b (Sylatron®/PEG-Intron®): a cytokine that targets the IFNAR1 pathway; approved for subsets of patients with melanoma

- Oncolytic Virus Therapy

- T-VEC (Imlygic®): a modified herpes simplex virus (HSV) that infects tumor cells and promotes their destruction; approved for subsets of patients with advanced melanoma

4. Development and descent of testis. 10

Answer

Descent of the testes

Between the 3rd month of pregnancy and its end the testes become transferred from the lumbar area (ventro-medial to the mesonephros) into the future scrotum. This transfer is due to a combination of **growth processes and hormonal influences.**. The **gubernaculum** testis also plays a decisive role in this phenomenon.

The **gubernaculum** testis arises in the course of the 7th week from the lower**gubernaculum**, after the mesonephros has atrophied. Cranially it has its origin at the testis and inserts in the region of the genital swelling (future scrotum).
At the same time, at the inguinal canal along the lower gubernaculum, an**evagination of the peritoneum** arises, the **vaginal process**, on which the testes will slide through the inguinal canal.

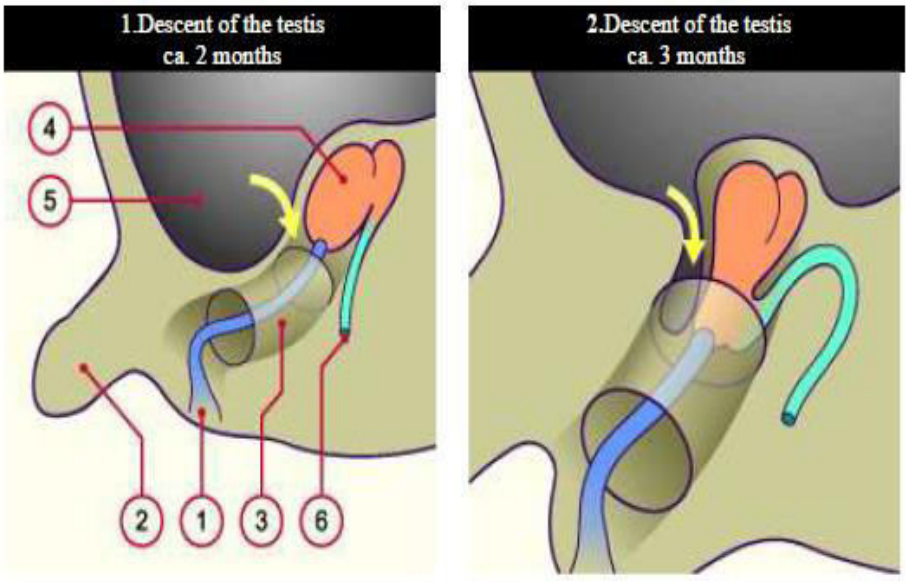
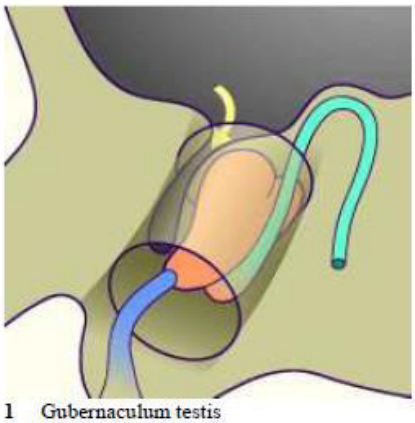


Fig.1

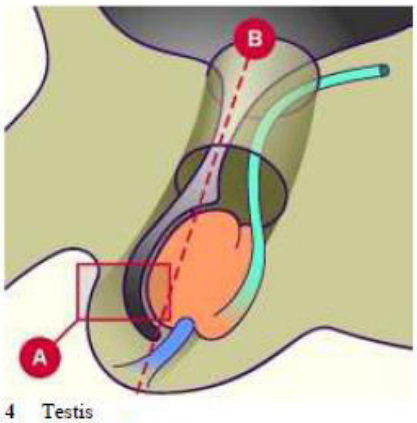
The yellow arrow shows the location of the protrusion of the peritoneum and the beginning of the testicular descent into the inguinal canal.

Fig. 2

In this diagram, the beginning of the formation of the vaginal process is visible. It enters with the testis into the inguinal canal. Shown in blue is the gubernaculum that becomes increasingly shorter.



1 Gubernaculum testis
2 Penis
3 Inguinal canal



4 Testis
5 Peritoneal cavity
6 Deferent duct

Fig. 3
Between the 3rd and 7th month of pregnancy the testes remain near the inguinal canal in order to pass through it. The vaginal process lengthens while the gubernaculum shortens, thereby drawing the testis, the deferent duct and its vessels on both sides downwards.

Fig. 4
In the 9th month of pregnancy (but also sometimes only after birth) the testes reach the scrotum. The vaginal process forms now a serous bilaminar structure on the front side of the testis.

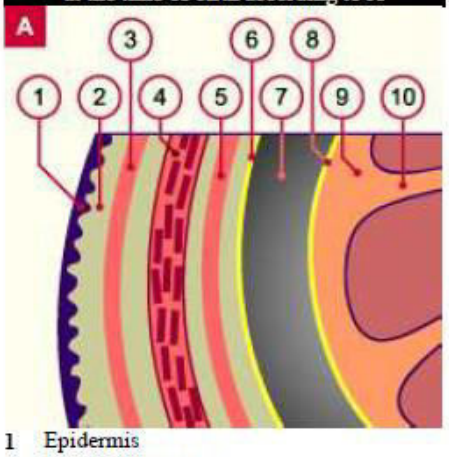
In that the vaginal process lengthens downwardly, it takes the muscle fibers of the oblique internal muscle and the transverse muscle with it.

The muscle fascia of the transverse muscle is the innermost layer and in the scrotal region, it forms the **internal spermatic fascia** of the spermatic cord and the scrotum.

The muscle layer of the musculus cremaster is formed from **fibers of the oblique internal and transverse muscles**.

Externally, the external spermatic fascia is formed from the superficial**aponeurosis of the oblique external abdominal muscle**.

5 - Section through the scrotum at the time of birth according to A



1 Epidermis
2 Dermis (tunica dartos)
3 External spermatic fascia
4 Musculus cremaster
5 Internal spermatic fascia
6 Parietal lamina of the tunica vaginalis
7 Virtual cavity between the two layers of the tunica vaginalis
8 Visceral lamina of the tunica vaginalis
9 Tunica albuginea
10 Interlobular septum of the testis

Fig. 5
Detail of the various layers that have formed in the scrotum by the end of the pregnancy.

The region, where the testes pass through the abdominal wall, is called the **inguinal canal**.

Between the 7th and the 12th week the **gubernaculum shortens** and pulls the testes, the deferent duct and its vessels downwards.
Between the 3rd and 7th month the testes stay in the area of the inguinal canal so they can enter into it. They reach the scrotum at roughly the time of birth under the influence of the androgen hormone.

While in the first year of life the upper part of the vaginal process becomes obliterated, there remains only the **peritoneo-vaginal ligament**. The lower portion persists as the **tunica vaginalis testis**, which consists of a parietal and a visceral layer.

5. Evaluation of a patient of obstructive jaundice. 10

Answer.

Causes of obstructive jaundice:

Benign	Malignant
• Biliary atresia.	• Carcinoma of head and periampullary region of thepancreas.
• Choledochal cyst.	• Cholangio carcinoma.
• CBD stones.	• Klatskin tumour (Carcinoma at the confluence of hepatic ducts above the level of the cystic duct and so will cause hydro hepatosis without GB enlargement).
• Chronic pancreatitis	
• Ascending cholangitis.	• Extrinsic compression of CBD by lymph nodes or tumours.
• Biliary strictures	• Carcinoma gall bladder
• Parasitic infestations	

Investigations:

Blood Tests:

- Patients with pancreatic head lesions frequently have elevated bilirubin and alkaline phosphatase levels suggestive of obstructive jaundice.
- Other routine laboratory studies are usually normal.
- Haemoglobin may be low.
- The two most widely used pancreatic cancer serum markers are the CEA and the Lewis blood group carbohydrate antigen CA 19-9. Both are frequently elevated in patients with advanced disease. Extremely high levels of either CA 19-9 or CEA usually indicate unresectable or metastatic disease.

Imaging Studies:

- The main imaging modalities used for patients with suspected pancreatic neoplasms include right upper quadrant ultrasonography, CT, MRI with or without magnetic resonance cholangiopancreatography (MRCP), endoscopic retrograde cholangiopancreatography (ERCP), and percutaneous transhepatic cholangiography (PTC).
- Right upper quadrant ultrasonography is a commonly used initial test. It can detect gallstones, dilatation of the biliary tree, and pericholecystic fluid. This imaging modality can also pick up hepatic metastases, pancreatic masses, peripancreatic and hilar lymphadenopathy, and ascites.

- The investigation of choice in the work-up of patients suspected of a pancreatic cancer is a multidetector spiral CT and is probably the single most useful diagnostic and staging modality.

    - ❖ CT provides more complete and accurate imaging of the pancreatic head and surrounding structures.
    - ❖ It gives very important information about the immediately adjacent vascular structures such as the portal, superior mesenteric, and splenic veins, as well as the superior mesenteric artery and celiac axis.
    - ❖ The involvement of periampullary lymph nodes and retroperitoneal structures may be demonstrated.
    - ❖ Additionally, information about distant metastatic disease can be gleaned if metastatic deposits are seen in the liver or in the peritoneal cavity.
    - ❖ The presence of ascites is usually an ominous sign.

- MRCP is now being utilized to image the biliary tree and the pancreatic duct. It has the advantage of being completely noninvasive.

    - ❖ The vascular structures can also be visualized with the use of the contrast agent gadolinium and the performance of a magnetic resonance angiogram (MRA).
    - ❖ Thus a single (long) session in a scanner can provide information about tumor size and extent (MRI), the intraductal anatomy of the biliary and pancreatic system (MRCP), and the status of the nearby vasculature (MRA).
    - ❖ The resulting scan has the potential to provide information about tumor size and extent, biliary and pancreatic ductal anatomy, and vascular involvement through a single, noninvasive procedure.

- ERCP sometimes is required to solidify the diagnosis of pancreatic cancer.

    - ❖ The classic findings of a long, irregular stricture in a pancreatic duct with distal dilation or a "double duct sign" in which there is cutoff of both the pancreatic duct and distal bile duct at the level of the genu of the pancreatic duct are pathognomonic
    - ❖ ERCP may be of benefit in patients with biliary obstruction and cholangitis whereupon an endoscopic stent can be placed for decompression.
    - ❖ ERCP is most useful when there is pancreatic duct obstruction, but no mass is evident on either CT or MRI. In this situation, it is necessary to try to distinguish chronic pancreatitis from pancreatic cancer.

- EUS is one of the most common imaging procedures used to diagnose pancreatic cancer.

    - ❖ It is often the best procedure to obtain samples of a tumor to make a definitive diagnosis of pancreatic cancer.
    - ❖ EUS may be able to find small pancreatic masses that have not been detected by computed tomography (CT) or magnetic resonance imaging (MRI) scans but suspected by the doctor as a result of symptoms and/or blood test results.
    - ❖ Studies show that EUS is equal to or better than CT scans for detection of early pancreatic cancer.

- ➢ Biopsy: Biopsy to confirm the presence and identify the type of cancer is usually required before chemoradiation therapy of unresectable pancreatic tumors or neoadjuvant treatment of

resectable tumors. Percutaneous biopsy, performed with either CT or ultrasound guidance, or transduodenal biopsy, performed with endoscopic ultrasound guidance, is routinely employed in these situations.

6. Role of endoscopic ultrasound in diagnostic evaluation. 10

Answer. Endoscopic ultrasound (EUS) or echo-endoscopy is a medical procedure in which endoscopy (insertion of a probe into a hollow organ) is combined with ultrasound to obtain images of the internal organs in the chest, abdomen and colon. It can be used to visualize the walls of these organs, or to look at adjacent structures. Combined with Doppler imaging, nearby blood vessels can also be evaluated.

- Upper digestive tract:

- Oesophagogastroduodenoscopy: it allows for screening for pancreatic cancer, esophageal cancer, and gastric cancer, as well as benign tumors of the upper gastrointestinal tract. It also allows for characterization and biopsy of any focal lesions found in the upper gastrointestinal tract, such as esophageal tuberculosis. Less commonly this procedure is used to identify malformations and masses in the bile ducts and pancreatic ducts.
- Organs such as the liver, pancreas, and adrenal glands are easily biopsied, as are any abnormal lymph nodes. In addition, the gastrointestinal wall itself can be imaged to see if it is abnormally thick, suggesting inflammation or malignancy.
- The technique is highly sensitive for detection of pancreatic cancer (90–95% sensitivity), particularly in patients who are suspected to have a mass or present with jaundice. Its role in staging patients with pancreatic cancer is limited to local metastases; however, in combination with CT scan which provides information on regional metastases, it provides an excellent imaging modality for diagnosis and staging of pancreatic carcinoma.
- Endoscopic ultrasound can also be used in conjunction with endoscopic retrograde cholangio pancreatography (ERCP). The ultrasound probe is used to locate gall stones which may have migrated into the common bile duct. This occurrence may cause obstruction of the drain shared by the liver and pancreas, which may lead to lower back pain, jaundice, and pancreatitis.

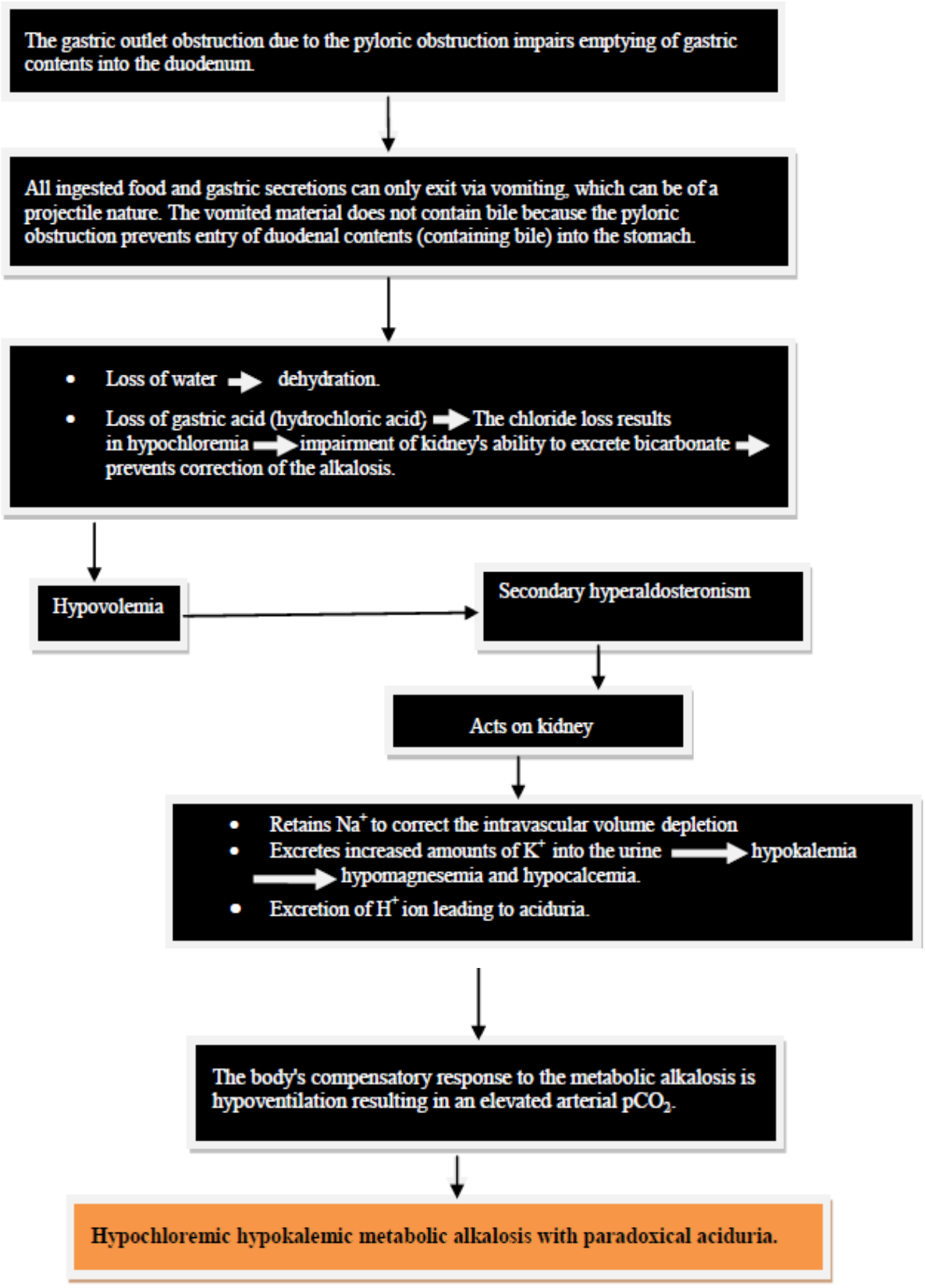
- Lower digestive tract:

- Echo-endoscopy can also be used for imaging of the rectum and colon, although these applications are lesser known. It is used primarily to stage newly diagnosed rectal or anal cancer. EUS-guided fine needle aspiration may be used to sample lymph nodes during this procedure. Evaluation of the integrity of the anal sphincters may also be done during lower EUS procedures.

- Respiratory tract: An endoscopic ultrasound probe placed in the esophagus can also be used to visualize lymph nodes in the chest surrounding the airways (bronchi), which is important for the staging of lung cancer. Ultrasound can also be performed with an endoscopic probe inside the bronchi themselves, a technique known as endobronchial ultrasound.

7. Metabolic changes and its management in gastric outlet obstruction. 10

Answer. Metabolic changes and its management in gastric outlet obstruction:


The gastric outlet obstruction due to the pyloric obstruction impairs emptying of gastric contents into the duodenum.
All ingested food and gastric secretions can only exit via vomiting, which can be of a projectile nature. The vomited material does not contain bile because the pyloric obstruction prevents entry of duodenal contents (containing bile) into the stomach.
Loss of water → dehydration.
Loss of gastric acid (hydrochloric acid) → The chloride loss results in hypochloremia → impairment of kidney's ability to excrete bicarbonate → prevents correction of the alkalosis.
Hypovolemia
Secondary hyperaldosteronism
Acts on kidney
Retains Na^+ to correct the intravascular volume depletion
Excretes increased amounts of K^+ into the urine → hypokalemia → hypomagnesemia and hypocalcemia.
Excretion of H^+ ion leading to aciduria.
The body's compensatory response to the metabolic alkalosis is hypoventilation resulting in an elevated arterial pCO_2.
Hypochloremic hypokalemic metabolic alkalosis with paradoxical aciduria.

Management of the patient:

- Rehydration with i/v isotonic saline with potassium supplementation. Replacing the sodium chloride and water allows the kidney to correct the acid–base abnormality.
- Following rehydration it may become obvious that the patient is also anaemic, the haemoglobin being spuriously high on presentation.
- The stomach should be emptied using a Wide-bore gastric tube. Pass an orogastric tube and lavage the stomach until it is completely emptied
- Then endoscopy and contrast radiology
- Biopsy of the area around the pylorus is essential to exclude malignancy
- The patient should also have an anti-secretory agent, initially given intravenously to ensure absorption.
- Build up nutrition.

8. Triage in disaster and principles of a polytrauma patient.10

Answer. Triage in disaster and principles of a polytrauma patient:

Triage Levels and Color Coding

A color-coded tagging method to categorize disaster victims in the field has been almost universally adopted and incorporated into existing triage systems [12].

1. Red Triage Tag ("Immediate" or T1 or Priority 1): Patients whose lives are in immediate danger and who require immediate treatment;
2. Yellow Triage Tag ("Delayed" or T2 or Priority 2): Patients whose lives are not in immediate danger and who will require urgent, not immediate, medical care;
3. Green Triage Tag ("Minimal" or T3 or Priority 3): Patients with minor injuries who will eventually require treatment;
4. Black Triage Tag ("Expectant" or No Priority): Patients who are either dead or who have such extensive injuries that they can not be saved with the limited resources available.

The "expectant" category can be the most challenging for caregivers from an ethical and emotional standpoint. While it is logical to help the greatest number of victims in a disaster, it is difficult to walk away from a person who is on the verge of succumbing to severe injuries. As the World Medical Association reminds us, "It is unethical for a physician to persist, at all costs, at maintaining the life of a patient beyond hope, thereby wasting to no avail scarce resources needed elsewhere". It is also important to note that patients need to be reassessed repeatedly, and initial color-coded triage designations can change over time.

START (Simple Triage and Rapid Transport)

START was developed in the 1980s in Orange County, California as one of the first civilian triage systems and was subsequently adopted as the de facto disaster triage standard by the Domestic Preparedness Program of the Department of Defense. However, little data regarding its efficacy existed in the literature prior to its adoption, and today there is some evidence that START can lead to the overtriage of patients (for example, tagging a patient as "immediate" who in reality should be labeled "delayed") in a real-time mass casualty setting.

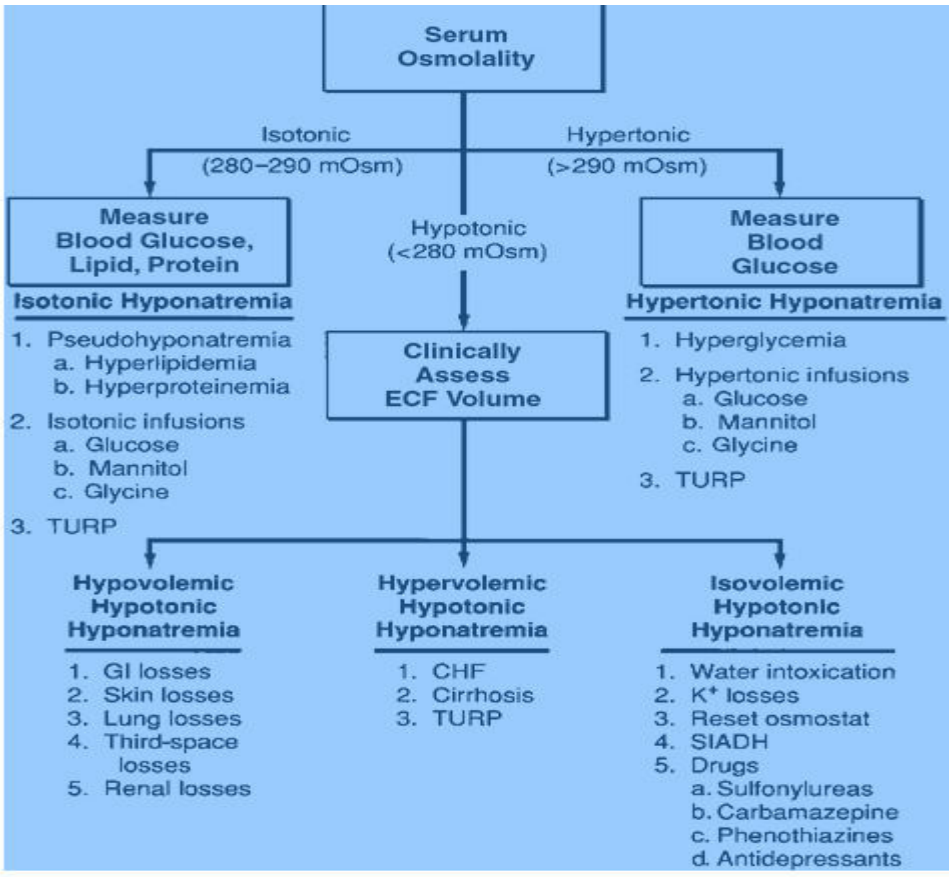
SALT (Sort-Assess-Lifesaving Interventions-Treatment/Transport)

More recently, in response to the lack of scientific data regarding the efficacy of mass casualty triage systems, the Centers for Disease Control and Prevention (CDC) formed an advisory committee to analyze the existing systems and recommend a national standard for disaster triage. Because the literature did not conclusively identify any existing triage system as optimal, the expert panel developed SALT by combining the best features of the existing systems . SALT is endorsed by several national organizations, including the American College of Emergency Physicians, the American College of Surgeons Committee on Trauma, the American Trauma Society, and the National Association of EMS Physicians .

9. Clinical approach to hyponatremia. 10

Answer.

Causes of hyponatremia



Treatment:

- Isotonic and hypertonic hyponatremia correct with resolution of the underlying disorder.
- Hypovolemic hyponatremia can be managed with administration of 0.9% NaCl to correct volume deficits and replace ongoing losses.
- Water intoxication responds to fluid restriction (1,000 mL/day).
- For SIADH, water restriction (1,000 mL/day) should be attempted initially. The addition of a loop diuretic (furosemide) or an osmotic diuretic (mannitol) may be necessary in refractory cases.

- Hypervolemic hyponatremia may respond to water restriction (1,000 mL/day) to return Na^+ to greater than 130 mmol/L.

In cases of severe congestive heart failure, optimizing cardiac performance may assist in Na^+ correction. If the edematous hyponatremic patient becomes symptomatic, plasma Na^+ can be increased to a safe level by the use of a loop diuretic while replacing urinary Na^+ losses with 3% NaCl. A reasonable approach is to replace approximately 25% of the hourly urine output with 3% NaCl.

Hypertonic saline should not be administered to these patients without concomitant diuretic therapy.

Administration of synthetic brain natriuretic peptide (BNP) is also useful therapeutically in the setting of acute heart failure. (because it inhibits Na^+ reabsorption at the cortical collecting duct and inhibits the action of vasopressin on water permeability at the inner medullary collecting duct.)

- {In the presence of symptoms or extreme hyponatremia [Na^+ <110 mmol/L] hypertonic saline (3% NaCl) is indicated. Serum Na^+ should be corrected to approximately 120 mmol/L . The quantity of 3% NaCl that is required to increase serum Na^+ to 120 mmol/L can be estimated by calculating the Na^+ deficit:

Na^+ deficit (mmol) = 0.60 × lean body weight (kg) × [120 - measured serum Na^+ (mmol/L)].

- Central pontine demyelination occurs in the setting of correction of hyponatremia. The risk factors for demyelination are controversial but appear to be related to the chronicity of hyponatremia (>48 hours) and the rate of correction. The serum Na^+ should be increased by no more than 12 mmol/L in 24 hours of treatment.
- For acute hyponatremia (<48 hours), the serum Na^+ may be corrected more rapidly [i.e., Na^+ = 1 to 2 mmol / hour]. The patient's volume status should be carefully monitored over this time, and the serum Na^+ should be determined frequently (every 1 to 2 hours). Once the serum Na^+ concentration reaches 120 mmol/L and symptoms have resolved, administration of hypertonic saline can be discontinued.}

10. Role of sentinel node biopsy in common malignancy. 10

Answer. Role of sentinel lymph node biopsy in different malignancies:

- Carcinoma breast:

- Sentinel lymph node biopsy is primarily used in women with early breast cancers (T1 and T2, N0).
- It also is accurate for T3 N0 cancers, but nearly 75% of these women will have nonpalpable axillary lymph node metastases.
- In women undergoing neoadjuvant chemotherapy to permit conservation surgery, sentinel lymph node biopsy may be used.

Contraindications to the procedure include

- Palpable lymphadenopathy,

- Prior axillary surgery, chemotherapy or radiation therapy, and
- Multifocal breast cancers.

- The combination of intraoperative gamma probe detection of radioactive colloid and intraoperative visualization of isosulfan blue dye (Lymphazurin) is more accurate than the use of either agent alone.
- On the day prior to surgery, or on the morning of surgery, the radioactive colloid is injected. Using a tuberculin syringe and a 25-gauge needle, 0.5 mCi of 0.2-micron technetium-99 sulfur colloid in a volume of 0.2 to 0.5 mL is injected (three to four separate injections) at the cancer site or subdermally.
- Subdermal injections are given in proximity to the cancer site or subareolar.
- Subsequently, in the operating room, 4 mL of isosulfan blue dye (Lymphazurin) is injected in a similar fashion, but with an additional 1 mL injected between the cancer site and the overlying skin.
- For nonpalpable cancers, the injection is guided by either intraoperative ultrasound or by a localization wire that is placed preoperatively under ultrasound or stereotactic guidance.
- It is helpful for the radiologist to mark the skin overlying the breast cancer at the time of needle localization using an indelible marker.
- In women who have undergone previous excisional biopsy, the injections are made around the biopsy cavity but not into it.
- Women are told preoperatively that the isosulfan blue dye injection will impart a change to the color of their urine and that there is a very small risk of allergic reaction to the dye (1 in 10,000).
- Anaphylactic reactions have been documented. The use of radioactive colloid is safe and radiation exposure is very low.

- A hand-held gamma counter is then employed transcutaneously to identify the location of the sentinel lymph node.
- The gamma counter is employed to pinpoint the location of the sentinel lymph node.
- As the dissection continues, the signal from the probe increases in intensity as the sentinel lymph node is approached.
- The sentinel lymph node also is identified by visualization of isosulfan blue dye in the afferent lymph vessel and in the lymph node itself.
- The lowest false-negative rates for sentinel lymph node biopsy have been obtained when all blue lymph nodes and all lymph nodes with radiation counts greater than 10% of the 10-second ex vivo count of the sentinel lymph node are harvested (10% rule).
- . This procedure is repeated until residual radioactivity in the surgical bed is less that 10% of the 10-second ex vivo count of the most radioactive sentinel lymph node. ii.

- Malignant melanoma: Management of Regional Lymph Nodes:

- After WLE of the primary tumor, the most common sites of first recurrence are regional (lymph nodes, in-transit metastases, and local recurrences).
- Nodal metastases generally appear in the basin or basins draining from the primary site. This is a predictable pattern for extremity melanomas; however, truncal and head and neck melanomas may drain to more than one site.
- Lines of drainage for truncal melanomas are divided by the midline and the line of Sappey, which extends from the umbilicus across the iliac crest and around to the spine at the level of L2.

- By using a combination of isotope lymphatic mapping, an intraoperative hand-held gamma probe, and intraoperative injection of blue dye, the SLN could be identified in more than 95% of cases in the groin and axilla, with identification in the head/neck region being slightly lower (85%).

- There was great anatomic variation resulting in drainage to multiple or uncommon sites.
- Detailed pathologic analysis of the sentinel nodes via step sections enabled detection of micrometastases that could be missed by standard techniques.
- The probability of finding a positive sentinel node can be predicted by using a nomogram derived from multifactorial analysis.
- In most cases a positive sentinel node was the only positive node.
- No prognostic factors were found that accurately identified a subpopulation of SLN-positive patients at zero risk of harboring other positive nodes.

❖ This sequence of recurrences led surgeons to conclude that resection of nodal basins containing occult metastases could provide an increase in survival. This procedure, termed elective lymph node dissection (ELND), was commonly practiced.

- As prognostic factors became better understood, it was postulated that patients with thin tumors (<1 mm in thickness) would have a low risk of metastases at any site and patients with thick tumors (>4 mm in thickness) would have a high risk of distant as well as regional metastases. In contrast, patients with intermediate-thickness melanoma (1-4 mm) would have an elevated risk for nodal metastases without a high risk for distant disease.

Development of the SLN concept ended one debate over ELND, changed clinical management, and opened a new series of questions about the tumor biology of melanoma.

▪ Carcinoma penis: Not used nowadays. Biopsy of the lesion is taken to confirm the diagnosis.

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2018

PAPER – I

1. **What are the changes that may occur in stored blood? How do you prevent and manage complications of massive blood transfusion? 3+3+4**
2. **Outline the role of CT scan in the diagnosis and management of pancreatic pathologies. 5+5**
3. **What is adenoma-carcinoma sequence in colorectal cancers? Mention the prognostic factors for colorectal cancers. What is the follow up protocol for such cancers? 10**
4. **Outline the perioperative pharmacological management of a patient with pheochromocytoma. 10**
5. **Discuss the causes of port site infections with particular reference to microbiology. How are they managed? 6+4**
6. **Mention the biochemical, immunological and nutritional derangements in short bowel syndrome. How do you manage such a patient? 2+2+2+4 = 10**
7. **What are the methods of promoting soft tissue healing? 10**
8. **Discuss the perioperative management of a patient having diabetes mellitus as a comorbidity. 10**
9. **Discuss the surgical anatomy of thoracic outlet syndrome. How is such a patient surgically treated? 5+5**
10. **Discuss the use of energy source devices in laparoscopic surgery. 10**

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2018

PAPER – I

1. What are the changes that may occur in stored blood? How do you prevent and manage complications of massive blood transfusion? 3+3+4

Answer. Changes in stored blood:

General: Whole blood contains RBC, plasma, proteins, coagulation factors, WBC, platelets, electrolytes, dissolved gases -
Additives to donated whole blood are aimed at prolonging the shelf life before transfusion, and minimised degradation of blood product during storage
Additives-
Anticoagulant: citrate-dextrose-phosphate; CDP-adenine;
SAG-M (saline-adenine-glucose-mannitol);
ADSOL
oAdenine prolongs shelf-life to 35 days (energy substrate)
oCitrate →↓Ca2+(anticoagulate blood)
oPhosphate buffers pH
oGlucose / dextrose for Ebden-Myerhoff glycolysis pathway
Storage Temp: 4°C to ↓metabolic activity of RBC, ↓bacterial colonisation
Time for storage:28 days- Measured as the max storage time which allowed the survival of >70% of RBC 24hrs after infusion

Changes with Storage
RBC- Cellular integritycannot be maintained (failure of Na+/K+ATPase) →some RBC become spherical which ↑cell rigidity

- If transfused at max storage time (28 days): 10-20% RBC destroyed within 24hrs.
- Once transfused →some spherocytes may recover normal shape with resumption of metabolic processes in vivo
- 2,3-DPG: Side-pathway in the glycolysis pathway- Important for maintaining OHDC to right (Bohr effect)
  - ↑storage time → depletion of glucose / dextrose substrates → ↓2,3-DPG production → left-shift OHDC
- p50 of stored blood → 15mmHg→→ min clinical effect

- Levels 5% at 28 days

WBC:
- Granulocytes lose phagocytic and bacteriocidal properties within 4-6hrs of collection
- Antigenic properties maintained

Platelets
- Non-functional within 48hrs of blood stored at 4°C
- Change shape from discoid →spherical

Factor V and VIII

- Decrease with storage

Factor V → ↓by 50% at 21 days

Factor VIII → exponential decrease to 75% at 24hrs → 30% after 21days

Other factors no significantly affected til >21 days storage

Biochemical Changes
- ↓ATP: Energy substrate derived from adenine; glucose / dextrose
- Levels fall with time in storage, slower that ↓2,3-DPG- ↑K+: Progressive impairment of Na+/K+ATPase results in ↓RBC K+ →↑extracellular K+→ ~30mmol/L at 28 days
- ↑Lactate
- ↓Na+
- ↓Ca2+ → effectively zero 2° citrate
- ↓glucose
- ↓pH → 6.8 at 28 days
- Free Hb: RBC lysis in storage →↑free Hb →haptoglobin/hemopexin (mop-ups) saturable
- 1.7% at collection → 30% at 28 days

Bacteria
- 3/1000 contaminated by bacteria
- Pseudomonas sp / yersinia enterocilitica can proliferate at 4°C

Immunity
- Micoraggregates cause binding of fibronectin and ↓macrophage activity and altered antigen presenting capability.

Complications of massive transfusion include metabolic and haemostatic abnormalities, immune haemolysis and air embolism (1) which can result in a patient presenting with cardiac arrhythmia or cardiac arrest.

Massive transfusion is an independent risk factor for developing multi-organ failure.

The complications associated with massive transfusion are dependent on the following factors:

- Number of units transfused
- Rate of transfusion
- Patient factors

Some of the complications of massive transfusion include:

- Hypothermia
- Dilutional coagulopathy
- Hypocalcaemia, hypomagnesaemia, citrate toxicity
- Metabolic acidosis
- Hyperkalaemia
- Air embolism

Prevention of complications:

All efforts should be initiated to avoid RBC transfusion in patients at risk for ALI and ARDS after completion of resuscitation.(Level 2)

. All efforts should be made to diagnose and report (TRALI) to the blood bank because it has emerged as a leading cause of transfusion-associated morbidity and mortality, despite underdiagnosis and underreporting. (Level 2)

Blood warmers should be used as the rapid transfusion of multiple units may reduce the core temperature and can lead to cardiac arrhythmias.

Clinically significant hypocalcemia usually does not occur unless the rate of transfusion exceeds one unit every 5 minutes.

To minimize the risk of hyperkalemia:

- Use of <5 days stored blood
- Wash unit before transfusion

To prevent volume overload: Careful monitoring of volume status and diuretic therapy.

Management of complications:

- Use of warmer.
- Calcium injection.
- Use of diuretics.
- Treatment of arrhythmias.

2. Outline the role of CT scan in the diagnosis and management of pancreatic pathologies. 5+5

Answer. Role of CT scan in the diagnosis and management of pancreatic pathologies.

i. Acute pancreatitis:

Role of CT scan in diagnosis:

Contrast-enhanced computed tomography (CECT) is the standard imaging modality for the evaluation of acute pancreatitis and its complications. Using non–contrast-enhanced CT, clinicians can establish the diagnosis and demonstrate fluid collections but cannot evaluate for pancreatic necrosis or vascular complications.

Role of CT scan in assessing severity:

CT SEVERITY INDEX AND MODIFIED CTSI

CT SEVERITY INDEX (BALTHAZAR, 1990)		MODIFIED CT SEVERITY INDEX (MORTELE, 2004)	
PROGNOSTIC INDICATOR	POINTS	PROGNOSTIC INDICATOR	POINTS
PANCREATIC INFLAMMATION		PANCREATIC INFLAMMATION	
NORMAL PANCREAS	0	NORMAL PANCREAS	0
ENLARGED PANCREAS	1	PANCREATIC ABN +/- PERIPANCREATIC INFLAMMATION	2
PANCREATIC ABNORMALITIES WITH PERIPANCREATIC INFLAMMATION	2	PANCREATIC OR PERIPANCREATIC FLUID COLLECTION/ FAT NECROSIS	4
SINGLE FLUID COLLECTION	3		
2/MORE COLLECTION OR GAS	4		

CT SEVERITY INDEX (BALTHAZAR,1990)		MODIFIED CT SEVERITY INDEX (MORTELE,2004)	
PROGNOSTIC INDICATOR	POINTS	PROGNOSTIC INDICATOR	POINTS
PANCREATIC NECROSIS		PANCREATIC NECROSIS	
NONE	0	NONE	0
<30%	2	<30%	2
30-50%	4	>30%	4
>50%	6	EXTRAPANCREATIC COMPLICATIONS	2

ii. Chronic pancreatitis:

CT features of chronic pancreatitis include:

- Dilatation of the main pancreatic duct
- Pancreatic calcification
- Changes in pancreatic size (i.e. Atrophy), shape, and contour
- Pancreatic pseudocysts.

iii. Pseudocyst pancreas: CTscan helps in the diagnosis and evaluation.
Pseudocysts appear as well-circumscribed, usually round or oval peripancreatic fluid collections of homogeneously low attenuation, that are usually surrounded by a well-defined enhancing wall.

iv. Cystic neoplasms of the pancreas:

Mucinous cystadenoma:

- The tumour contour tends to be rounded or ovoid although this is not an absolutely specific feature
- Associated calcification when present tends to be more peripheral
- Contents of the lesion may be heterogenous is attenuation
- Internal septations may be present and tend to be linear or curvilinear

Serous cystadenoma

CT scan helps in the diagnosis:

- Typically demonstrates a multicystic, lobulated mass in the pancreatic head sometimes described as a 'bunch of grapes'
- The individual cysts are typically <20 mm in size and greater than six in number (except for the oligocystic variety
- A characteristic enhancing central scar may be present which can show associated stellate calcification (present in ~20% of cases)

Intraductal papillary mucinous neoplasms or tumours (IPMNs or IMPTs) are cystic tumours of the pancreas.

In some cases, the tumour is very localised and appears cystic. It can, therefore, be difficult to distinguish from peripheral mucinous cystadenoma / cystadenocarcinoma unless convincing communication with the duct system can be demonstrated. They do not calcify.

- Main duct IPMN (with dilatation of the main duct >5 mm)
  - either segments of the pancreatic duct (or the entire duct) are dilated and filled with low density (mucin thus water density) material
  - overlying pancreatic parenchyma may be thinned
  - if proximal, the distal pancreatic duct may be dilated without direct involvement (cystic neoplasms can have a similar appearance)
  - solid mural nodules are concerning for malignant transformation, and appear as hyperdense nodules protruding into the mucin-filled dilated ducts
  - enhancing nodules following administration of contrast are very concerning
  - occasionally mucinous material can be seen to bulge out of a dilated ampulla of Vater (uncommon but essentially pathognomonic)
- Branch duct IPMN
  - the majority of the gland is normal in appearance, except for a single or multiple side branches demonstrating marked dilatation
  - cystic mass-like appearance which often mimicks cystic tumours of the pancreas
  - its appearance has been termed a bunch of grapes due to its appearance
  - microcystic variety has appearances similar to serous cystadenomas, but again communication with the main pancreatic duct is the key to correct diagnosis

v. Pancreatic malignancy:

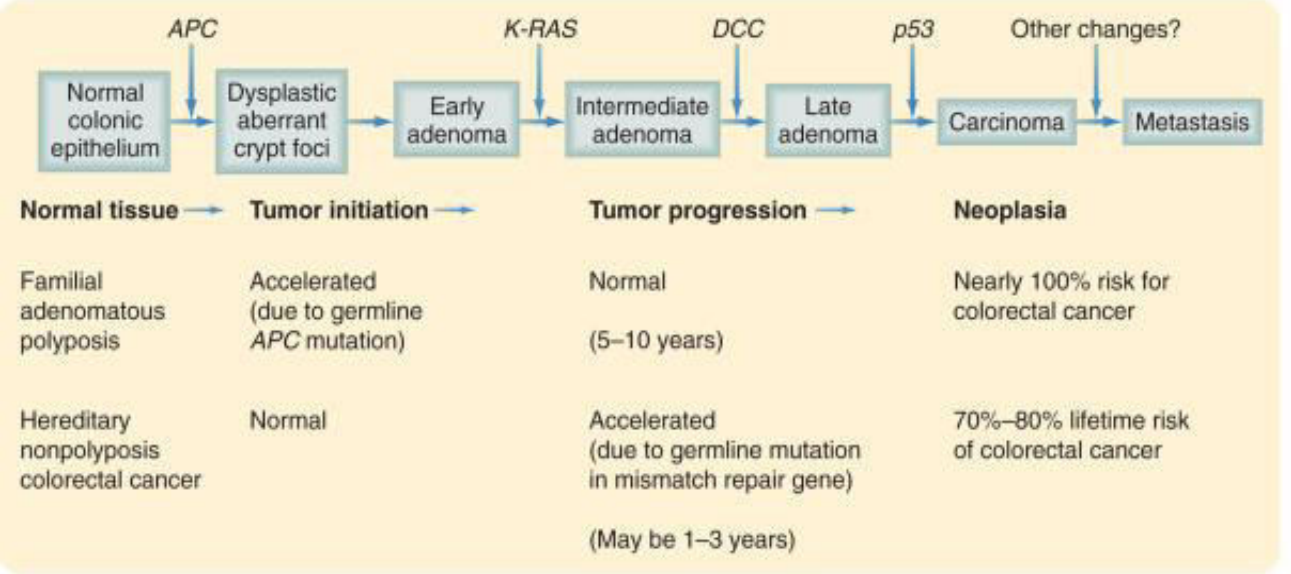
CT is the work-horse of pancreatic imaging. Typically ductal adenocarcinomas appear as poorly defined masses with extensive surrounding desmoplastic reaction. They enhance poorly compared to adjacent normal pancreatic tissue and thus appear hypodense on arterial phase scans in 75-90% of cases, but may become isodense on delayed scans (thus the need for multiple phase scanning when pancreatic cancer is the clinical question). Double duct sign may be seen.

CT correlates well with surgical findings in predicting unresectability (positive predictive value of 89-100% [3]). The most important feature to assess locally is the relationship of the tumour to

surrounding vessels (SMA and coeliac axis). If the tumour surrounds a vessel by more than 180 degrees, then it is deemed T4 disease and is unresectable.

3. What is adenoma-carcinoma sequence in colorectal cancers? Mention the prognostic factors for colorectal cancers. What is the follow up protocol for such cancers? 10

Answer. The adenoma-carcinoma sequence in sporadic and hereditary colorectal cancer.



- Prognosis and survival for colorectal cancer
-]Prognosis and survival depend on many factors.

The following are prognostic and predictive factors for colorectal cancer:

- Stage: Stage is the most important prognostic factor for colorectal cancer. The lower the stage at diagnosis, the better the outcome. Tumours without distant metastasis have more favourable prognosis than those that have distant metastases.
- Surgical margins: The prognosis is better if there are no cancer cells in the tissue removed with the tumour than if there are cancer cells in the tissue (called positive surgical margins).
- Cancer cells in lymph and blood vessels: Cancer cells can move or grow into nearby lymph vessels and blood vessels called lymphovascular invasion. Tumours that don't have lymphovascular invasion have a better prognosis than tumours that have lymphovascular invasion.
- Carcinoembryonic antigen (CEA) levels: The lower the CEA level before surgery, the more favourable the prognosis.
- Bowel obstruction or perforation: Patients who have a bowel obstruction or perforation at diagnosis have a less favourable prognosis.
- Grade: High-grade colorectal cancer means that the cancer cells are poorly differentiated or undifferentiated. High-grade cancers have a poorer prognosis than low-grade cancers.
- Type of tumour: Mucinous adenocarcinoma, signet ring cell carcinoma and small cell carcinoma have a less favourable prognosis than other types of colorectal tumours.

- Microsatellite instability (MSI): MSI is a change to the genetic material, or DNA, in a cell. Some colorectal cancer cells show MSI. Tumours that have cells with high MSI (MSI-H) have a more favourable prognosis than tumours without MSI (called microsatellite stable or MSS).
- Gene changes: The following genes are linked with colorectal cancer and affect prognosis.
  - DCC gene is found at chromosome 18q. It is a tumour suppressor gene that normally controls cell growth and death. Part of chromosome 18q, along with the DCC gene, are often missing in colorectal cancer cells. When the DCC gene is missing, cell growth, division and death may be uncontrolled. Missing the DCC gene is also linked with metastases and resistance to chemotherapy. Colorectal tumours with cancer cells that are missing part of chromosome 18q and the DCC gene may have a poor prognosis.
  - KRAS gene can be mutated, or changed, in some colorectal cancer cells. KRAS gene mutations mean that the cancer cells are unlikely to respond to targeted therapy drugs such as cetuximab and panitumumab. People with colorectal cancer cells that test positive for the KRAS gene mutation have a less favourable prognosis because targeted therapy drugs will not work on the tumour.
  - BRAF gene mutations mean that the cancer cells may be more aggressive. As a result, people with cancer cells that have the BRAF gene mutation have a worse prognosis.

Follow-Up Care Recommendations for Colorectal Cancer by Years After Treatment

Follow-Up Care Recommendations	Year 1	Year 2	Year 3	Year 4 and 5*
Doctor's Visit	Every 3 to 6 months	Every 3 to 6 months	Every 3 to 6 months	Every 6 months
CEA test	Every 3 months	Every 3 months	Every 3 months	As determined by your doctor
CT scan (chest and abdomen)	Every year, if recommended by your doctor	Every year, if recommended by your doctor	Every year, if recommended by your doctor	As determined by your doctor
CT scan (pelvis) (rectal cancer only)	Every year, if recommended by your doctor	Every year, if recommended by your doctor	Every year, if recommended by your doctor	As determined by your doctor
Colonoscopy	Once		At 3 years	
Proctosigmoidoscopy (rectal cancer only)	Every 6 months for 5 years			

**After 5 years, the need for future tests and visits are decided by the patient and doctor.*

4. Outline the perioperative pharmacological management of a patient with pheochromocytoma. 10

Answer. Perioperative pharmacological management of a patient with pheochromocytoma:

- Preoperative preparation includes administration of an α-adrenergic blocker to control hypertension and to permit re-expansion of intravascular volume. Phenoxybenzamine, 10 mg orally twice a day, is initiated and increased to 20 to 40 mg orally twice a day until the desired effect or prohibitive side effects are encountered.
- Other selective competitive alpha 1 adrenergic antagonist like prazosin can also be used. It has a short elimination half life of two to three hours and requires more frequent dosing5 starting at 1mg three to four times daily and gradually increased up to 12mg daily.
- Whichever drug is used, it is important to introduce it cautiously starting with small doses and increasing gradually until orthostatic hypotension develops indicating adequate alpha blockade.
- Postural hypertension is expected and is the desired endpoint. β-Adrenergic blockade (e.g., propranolol) may be added if tachycardia or arrhythmias develop but only after complete α-adrenergic blockade.
- Beta adrenergic blockade should be avoided in patients with catecholamine induced cardiomyopathy as it can lead to development of intractable hypotension, bradycardia and asystolic arrest.5,26 Selective beta I adrenoceptor antagonists such as atenolol (100 mg day-1) or bisoprolol (10-20 mg day-1) should be used in order to minimize undesirable side effects in the bronchi or peripheral vasculature.
- Calcium channel blockers have also been employed in the preoperative and intraoperative haemodynamic control, such as nifedipine 30-90 mg /day and nicardipine infusion starting at 5 mg/ hour, increasing by 2.5 mg/ hour every 5 minutes to a maximum of 15 mg/ hour.
- High-sodium diet with fluid intake to prevent severe hypotension after removal of the tumor.
- Preoperative sedation and anxiolysis, preferably with a benzodiazepine, and assurance by the anaesthesiologist will decrease anxiety and prevent marked haemodynamic fluctuation in the immediate preoperative period.
- Medication for alpha and beta blockade should be continued until the day of the operation except phenoxybenzamine which may be stopped the day before surgery as it has a long half life and can cause postoperative hypotension.
- Blood pressure, heart rate, and glucose levels should be monitored.

5. Discuss the causes of port site infections with particular reference to microbiology. How are they managed? 6+4

Answer. Mycobacterial infections due to atypical mycobacteria at the laparoscopic port site are a common menace encountered in patients undergoing laparoscopic surgery. Atypical mycobacterial colonies often exist in tap water, natural waters and soil and so can easily contaminate solutions and disinfectants used in hospital settings. These infections have been a source of significant morbidity for patients recovering from laparoscopic surgeries.

Port Site Wound infections in laparoscopy can be of two types:

- The first type occurs immediately within 1 week of laparoscopic surgery due to gram negative or positive bacteria derived from infection acquired during surgery from the infected gall bladder or

from the skin or the surgical procedure itself and can be treated by common antibiotics and local wound dressing.
- The second type is caused by atypical mycobacteria which includes the group of mycobacterial species that is not part of the M. tuberculosis complex having an incubation period of 3 to 4 weeks which do not respond to common antibiotics

Infections with atypical mycobacteria have been primarily reported after laparoscopic procedures. This is because, unlike open surgery, the instruments used for laparoscopic surgery have a layer of insulation that restricts the use of the autoclave in the sterilization process as the high temperatures involved destroy the insulation on them. The standard sterilization procedure has been a 20 minute exposure to 2.0 2.5% glutaraldehyde. At the current exposure time, these solutions act only as disinfectants and not sterilants thus allowing bacterial endospores to survive.

Also, when proper mechanical cleaning of the instruments is not done, blood and charred tissue deposits are left in the joints of the instruments during laparoscopic surgery. These Contaminated instruments deposit the endospores on to the subcutaneous tissue during the surgery which then germinate following which clinical symptoms appear after an incubation period of 3 to 4 weeks.

Prevention:

- Disposable laparoscopic instruments is the best solution for prevention of infection and is used in western countries.
- The use of advanced sterilization systems like STERRAD, which utilises gas plasma technology to kill spores at low temperatures, or using ethylene oxide gas for sterilization of insulated laparoscopic instruments. One can also keep instruments for 24 hours in a formalin gas chamber.

Treatment:

- These microorganisms show limited response to first line anti-tuberculosis drugs. the standard treatment consist of combinations of second line anti-tubercular drugs including macrolides such as clarithromycin, quinolones like ciprofloxacin, tetracyclines like doxycycline, and aminoglycosides like amikacin.
- The standard treatment starts after manifestation of clinical symptoms which consists of a 28 day regimen of oral clarithromycin and ciprofloxacin or amikacin. However, local administration of aminoglycosides has been shown to be highly efficacious in the treatment of particularly stubborn nodules and sinuses that persist after completion of oral therapy.

6. Mention the biochemical, immunological and nutritional derangements in short bowel syndrome. How do you manage such a patient? 2+2+2+4 = 10

Answer. Metabolic changes in short bowel syndrome:

- Short-bowel syndrome is characterized by dehydration, electrolyte derangements, acidic diarrhea, steatorrhea, malnutrition, and weight loss.
- Congenital anomalies leading to short-bowel syndrome include intestinal atresia, midgut volvulus with intestinal necrosis, and necrotizing enterocolitis.
- In middle-aged adults, inflammatory bowel disease and trauma are the leading causes of massive intestinal resection.

- In the elderly, prominent causes include mesenteric ischemia and strangulated hernia.

- Adaptation:The distal small intestine has the greatest adaptive potential and can assume many of the absorptive properties of the proximal GI tract. Cellular hyperplasia and bowel hypertrophy occur over a 2- to 3-year period, increasing the absorptive surface area. Fat absorption is the metabolic process most likely to be permanently impaired; other functions adjust and normalize fairly well.
- Fluid and electrolyte response. Of the 8 to 10 L of fluid presented daily to the small intestine, only 1 to 2 L are delivered into the colon. Significant quantities of electrolytes are absorbed in this process. With short-bowel syndrome, this physiology is altered. Strict intake and output records and close monitoring of serum electrolytes are critical in the early management of patients with short-bowel syndrome.
- Malabsorption and malnutrition:

- Gastric hypersecretion, seen early in the postoperative period, can persist for prolonged periods. Increased acid load may injure distal bowel mucosa, leading to hypermotility and impaired absorption. The severity of hypersecretion correlates directly with the extent of bowel resection. This generally is more pronounced after jejunal than after ileal resection. Loss of an intestinal inhibitory hormone has been implicated.
- Cholelithiasis. Altered bilirubin metabolism after ileal resection increases the risk of gallstones secondary to a decreased bile salt pool, which causes a shift in the cholesterol saturation index. Chronic total parenteral nutrition (TPN) also increases risk of cholelithiasis.
- Hyperoxaluria and nephrolithiasis. Excessive fatty acids within the colonic lumen bind intraluminal calcium. Unbound oxalate, normally made insoluble by calcium binding and excreted in the feces, thus is absorbed readily, resulting in hyperoxaluria and calcium oxalate urinary stone formation.
- Diarrhea and steatorrhea. Rapid intestinal transit, presence of hyperosmolar enteric contents in the distal bowel, disruption of the enterohepatic bile acid circulation, and bacterial overgrowth all promote diarrhea and steatorrhea. Fat absorption is most severely impaired by ileal resection. The delivery
  of bile acids into the colon produces a reactive watery diarrhea that may be severe. Unabsorbed fats in the colon further inhibit absorption and stimulate secretion of water and electrolytes.
- Intestinal microflora. Loss of the ileocecal valve permits reflux of colonic bacteria into the small bowel. Intestinal dysmotility further promotes bacterial colonization. Bacterial overgrowth and changes in the indigenous microbial population result in pH alteration and deconjugation of bile salts, with resultant malabsorption, fluid loss, and decreased vitamin B_{12} absorption. Infectious diarrhea (bacterial or viral) is a major cause of morbidity.

Treatment: Acutely, the primary goal is to stabilize the metabolic, respiratory, and cardiovascular parameters related to the fluid shift and sepsis that frequently accompany massive small-bowel resection.

- Deranged motility patterns and changes in intraluminal milieu may produce a prolonged ileus. Parenteral nutrition should be provided until GI function resumes. If ileus persists for an unduly prolonged period, mechanical obstruction or sepsis may be the cause.
- Gastric hypersecretion requires H_2-receptor antagonists or proton-pump inhibitors to reduce the hypersecretion response and protect against peptic ulceration. Antacids neutralize acid on contact and should be administered for nasogastric aspirate pH of less than 5.
- Nutritional support should be instituted early to maintain positive nitrogen balance and to promote wound healing and adaptation of the remaining bowel. Enteral nutrition has a positive trophic

effect on the bowel mucosa and should be started as soon as possible. Feeding tubes placed at laparotomy can be very helpful. Even if caloric goals are not met, enteral formula stimulates the remaining intestine and facilitates adaptation. Feeds should initially be low volume, low fat, and isosmotic.

Chronic Treatment

- Diarrhea has many causes in short-bowel syndrome. Frequently, dietary modification improves symptoms. H_2-receptor antagonists reduce acid production and the volume of enteric contents. Chelating resins, such as cholestyramine, reduce intraluminal bile salts and subsequent diarrhea but affect the available systemic bile salt pools. Antisecretory medications, such as loperamide and somatostatin analog, may be beneficial. Low-dose oral narcotics, such as diphenoxylate hydrochloride and atropine (Lomotil) or codeine, are efficacious but addictive. Bacterial overgrowth should be evaluated by stool culture and prophylactic antimicrobials administered as needed.
- Nutritional support with supplemental vitamins, trace elements and minerals, and essential fatty acids should be given parenterally until adequate enteral absorption is established. The absorption of fat-soluble vitamins A, D, E, and K is especially likely to be compromised. Vitamin B_{12} and calcium absorption are also affected by altered fat absorption and should be supplemented. If required, chronic TPN can be administered nightly to permit normal daytime activities.
- Late complications, mostly secondary to metabolic derangements, are common. Problems include nephrolithiasis, cholelithiasis, nutritional deficiency (e.g., anemia, bone disease, coagulopathy), liver dysfunction, TPN-related complications, and central venous catheter–related problems, for example, sepsis or thrombosis. Anastomotic leak, fistula, stricture, and obstruction can also occur well beyond the early postoperative period. Late obstruction (partial or complete) is fairly common, and reoperative rates are high.

Surgical therapy: Operative therapies for short-bowel syndrome can be divided into two broad categories: (i) intestinal or combined liver-intestinal transplantation, and (ii) nontransplant operations. Nontransplant components of the surgical armamentarium for the treatment of short-bowel syndrome include intestinal lengthening (Bianchi) procedures, intestinal tapering for dilated dysfunctional bowel segments, strictureplasty, and creation of intestinal valves or reversed bowel segments for patients with rapid intestinal transit times.

7. What are the methods of promoting soft tissue healing? 10

Answer. Methods of promoting soft tissue healing:

- Soft tissue injuries, both acute or chronic, are among the most frequent issues addressed by physical therapists, athletic trainers and primary care physicians; however, many currently available treatment options are costly, time consuming, and potentially harmful.
- Nonsteroidal anti-inflammatory pharmacotherapies can be deleterious to soft tissue healing and harmful to the gastrointestinal and renal systems.
- Interventions such as prescription painkillers, corticosteroid injections, and platelet-rich plasma injections can be addictive, costly, and of questionable efficacy, respectively.
- Traditional rest, time-off, and elevation therapy may not be feasible for all soft tissue injuries and patient lifestyles.

- Many use the regimen of rest, ice, compression, elevation and stabilization (RICES) to treat acute injury, but are unsure what to do if the injury becomes chronic.
- Whereas, many of these current treatment options address inflammation and pain management, therapeutic ultrasound can both manage pain and facilitate healing.
- Low intensity therapeutic ultrasound (LITUS) is currently used in promoting healing of soft tissue injuries.
- Hyperbaric oxygen has also been used to promote healing. Agents such as platelet-rich plasma (PRP) and erythropoietin (EPO) are modulators that have a positive effect on tissue regeneration and have been used successfully to enhance the healing of wounds.
- Stem cells of endothelial cells, originating from parts of uninjured blood vessels, develop pseudopodia and push through the ECM into the wound site to establish new blood vessels

- Overview of involved growth factors

Growth factor	Abbreviation	Main origins	Effects
Epidermal growth factor	EGF	▪ Activated macrophages ▪ Salivary glands ▪ Keratinocytes	▪ Keratinocyte and fibroblast mitogen ▪ Keratinocyte migration ▪ Granulation tissue formation
Transforming growth factor-α	TGF-α	▪ Activated macrophages ▪ T-lymphocytes ▪ Keratinocytes	▪ Hepatocyte and epithelial cell proliferation ▪ Expression of antimicrobial peptides ▪ Expression of chemotactic cytokines
Hepatocyte growth factor	HGF	▪ Mesenchymal cells	▪ Epithelial and endothelial cell proliferation ▪ Hepatocyte motility
Vascular endothelial growth factor	VEGF	▪ Mesenchymal cells	▪ Vascular permeability ▪ Endothelial cell proliferation
Platelet derived growth factor	PDGF	▪ Platelets ▪ Macrophages ▪ Endothelial cells ▪ Smooth muscle cells ▪ Keratinocytes	▪ Granulocyte, macrophage, fibroblast and smooth muscle cell chemotaxis ▪ Granulocyte, macrophage and fibroblast activation ▪ Fibroblast, endothelial cell and smooth muscle cell proliferation ▪ Matrix metalloproteinase, fibronectin and hyaluronan production ▪ Angiogenesis ▪ Wound remodeling ▪ Integrin expression regulation
Fibroblast growth factor 1 and 2	FGF-1, −2	▪ Macrophages ▪ Mast cells ▪ T-lymphocytes ▪ Endothelial cells ▪ Fibroblasts	▪ Fibroblast chemotaxis ▪ Fibroblast and keratinocyte proliferation ▪ Keratinocyte migration ▪ Angiogenesis ▪ Wound contraction ▪ Matrix (collagen fibers) deposition
Transforming growth factor-β	TGF-β	▪ Platelets ▪ T-lymphocytes ▪ Macrophages ▪ Endothelial cells ▪ Keratinocytes ▪ Smooth muscle cells ▪ Fibroblasts	▪ Granulocyte, macrophage, lymphocyte, fibroblast and smooth muscle cell chemotaxis ▪ TIMP synthesis ▪ Angiogenesis ▪ Fibroplasia ▪ Matrix metalloproteinase production inhibition ▪ Keratinocyte proliferation
Keratinocyte growth factor	KGF	▪ Keratinocytes	▪ Keratinocyte migration, proliferation and differentiation

8. Discuss the perioperative management of a patient having diabetes mellitus as a comorbidity. 10

Answer. General Preoperative Assessment:

History:

- Suggestive symptoms (eg, polyuria/polydipsia, blurred vision)
- Eating patterns, nutritional status, exercise history, and weight history
- Current treatment of diabetes, including medication regimen, diet, exercise, and glucose monitoring results
- Frequency, severity, and etiology of acute complications (eg, ketoacidosis, hypoglycemia)
- Previous or current infections (eg, skin, foot, dental, genitourinary)
- Symptoms and treatment of chronic microvascular or macrovascular complications (eg, eye; kidney; nerve; genitourinary, bladder, and gastrointestinal function; heart; peripheral vascular; foot; and cerebrovascular complications)
- Nondiabetic medications that may affect blood glucose levels (eg, corticosteroids)
- Risk factors for atherosclerosis (eg, smoking, hypertension, obesity, dyslipidemia, family history)
- History and treatment of other conditions (eg, endocrine and eating disorders)
- Family history of DM and endocrine disorders
- Lifestyle, cultural, psychosocial, and economic factors that might influence DM management.
- Tobacco, alcohol, and controlled substance use

Physical Examination:

- The physical examination includes assessment for orthostatic hypotension, a potential sign of autonomic neuropathy. A funduscopic examination may provide insight into the patient's risk of developing postoperative blindness, especially following prolonged spinal surgery in the prone position and cardiac surgery requiring cardiopulmonary bypass.
- Type 1 DM is associated with a "stiff joint" syndrome, which poses a significant risk during airway management at the time of general anesthesia. The temporomandibular, atlantooccipital, and other cervical spine joints may be affected.
- Further airway evaluation should include assessment of thyroid gland size, as patients with type 1 DM have a 15% association of other autoimmune diseases, such as Hashimoto thyroiditis and Graves disease.
- Finally, the degree of preoperative neurologic dysfunction is important to document, especially before the administration of regional anesthesia or peripheral nerve blocks, to assess the degree of subsequent nerve injury.

The physical examination should include the following:

- Blood pressure (including orthostatic measurements)
- Funduscopic examination
- Airway examination
- Thyroid palpation
- Cardiac examination
- Abdominal examination (hepatomegaly)

- Evaluation of pulses by palpation and with auscultation
- Feet examination
- Skin examination (insulin-injection sites)
- Neurologic examination

General Preoperative Management:

- Given that patients with DM are treated with a variety of regimens and are scheduled for surgery at varying times of the day, there is no established consensus for optimal perioperative management. However, using general management principles to minimize the likelihood of hypoglycemia and to limit the incidence of excessive hyperglycemia should guide decision making.
- In general, on the day of surgery, patients on oral regimens should be advised to discontinue these medications. Secretagogues (eg, sulfonylureas, meglitinides) have the potential to cause hypoglycemia. In addition, sulfonylureas may interfere with ischemic myocardial preconditioning and may theoretically increase the risk of perioperative myocardial ischemia and infarction. Patients taking metformin should be advised to discontinue this drug preoperatively because of the risk of developing lactic acidosis.
- Patients who are insulin dependent are typically advised to reduce their bedtime dose of insulin the night before surgery to prevent hypoglycemia while nil per os (NPO). Maintenance insulin may be continued, based on the history of glucose concentrations and the discretion of the advising clinician. Patients may be advised to consult with their anesthesiologist and diabetes-managing practitioner for individualized recommendations regarding their diabetes plan. Additionally, patients should be monitored preoperatively to assess for hyperglycemia and hypoglycemia.

Metabolic Response to Anesthesia and Surgery

Surgery induces a considerable stress response mediated by the neuroendocrine system through the release of catecholamines, glucagon, and cortisol. The principal mechanism lies with the elevation of sympathetic tone, with a subsequent release of cortisol and catecholamines during surgery. This compensatory mechanism is impaired in diabetic patients through a relative insulin deficiency (type 2) or an absolute insulin deficiency (type 1), necessitating supplemental insulin in the perioperative period. Thus, patients with type 1 DM usually require intravenous insulin therapy, depending on the nature of surgery, and are more predisposed to end-organ complications than patients with type 2 DM. Patients with type 2 DM need to have their oral hypoglycemic drugs discontinued preoperatively, with intravenous insulin administered if dictated by the extent of the procedure.

Even nondiabetic patients, because of the considerable stress response, may become hyperglycemic perioperatively. Multiple randomized controlled studies have shown that controlling serum glucose levels in all patients, not merely those with DM, impacts the outcome of surgical patients who are critically ill. This effect does not appear to be related to the dose of insulin but rather to the absolute level of serum glucose achieved.

Anesthetic agents can affect glucose metabolism through the modulation of sympathetic tone; in vitro data suggest that inhalational agents suppress insulin secretion. The resulting relative insulin deficiency often leads to glucose dysregulation and hyperglycemia. This deficiency is compounded in diabetic patients, particularly those with insulin resistance, raising the risk of ketoacidosis. The use of regional anesthesia or peripheral nerve blocks may mitigate these concerns, but no data suggest that these forms of anesthesia improve postoperative survival in patients with DM.

Consensus Recommendations for Target Inpatient Blood Glucose Concentrations:

Patient Population	Blood Glucose Target	Rationale
General medical/surgical*	Fasting: 90-126 mg/dL Random: < 200 mg/dL	Decreased mortality, shorter length of stay, lower infection rates
Cardiac surgery*	< 150 mg/dL	Reduced mortality, reduced risk of sternal wound infections
Critically ill†	< 150 mg/dL	Beneficial effect on short-term mortality, morbidity; length of stay
Acute neurologic disorders‡	80-140 mg/dL	Lack of data, consensus on specific target; consensus for controlling hyperglycemia

*American Diabetes Association.

†Society Critical Care Medicine.

‡American Heart Association/American Stroke Association.

Methods of Achieving Glycemic Control:

Class of Oral Agent	Example	Considerations
Alpha-glucosidase inhibitors	Acarbose	Inhibit enzymes that metabolize carbohydrates; no benefit if NPO
Secretagogues (eg, sulfonylureas, meglitinides)	Glyburide, glimepiride	Hypoglycemia, prolonged action, may be unpredictable, difficult to titrate
Biguanides	Metformin	Risk of lactic acidosis; use cautiously in the presence of renal or hepatic insufficiency, chronic heart failure (CHF); may be found in combination medications
Thiazolidinediones	Rosiglitazone	Increased intravascular volume (CHF), slow onset of effect, difficult to titrate
Dipeptidyl peptidase-4 (DPP-4) inhibitor	Sitagliptin	Slows inactivation of incretin hormones to enhance physiologic glucose control; dosage reduction required for renal insufficiency

Perioperative Methods for Achieving Glycemic Control

Establish separate intravenous access for a "piggyback" infusion of regular insulin (100 U per 100 mL 0.9% saline). The infusion rate can be determined by using the following formula: insulin (U/hr) = serum glucose (mg/dL)/150. Intra-arterial catheter placement is recommended to facilitate checking blood glucose concentrations every 1-2 hours intraoperatively and postoperatively. A second intravenous catheter may be used for intravascular volume replacement with a normal saline solution.

Numerous insulin protocols are available, with varying reliability and validation. In addition, computer-based systems are available that calculate the continued dosing based on glucose concentration and rate of change.

Diabetic Complications and Perioperative Management Considerations

Diabetic Complication	Potential Complication	Therapeutic Considerations/Strategies
Atherosclerotic vascular disease	Myocardial infarction	• Low threshold to evaluate for myocardial ischemia • Perioperative beta-blockers • Glycemic control • Lipid-lowering therapy • Aspirin (antiplatelet therapy) • Maintain BP < 130/80 mm Hg*
	Stroke	• Perioperative beta-blocker • ACE inhibitor/ARB • Glycemic control • Antiplatelet agents as appropriate • Lipid-lowering therapy

Peripheral neuropathy	Lower extremity ulceration	• Foot and heel protection • Close evaluation for pressure ulcers
	Increased infection rates	• Glycemic control • Vaccinations (eg, influenza, pneumococcal)
	Inhibited wound healing	• Glycemic control • Close evaluation of wound status
Autonomic neuropathy	Decreased bladder tone	• Avoid aggravating medications (eg, anticholinergics)
	Gastroparesis	• Minimize opiate analgesics • Gradual dietary progression • Prokinetic agents (eg, metoclopramide)

Nephropathy	Renal insufficiency	• Avoid hypotension/optimize BP control • Glycemic control • Pretreat for contrast-induced nephropathy • ACE inhibitor/ARB • Judicious use of nephrotoxic agents (eg, aminoglycosides, NSAIDs) • Limit protein intake to 0.8 g/kg/d, if appropriate**
Retinopathy	Limited visual acuity for ambulation	• Optimal room lighting • Assistance with ambulation • Glycemic control • Optimal BP control • Proper intraoperative eye protection
	Disorientation/greater risk for delirium	• Temporal and spatial orientation • Minimize medications that may cause delirium

ACE = angiotensin II converting enzyme; ARB = angiotensin receptor blocker; BP = blood pressure; NSAIDs = nonsteroidal anti-inflammatory drugs.

* If no contraindication with agent shown to be effective in lowering cardiovascular events.

†Other disease states (critical illness) may necessitate higher amounts of protein.

9. Discuss the surgical anatomy of thoracic outlet syndrome. How is such a patient surgically treated? 5+5

Answer.

Thoracic outlet syndrome (TOS), also called the scalenus anticus syndrome, costoclavicular syndrome and hyperabduction syndrome, is defined as upper extremity symptoms due to compression of neurovascular bundle in the thoracic outlet area. The three elements of neurovascular bundle - nerves, artery and vein - can be compressed separately and distinct symptom complexes are thus produced, resulting in neurogenic, venous or arterial TOS. Neurogenic TOS is the most common form constituting more than 95% of cases. Venous and arterial TOS together account for the remaining 5% of cases.

Anatomy

The thoracic outlet is bounded by manubrium sternum anteriorly the spine posteriorly and the first rib laterally. The interscalene space is bounded by the anterior scalene muscle anteriorly the middle scalene muscle posteriorly and the first rib inferiorly. The costoclavicular space is bounded by the clavicle and the subclavius muscle anteriorly, the anterolateral border of the first rib medially and the scapula posteriorly. The subclavian artery, vein and the brachial plexus pass from neck into the upper extremity through these spaces, where they are liable to get compressed.

The first rib is strategically located. It is the only bony structure to border the three anatomic spaces through which the neurovascular bundle passes. It also serves as the osseous framework to which muscles and ligaments are attached. It is hypothesized that the first rib is the common denominator against which the various structures compress the neurovascular bundle and the removal of the first rib will ameliorate all the symptoms.

Etiology of TOS

The various etiological factors are listed below in the Table 4. The incidence of cervical rib varies from 0.45% to 1.5%. Gruber classifies cervical rib into four types: (a complete fibrous band, a rib ending with a tapering point connected to the first rib by a fibrous band, the free end of the rib expanding into a bony mass, or a complete rib articulating with the manubrium/ first rib). Cervical ribs are common, and its mere presence in a patient with upper limb pain does not establish a diagnosis of TOS.

Sport Specific Biomechanics

Thoracic outlet syndrome is most often seen in patients who engage in repetitive motions that place the shoulder at the extreme of abduction and external rotation. An example of such activity is swimming, especially with the freestyle stroke, butterfly stroke, and backstroke. When a swimmer reports tightness and pain around the shoulder, neck, and clavicle as his or her hand enters the water, thoracic outlet syndrome should be suspected.

In addition to swimmers, other athletes affected by thoracic outlet syndrome include water polo, baseball, and tennis players and athletes in any other activity that places repetitive stress on the shoulder at the extremes of abduction and external rotation. These individuals may present with neurologic and arterial or venous symptoms. Venous thoracic outlet syndrome most commonly develops in young male athletes in whom the upper extremity musculature is overdeveloped as a result of work or physical conditioning. Baseball players, whose sport requires repetitive throwing motions, are at increased risk for arterial thoracic outlet syndrome in their dominant arm.

Etiological factors in thoracic outlet syndrome

Congenital

- Cervical rib
- Abnormal first rib
- Soft tissue anomalies (myo-fascial bands, anomalous scalene muscle insertion)
- Brachial plexus anomalies ('post-fixed' plexus)

Acquired

- Fracture first rib, clavicle
- Bony exostosis / tumor, or soft tissue tumor
- Previous surgery / scars
- **Scalene muscle injuries / hypertrophy**
- Drooping shoulders

Surgical Intervention:

- Surgery in cases of thoracic outlet syndrome is indicated for acute vascular insufficiency and progressive neurologic dysfunction. For subclavian venous thrombosis, treatment addresses 3 problems: the clot, the extrinsic compression, and the intrinsic damage to the vein.
- Thrombolysis with urokinase is the most commonly recommended treatment, with continued anticoagulation for several months. The timing of surgical decompression is debated, but surgical decompression is needed for long-term improvement. Patients with acute ischemia of the upper extremity require prompt diagnosis and surgical treatment.
- Little argument exists against the surgical treatment of a patient with severe compression or compromise of the subclavian vein or artery. Likewise, patients with atrophy of the intrinsic muscles of the hand secondary to thoracic outlet syndrome with no distal sites of compression need surgical intervention. However, less severe cases are more controversial.
- Because of the high prevalence of surgical complications and variable reports of success, many surgeons offer surgery to patients with disputed or nonspecific-type thoracic outlet syndrome only as a last resort after prolonged conservative management and a detailed discussion regarding the risks and complications of surgery. Potential complications from surgery can include pneumothora, injury to the subclavian artery or vein, injury to the brachial plexus and long thoracic nerve, apical hematoma, intercostobrachial nerve injury, and injury to the thoracic duct.
- The surgical approach used varies and may be specialty dependent, with the transaxillary approach preferred by many thoracic and vascular surgeons and the anterior supraclavicular approach favored by most neurosurgeons. Both approaches allow for supraclavicular decompression, which consists of first rib (and cervical rib if present) removal and part or total scalene muscle removal.
- For neurogenic thoracic outlet syndrome with examination findings of tenderness or reproduction of symptoms on palpation of the coracoid space only, isolated pectoralis minor tenotomy may be sufficient.
- Success rates for surgery vary dramatically in the literature. One review of 47 patients with thoracic outlet syndrome revealed 75% lower plexus and 50% upper plexus compressions remained asymptomatic at 4.6 years.
- A literature review by Peek et al found evidence that most patients who undergo surgery for thoracic outlet syndrome benefit from the treatment. The investigators reported that postoperatively, 90% of the study's patients with arterial or venous thoracic outlet syndrome improved under Derkash's classification to an excellent/good rating, while patients with neurogenic thoracic outlet syndrome showed a 28.3-point improvement in their Disabilities of the Arm, Shoulder and Hand scores.

- However, not all studies have been so impressive. One retrospective analysis of patients with nonspecific neurogenic thoracic outlet syndrome demonstrated work disability at 1 year after surgery in 60% of patients. At 4.8 years of follow-up, 72.5% patients were limited in activities.
- A study that evaluated the outcomes of patients who underwent first rib resection (FRR) for all 3 forms of thoracic outlet syndrome (TOS) during a period of 10 years reported that excellent results were seen in this surgical series of neurogenic, venous, and arterial TOS due to appropriate selection of neurogenic patients, use of a standard protocol for venous patients, and expedient intervention in arterial patients.

10. Discuss the use of energy source devices in laparoscopic surgery. 10

Answer. Energy source devices in laparoscopic surgery:

Bipolar

In bipolar electrosurgery, both the active electrode and return electrode functions are performed at the site of surgery. The two tines of the forceps perform the active and return electrode functions. Only the tissue grasped is included in the electrical circuit. Because the return function is performed by one tine of the forceps, no patient return electrode is needed.

Monopolar

Monopolar is the most commonly used electrosurgical modality. This is due to its versatility and clinical effectiveness. In monopolar electrosurgery, the active electrode is in the surgical site. The patient return electrode is somewhere else on the patient's body. The current passes through the patient as it completes the circuit from the active electrode to the patient return electrode.

PK Gyrus Spatula Eletrode - bipolar vaporization & desiccation -

(43) PK Gyrus has also been used to create a spatula electrode, which almost looks like an armadillo that has multiple electrode surfaces that can be used to both desiccate and cut. This is the first evolution of bipolar electrosurgical cutting. This is a surface desiccation at a rotation 90◦ cut, surface rotation desiccation, rotate 90◦ and cut. So we have both bipolar PK pulsed desiccation and coagulation, also cutting.

EnSeal - Another device, very innovative, EnSeal. Where now the generator has really been put in the jaws. What you have is you have a plastic that's been imbedded with nickel spheres, it's temperature sensitive. When the plastic is cool, it will conduct. Then when it heats up at a certain specified temperature, it will turn into a different form called amorphous, it won't conduct anymore. Now, when it cools down, it will start to conduct again. This will happen almost in a near infinite number of times until everything is uniformly heated, and ultimately no more current can flow along these nanosphere nickel elements of the plastic jaws. That's called EnSeal, again, a low-voltage, impedance feedback modality. Here is a simple transection. It also has a mechanical arm that comes down after the desiccation and allows you to desiccate after the ligation of the tissue. And the cut, another low-voltage impedance feedback device.

Ultrasonic Energy = Mechanical Energy - Ultrasonic energy is mechanical energy and ultrasonic forces are used to cut and coagulate. And in somewhat of a similar fashion the context of how collagen works and how it's configured and how it's manufactured by the body is that if you agitate collagen enough you can deconfigure it by breaking up the hydrogen bonds. You can denature the protein. Then if you keep rubbing tissue, just as if I kept rubbing your back, it would start to get warm, the heat starts to form steam, and the steam starts to percolate through the tissue. As the tissue gets percolated with steam, what happens is it falls apart, which is called cutting. So, ultrasonic energy creates steam, which percolates through the parenchyma, breaks up the parenchyma, and tissue falls apart, called cutting.

Harmonic scalpel and ultrasonic scalpel

Argon beam coagulator

Argon gas is an inert, noncombustible and easily ionized gas which is used in conjuction with monopolar electrosurgery to produce fulguration. Essentially, the electrical current ionizes the argon gas, thereby creating a more efficient pathway for that current to flow since the gas is much more conductive than air, therefore providing a bridge between your tissue and also the electrode. Less smoke is produced with the argon beam coagulator since there is less depth of injury. Despite these advantages, the argon beam coagulator suffers from one very significant drawback in laparoscopic surgery, namely, high flow infusion of argon gas to the abdominal cavity which not just boosts the intraabdominal pressure to very damaging levels, but could also lead to fatal gas embolism.

The Ligasure: The Ligasure System (Valleylab, Boulder, Colorado) LVSS (Ligasure vessel sealing system) utilizes a brand new bipolar technology for vascular sealing having a higher current and lower voltage (180 V) than conventional electrosurgery. It uses a unique mixture of pressure and energy to produce vessel fusion. This fusion is accomplished by melting the elastin and collagen within the vessel walls and reforming it right into a permanent, plastic-like seal. It doesn't depend on a proximal thrombus along with classic bipolar electrocautery. This unique energy output leads to virtually no sticking or charring, and also the seals can withstand Three times normal systolic blood pressure level.

- Thunderbeat is the world's first and only advanced energy system that delivers two well-established forms of energy to a tissue simultaneously:
    - Ultrasonic energy for superior dissection and fast cutting
    - Advanced bipolar energy for secure hemostasis and sealing of vessels up to 7 mm in diameter.

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2017

PAPER I

Time Allowed: 3 Hours **Full Marks: 100**

1. **Give the anatomical description of the different lymph nodal stations draining mainly stomach with a schematic diagram and discuss the role of sentinel lymph node biopsy in the setting of gastric cancers. 6+4**
2. **What are the different types of allograft rejection? Discuss the management policy. 10**
3. **Discuss the causes of hypercalcemia in surgical practice and how to correct it? 10**
4. **Causes and management of chronic pain following mesh repair of inguinal hernia. 10**
5. **Discuss indications and technique of supplementing nutrition in surgical patients. 3+7**
6. **A previously healthy 55 years old man undergoes laparoscopic cholecystectomy for cholelithiasis and has prolonged paralytic ileus with frequent vomiting (skin turgor was diminished) with dry mucus membrane and orthostatic hypotension, laboratory values were: ABG: Ph – 7.56, Po2 85, Pco2 50, Na 132, K 3.1, Cl 80, HCO3 42, Urine : Na 2, K 5, Cl 16. Give the diagnosis and therapy. Discuss the best regimen for routine maintenance of fluid for surgical patients. 2+3+5**
7. **Discuss the surgical anatomy of Oesophagogastric junction. Discuss the investigations for reflux disease. 10**
8. **How would you determine the criteria for preoperative biopsy (Paddington clinico pathological score) and the criteria for the diagnosis of nature (Azzopardi and Salvadori criteria) of phyllodes tumour of breast. 10**
9. **What are the different molecular markers for cancer? Give an outline of Targeted therapy for cancer. 10**
10. **Discuss damage control surgery in critically injured patients. 10**

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2017

PAPER I

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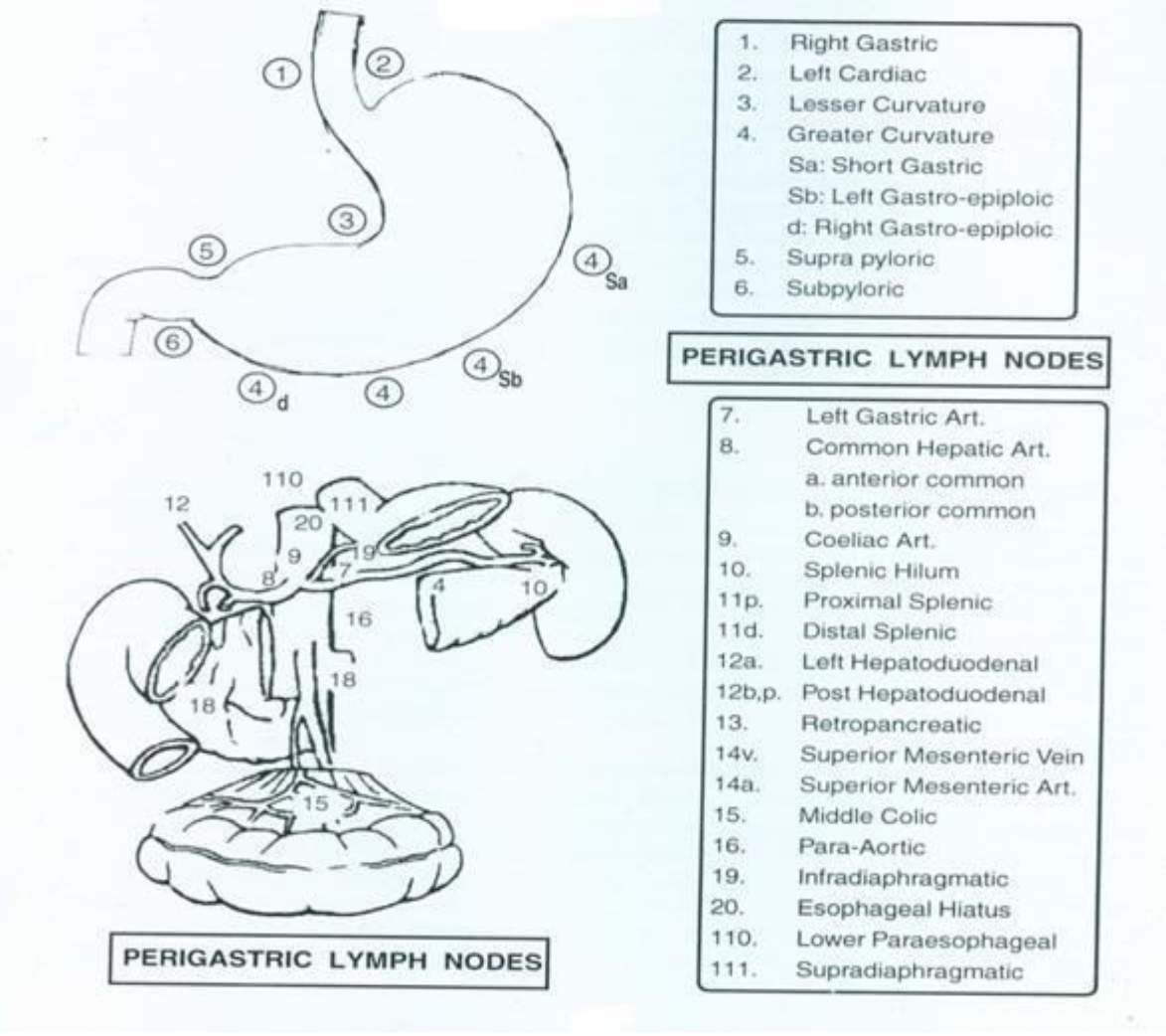
1. **Give the anatomical description of the different lymph nodal stations draining mainly stomach with a schematic diagram and discuss the role of sentinel lymph node biopsy in the setting of gastric cancers. 6+4**

Answer. Lymph node stations:



Grouping of Regional Lymph Nodes (Groups 1-3) by Location of Primary Tumor According to the Japanese Classification of Gastric Carcinoma

		LOCATION OF PRIMARY TUMOR IN STOMACH		
LYMPH NODE STATION (NO.)	DESCRIPTION	Upper Third	Middle Third	Lower Third
1	Right paracardial	1	1	2
2	Left paracardial	1	3	M
3	Lesser curvature	1	1	1
4sa	Short gastric	1	3	M
4sb	Left gastroepiploic	1	1	3
4d	Right gastroepiploic	2	1	1
5	Suprapyloric	3	1	1
6	Infrapyloric	3	1	1
7	Left gastric artery	2	2	2
8a	Anterior comm. hepatic	2	2	2
8p	Posterior comm. hepatic	3	3	3
9	Celiac artery	2	2	2
10	Splenic hilum	2	3	M
11p	Proximal splenic	2	2	2
11d	Distal splenic	2	3	M
12a	Left hepatoduodenal	3	2	2
12b,p	Posterior hepatoduodenal	3	3	3

		LOCATION OF PRIMARY TUMOR IN STOMACH		
LYMPH NODE STATION (NO.)	DESCRIPTION	Upper Third	Middle Third	Lower Third
13	Retropancreatic	M	3	3
14v	Superior mesenteric vein	M	3	2
14a	Superior mesenteric artery	M	M	M
15	Middle colic	M	M	M
16al	Aortic hiatus	3	M	M
16a2,b1	Para-aortic, middle	M	3	3
16b2	Para-aortic, caudal	M	M	M

Role of Sentinel lymph node biopsy in Gastric Cancer:

- SLN biopsy using a radioisotope in patients with gastric cancer is a technically feasible and accurate technique, and it is a minimally invasive approach in the assessment of patient nodal status.
- The concept of SLN characterization is of great interest to many surgical oncologists because it may be a guideline to the determination of the extent of cancer surgery. The clinical implications of SLN biopsy, however, in gastric cancer remain controversial.
- Maruyama et al asserted that SLN biopsy in gastric cancer could not be used for reducing the extent of lymphadenectomy because of the complicated lymphatic streams from the stomach and the presence of frequent skip metastases.
- Tsuburaya et al reported that the sensitivity of sentinel lymph node biopsy performed by exploring the adjacent basin would be very low, especially for the lesions in the lesser curvature and posterior wall.
- However, Kitagawa et al recently claimed that SLN mapping during laparoscopic surgery, and during laparotomy, is a sensitive and feasible intraoperative technique for identifying lymph node metastasis in patients with gastric cancer.
- SLN mapping and biopsy in patients with gastric cancer using ^{99m}Tc tin colloid proved satisfactory.
- Unlike breast cancer and malignant melanoma, a preoperative lymphoscintigraphy in cases of SLN biopsy for gastric cancer may be not available.
- The skip metastasis in gastric cancer has been considered an obstacle to the utilization of the SLN concept.
- Skip metastasis in gastric cancer, however, is not an obstacle in the use of SLN concept because a SLN biopsy can localize and identify such metastasis.

- Micrometastasis in gastric cancer using antibodies to cytokeratin was found in 4-6.3% of cases in other studies.
- In conclusion, SLN biopsy in gastric cancer using a radioisotope proved technically feasible for the detection of SLN located at level II or I and accurately predicted metastasis in the regional lymph nodes in each patient. This technique may be of a great benefit to surgeons for the determination of the extent of lymphadenectomy in gastric cancer. A multicenter validation study of SLN biopsy should establish standard guidelines for deciding the extent of lymphadenectomy in gastric cancer.

2. What are the different types of allograft rejection? Discuss the management policy. 10

Answer.

Types of graft rejection

- Hyperacute rejection
  - Immediate graft destruction due to ABO or preformed anti-HLA antibodies
  - Characterised by intravascular thrombosis and interstitial haemorrhage
- Acute rejection
  - Usually occurs during first six months
  - T cell dependent
  - May be cell-mediated, antibody-mediated or both
  - Usually reversible
- Chronic rejection
  - Occurs after first six months
  - Most common cause of graft failure
  - Antibodies play an important role
  - Non-immune factors contribute to pathogenesis
  - Characterised by myointimal proliferation in graft arteries leading to ischaemia and fibrosis

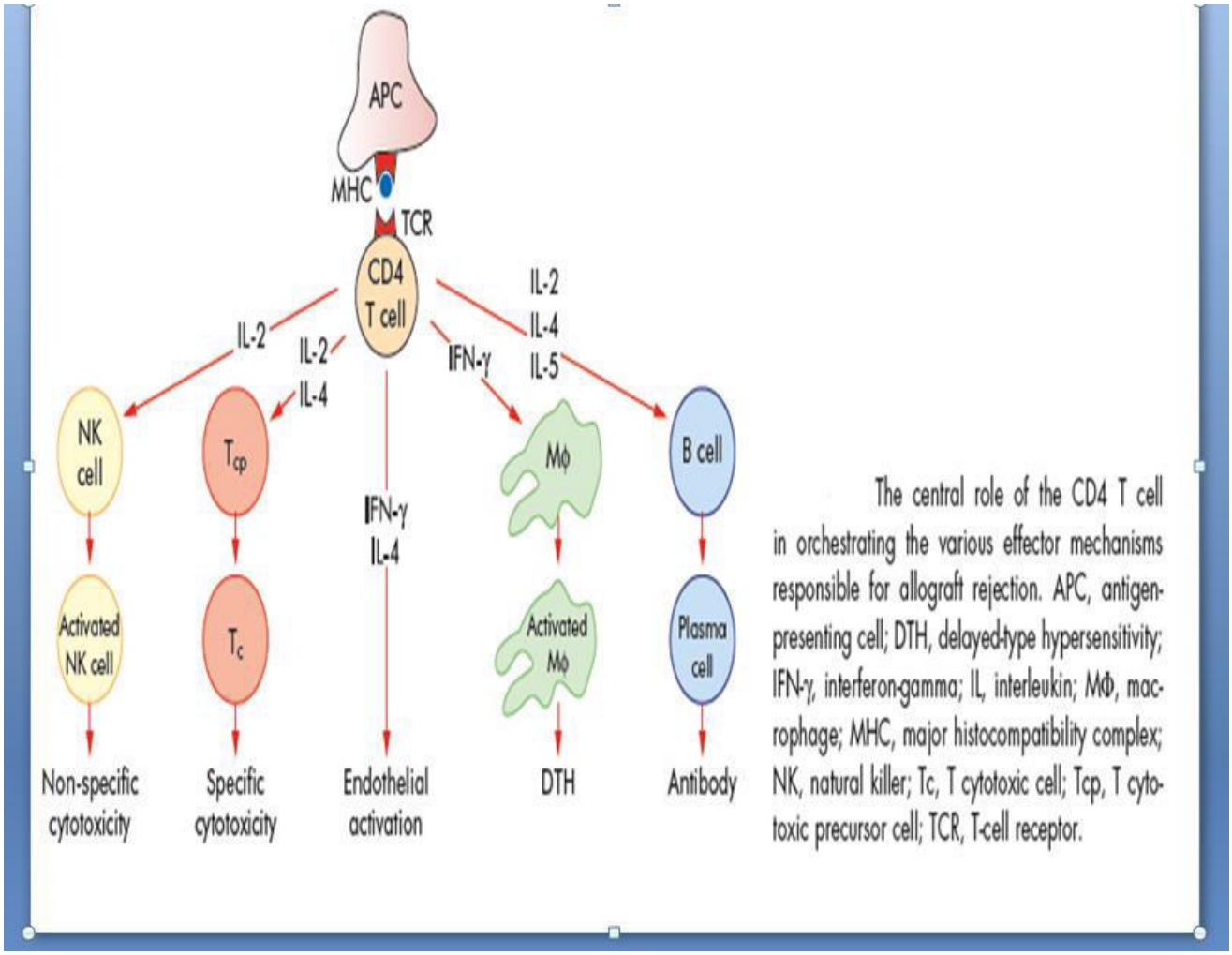
❖ Hyperacute rejection manifests severely and within minutes, and so treatment is immediate: removal of the tissue.

❖ Management of acute rejection:

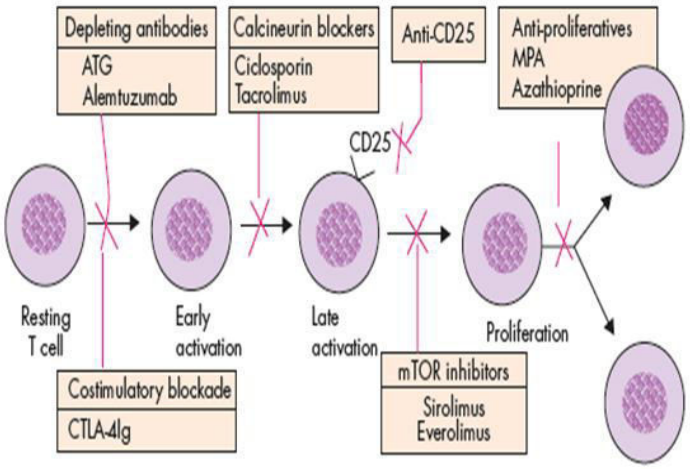
- Take biopsy before treating acute rejection, unless the biopsy will substantially delay treatment.
- Use of corticosteroids for the initial treatment of acute cellular rejection.
- Adding or restoring maintenance prednisone in patients not on steroids who have a rejection episode.
- Add lymphocyte-depleting antibodies or OKT3 for acute cellular rejections that do not respond to corticosteroids, and for recurrent acute cellular rejections.
- Suggestions are there for treating antibody-mediated acute rejection with one or more of the following alternatives, with or without corticosteroids.
  - Plasma exchange;
  - Intravenous immunoglobulin;

- Anti-CD20 antibody;
- Lymphocyte-depleting antibody.

- For patients who have a rejection episode, mycophenolate can be added if the patient is not receiving mycophenolate or azathioprine, or switching azathioprine to mycophenolate.
- OKT3, muromonab (anti–T-cell antibody).



The central role of the CD4 T cell in orchestrating the various effector mechanisms responsible for allograft rejection. APC, antigen-presenting cell; DTH, delayed-type hypersensitivity; IFN-γ, interferon-gamma; IL, interleukin; MΦ, macrophage; MHC, major histocompatibility complex; NK, natural killer; Tc, T cytotoxic cell; Tcp, T cytotoxic precursor cell; TCR, T-cell receptor.



Site of action of immunosuppressive agents on T cell. ATG, antithymocyte globulin; MPA, mycophenolic acid derivatives; mTOR, mammalian target of rapamycin.

CTLA-4Ig	Blocks T-cell costimulation

Chronic rejection

This usually occurs after the first six months. All types of transplant are susceptible to chronic rejection, and it is the major cause of allograft failure. Interestingly, the liver is more resistant than other organs to the destructive effects of chronic rejection. The pathophysiology of chronic rejection is not well understood. The underlying mechanisms are immunological, and alloantibodies are thought to be a major cause although cellular effector mechanisms may also contribute. Alloantigen-independent factors also contribute. The risk factors for chronic rejection of a kidney transplant are:

- previous episodes of acute rejection;
- poor HLA match;
- long cold ischaemia time;
- cytomegalovirus (CMV) infection;
- raised blood lipids;
- inadequate immunosuppression (including poor compliance).

Management of chronic rejection:

- Take care of risk factors.
- Proper and adequate immunosuppression

Agent	Principal mode of action
Corticosteroids	Widespread anti-inflammatory effects
Azathioprine	Prevents lymphocyte proliferation
Mycophenolic acid preperations	Prevents lymphocyte proliferation
Calcineurin inhibitors (ciclosporin/tacrolimus)	Blocks IL-2 gene transcription
mTOR inhibitors	Blocks IL-2 receptor signal transduction
ALG	Depletion and blockade of lymphocytes
Anti-CD25 mAb	Targets activated T cells
Anti-CD52 mAb	Depletion of lymphocytes
Anti-CD20	Depletion of B lymphocytes
CTLA-4Ig	Blocks T-cell costimulation

3. Discuss the causes of hypercalcemia in surgical practice and how to correct it? 10

Answer. Causes of Hypercalcemia

Disease	Confirmatory Test
Primary Hyperparathyroidism	
Sporadic	Intact parathyroid hormone
Familial	
Malignancy	
Humoral/multiple myeloma	Parathyroid hormone-related protein
Osteolytic – breast cancer, lung cancer, RCC, GIT cancer.	
Endocrinopathy	
Hyperthyroidism	Thyroid stimulating hormone
Addison's disease	Adrenocorticotropic hormone stimulation test

Disease	Confirmatory Test
Drug-related	
Vitamin D intoxication	25-hydroxyvitamin D_3
Thiazide diuretics	
Granulomatous Disease	
Sarcoidosis	Angiotensin-converting enzyme 1,25-dihydroxyvitamin D_3
Familial hypocalciuric hypercalcemia	Urine calcium: creatinine ratio

Management:

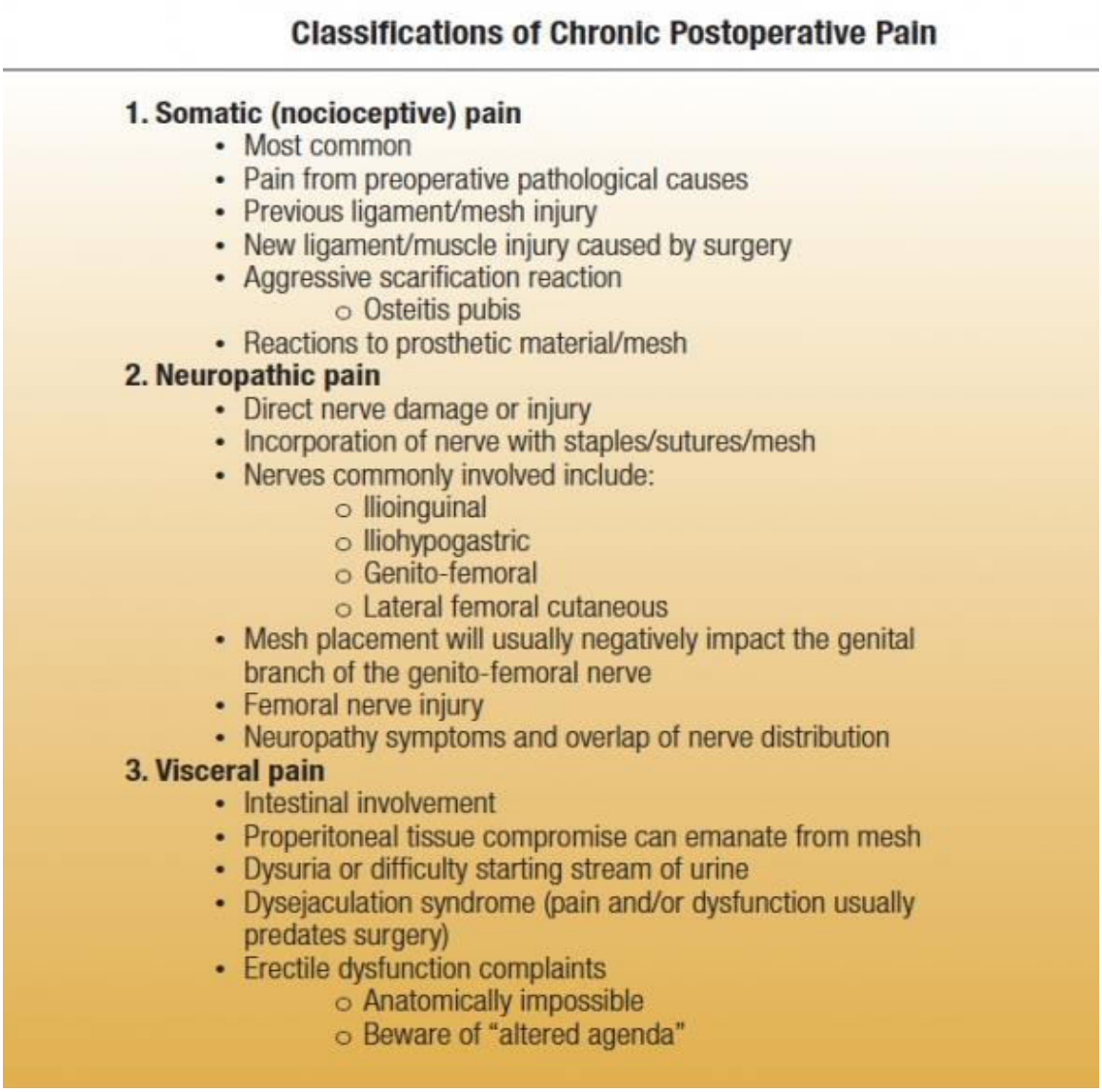
- Calcimimetics. This type of drug mimics calcium circulating in the blood, so it can help control overactive parathyroid glands.
- Bisphosphonates. Intravenous osteoporosis drugs can help rebuild bone weakened by hypercalcemia. Risks associated with this treatment include osteonecrosis of the jaw and certain types of thigh fractures.
    - Risedronate
    - Ibandronate
    - Alendronate
    - Zoledronic acid
    - Pamidronate
- Other drugs stopping breakdown of bones:
    - Calcitonin
    - Plicamycin
    - Gallium nitrate
- Prednisone. If hypercalcemia is caused by high levels of vitamin D, short-term use of steroid pills such as prednisone might be helpful.
    - IV fluids and diuretics. Extremely high calcium levels can be a medical emergency. Hospitalization for treatment with IV fluids and diuretics to promptly lower the calcium level may be needed to prevent heart rhythm problems or damage to the nervous system.

Surgical and other procedures: Problems associated with overactive parathyroid glands often can be cured by surgery to remove the malfunctioning tissue. In many cases, only one of a person's four

parathyroid glands is affected. A special scanning test uses an injection of a small dose of radioactive material to locate the gland or glands that aren't working properly.

4. Causes and management of chronic pain following mesh repair of inguinal hernia. 10

Answer. Chronic pain following groin hernia operation:



- Chronic postoperative groin pain has been defined as pain lasting more than 30 days and interfering with the patient's activities of daily living or work activities. Mesh inguinodynia is a phrase coined by Heise and Starling in 19981 and refers to pain following hernia repair.
- 47% of all patients undergoing all types of inguinal hernia repairs had chronic neuropathic pain.
- The causes for pain included general anesthesia, lengthy surgery, wound infection, and hemorrhage. Operations removing the mesh and orchiectomies did not abolish the pain. Most complications were related to primary hernia repairs, non-emergency repairs, and the "open" technique.

- Mesh did not increase the rate of chronic pain; however, those factors influencing chronic pain were increased: preoperative pain levels, age fewer than 40 years, pain at other sites (such as back pain), psychosocial issues, and a history of heavy manual labor.
- Technical expertise was also an issue creating variances in postoperative pain.
- Five main factors of causation have been positively identified. The first factor is that bulky heavyweight mesh material will cause pain. Secondly, the patient's idiosyncratic reactions with an exaggerated scarification response can generate significant pain. The third cause of pain is the scenario in which the surgeon exhibits an inattention to the technical details of mesh implantation. A fourth cause of pain may be allergic reactions to the mesh materials (ie, polypropylene, polyester, PTFE, and/or the coatings of mesh). The fifth direct cause of pain emanates from direct or indirect nerve injury or inflammation surrounding the nerves secondary to the mesh affixation process or the mere presence of the mesh.
  Recommendations:

- Nonsurgical management:
  - Evaluation and treatment can be very challenging in this patient population. Exam and imaging to exclude occult recurrence is important. Following that, use of antiinflammatories, nerve blocks, neuromodulators, and pain clinic referrals should be considered. Unless there is evidence of a recurrence, operative intervention should be deferred for at least 1 year since groin pain decreases with time elapsed from surgery.
- Triple neurectomy and/or mesh removal: Triple neurectomy of the iliohypogastric, ilioinguinal, and genital femoral nerves.
- Any intervention must be tailored to the individual, with full preoperative disclosure of all potential complications and consideration given to the skills and resources available to the individual surgeon.

5. Discuss indications and technique of supplementing nutrition in surgical patients. 3+7

Answer. Indications:

- The patient's premorbid state (healthy or otherwise)
- Poor nutritional status (current oral intake meeting <50% of total energy needs)
- Significant weight loss (initial body weight less than usual body weight by 10% or more or a decrease in inpatient weight by more than 10% of the admission weight
- The duration of starvation (>7 days' inanition)
- An anticipated duration of artificial nutrition (particularly total parenteral nutrition [TPN]) of longer than 7 days
- The degree of the anticipated insult, surgical or otherwise
- A serum albumin value less than 3.0 g/dL measured in the absence of an inflammatory state
- A transferrin level of less than 200 mg/dL
- Anergy to injected antigens

Indications for Parenteral Nutrition

Primary Therapy

Efficacy shown

Gastrointestinal cutaneous fistulas

Renal failure (acute tubular necrosis)

Short-bowel syndrome

Acute burns

Hepatic failure (acute decompensation superimposed on cirrhosis)

Efficacy not shown

Crohn's disease

Anorexia nervosa

Supportive Therapy

Efficacy shown

Acute radiation enteritis

Acute chemotherapy toxicity

Prolonged ileus

Weight loss preliminary to major surgery

Efficacy not shown

Before cardiac surgery

Prolonged respiratory support

Large wound losses

Areas Under Intensive Study

Patients with cancer

Patients with sepsis

Techniques of Supplementation of nutrition:

- Routes for Administration of Enteral Feeding:
  - Nasoenteric and postpyloric feeding
  - Gastrostomy
  - Jejunostomy

- Routes of administration for TPN
  - Peripheral (PPN) given via a medium calibre cannula in a peripheral vein. Maximum calorie input limited by the maximum osmolarity of the solution given into a peripheral vein. Avoids the risks of central venous cannulation. Usually used for short-term supplementation.
  - Central (TPN) given into a central vein (SVC or brachiocephalic). May be via a dedicated tunnelled line (e.g. Hickman line), a conventional central venous cannula, or a peripherally inserted central venous catheter (PICC line). Maximum calorie input only limited by volume of fluid that can be infused. Carries risks of central venous catheterization.

- In general, the enteral route is preferred over the parenteral route.
- Enteral feeding is simple, physiologic, relatively inexpensive, and well tolerated by most patients. Enteral feeding maintains the GI tract cytoarchitecture and mucosal integrity (via trophic effects), absorptive function, and normal microbial flora.
- This results in less bacterial translocation and endotoxin release from the intestinal lumen into the bloodstream.
- Enteral feedings are indicated for patients who have a functional GI tract but are unable to sustain an adequate oral diet.
- Enteral feedings may be contraindicated in patients with an intestinal obstruction, ileus, GI bleeding, severe diarrhea, vomiting, enterocolitis, or a high-output enterocutaneous fistula.
- Feeding tubes: Nasogastric, nasojejunal (e.g., Dobhoff), gastrostomy, and jejunal tubes (feeding jejunostomy) are available for the administration of enteral feeds. Percutaneous gastrostomy tubes can be placed endoscopically or under fluoroscopy.
- Enteral feeding products. A variety of commercially available enteral formulas are available. Standard solutions provide 1 kcal/mL; calorically concentrated solutions (>1 kcal/mL) are available for patients who require volume restriction. The available dietary formulations for

enteral feedings can be divided into polymeric (blenderized and nutritionally complete commercial formulas), chemically defined formulas (elemental diets), and modular formulas.

- Blenderized tube feedings can contain any food that can be blenderized. Caloric distribution of these formulas should parallel that of a normal diet.
- Nutritionally complete formulas (standard enteral diets) vary in protein, carbohydrate, and fat composition.
- Chemically defined formulas (elemental diets). The nutrients are provided in predigested and readily absorbed form. They contain protein in the form of free amino acids or polypeptides. They are hyperosmolar, which may cause cramping and diarrhea. Elemental diets are efficiently absorbed in the presence of compromised gut function. However, they are costlier.
- Modular formulations are designed for use in specific clinical situations (e.g., pulmonary, renal, or hepatic failure or immune dysfunction).

- Enteral feeding protocols. It is recommended to start with a full-strength formula at a slow rate, which is steadily advanced. This reduces the risk of microbial contamination and achieves goal intake earlier. This approach can also be used with high-osmolarity or elemental feeds. Conservative initiation and advancement are recommended for patients who are critically ill, those who have not been fed for some time, and those receiving a high-osmolarity or calorie-dense formula.
- Bolus feedings are reserved for patients with nasogastric or gastrostomy feeding tubes. Feedings are administered by gravity, begin at 50 to 100 mL every 4 hours, and are increased in 50-mL increments until goal intake is reached (usually 240 to 360 mL every 4 hours). Tracheobronchial aspiration is a potentially serious complication because feedings are prepyloric. To reduce the risk of aspiration, the patient's head and body should be elevated to 30 to 45 degrees during feeding and for 1 to 2 hours after each feeding. The gastric residual volume should be measured before administration of the feeding bolus. If this volume is greater than 50% of the previous bolus, the next feeding should be held. The feeding tube should be flushed with approximately 30 mL of water after each use. Free water volume can be adjusted as needed to treat hypo- or hypernatremia.
- Continuous infusion administered by a pump is generally required for nasojejunal, gastrojejunal, or jejunal tubes. Feedings are initiated at 20 mL/hour and increased in 10- to 20-mL/hour increments every 4 to 6 hours until the desired goal is reached. The feeding tube should be flushed with approximately 30 mL of water every 4 hours. Feedings should be held or advancement should be slowed if abdominal distension or pain develops.

For some patients, the entire day's feeding can be infused over 8 to 12 hours at night to allow the patient mobility free from the infusion pump during the day.

- Conversion to oral feeding. When indicated, an oral diet is resumed gradually. In an effort to stimulate appetite, enteral feeding can be modified by the following measures:
    - Providing fewer feedings.
    - Holding daytime feedings.
    - Decreasing the volume of feedings. When oral intake provides approximately 75% of the required calories, tube feedings can be stopped.
- Administration of medications. Many oral medications can be administered through feeding tubes. The elixir form is preferred but is not always available. Medications that are not suitable for administration through a feeding tube include the following:
    - Enteric-coated medications.
    - Drugs in gelatinous capsules.
    - Medications that are designed for sublingual use.
    - Most sustained-release medications.

Perenteral nutrition:

- TPN solutions must be administered through a central venous catheter. A dedicated single-lumen catheter or a multilumen catheter can be used. Catheters should be replaced for unexplained fever or bacteremia.

- Administration of TPN.

  - Introduction of TPN should be gradual. For example, approximately 1,000 kcal is provided the first day. If there is metabolic stability (i.e., normoglycemia), this is increased to the caloric goal over 1 to 2 days.
  - TPN solutions are delivered most commonly as a continuous infusion. A new 3-in-1 admixture bag of TPN is administered daily at a constant infusion rate over 24 hours. Additional maintenance intravenous fluids are unnecessary, and total infused volume should be kept constant while nutritional content is increased.

- Cyclic administration of TPN solutions may be useful for selected patients, including

  - Those who will be discharged from the hospital and subsequently receive home TPN,
  - Those with limited intravenous access who require administration of other medications,
  - Those who are metabolically stable and desire a period during the day when they can be free of an infusion pump.

  Cyclic TPN is administered for 8 to 16 hours, most commonly at night. This should not be done until metabolic stability has been demonstrated for patients on standard, continuous TPN infusions.

6. A previously healthy 55 years old man undergoes laparoscopic cholecystectomy for cholelithiasis and has prolonged paralytic ileus with frequent vomiting (skin turgor was diminished) with dry mucus membrane and orthostatic hypotension, laboratory values were: ABG: Ph – 7.56, Po2 85, Pco2 50, Na 132, K 3.1, Cl 80, HCO3 42, Urine : Na 2, K 5, Cl 16. Give the diagnosis and therapy. Discuss the best regimen for routine maintainance of fluid for surgical patients. 2+3+5

Answer. ABG: Ph – 7.56, Po2 85, Pco2 50, Na 132, K 3.1, Cl 80, HCO3 42,

- Urine: Na 2, K 5, Cl 16.
- ABG shows – uncompensated metabolic alkalosis.
- Urine shows – dehydration
- Diagnosis is CONTRACTION ALKALOSIS

Treatment: Treatment consists of NaCl infusion to correct ECF volume contraction and administration of K^+ to replace urinary losses.

Metabolic alkalosis can be corrected partially with the following:

- Potassium supplementation
- Potassium-sparing diuretics
- Nonsteroidal anti-inflammatory drugs

- ACE inhibitors

Intravenous fluid therapy for routine maintenance refers to the provision of IV fluids and electrolytes for patients who cannot meet their needs by oral or enteral routes, yet are otherwise well in terms of fluid and electrolyte balance and handling (i.e. they are essentially euvolaemic with no significant electrolyte deficits, ongoing abnormal losses or complex internal redistribution issues). However, even when prescribing IV fluids for more complex cases, there is still a need to account for patients' routine maintenance requirements, providing IV fluid maintenance prescriptions that are then adjusted to account for their more complex fluid or electrolyte problems. Estimates of routine maintenance requirements are therefore essential for any patient on continuing IV fluid therapy.

The goal of fluid therapy is to preserve the normal body water volume and its electrolyte composition: ● Maintenance therapy replaces the ongoing daily losses of water and electrolytes occurring via physiologic processes (urine, sweat, respiration, and stool), which normally preserve homeostasis.

For calculating the minimum amount of fluid per day, a formula based on body weight is recommended: 1500 ml is the minimum water intake with 15ml fluid per kg to be added for the actual weight minus 20 kg. This formula can be used for older adults who are normal weight, underweight, or overweight.

Routine maintenance fluids for surgical patients:

- One group that frequently receives IV fluids which are essentially for 'routine maintenance' is postoperative patients, although early after surgery many such patients have fluid redistribution issues and either deficits or more frequently excesses consequent to imbalances in fluid and electrolyte loss vs. provision during the operation itself. '
- Advances in surgery, anaesthesia and peri-operative care, however, have reduced the length of time that patients need to be nil by mouth (NBM) both prior to and following surgery and so even after major abdominal operations, gastrointestinal function returns rapidly.
- Early post-operative oral intake is often therefore possible and the absence of bowel sounds per se does not mean that food and drink will not be tolerated. Generally, Nasogastric (NG) tubes are only indicated for drainage in the presence of true ileus or gastric dysfunction (e.g. delayed gastric emptying after pancreatic surgery) and indeed, in many cases, morbidity from NG tubes may exceed benefit.
- The aim when giving routine maintenance fluids is to provide enough fluid and electrolytes to meet insensible losses (500–1000 ml), maintain normal status of body fluid compartments and enable renal excretion of waste products (500–1500 ml.).
- Routine maintenance provision should nearly always be a short-term measure since inappropriate therapy risks volume overload and electrolyte and acid-base disturbance particularly hyponatraemia. There may also be problems related to prolonged venous access.

Choice of intravenous fluids for maintenance:

A variety of fluids can be used to meet routine maintenance needs although there is considerable debate about the optimal ones to use.

Isotonic saline

- Sodium chloride 0.9%, with or without additional potassium, is one of the most commonly used IV fluids in UK practice. It is distributed throughout the extracellular fluid compartment (ECF) with perhaps only 25% of the infused volume remaining in the intravascular compartment. In recent years, questions have been raised as to whether it is suitable for routine maintenance purposes since the high sodium content could promote a degree of unnecessary sodium and water retention and the high chloride content will promote some degree of hyperchloraemia. This may then lead to hyperchloraemic acidosis and/or significant reductions in renal blood flow and glomerular filtration rate as well as gastrointestinal mucosal acidosis and ileus..
- Glucose 5% solution: Glucose 5% solution provides a useful means of giving free water for, once the glucose is metabolised, the fluid is distributed throughout total body water. It is therefore a potentially useful means of correcting or preventing simple dehydration and the glucose content will also help to prevent starvation ketosis, although it is important to recognize that it will not make much of a contribution to covering a patients overall nutritional needs. The use of 5% glucose, will increase risks of significant hyponatraemia, particularly in children, the elderly, patients on diuretics and those with excess ADH due to osmotic and non osmotic stimuli (a problem seen quite frequently in hospitalized patients).
- Glucose salines: There are many different IV fluids containing glucose and saline in different concentrations but the two most commonly used in general areas of UK hospital practice are glucose 4% with sodium chloride (either 0.18% or 0.45%). Both are available with or without potassium at various concentrations). The use of glucose 4% with sodium chloride 0.18% or even glucose 4% with sodium chloride 0.45% will promote hyponatraemia if given rapidly or in excess, although both are less likely to cause this than glucose 5% alone.
- Balanced crystalloid solutions: Balanced crystalloids are distributed throughout the ECF and therefore have similar properties to sodium chloride 0.9% in terms of plasma volume expansion and overall fluid distribution. However, they have theoretical advantages over sodium chloride 0.9% in that they contain somewhat less sodium and significantly less chloride.

A number of newer balanced crystalloid solutions are likely to appear on the market, better tailored to meet the theoretical requirements for maintenance. When prescribing these fluids it will be is essential to specify the ‘Maintenance’ version where appropriate since there may be other versions of the fluids designed for Resuscitation of Replacement. The fact that some balanced solutions contain lactate or other buffers is not likely to alter their usefulness for routine maintenance.

Recommendations

If patients need IV fluids for routine maintenance alone, restrict the initial prescription to:

- 25–30 ml/kg/day of water and
- approximately 1 mmol/kg/day of potassium, sodium and chloride and
- approximately 50–100 g/day of glucose to limit starvation ketosis. (This quantity will not address patients' nutritional needs;

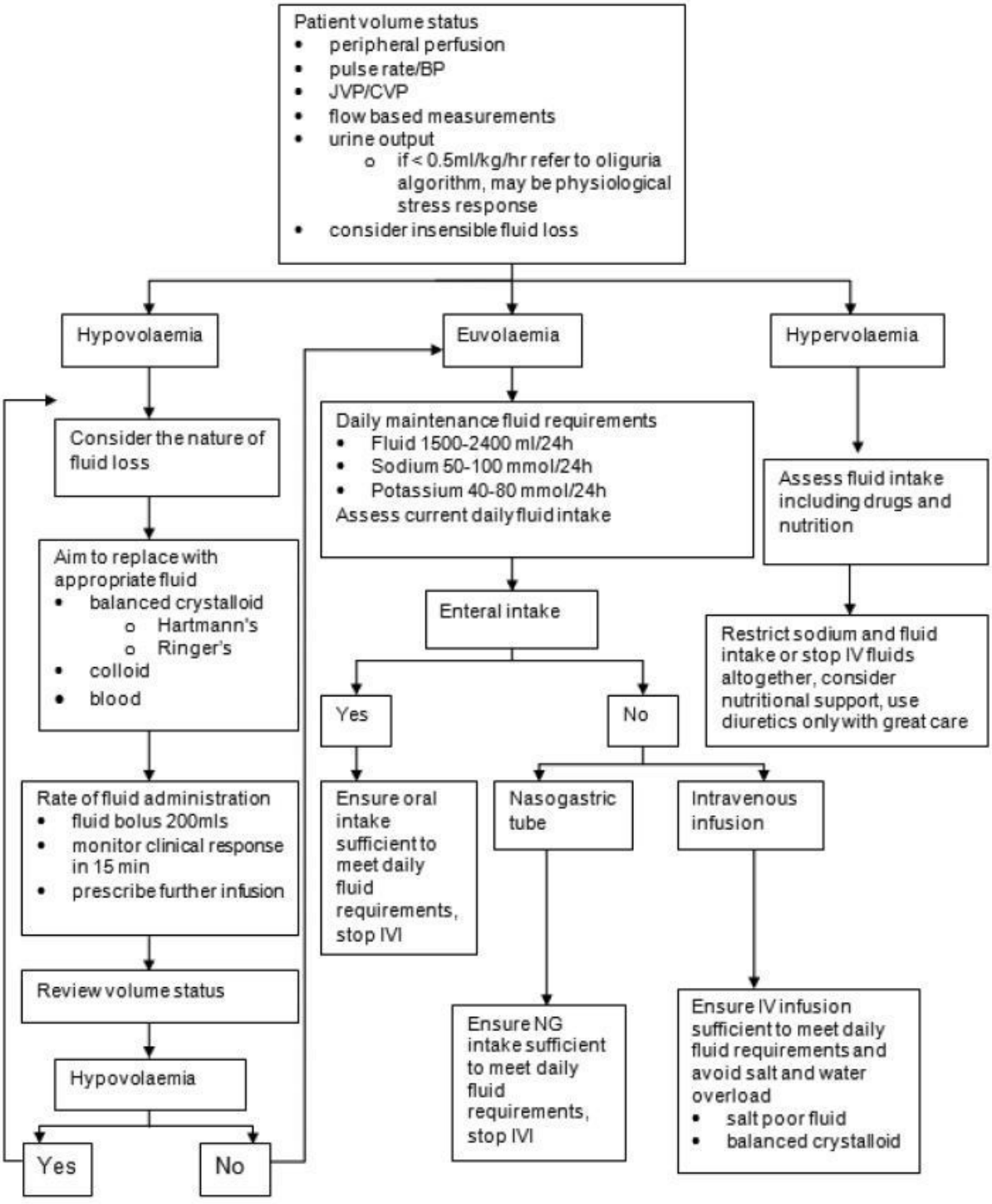
For patients who are obese, adjust the IV fluid prescription to their ideal body weight. Use lower range volumes per kg (patients rarely need more than a total of 3 litres of fluid per day) and seek expert help if their BMI is more than 40 kg/m^2.

Consider prescribing less fluid (for example, 20–25 ml/kg/day fluid) for patients who:

- Are older or frail
- Have renal impairment or cardiac failure
- Are malnourished and at risk of refeeding syndrome.

Assessment and monitoring of fluid balance:

Parameter	Significance
History	Alerts to likelihood of fluid deficit (e. g. vomiting/diarrhoea/ haemorrhage) or excess (e. g. from intraoperative fluids)
Weighing	24-h change in weight (performed under similar conditions) – best measure of change in water balance. Simple to carry out by bedside.
Fluid balance charts	Inherent inaccuracies in measurement and recording. Does not measure insensible loss. Large cumulative error over several days. Good measure of changes in urine output, fistula loss, gastric aspirate, etc.
Urine output	<30 ml/h is commonly used as indication for fluid infusion, but in the absence of other features of intravascular hypovolaemia is usually due to the normal oliguric response to surgery. Urine quality (e. g. urine:plasma urea or osmolality ratio) is just as important, particularly in the complicated patient.
Blood pressure	Cuff measurements may not always correlate with intra-arterial monitoring. Does not necessarily correlate with flow. Affected by drugs, etc. Nonetheless, a fall is compatible with intravascular hypovolaemia, particularly when it correlates with other parameters such as pulse rate, urine output, etc.
Capillary refill	Slow refill compatible with, but not diagnostic of volume deficit. Can be influenced by temperature and peripheral vascular disease.
Autonomic responses	Pallor and sweating, particularly when combined with tachycardia, hypotension and oliguria are suggestive of intravascular volume deficit, but can also be caused by other complications, e.g. pulmonary embolus or myocardial infarction.
Skin turgor	Diminished in salt and water depletion, but also caused by ageing, cold and wasting.
Dry mouth	Usually due to mouth breathing, but compatible with salt and water depletion.
Sunken facies	May be due to starvation or wasting from disease, but compatible with salt and water depletion.
Serum biochemistry	Indicates ratio of electrolytes to water in the extracellular fluid and is a poor indicator of whole body sodium status. Hyponatraemia most commonly caused by water excess. If change in water balance over 24 h is known, then change in serum sodium concentration can guide sodium balance. Hypokalaemia nearly always indicates the need for potassium supplementation. Blood bicarbonate and chloride concentrations measured on point of care blood gas machines are useful in patients with acid-base problems including iatrogenic hyperchloraemia.
Urine biochemistry	Urine sodium concentration reflects renal perfusion and a low value (< 20 mmol/L) indicates renal hypoperfusion. Measurement of urine sodium allows assessment of postoperative sodium mobilisation (see text) Urine potassium measurement is helpful in assessing the cause of refractory hypokalaemia. Urine urea excretion increases several fold in catabolic states (e.g. sepsis) and is an indication for provision of additional free water to avoid hypernatraemia and uraemia.



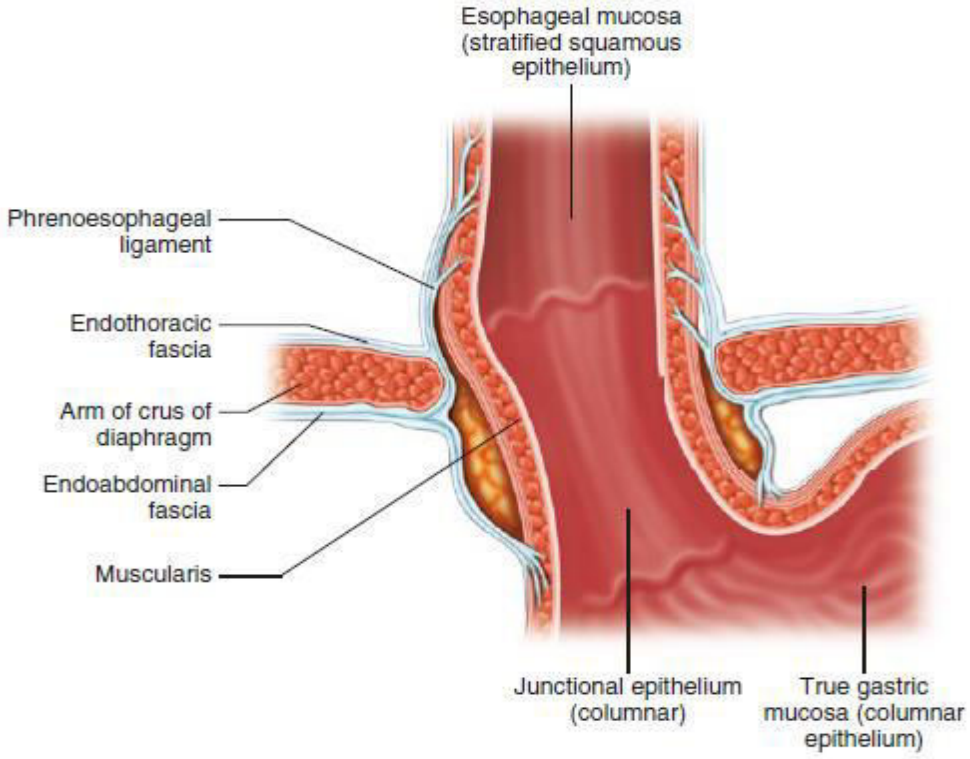
Guideline for fluid therapy

7. Discuss the surgical anatomy of Oesophagogastric junction. Discuss the investigations for reflux disease. 10

Answer. The esophagus joins the stomach at the esophagogastric junction (EGJ), which lies in the abdomen just below the diaphragm. Therefore, the term "esophagogastric junction" implies a transition from the esophagus to the stomach

EGJ is a complex of structures, which may be defined differently by the surgeon, the anatomist, the radiologist, and the endoscopist.

- The surgeon identifies the EGJ just below the diaphragm at the upper border of the peritoneal reflection from the stomach to the distal esophagus.
- It is important to remove the gastric fat pad to accurately identify the gastroesophageal junction during a Nissen fundoplication or a Heller myotomy



- The gross anatomist considers EGJ the termination of the tubular esophagus and the saccular stomach.
- The criteria used by microscopic anatomist to define EGJ are the distal extent of th eesophageal squamous epithelium, the proximal extent of gastric oxyntic mucosa, the point beyond which no submucosal esophageal glands are found, and the change in the muscularis propria from a circular and longitudinal layer in the esophagus to a less defined muscularis propria of the stomach with a third oblique layer.
- The EGJ of the radiologist is the imaginary line of the gastric sling from the acute angle of His to the middle of the junctional mucosa at the lesser curvature, where longitudinal mucosal folds of the esophagus change to transverse folds of the stomach.
- The endoscopist defines the EGJ as the junction of the pale pink esophageal mucosa with the bright red gastric mucosa (Z line), but also considers the distal end of esophageal longitudinal mucosal veins (palisade vessels) and the proximal end of gastric longitudinal mucosal folds.

- Moreover, the muscular structure of the EGJ, forming the LES, can be evaluated by physiologic manometric methods, and EGJ can be defined as the manometric distal end of the LES.

- The external EGJ can be described as the point at which the esophageal tube becomes the gastric pouch and lies in the abdomen at the level of the 11th or 12th thoracic vertebra.
- Internally, the junction is marked by an irregular boundary between stratified squamous esophageal epithelium and columnar gastric epithelium, but this boundary may lie as far as 1–2 cm above the external junction.
- The columnar epithelium below the internal junction contains mucus-secreting glands (the cardiac glands of the histologists), and lacks the chief and parietal cells that characterize the true gastric glands of the body of the stomach.
- The term "junctional epithelium" was proposed for this area by Hayward. The external and internal junctions do not coincide.
- In addition, the loose submucosal connective tissue permits considerable sliding of the mucosa on the muscularis propria, changing the relation between them as the stomach fills with food.
- Furthermore, with damage to the distal esophagus from gastroesophageal reflux and development of a hiatal hernia, the landmarks and relationships of structures around the junction become altered, and the identification of the precise EGJ becomes even more difficult.

  - ❖ Gastroesophageal reflux disease (GERD) and H. pylori infection are the major etiologic factors in the development of inflammation and intestinal metaplasia of the GEJ region.
  - ❖ In some individuals, both these etiologic agents may, in fact, act synergistically to cause inflammation.
  - ❖ The possibility that other as yet unidentified etiologic factors, such as NSAIDs, may be responsible for inflammation in the GEJ region needs to be considered, but alternative etiologies have not been investigated thoroughly.
  - ❖ Both GERD and H. pylori may induce chronic inflammation and the subsequent development of intestinal metaplasia, which, in turn, increase the risk of neoplasia.
  - ❖ Cancers of the gastroesophageal junction are among the most challenging oncologic problems because of the anatomic location of the esophagus and its physical closeness to many vital organs.

8. How would you determine the criteria for preoperative biopsy (Paddington clinico pathological score) and the criteria for the diagnosis of nature (Azzopardi and Salvadori criteria) of phyllodes tumour of breast. 10

Answer. Criteria for preoperative biopsy in Phyllodes tumour of breast (Paddington

clinicopathological suspicious score)

Clinical findings:

- Sudden increase in size in a longstanding breast lesion.
- Apparent fibroadenoma > 3 cm in diameter in a patient>35 years.

Imaging:

- Rounded borders with a lobulated appearance at mammography.

- Alteration of cystic areas within a solid mass on high-rsolution ultrasound.

Cytopathologic findings:

- Presence of hypercellular stromal fragments.
- Indeterminate features.

Azzopardi and Salvadori criteria for diagnosis of nature of phyllodes tumour

Histological type			
Criteria	Benign	Borderline	Malignant
Tumour margins	Pushing	Unequivocal	Infiltrative
Stromal cellularity	Low	Moderate	High
Mitotic rate (per 10 hpf)	<5	5-9	>10
Pleomorphism	Mild	Moderate	Severe

9. What are the different molecular markers for cancer? Give an outline of Targeted therapy for cancer. 10

Answer. Molecular cancer biomarkers

Tumor Type	Biomarker
Breast	ER/PR (estrogen receptor/progesteron receptor)
	HER-2/neu
	EGF
Colorectal	KRAS
	UGT1A1
Gastric	HER-2/neu
GIST	c-KIT
Leukemia/Lymphoma	CD20
	CD30
	FIP1L1-PDGFRalpha
	PDGFR
	Philadelphia Chromosome (BCR/ABL)
	PML/RAR-alpha
	TPMT
	UGT1A1
	EML4/ALK
Lung	EGFR
	KRAS
Melanoma	BRAF
Pancreas	Elevated levels of leucine, isoleucine and valine

Other Examples of Biomarkers

- Tumor Suppressors Lost in Cancer
  - Examples: BRCA1, BRCA2
- RNA
  - Examples: mRNA, microRNA
- Proteins found in body fluids or tissue.
  - Examples: Prostate-specific antigen, and CA-125

Types of Targeted Therapy:

- Most targeted therapies are either small-molecule drugs or monoclonal antibodies.
- Small-molecule drugs are small enough to enter cells easily, so they are used for targets that are inside cells.
- Monoclonal antibodies are drugs that are not able to enter cells easily. Instead, they attach to specific targets on the outer surface of cancer cells.

Mechanisms of action:

- Help the immune system destroy cancer cells.
- Stop cancer cells from growing.
- Stop signals that help form blood vessels.
- Deliver cell-killing substances to cancer cells.
- Cause cancer cell death.
- Starve cancer of the hormones it needs to grow.

Types of target therapies:

- Hormone therapies slow or stop the growth of hormone-sensitive tumors, which require certain hormones to grow. Hormone therapies act by preventing the body from producing the hormones or by interfering with the action of the hormones. Hormone therapies have been approved for both breast cancer and prostate cancer.
- Signal transduction inhibitors block the activities of molecules that participate in signal transduction, the process by which a cell responds to signals from its environment. During this process, once a cell has received a specific signal, the signal is relayed within the cell through a series of biochemical reactions that ultimately produce the appropriate response(s). In some cancers, the malignant cells are stimulated to divide continuously without being prompted to do so by external growth factors. Signal transduction inhibitors interfere with this inappropriate signaling.
- Gene expression modulators modify the function of proteins that play a role in controlling gene expression.
- Apoptosis inducers cause cancer cells to undergo a process of controlled cell death called apoptosis. Apoptosis is one method the body uses to get rid of unneeded or abnormal cells, but cancer cells have strategies to avoid apoptosis. Apoptosis inducers can get around these strategies to cause the death of cancer cells.
- Angiogenesis inhibitors block the growth of new blood vessels to tumors (a process called tumor angiogenesis). A blood supply is necessary for tumors to grow beyond a certain size because blood provides the oxygen and nutrients that tumors need for continued growth.

Treatments that interfere with angiogenesis may block tumor growth. Some targeted therapies that inhibit angiogenesis interfere with the action of vascular endothelial growth factor (VEGF), a substance that stimulates new blood vessel formation. Other angiogenesis inhibitors target other molecules that stimulate new blood vessel growth.

- Immunotherapies trigger the immune system to destroy cancer cells. Some immunotherapies are monoclonal antibodies that recognize specific molecules on the surface of cancer cells. Binding of the monoclonal antibody to the target molecule results in the immune destruction of cells that express that target molecule. Other monoclonal antibodies bind to certain immune cells to help these cells better kill cancer cells.
- Monoclonal antibodies that deliver toxic molecules can cause the death of cancer cells specifically. Once the antibody has bound to its target cell, the toxic molecule that is linked to the antibody—such as a radioactive substance or a poisonous chemical—is taken up by the cell, ultimately killing that cell. The toxin will not affect cells that lack the target for the antibody—i.e., the vast majority of cells in the body.
- Cancer vaccines and gene therapy

Targeted therapies approved for specific types of cancer:

The FDA has approved targeted therapies for the treatment of some patients with the following types of cancer (some targeted therapies have been approved to treat more than one type of cancer):

- Adenocarcinoma of the stomach or gastroesophageal junction: Trastuzumab, ramucirumab.
- Bladder cancer: Atezolizumab.
- Brain cancer: Bevacizumab, everolimus.
- Breast cancer: Everolimus, tamoxifen, toremifene, Trastuzumab, fulvestrant , anastrozole, exemestane, lapatinib, letrozole, pertuzumab.
- Colorectal cancer: Cetuximab, panitumumab, bevacizumab.
- Dermatofibrosarcoma protuberans: Imatinib mesylate.
- Head and neck cancer: Cetuximab.
- Gastrointestinal stromal tumor: Imatinib mesylate, sunitinib.
- Giant cell tumor of the bone: Denosumab.
- Kidney cancer: Bevacizumab, sorafenib, sunitini, temsirolimus, everolimus.
- Liver cancer: Sorafenib.
- Lung cancer: Bevacizumab , erlotinib.
- Neuroblastoma: Dinutuximab.
- Pancreatic cancer: Erlotinib, everolimus, sunitinib.
- Prostate cancer: Cabazitaxel.
- Soft tissue sarcoma: Pazopanib.
- Systemic mastocytosis: Imatinib mesylate.
- Thyroid cancer: Cabozantinib.

10. Discuss damage control surgery in critically injured patients. 10

Answer. Damage control surgery (DCS) is a technique of surgery utilized to care for critically ill patients. While typically trauma surgeons are heavily involved in treating such patients, the concept has evolved to other sub-specialty services. The leading cause of death among trauma patients remains uncontrolled hemorrhage and accounts for approximately 30–40% of trauma related deaths.

Damage control surgery can be divided into the following three phases: Initial laparotomy, Intensive Care Unit (ICU) resuscitation, and definitive reconstruction. Each of these phases has defined timing and objectives to ensure best outcomes. The following goes through the different phases in order to illustrate step by step how one might approach this. There are clearly different approaches throughout the country, and no one way is necessarily correct. However, the ability to evaluate objectively the differences and then choose the one that fits your team is important.

Initial laparotomy:

- This is the first part of the damage control process whereby there are some clear-cut goals surgeons should achieve. The first is controlling hemorrhage followed by contamination control, abdominal packing, and placement of a temporary closure device.
- Minimizing the length of time spent in this phase is essential. In order for groups (i.e. trauma centers) to be effective in damage control surgery, a multi-disciplinary team is critical. The approach to caring for such critically ill patients is dependent on nurses, surgeons, critical care physicians, operating room staff, blood bank personnel, and administrative support. In addition to having the right team in place is having a prepared team.
- The ability to mobilize personnel, equipment, and other resources is bolstered by preparation; however, standardized protocols ensure that team members from various entities within the health care system are all speaking the same language. This has been seen during implementation of complex processes such as the massive transfusion protocol (MTP).
- Controlling of hemorrhage as discussed above is the most important step in this phase. Eviscerating the intra-abdominal small bowel and packing all four abdominal quadrants usually will allow surgeons to establish initial hemorrhagic control. Depending up on the source of hemorrhage a number of different maneuvers might need to be performed allowing for control of aortic inflow.
- Solid organ injury (i.e. spleen, kidney) should be dealt with by resection. When dealing with hepatic hemorrhage a number of different options exist such as performing a Pringle maneuver that would allow for control of hepatic inflow. Surgeons can also apply manual pressure, perform hepatic packing, or even plugging penetrating wounds. Certain situations might require leaving the liver packed and taking the patient for angio-embolization or if operating in a hybrid operating room having perform an on table angio-embolization. Vessels that are able to be ligated should, and one should consider shunting other vessels that do not fall into this category. This has been described by Reilly and colleagues when they shunted the superior mesenteric artery in order to decrease the length of time spent in the operating room.
- Once hemorrhage control is achieved one should quickly proceed to controlling intra-abdominal contamination from hollow-viscus organs. The perception might be that one could quickly perform an anastomosis. This should not be attempted in the damage control setting. The key is to simply prevent continued intra-abdominal contamination, and to leave patients in discontinuity.
- A number of different techniques can be employed such as utilization of staplers to come across the bowel, or primary suture closure in small perforations. Once this is complete the abdomen should be packed.
- Many of these patients become coagulopathic and can develop diffuse oozing. It is important to not only pack areas of injury but also pack areas of surgical dissection. There are various methods that can be utilized to pack the abdomen. Packing with radiopaque laparotomy pads allow for the benefit of being able to detect them via x-ray prior to definitive closure.
- As a rule abdomens should not be definitively closed until there has been radiologic confirmation that no retained objects are present in the abdomen. The final step of this phase is

applying a temporary closure device. Numerous methods of temporary closure exist, with the most common technique being a negative-vacuum type device. Regardless of which method one decides to use it is important that the abdominal fascia is not reapproximated. The ability to develop Abdominal Compartment Syndrome is a real concern and described by Schwab.

ICU resuscitation:

- Upon completion of the initial phase of damage control the key is to reverse the physiologic insult that has taken place. This specifically relates to factors such as acidosis, coagulopathy, and hypothermia (lethal triad) that many of these critically ill patients will develop.
- When developing a strategy to best care for these patients, the same principles of having a multi-disciplinary team that work together in parallel for the same end result apply. The intensivist is critical in working with the staff to ensure that the physiologic abnormalities are treated. This typically requires close monitoring in the intensive care unit, ventilator support, laboratory monitoring of resuscitation parameters (i.e. lactate). In utilizing a number of different resuscitation parameters, the critical care team can have a better idea as to which direction is progressing.
- The first 24 hours will often require a significant amount of resources (i.e. blood products) and investment of time from personnel within the critical care team. In many circumstances, especially trauma patients will require a variety of injuries to be addressed by other specialties.
- Moving the patient unless absolutely necessary early on can be detrimental. Certain circumstances might require this, and the patients should continue to receive care from the critical care team during the entire transport period.
- As the literature begins to grow within the field of damage control surgery, the medical community is continuously learning how to improve the process. Certain pitfalls have also become evident, one of which is the potential to develop abdominal compartment syndrome (ACS). While it might sound counterintuitive since the fascia is left open during the placement of these temporary closure devices, they can create a similar type process that leads to ACS. If this occurs the temporary closure device should be taken down immediately.

Definitive reconstruction:

- The third step in damage control surgery is addressing closure of the abdomen. Definitive reconstruction occurs only when the patient is improving. At this point in process the critical care team has been able to correct the physiologic derangements.
- The optimization will typically take 24–48 hours depending on how severe the initial insult is. Prior to being taken back to the operating room it is paramount that the resolution of acidosis, hypothermia, and coagulopathy has occurred.
- The first step after removing the temporary closure device is to ensure that all abdominal packs are removed. Typically the number of packs has been documented in the initial laparotomy; however, an abdominal radiograph should be taken prior to definitive closure of the fascia to ensure that no retained sponges are left in the abdomen.
- Once the abdominal packs are removed the next step is to re-explore the abdomen allowing for the identification of potentially missed injuries during the initial laparotomy and re-evaluating the prior injuries. Attention is then turned to performing the necessary bowel anastomosis or other definitive repairs (i.e. vascular injuries).

- An attempt should be made to close the abdominal fascia at the first take back in order to prevent complications that can result from having an open abdomen. The concern for early closure of the abdomen with development of compartment syndrome is a real one.
- A method to pre-emptively evaluate whether fascial closure is appropriate would be to determine the difference in peak airway pressure (PAP) prior to closure and the right after closure. An increase of over 10 would suggest that the abdomen be left open. As mentioned above, it is important to obtain an abdominal radiograph to ensure that no retained sponges are left intra-operatively.
- After about one week if the abdomen is not able to be closed surgeons should consider placing a Vicryl mesh to cover the abdominal contents. This will then allow granulation to occur over a few weeks with the subsequent ability to place a split-thickness skin graft (STSG) on top for coverage. These patients will clearly have a hernia that will need to be fixed 9 – 12 months down the line.

Resuscitation

- Permissive hypotension

  - Typical resuscitation strategies have utilized an approach where aggressive crystalloid and/or blood product resuscitation is performed to restore blood volume. The term permissive hypotension refers to maintaining a low blood pressure in order to mitigate hemorrhage; however, continue providing adequate end-organ perfusion [Duchesene, 2010].
  - The key is to prevent exacerbation of hemorrhaging until definitive vascular control can be achieved, the theory being that if clots have formed within a vessel then increasing the patient's blood pressure might dislodge those established clots resulting in more significant bleeding.
  - Subsequent animal studies have shown equivalent outcomes with no real benefit in mortality. Recently there has been further data in trauma patients that has demonstrated increased survival rates [Morrison,2011].
  - Cotton and colleagues found that the use of a permissive hypotentsion resuscitation strategy resulted in better outcomes (increased 30-day survival) in those undergoing damage control laparotomy. This would not be utilized in situations where patients might have injuries such as a Traumatic Brain Injury (TBI) considering that such patients are excluded from the studies.

- Transfusion ratios

  - For over a century the casualties of war have provided valuable lessons that can be applied within the civilian sector. Specifically the past decade has seen a paradigm shift in early resuscitation of critically injured patients. Instead of replacing blood volume with high volumes of crystalloid and packed red blood cells with the sporadic use of fresh frozen plasma and platelets, we have now learned that maintaining a transfusion ratio of 1:1:1 of plasma to red blood cells to platelets in patients requiring massive transfusion results in improved outcomes [Borgman 2007].
  - Prospective Observational Multicenter Major Trauma Transfusion (PROMMTT) Study: They compared administration a higher ratio of plasma and platelets (1:1:1) compared to a lower ratio (1:1:2). The patients that received a higher ratio had an associated three to four-fold decrease in mortality. In order to help mitigate confounding variables a randomized control

trial called the Pragmatic Randomized Optimal Platelet and Plasma Ratios (PROPPR) is being performed to evaluate the transfusion requirement.

- Massive transfusion protocol

  - Initial resuscitation of trauma patients continues to evolve. Massive transfusion (defined as receiving greater than or equal to 10 units of packed red blood cells with a 24-hour period) is required in up to 5% of civilian trauma patients that arrive severely injured.
  - Patients who are arriving severely injured to trauma centers can be coagulopathic. In fact data would suggest that around 25% of patients will arrive having coagulopathy.
  - New ways of measuring coagulopathy such at thromboelstography (TEG) and rotational thromboelastometry (ROTEM) have allowed for a more robust assessment of the coagulation cascade compared to traditional methods of measuring international normalized ratio (INR) allowing clinicians to better target areas of deficiency.
  - In order for trauma teams to be able to systematically and efficiently deliver blood products institutions have created protocols that allow for this. The protocols allow for clear communication between the trauma center, blood bank, nurses, and other ancillary staff. They also allow for the quick delivery of certain set of blood products depending upon the institution. One example might be that a "cooler" would contain 10 units of packed red blood cells, 10 units of plasma, and 2 packs of platelets.
  - Certain factors have been looked at by Callcut and colleagues to determine the predictive ability of patients arriving at trauma centers. The different variables were systolic blood pressure below 90, hemoglobin <11 g/dL, temperature <35.5, INR > 1.5, base deficit >=6, heart rate >= 120 bpm, presence of penetrating trauma, and positive Focused Abdominal Sonography Trauma (FAST) exam. All the variables were found to be predictive of the need of massive transfusion protocol except for temperature (Callcut 2013).

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2016

PAPER - I

Time Allowed: 3 Hours **Full Marks: 100**

Attempt all questions (ten marks for each question)

1. **Describe boundaries of retroperitoneum and give a short account of management of retroperitoneal haemorrhage.**
2. **Describe the anatomy of anal sphincter. How do you evaluate its function?**
3. **Write notes on gastrointestinal hormones.**
4. **Write notes on compartment syndrome.**
5. **What are the complications of pneumoperitoneum and describe their management.**
6. **Discuss the pathology and management of malignant melanoma.**
7. **Describe the concept of zero fluid balance in perioperative fluid management.**
8. **Classify anticancer drugs. What is the role of chemotherapy in the management of carcinoma breast?**
9. **Write notes on diagnostic modalities of blunt abdominal trauma.**
10. **Role of blood components in surgery.**

MS (General Surgery) Examination, 2016

PAPER - I

Time Allowed: 3 Hours **Full Marks: 100**

Attempt all questions (ten marks for each question)

1. **Describe boundaries of retroperitoneum and give a short account of management of retroperitoneal haemorrhage.**

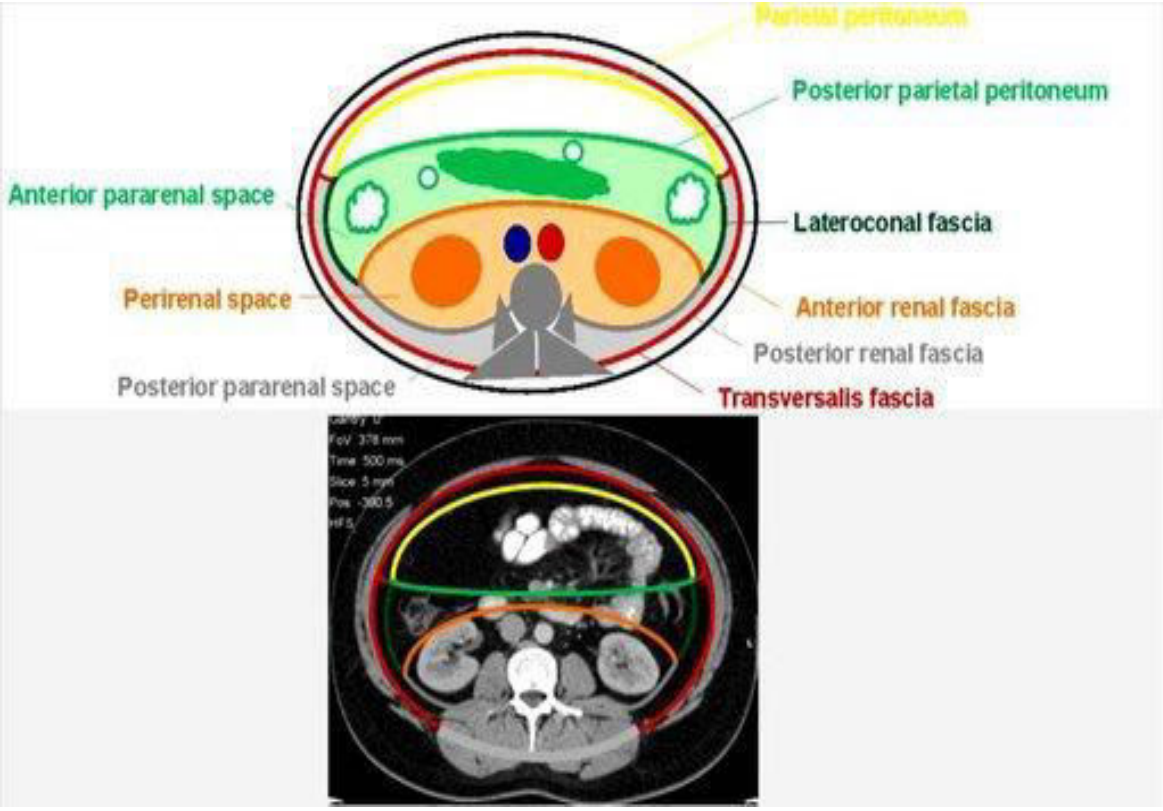
Answer. Boundaries of retroperitoneal space:

Anterior – posterior parietal peritoneumPosterior – transversalis fascia

Superior – diaphragmatic fasciaInferior – pelvic brim

Major compartments:Anterior pararenal spacePosterior pararenal space

Perirenal space – the largest of all 3 compartments.



Anterior Pararenal Space

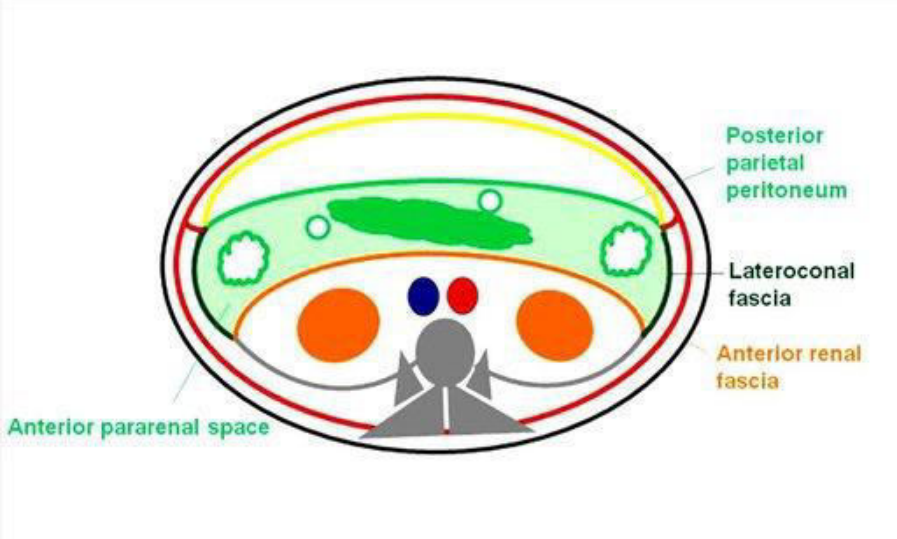
Boundaries:

Anterior - Posterior parietal peritoneum

Posterior - Anterior renal fascia (Gerota fascia)

Lateral - Lateroconal fascia

This space is continuous across the midline. But pathologies remain to one side



Posterior pararenal space

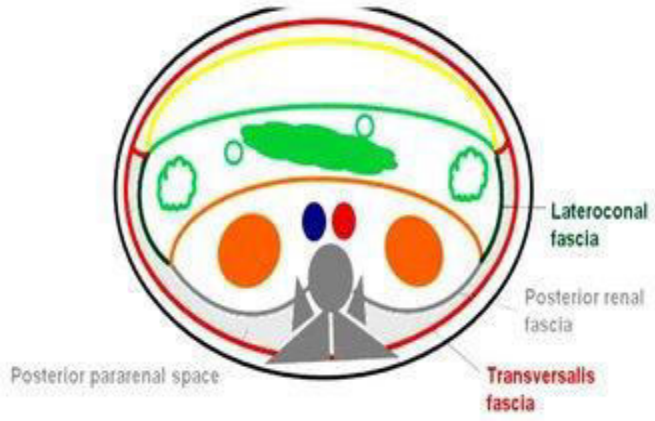
Posterior pararenal space is a thin compartment.

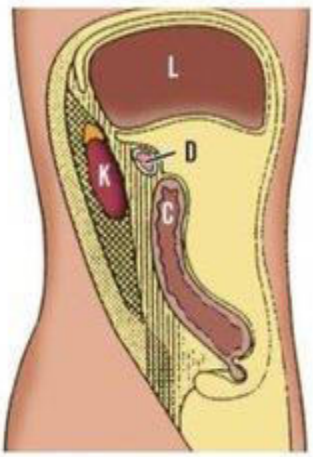
Boundaries

anteromedial - the Posterior renal fascia (Zuckerkandl fascia) and Lateroconal fascia

posterolateral - the Transversalis fascia

Medial - margin of the psoas muscle and quadratuslumborus musclesopens laterally toward the flank and inferiorly toward the pelvis





This space is closely related to the posterior surfaces of the ascending and descending colon, therefore inflammatory processes originating in these colonic segments easily extend into this space.

The posterior pararenal fat is also adjacent to the junction of the anterior and posterior renal fasciae, so fluid collections coursing within these pathways can track into the Posterior pararenal space.

Perirenal Space (Gerota's space)

Perirenal space lies in the central compartment of the retroperitoneum, lateral to the lumbar spine.

inverted cone shaped with superolateral to inferomedial orientation.

Boundaries

Anterior – anterior renal fascia (Gerota's Fascia)

Posterior – posterior renal fascia (Fascia of Zuckerkandl)

Superior – it opens into bare area of liver and the mediastinum

Medial – blends with the connective tissue surrounding the great vessels.

Lateral – lateroconal fascia

Laterally the Anterior and the Posterior renal fascia blend, and the posterior layer of the Posterior renal fascia continues anterior-laterally to form the Lateroconal fascia.

Lateroconal fascia continues anterolaterally behind the colon to blend with the Parietal peritoneum.

Midline communication

There is evidence of potential communication across the midline between the two Perirenal spaces anterior to the lower aorta and inferior vena cava and posterior to the Anterior renal fascia at the level of lower lumbar vertebrae (L3-5).

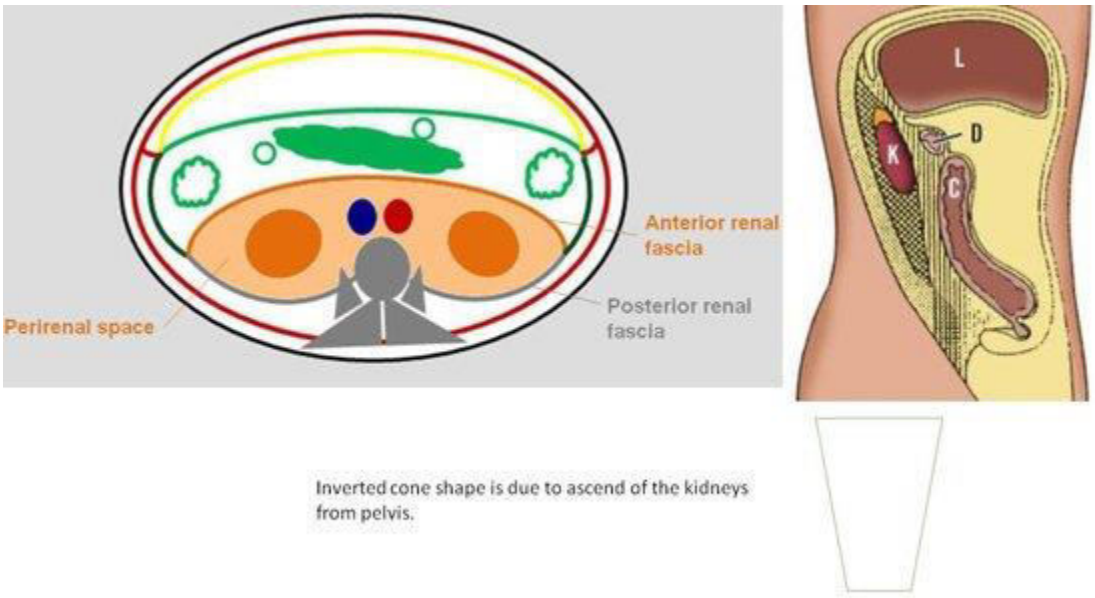
Open inferior ends

Inferiorly this space blends loosely with the iliac fascia and periureteric connective tissue, having its inferior apex open toward to the upper margins of the psoas muscles, ureter, iliac vessels and to the prevesical and presacral spaces.

At this level the perirenal spaces do not communicate.

Thoracic communication

The perirenal space communicates superiorly with the mediastinum through splanchnic foramina of the diaphragmatic crura and through small transdiaphragmatic perforations and lymphatic vessels, providing conduits of potential disease spread between the thorax and the abdomen.



Management of retroperitoneal haemorrhage:

Radiographic features

The radiographic features can be variable depending on the stage of the haematoma.

Plain film - abdominal radiograph

Non-specific but may show

- obliteration of psoas muscle outline
- displaced bowel loops
- in case of an aortic aneurysm as the cause, there may be calcification of aortic aneurysm giving a clue towards the cause in the correct correct clinical context

Ultrasound

- spillage of haemorrhage into the peritoneal cavity can be picked up
- a large haematoma in the retroperitoneum may be seen
- may show indirect evidence of displacement of retroperitoneal structures
- the presence of an abdominal aortic aneurysm with peri-aortic haemorrhage could favour a ruptured aortic aneurysm as the cause

CT

- retroperitoneal structures have a hazy margin with fluid tracking through the retroperitoneum
- **non contrast**
    - acute and subacutehaematomas - heterogeneous high attenuation
    - chronic haematomas - low attenuation
- **contrast-enhanced CT** - without dedicated angiography
    - well-defined margin in case of a formed hematoma and absence of contrast enhancement

CT angiography

On angiography an active bleeding point or the breach in the wall of aneurysm (if its an underlying cause) may be identified.

MRI - MRA

On MRI a retroperitoneal haematoma has a variable appearance depending on the stage of the blood. It helps in better assessment as it can distinguish between blood and a neoplasm:

- acute and subacute stages - hyperintense on T1- and T2-weighted images
- chronic stage - hypointense is present on T1- and T2-weighted images

Treatment:

Management is based on the overall clinical context and vitals signs of the patient, the cause and stage of the haemorrhage.

Medical

Initial medical management involves:

- correction of coagulation disorders
- reversal of any anticlotting therapies (e.g. octaplex for warfarin)
- intravenous fluid resuscitation
- blood transfusion
- admission to appropriate level of care (e.g. HDU for significant bleeds)

Although no consensus guidelines exist for retroperitoneal haemorrhage, it is accepted that patients with small haematomas or without ongoing bleeding can be managed conservatively.

Interventional radiology

It was previously thought that spontaneous retroperitoneal haemorrhage is related to microvascular causes which cannot be treated endovascularly. However, endovascular treatments now have a proven role in management, including:

- stent graft placement
- arterial embolisation

Chronic haematomas can become infected and are evacuated by percutenous drainage or surgery. It has a better prognosis compared to that of the acute type.

Spontaneous retroperitoneal hemorrhage occurs in critically ill patients who are taking anticoagulant or antiplatelet medications, or both

• Femoral vascular access common etiology of clinically silent large retroperitoneal hematoma formation

• Traumatic retroperitoneal hematoma can occur after either blunt or penetrating trauma

• Traumatic retroperitoneal hematomas divided into 3 anatomic zones:

- Zone 1: Centrally located, associated with pancreaticoduodenal injuries or major abdominal vascular injury
- Zone 2: Flank or perinephric regions, associated with injuries to the genitourinary system or colon
- Zone 3: Pelvic location, frequently associated with pelvic fractures or ileal-femoral vascular injury

Surgery: Inappropriate surgical evacuation can exacerbate haemorrhage by relieving haematoma induced tamponade. However, active retroperitoneal hemorrhage giving a large intra-abdominal haemoperitoneum can be fatal, and can require emergency surgery.

2. Describe the anatomy of anal sphincter. How do you evaluate its function?

Answer. Surgical anatomy of anal canal: The anal canal commences at the level where the rectum passes through the pelvic diaphragm and ends at the anal verge. The muscular junction between the rectum and anal canal can be felt with the finger as a thickened ridge – the anorectal 'bundle' or 'ring'.

Anal canal anatomy:

The anorectal ring

The anorectal ring marks the junction between the rectum and the anal canal. It is formed by the joining of the puborectalismuscle ,the deep external sphincter, conjoined longitudinal muscle and the highest part of the internal sphincter. The anorectal ring can be clearly felt digitally, especially on its posterior and lateral aspects.

The puborectalis muscle

Puborectalis, part of the funnel-shaped muscular pelvic diaphragm, maintains the angle between the anal canal and rectum and hence is an important component in the continence mechanism . The muscle derives its nerve supply from the sacral somatic nerves, and is functionally indistinct from the external anal sphincter. The position and length of the anal canal, as well as the angle of the anorectal junction, depend to a major extent on the integrity and strength of the puborectalis muscle sling. It gives off fibres that contribute to the longitudinal muscle layer.

The external sphincter

The external sphincter forms the bulk of the anal sphincter complex and, although traditionally it has been subdivided into deep, superficial and subcutaneous portions, it is a single muscle(Goligher), which is variably divided by lateral extensions from the longitudinal muscle layer. Some of its fibres are attached posteriorly to the coccyx, whereas anteriorly they fuse with the perineal muscles. Being a somatic voluntary muscle, the external sphincter is red in colour and is innervated by the pudendal nerve.

The intersphincteric plane

Between the external sphincter muscle laterally and the longitudinal muscle medially exists a potential space, the intersphincteric plane. This plane is important as it contains intersphincteric anal glands and is also a route for the spread of pus, which occurs along the extensions from the longitudinal muscle layer. The plane can be opened up surgically to provide access for operations on the sphincter muscles.

The longitudinal muscle

The longitudinal muscle is a direct continuation of the smooth muscle of the outer muscle coat of the rectum, augmented in its upper part by striated muscle fibres originating from the medial components of the pelvic floor. Most of the muscle continues caudally before splitting into multiple terminal septa that surround the muscle bundles of the subcutaneous portion of the external sphincter to insert into the skin of the lowermost part of the anal canal and adjacent perianal skin. Milligan and Morgan named the most medial of these septa, passing around the inferior border of the internal sphincter, the 'anal intermuscular septum'. As it descends, however, it gives off fibres that pass medially across the internal sphincter to reach the submucosal space, and laterally across the external sphincter and ischiorectal space to reach the fascia of the pelvic side walls. As well as providing a supportive mesh for the anal canal and other muscular components, its ramifications provide potential pathways for the spread of infection. During defaecation, its contraction widens the anal

lumen, flattens the anal cushions, shortens the anal canal and everts the anal margin; subsequent relaxation allows the anal cushions to distend and thus contribute to an airtight seal.

The internal sphincter

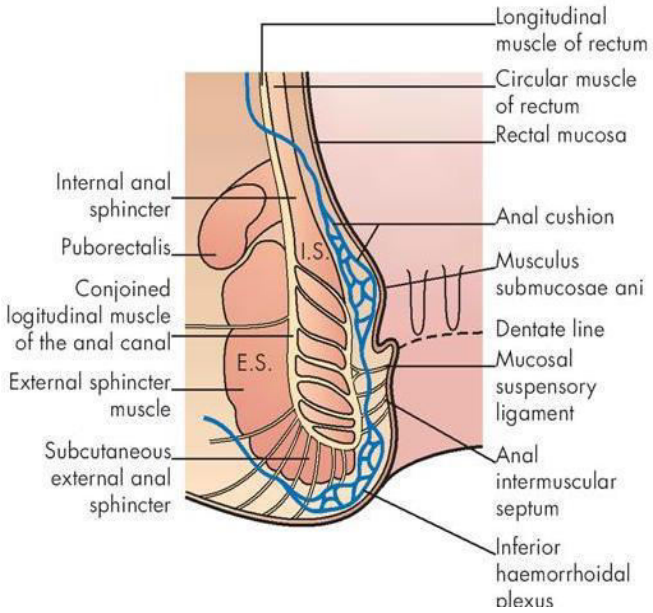
The internal sphincter is the thickened (2–5 mm) distal continuation of the circular muscle coat of the rectum, which has

developed special properties and which is in a tonic state of contraction. This involuntary muscle commences where the rectum passes through the pelvic diaphragm and ends above the anal orifice, its lower border palpable at the intersphincteric groove, below which lie the most medial fibres of the subcutaneous external sphincter, and separated from it by the anal intermuscular septum. When exposed during life, it is pearly-white in colour and its circumferentially placed fibres can be seen clearly. Although innervated by the autonomic nervous system, it receives intrinsic non-adrenergic and non-cholinergic (NANC) fibres, stimulation of which causes release of the neurotransmitter nitric oxide, which induces internal sphincter relaxation.

The epithelium and sub-epithelial structures: The pink columnar epithelium lining the rectum extends through the anorectal ring into the surgical anal canal. Passing downwards the mucous membrane becomes cuboidal and redder in colour whereas above the anal valves it is plum coloured. Just below the level of the anal valves there is an abrupt, albeit wavy, transition to stratified squamous epithelium, which is parchment coloured. This wavy junction constitutes the dentate line. The dentate line is a most important landmark both morphologically and surgically,

representing the site of fusion of the proctodaeum and post-allantoic gut, and being the site of the crypts of Morgagni (synonym: anal crypts, sinuses). The latter are small pockets between the inferior extremities of the columns of Morgagni through which anal ducts that communicate with deeper placed anal glands open into the anal lumen. The squamous epithelium lining the lower anal canal is thin and shiny and is known as the anoderm; it differs from the true skin in that it has no epidermal appendages, i.e. hair and sweat glands. At the dentate line, the anoderm is attached more firmly to deeper structures. The mucosa and submucosa above the dentate line is uneven and thrown into folds, the so called anal cushions. There are variations in the numbers and positions of these cushions but there are usually three, corresponding to those seen in later life. These are described classically as occupying the left lateral, right posterior and right anterior positions, and they continue proximally as the primary rectal foldings. Secondary foldings (the rectal columns of Morgagni) lie both over and between the primary folds. This area is the caudal limit of the so called epithelialtransitional zone, below which the stratified squamous epithelium is richly innervated by sensory nerve endings serving several modalities including touch, pain and temperature. The bulk of the anal cushions themselves, situated in the upper part of the anal canal, receive only visceral afferent innervation and, although there is perception of stretching, sensitivity to noxious stimuli is much more blunted than distally. Between the epithelial layer and the internal sphincter lies the submucosa, consisting of vascular, muscular and connective tissue supportive elements. From the longitudinal muscle, medial extensions cross the internal anal sphincter and form part of the supporting meshwork of the submucosa, blending with the true submucosal smooth muscle layer and thereby supporting the mucosa itself. Parks described the increased density of fibres that insert into the mucosa of the anal crypts at the level of the dentate line, termed the ‘mucosal suspensory ligament’. One feature of this structure is that it separates the superior (portal) and inferior (systemic) haemorrhoidal plexuses, another is that the

mucosa is more firmly tethered to underlying tissues at this level than above. It is important to appreciate that the meshwork of supporting tissues (muscle fibres and connective tissue) within the subepithelial space is intimately linked to deeper structures within the anal sphincter complex, including the internal sphincter, longitudinal muscle layer and external anal sphincter, and indeed structures beyond the sphincter complex. With age, the smooth muscle component of this mesh is reduced and muscle fibres are gradually replaced with fibroelastic connective tissue, which in turn becomes fragmented.



Relevant anatomy of the anus

Blood supply: In addition to the meshwork support of the lining of the anal canal, the subepithelial space contains venous dilatations supported by the same fibroelastic connective tissue and smooth muscle scaffolding. Debate has centred on the nature of the vascular component of haemorrhoids, but the seminal anatomical studies of Thomson have clarified this issue. Venous dilatations are seen in the submucosa both above and below the level of the dentate line; they are much more numerous above although tend to be larger below. The historical description of the blood supply to the upper anal canal as constant, with bifurcation of the main trunk of the superior rectal artery into right and left branches and with subsequent division of the former into anterior and posterior divisions thereby determining the sites of haemorrhoids around the anal circumference. Later it was found that the divisions of the superior rectal artery were not constant and that, furthermore, the anal submucosa may sometimes can receive blood supply from the middle and inferior rectal arteries. There is also presence of free communications between tributaries of the superior, middle and inferior rectal veins, as well as tiny direct arteriovenous communications with the submucosal venous dilatations. These communications have been shown both histologically and radiologically, and the oxygen tension of the blood contained within the venous dilatations (as well as the colour) is more arterial than venous.

Venous drainage: The anal veins are distributed in a similar fashion to the arterial supply. The upper half of the anal canal is drained by the superior rectal veins, tributaries of the inferior mesenteric vein and thus the portomesenteric venous system, and the middle rectal veins, which drain into the internal iliac veins. The inferior rectal veins drain the lower half of the anal canal and the subcutaneous perianal plexus of veins: they eventually join the internal iliac vein on each side.

Lymphatic drainage: Lymph from the upper half of the anal canal flows upwards to drain into the postrectal lymph nodes and from there goes to the para-aortic nodes via the inferior mesenteric chain. Lymph from the lower half of the anal canal drains on each side first into the superficial and

then into the deep inguinal group of lymph glands. However, if the normal flow is blocked, e.g. by tumour, the lymph can be diverted into the alternative route.

Examination of the anus:

- Careful clinical examination will be diagnostic in the vast majority of patients complaining of anal symptoms but it requires arelaxed patient who is informed of what the examination will entail, a private environment, a chaperone (for the security of both parties) and good light.
- Most commonly, the patient is examined in the left lateral (Sims) position with the buttocks overlying the edge of the examination couch and with the axis of the torso crossing, rather than parallel with, the edge of the couch.
- Alternatively, in younger patients, the prone jack-knife or knee–elbow positions may be used. The examining couch should be of sufficient height to allow easy inspection and access for any necessary manoeuvres. A protective glove should be worn.

Inspection

- The buttocks are gently parted to allow inspection of the anus and perineum: the presence of any skin lesions and whether they are confined to the perineum or evident elsewhere on general examination, e.g. psoriasis, lichen planus, or on genital examination, e.g. warts, candidiasis, lichen sclerosus et atrophicus, the vesicles of herpes simplex virus (HSV); evidence of anal leakage; whether the anus is closed or patulous; and the position of the anus and perineum at rest and on bearing down (the latter may reveal prolapse of haemorrhoids or even the rectum).
- Pain on parting the buttocks, perhaps together with the presence of a sentinel tag, may indicate the presence of an underlying fissure, but may also prompt the need for examination under anaesthesia to exclude more suspicious pathology, for example squamous cell carcinoma of the anal canal.

Digital examination with the index finger

With an adequately lubricated index finger, the soft tissues around the anus are palpated for induration, tenderness and subcutaneous lesions. The index finger is then introduced gently into the anal canal along its posterior aspect. At the apex of the canal, the sling of puborectalis is felt posteriorly; supralevator induration feels bony hard and is more easily appreciated if unilateral. The posterior surface of the prostate gland with its median sulcus can be palpated anteriorly in male patients; in female patients, the

uterine cervix can be palpated. The presence of any distal intrarectal, intra-anal or extraluminal mass is recorded. Sphincter length, resting tone and voluntary squeeze are assessed. On withdrawalmthe examining finger is inspected for the presence of mucus, blood or pus and to identify stool colour.

Proctoscopy

Proctoscopy, performed with the patient in the same position, allows a detailed inspection of the distal rectum and anal canal. Minor procedures can also be carried out through this instrument, e.g. treatment of haemorrhoids by injection or banding (see below) and biopsy. Asking the patient to bear down on slow withdrawal of the proctoscope may reveal a descending intussusceptions.

Sigmoidoscopy

Although this is strictly an examination of the rectum, it should always be carried out even when an anal lesion has been confirmed. Rectal pathology, e.g. colitis or carcinoma, is frequently associated

with an anal lesion, e.g. fissure or haemorrhoids. Not infrequently, rectal pathology is found that is independent of the anal lesion and which requires treatment.

Physiological Aspects of The Anal Sphincters And Pelvic Floor, And Special Investigations:

- Anal continence and defaecation are highly complex processes that necessitate the structural and functional integrity of the cerebral, autonomic and enteric nervous systems, the gastrointestinal tract (especially the rectum) and the pelvic floor and anal sphincter complex, any of which may be compromised and lead to disturbances of function of varying severity.
- The sphincter mechanism provides the ultimate barrier to leakage and its integrity can be assessed fairly simply and objectively in the physiology laboratory (Swash and Henry). Perineal position and degree of descent on straining (markers of pelvic floor and pudendal nerve function) can be quantified, and functional anal canal length, resting tone (reflective predominantly of internal sphincter activity) and squeeze increment (reflective of external sphincter function) can be measured by a variety of simple manometric techniques.
- The structural integrity of the sphincters can be visualised with endoluminal ultrasound, and neuromuscular function can be measured by assessment of conduction velocity along the pudendal nerve on each side, or, more painfully, by needle electromyogram (EMG) studies.
- In the elderly especially, but also in younger patients, disorders relating to rectal sensorimotor dysfunction can lead to 'overflow' of rectal contents through what may be an otherwise normal sphincter.
- The dynamics of defaecation can also be assessed radiologically by evacuation proctography, in which radio-opaque pseudo-stool is inserted into the rectum and the patient asked to rest, squeeze and then bear down to evacuate the rectal contents under real-time imaging.
- Proctography can be combined with synchronous EMG and pressure studies (Williams) to yield more information about possible reasons [mechanical (rectocoele, intussusception) or functional (anismus, lack of effort)] for disordered defaecation in an individual. Results of all physiological tests have to be compared with a normal range and within the context of the patient's symptoms, and are used to guide rational rather than empirical treatment strategies.

Electromyography:

Single fiber density determination is of historical interest and is also extremely painful for the patient. It is not routinely performed.Pudendal nerve terminal motor latency determination measures the conduction velocity of the nerve action potential through the terminal 4 cm of the pudendal nerve between Alcock's canal and the external sphincter. A delay in conduction reflects injury to the fast-conducting fibers of the nerve. This injury usually is the result of stretch, direct trauma, or systemic disease. The normal terminal motor latency is 2.2 ± 0.2 ms.Any delay in conduction velocity greater than this indicates nerve injury.

Transrectal Ultrasound

The most sensitive method for documenting sphincter injury may be the anal ultrasound using a 360° rotating 10-MHz transducer covered with an anal cap and inserted into the anal canal. The focal length of the anal probe is approximately 1–2 cm and allows evaluation of the anal sphincter muscles in three dimensions as the probe is withdrawn from the rectum Scarring at the site of an injury is usually easily seen by endoanal ultrasound. A rectovaginal fistula can also be detected. An algorithm for the evaluation and management of anal incontinence can be produced using these diagnostic techniques.

3. Write notes on gastrointestinal hormones.

Answer.

- Cholecystokinin is produced by duodenal and jejunal I cells and enteric nerves in response to intraluminal amino acids and fats. CCK induces gallbladder contraction, pancreatic enzyme secretion, and relaxation of the sphincter of Oddi.
- Enteroglucagon from ileal and colonic L cells is produced in response to intraluminal fat and bile acids. Of note, inflammatory processes, such as Crohn disease and celiac sprue, can dramatically increase enteroglucagon secretion.
- Gastric inhibitory peptide (GIP), secreted by duodenal and jejunal K cells in response to active transport of monosaccharides, long-chain fatty acids, and amino acids, inhibits gastric acid and pepsinogen secretion and gastric emptying but stimulates insulin release.
- Duodenal G cells secrete gastrin in response to vagal stimulation and intraluminal peptides. Gastrin stimulates acid secretion by the gastric fundus and body and increases gastric mucosal blood flow.
- Motilin is produced by duodenal and jejunal M cells in response to duodenal acid, vagal stimulation, and gastrin-releasing peptide. Motilin initiates phase III of the MMC during the fasting state. Erythromycin is useful as a promotility agent due to its action as a motilin agonist.
- Duodenal and jejunal S cells release secretin in response to acid, bile salts, and fatty acids in the duodenum. Secretin increases bicarbonate and water secretion from pancreatic ducts. It inhibits gastric acid secretion and gastric motility.
- Somatostatin broadly inhibits gut exocrine and endocrine function. Somatostatin and its analog, octreotide, are often used to decrease the volume of intestinal secretions in patients with enterocutaneous fistulas. Intestinal D cells and enteric neurons secrete somatostatin in response to intraluminal fat, protein, and acid.
- Vasoactive intestinal peptide (VIP) is secreted throughout the small intestine in response to vagal stimulation. VIP increases mesenteric blood flow, intestinal motility, and pancreatic and intestinal secretions.

4. Write notes on compartment syndrome.

Answer. Introduction:

- Compartment syndrome is a painful condition that occurs when pressure within the muscles builds to dangerous levels. This pressure can decrease blood flow, which prevents nourishment and oxygen from reaching nerve and muscle cells.
- Compartment syndrome can be either acute or chronic.
- Acute compartment syndrome is a medical emergency. It is usually caused by a severe injury. Without treatment, it can lead to permanent muscle damage.
- Chronic compartment syndrome, also known as exertional compartment syndrome, is usually not a medical emergency. It is most often caused by athletic exertion.

Description: Compartment syndrome develops when swelling or bleeding occurs within a compartment. Because the fascia does not stretch, this can cause increased pressure on the capillaries, nerves, and muscles in the compartment. Blood flow to muscle and nerve cells is disrupted. Without a steady supply of oxygen and nutrients, nerve and muscle cells can be damaged.

- In acute compartment syndrome, unless the pressure is relieved quickly, permanent disability and tissue death may result. This does not usually happen in chronic (exertional) compartment syndrome.
- Compartment syndrome most often occurs in the anterior (front) compartment of the lower leg (calf). It can also occur in other compartments in the leg, as well as in the arms, hands, feet, and buttocks.

Anatomy:

Compartments are groupings of muscles, nerves, and blood vessels in your arms and legs. Covering these tissues is a tough membrane called a fascia. The role of the fascia is to keep the tissues in place, and, therefore, the fascia does not stretch or expand easily.

Figure A

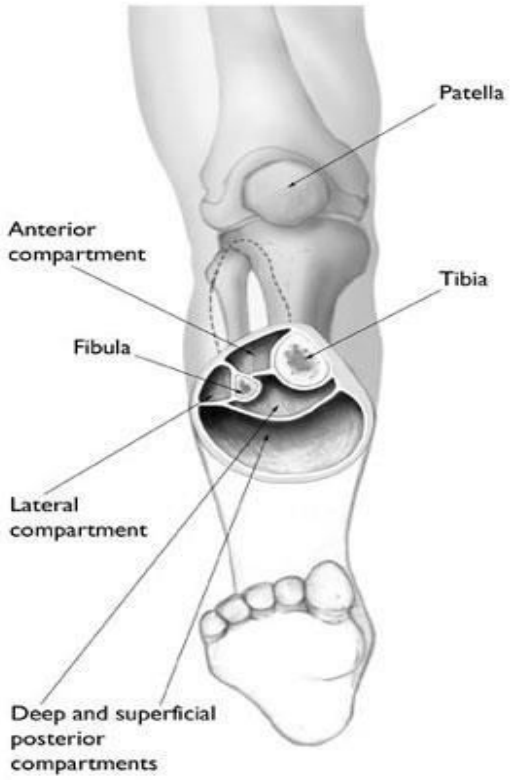


Figure B

Cause:

Acute Compartment Syndrome

- Acute compartment syndrome usually develops after a severe injury, such as a car accident or a broken bone. Rarely, it develops after a relatively minor injury.
- Conditions that may bring on acute compartment syndrome include:

  - **A fracture.**
  - **A badly bruised muscle.** This type of injury can occur when a motorcycle falls on the leg of the rider, or a football player is hit in the leg with another player's helmet.

- **Reestablished blood flow after blocked circulation.** This may occur after a surgeon repairs a damaged blood vessel that has been blocked for several hours. A blood vessel can also be blocked during sleep. Lying for too long in a position that blocks a blood vessel, then moving or waking up can cause this condition. Most healthy people will naturally move when blood flow to a limb is blocked during sleep. The development of compartment syndrome in this manner usually occurs in people who are neurologically compromised. This can happen after severe intoxication with alcohol or other drugs.
- **Crush injuries.**
- **Anabolic steroid use.** Taking steroids is a possible factor in compartment syndrome.
- **Constricting bandages.** Casts and tight bandages may lead to compartment syndrome. If symptoms of compartment syndrome develop, remove or loosen any constricting bandages. If you have a cast, contact your doctor immediately.

Chronic (Exertional) Compartment Syndrome: The pain and swelling of chronic compartment syndrome is caused by exercise. Athletes who participate in activities with repetitive motions, such as running, biking, or swimming, are more likely to develop chronic compartment syndrome. This is usually relieved by discontinuing the exercise, and is usually not dangerous.

Symptoms: **Acute Compartment Syndrome**

The classic sign of acute compartment syndrome is pain, especially when the muscle within the compartment is stretched.

- The pain is more intense than what would be expected from the injury itself. Using or stretching the involved muscles increases the pain.
- There may also be tingling or burning sensations (paresthesias) in the skin.
- The muscle may feel tight or full.
- Numbness or paralysis are late signs of compartment syndrome. They usually indicate permanent tissue injury.

Chronic (Exertional) Compartment Syndrome: Chronic compartment syndrome causes pain or cramping during exercise. This pain subsides when activity stops. It most often occurs in the leg.

Symptoms may also include:

- Numbness
- Difficulty moving the foot
- Visible muscle bulging

Treatments for compartment syndrome

- **Acute compartment syndrome**
- Acute compartment syndrome must be treated in hospital using a surgical procedure called an emergency fasciotomy.

Chronic compartment syndrome

- Chronic compartment syndrome isn't usually dangerous and can sometimes be relieved by stopping the exercise that triggers it and switching to a less strenuous activity.

- Physiotherapy, shoe inserts (orthotics) and non-steroidal anti-inflammatory medicines may help – speak to your GP about this.
- Surgery (see above) will only be considered if your symptoms persist despite the above measures.

5. What are the complications of pneumoperitoneum and describe their management.

Answer. Complications:
Anesthetists should always bear in mind the possible pulmonary complications of pneumoperitoneum like gas embolism, barotraumas, hypoxemia, pulmonary edema, atelectasis, subcutaneous emphysema, pneumothorax, pneumomediastinum and pneumopericardium.

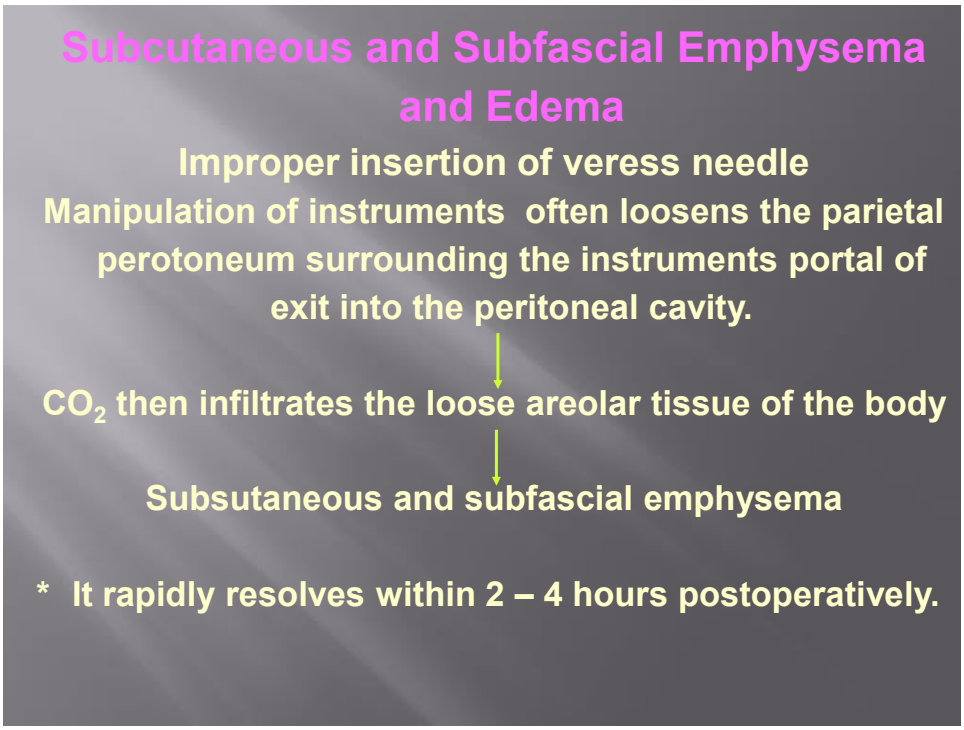
- Carbon dioxide embolism is rare, occurring in about 0.0014–0.6% of laparoscopic surgeries, but with a mortality rate of about 28%. Carbon dioxide enters the circulation through an opening in a damaged vessel under raised IAP. It can also occur if the Veress needle is misplaced into a vessel or parenchymal organ.
  Transesophagal echocardiography studies have shown bubbling of CO2 in the right heart chamber in asymptomatic patients during pneumoperitoneum.
  Clinical manifestations of gas embolism are severe drop in blood pressure, cyanosis, cardiac arrhythmias or asystole. A mill-wheel murmur may be heard on auscultation of the heart, and ETCO2 will increase.

  Air Embolism
  CO_2 used for pneumoperitonium

  Gets absorbed into circulation
  Embolus may form and block pulmonary circulation
  - **Loud and clear murmur heard in (R) atrium and (R) ventricle (Mill-Wheel murmur)**

  Management –
  - **Direct intracardiac insertion of needle**
  - **Central venous catheter.**

- Subcutaneous emphysema occurs in 0.3–3.0% laparoscopic surgeries. Mild to severe subcutaneous emphysema has generally not been shown to have clinical effects, but upper airway obstruction must be considered if there is neck involvement.



- Pneumothorax can occur following peritoneum visceral tear, parietal pleura tear during resection around the esophagus or congenital defect in the diaphragm through which CO2 gas travels.

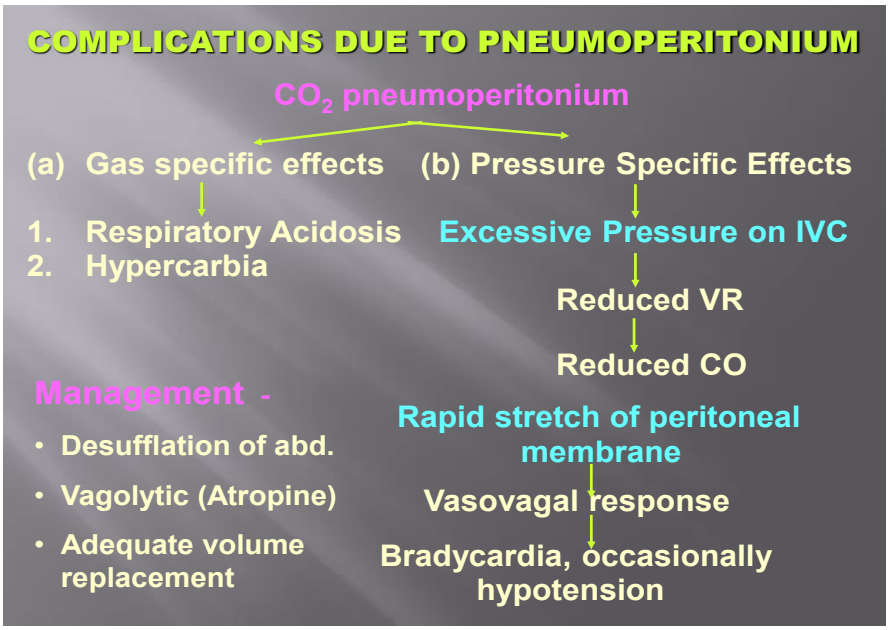
  Cause:
  - Due to true diaphragmatic hernia.
  - Without any apparent cause.

Diagnosis -
- Presence of rapidly falling Oxygen saturation or PO2 together with difficult ventilation and decreased breath sounds.

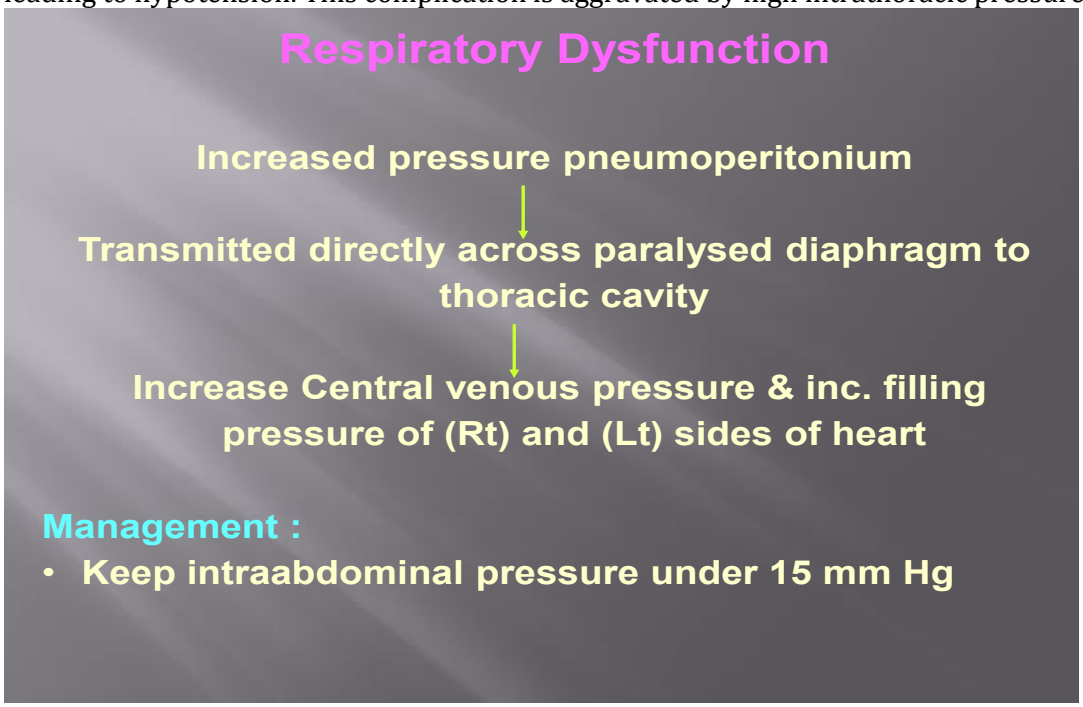
Management –
- Immediate needle thoracostomy.
- Aspiration
- Chest radiograph
- Placement of chest tube

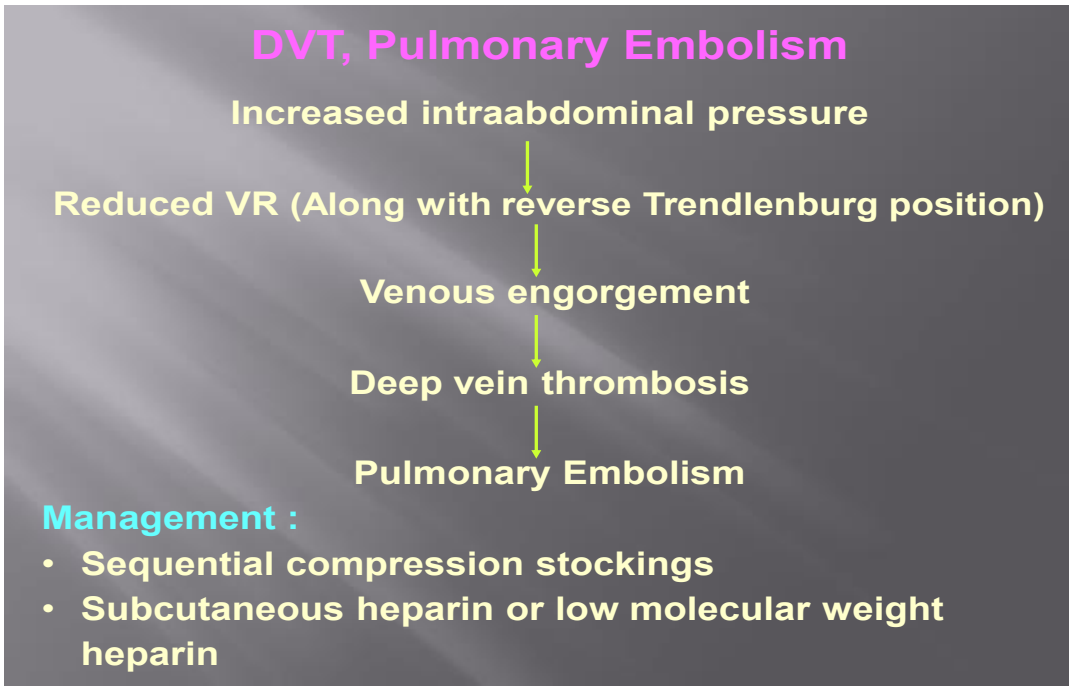
Pneumothorax should be differentiated with capnothorax following CO2 diffusion into the intrapleural space. With both pneumothorax and capnothorax, the ETCO2 increases, so capnothorax can be suspected if the mean airway pressure increases with a drop in SpO2, and confirmation should be made with a chest x-ray.

- Pneumopericardium can develop when CO2 is forced into the mediastinum and pericardium. It can also occur if CO2 enters the defect in the membranous portion of the diaphragm, resulting in a communication between the pericardial and peritoneal cavities.

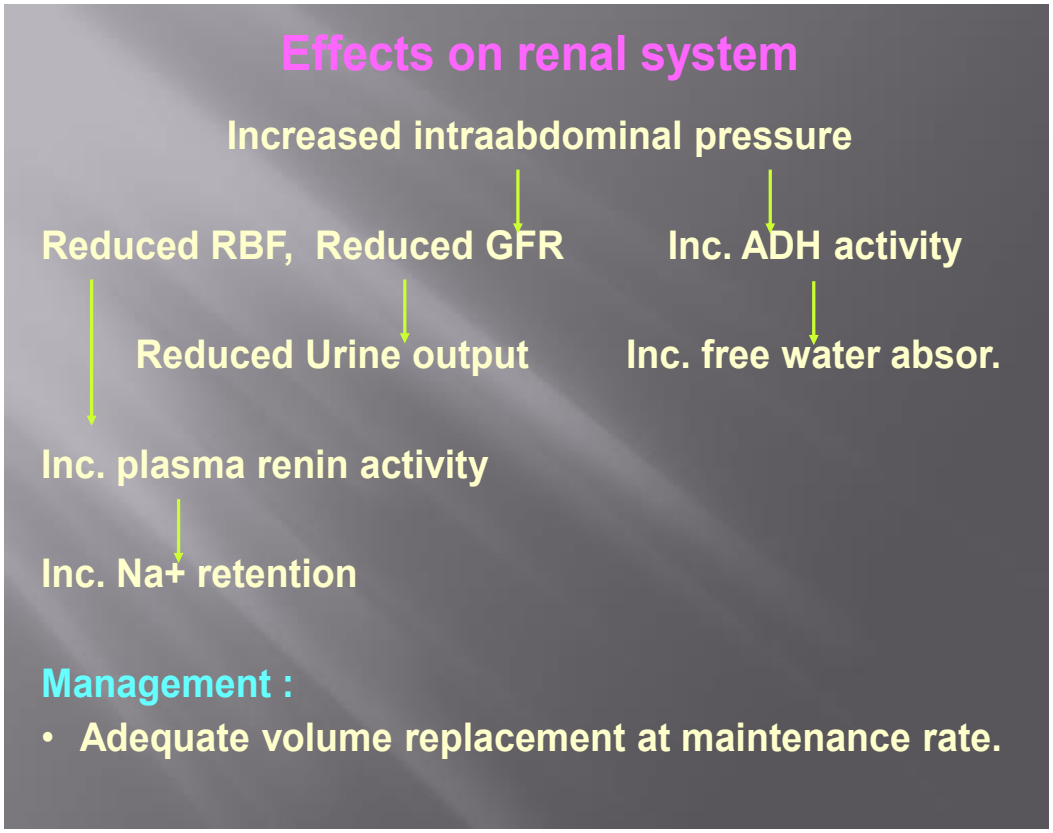


- Cardiovascular complications such as hypertension, arrhythmias, hypotension and cardiac arrest have been reported with pneumoperitoneum. Hypertension seems to have a higher incidence at the beginning of insufflation when the blood volume in the splanchnic vasculature is reduced due to increased IAP, thereby increasing preload and arterial pressure.
  Hypotension is a potentially serious complication. IAP of 20 mmHg or more results in compression of the inferior vena cava, reducing the venous return. Cardiac output is reduced, leading to hypotension. This complication is aggravated by high intrathoracic pressure.





- The possible development of acute tubular necrosis in response to long lasting hypoperfusion from pneumoperitoneum is controversial.



- Free radicals are released by inflation and deflation of the peritoneum. Oxygen and organic free radicals may contribute to ischemia reperfusion phenomena or chemical carcinogenesis.

6. Discuss the pathology and management of malignant melanoma.

Answer. Histologically, melanoma is divided into four major types based on growth pattern and location: lentigo maligna melanoma (LMM), superficial spreading melanoma (SSM), acral lentiginous melanoma (ALM), and nodular melanoma (NM). Melanomas arise as proliferations of melanocytes in the basal layer of the skin. As they multiply, these cells expand radially in the epidermis and superficial dermal layer. With time, growth begins in a vertical direction and the skin lesion may become palpable. NMs are an exception to this pattern in that the vertical growth phase is present from an early point in tumor development. It is the vertical growth phase more than any other histologic parameter of the primary tumor that determines prognosis.

- Superficial spreading melanoma (SSM) is the most common form of melanoma (80%), with approximately one half arising from a preexisting mole. The lesions usually are slow growing and brown, with small discrete nodules of differing colors. SSM tends to spread laterally but can be slightly elevated. SSM is found most commonly on the back in men and women and on the lower extremities of women.
- Nodular melanoma is the most aggressive form, rapidly becoming a palpable, elevated, firm nodule that may be dense black or reddish blue-black. A distinct convex nodular development indicates deep dermal invasion. Nodular melanomas arise from the epidermal-dermal junction and invade deeply into the dermis and subcutaneous tissue. Approximately 5% are amelanotic.
- Lentigo maligna melanoma usually is found on older patients as a large melanotic freckle on the temple or malar region known as Hutchinson freckle. It usually is slow growing but becomes large, often reaching 5 to 6 cm in diameter. Initially, it is flat, but it becomes raised and thicker, with discrete brown to black nodules and irregular edges.
- Acral lentiginous melanoma occurs on the palms, soles, and nail beds, occurs primarily in darker-skinned people, and metastasizes more frequently than do other melanomas, possibly related to later stage at presentation.
- In-transit metastases and satellites both signify a poor prognosis with a high risk of local recurrence and distant metastasis. In-transit metastases are lesions in the skin more than 2 cm from the primary lesion; they arise from tumor cells in intradermal lymphatics. Satellites are metastatic lesions in the skin within 2 cm of the primary tumor.

Breslow's depth	
Stage	**Depth**
Stage I	less or equal to 0.75mm
Stage II	0.76 mm - 1.50mm
Stage III	1.51 mm - 2.25mm
Stage IV	2.26 mm - 3.0mm
Stage V	greater than 3.0 mm[

Clark's Classification (Level of Invasion) of Melanoma

Level I	Lesions involving only the epidermis (*in situ* melanoma); not an invasive lesion
Level II	Invasion of the papillary dermis but does not reach the papillary-reticular dermal interface
Level III	Invasion fills and expands the papillary dermis but does not penetrate the reticular dermis
Level IV	Invasion into the reticular dermis but not into the subcutaneous tissue
Level V	Invasion through the reticular dermis into the subcutaneous tissue

Treatment:

- Wide local excision is the primary treatment for most melanomas and premalignant lesions. Melanoma in situ (MIS) should be excised to clean margins. For all other malignant melanomas, the width of the surgical margin depends on the Breslow tumor thickness: Thin melanomas (Breslow <1 mm) should have a margin of 1 cm; lesions thicker than 1 mm and all scalp lesions should have a margin of at least 2 cm. Several prospective, randomized trials have investigated margin requirements.
- A 2-cm margin is both safe and effective for primary melanomas between 1 and 4 mm, with a significant decrease in the need for skin grafting. In general, excisions should be closed primarily, with flaps or skin grafts reserved for large defects. Mohs micrographic surgery has been advocated for areas where wide and deep excisions are difficult.
- Elective lymph node dissection (ELND). The term “elective” refers here to lymph node dissection done in the absence of clinically evident, palpable nodes (for palpable nodes, see Section III.E.1.d of this part on therapeutic lymph node dissection). In the past, ELND was at times performed for the staging of patients presenting with localized melanoma. ELND provided an element of local control and reasonably accurate staging for patients with occult lymph node metastases.
- Sentinel lymph node biopsy (SLNB). SLNB has greatly enhanced accurate staging of melanoma patients. This technique is based on the documented pattern of lymphatic drainage of melanomas to a specific, initial lymph node, termed the sentinel lymph node, before further spread. The histology of the SLN is highly (although not perfectly) reflective of the rest of the nodal basin. If the SLN is negative for metastases, a more radical and morbid lymph node dissection can be avoided.The SLN can be accurately identified 96% of the time using radiolymphoscintigraphy and intraoperative dye injection and radioprobe guidance. SLNB appears to be most beneficial for intermediate-thickness melanomas (Breslow 1 to 4 mm).
- Therapeutic lymph node dissection should be performed for involved axillary and superficial inguinal lymph nodes unless unresectable distant metastases are present. Surgical therapy of the inguinal region includes a superficial inguinal lymphadenectomy with inclusion of the deep pelvic region for either clinical evidence of disease (palpable pelvic nodes) or radiographic or intraoperative evidence of obvious lymph node involvement.
- Resection of metastases. The surgical options for patients with metastatic melanoma can be divided into two categories: curative or palliative. Curative interventions for metastatic melanoma should carefully weigh the risks of the surgery against the potential benefits. Recent data on the surgical management of metastatic melanoma note that certain factors are associated with an improved overall survival: (1) ability to achieve a complete resection with negative margins, (2) the initial site of metastasis, (3) extent of metastatic disease (single or multiple sites), (4) disease-free interval after surgical removal of the primary melanoma, and (5) stage of initial disease. Favorable sites for resection include the skin, subcutaneous tissue, lymph nodes, lung, and gastrointestinal tract. Unfavorable sites include metastases to the brain, adrenal, and liver.

- Isolated limb perfusion (ILP) is used for recurrent limb melanoma that is locally advanced and cannot be resected by simple surgical means. ILP delivers high-dose regional chemotherapy and establishes a hyperthermic environment to an extremity while its circulation has been isolated from the rest of the body. Melphalan is commonly used. with melphalan alone to melphalan plus TNF suggested that addition of TNF did not significantly enhance short-term response rates in locally advanced extremity melanoma.
- Immunotherapy: Complete and durable regression of stage IV melanoma has been reported using interleukin-2 (IL-2)–based immunotherapy alone. Although patients can be cured of metastatic melanoma solely using high-dose IL-2, the response rate is low. This has led to the use of IL-2 in conjunction with other treatments, including vaccines, monoclonal antibodies, and adoptive transfer of T lymphocytes. Recently, a 50% response rate according to Response Evaluation Criteria in Solid Tumors (RECIST) criteria was reported in patients with metastatic melanoma treated with in vitro expanded tumor-infiltrating lymphocytes and IL-2 following a lymphodepleting nonmyeloablative preparative regimen of cyclophosphamide and fludarabine .

7. Describe the concept of zero fluid balance in perioperative fluid management.

Answer.

· Use fluid management technologies to deliver individualised goal directed fluid therapy.

· Avoid crystalloid excess (salt and water overload). 'Maintenance' fluid, if utilised, should be limited to less than 2 ml/kg/hr including any drug infusions. The use of isotonic balanced electrolyte solution (e.g. Hartmann's) will minimise hyperchloraemic acidosis.

Aims by the end of surgery:

- Patients core temperature is normal (circa 37°C).
- No evidence of hypovolaemia, tissue hypoperfusion or hypoxia.
- No evidence of hypervolaemia or excess fluid ('zero balance').
- Hb ≫ 7 g/dl.
- No clinically significant coagulopathy.
- Minimal use of vasopressors.

- Predictors of poor outcome include: greater age, higher ASA status, high blood loss, longer than expected surgery, evidence of hypovolaemia or hypoperfusion (e.g. metabolic acidosis, blood lactate ≫ 2 mmol/litre, central venous O2 ≪ 70%), greater use of vasopressors, high volumes of i.v. fluids (≫ 3.5 litres total), positive fluid balance (≫ 2 litres positive on day of surgery) .
- **The Enhanced Recovery Partnership recommends that all Anaesthetists caring for patients undergoing intermediate or major surgery should have cardiac output measuring technologies immediately available and be trained to use them.**
- The use of intra-operative fluid management technologies are recommended from the outset in the following types of cases:

- Major surgery with a 30 day mortality rate of ≫ 1%.
- Major surgery with and anticipated blood loss of greater than 500 ml.
- Major intra-abdominal surgery.

- Intermediate surgery (30 day mortality ≫ 0.5%) in high risk patients (age ≫ 80 years, history of LVF, MI, CVA or peripheral arterial disease).
- Unexpected blood loss and/or fluid loss requiring ≫ 2 litres of fluid replacement.
- Patients with ongoing evidence of hypovolaemia and or tissue hypoperfusion (e.g. persistent lactic acidosis).

8. Classify anticancer drugs. What is the role of chemotherapy in the management of carcinoma breast?

Answer. Anticancer drugs.

According to Drug Acting Directly on Cells

❖ Alkalyting agent

- Nitrogen Mustard

e.g. : Mechlorethamine (Mustine HCL), Cyclophosphamide, Ifosfamide.

- Ethylenimine

e.g. : Thio- TEPA

- Alkyl Sulphonate

e.g. : Busulfan

- Nitrosourea

e.g. : Carmustine, Lomustine

- Triazine

e.g. : Dacarbazine

❖ Antimetabolites

❑ Folate Antagonist

e.g.: Methotrixate

❑ Purine Antagonist

e.g.: 6-Mercaptopurine, 6-thiogunine, Azathioprine

❑ Pyrimidine Antagonist

e.g.: 5-Fluorouracil, Cytarabine

- ❖ Vinka Alkaloids

e.g.: Vincristine, Vinblastine

- ❖ Taxanes

e.g.: Paclitaxel

- ❖ Epipodophyllotoxin

e.g.: Etoposide

- ❖ Antibiotics

e.g.: Actinomycin, Doxorubicin, Daunorubicin, Mitoxantrone, Bleomycins, Mithramycin.

- ❖ Miscellaneous

e.g.: Hydroxyurea, Procarbazine,

L- Asparaginase, Cisplatin, Carboplatin.

Drug Altering Hormonal milieu

- Glucocorticoids

e.g. : Prednisolone & Its Derivatives

- Estrogen

e.g.: Fosfestrol, Ethinylestradiol

- Antiestrogen

e.g.: Tomoxifen

- Antiandrogen

e.g.: Flutamide

- 5α reductase inhibitor

e.g.: Finasteride

- GnRH analogues

e.g.: Naferelin, Goserelin

According to mechanism of action:

- Drugs affecting biosynthesis of nucleic acid
- Drugs destroying DNA structure and function
- Drugs interfering with transcription and blocking

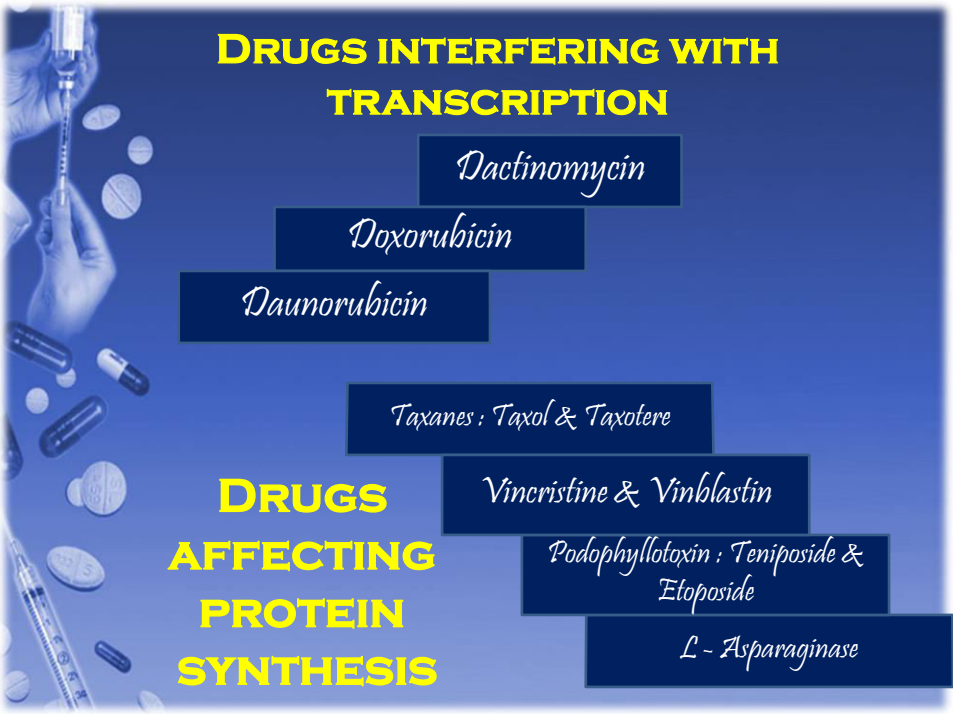
RNA synthesis

- Drugs affecting protein synthesis
- Hormonal agents

Drug Affecting Nucleic Acid Synthesis: Hydroxyurea

Drug Destroying DNA Structure & its Function:

Alkylating Agent, Camptothecins , Antitumor Antibiotics, Cisplatin & carboplantin



Chemotherapy in carcinoma breast:

Not all women with breast cancer will need chemo, but there are several situations in which chemo may be recommended:

- **After surgery (adjuvant chemotherapy):** Adjuvant chemo is used after surgery to try to kill any cancer cells that may have been left behind or spread but can't be seen, even on imaging tests. If these cells were allowed to grow, they could form new tumors in other places in the body. Adjuvant chemo can reduce the risk of breast cancer coming back.

- **Before surgery (neoadjuvant chemotherapy):** Neoadjuvant chemo is given before surgery. It can be used to try to shrink the tumor so that it can be removed with less extensive surgery. Because of this, neoadjuvant chemo is often used to treat cancers that are too big to be removed at the time of diagnosis (called *locally advanced* cancers). Also, by giving chemo before the tumor is removed, doctors can better see how the cancer responds to it. If the first set of chemo drugs doesn't shrink the tumor, your doctor will know that other drugs are needed.
- **For advanced breast cancer:** Chemo can be used as the main treatment for women whose cancer has spread outside the breast and underarm area, either when it is diagnosed or after initial treatments. The length of treatment depends on how well the chemo is working and how well you tolerate it.

Chemotherapeutic drugs are used for breast cancer:

In most cases (especially as adjuvant or neoadjuvant treatment), chemo is most effective when combinations of more than one drug are used. Today, doctors use many different combinations, and it's not clear that any single combination is clearly the best.

The most common drugs used for adjuvant and neoadjuvant chemotherapy include:

- Anthracyclines, such as doxorubicin (Adriamycin) and epirubicin (Ellence)
- Taxanes, such as paclitaxel (Taxol) and docetaxel (Taxotere)
- 5-fluorouracil (5-FU)
- Cyclophosphamide (Cytoxan)
- Carboplatin (Paraplatin)

Most often, combinations of 2 or 3 of these drugs are used.

Chemotherapy for advanced breast cancer

Chemo drugs useful in treating women with breast cancer that has spread include:

- Docetaxel
- Paclitaxel
- Platinum agents (cisplatin, carboplatin)
- Vinorelbine (Navelbine)
- Capecitabine (Xeloda)
- Liposomal doxorubicin (Doxil)
- Gemcitabine (Gemzar)
- Mitoxantrone (Novantrone)
- Ixabepilone (Ixempra)
- Albumin-bound paclitaxel (nab-paclitaxel or Abraxane)
- Eribulin (Halaven)

Although drug combinations are often used to treat early breast cancer, advanced breast cancer is more often treated with single chemo drugs. Still, some combinations, such as carboplatin or cisplatin plus gemcitabine, are commonly used to treat advanced breast cancer.

9. Write notes on diagnostic modalities of blunt abdominal trauma.

Answer. Diagnostic modalities of blunt abdominal trauma:

- FAST should be the initial diagnostic modality to evaluate for hemoperitoneum.
- CT is accurate in determining the presence of injury and delineating the need for operation in BAT but is best reserved for hemodynamically stable patients.
- DPL is accurate in diagnosing intraperitoneal injury but has a limited role in current practice.
- Bowel, diaphragm, and pancreas injuries are difficult to exclude with any of the 3 diagnostic modalities.
- CT, FAST, and DPL play complementary roles in BAT diagnostic algorithms.

Recommendations:

A. Level I

1. Exploratory laparotomy is indicated for patients with a positive DPL.
2. CT is recommended for the evaluation of hemodynamically stable patients with equivocal findings on physical examination, associated neurologic injury, or multiple extra-abdominal injuries. Under these circumstances, patients with a negative CT should be admitted for observation.
3. CT is the diagnostic modality of choice for nonoperative management of solid visceral injuries.
4. In hemodynamically stable patients, DPL and CT are complementary diagnostic modalities.

B. Level II

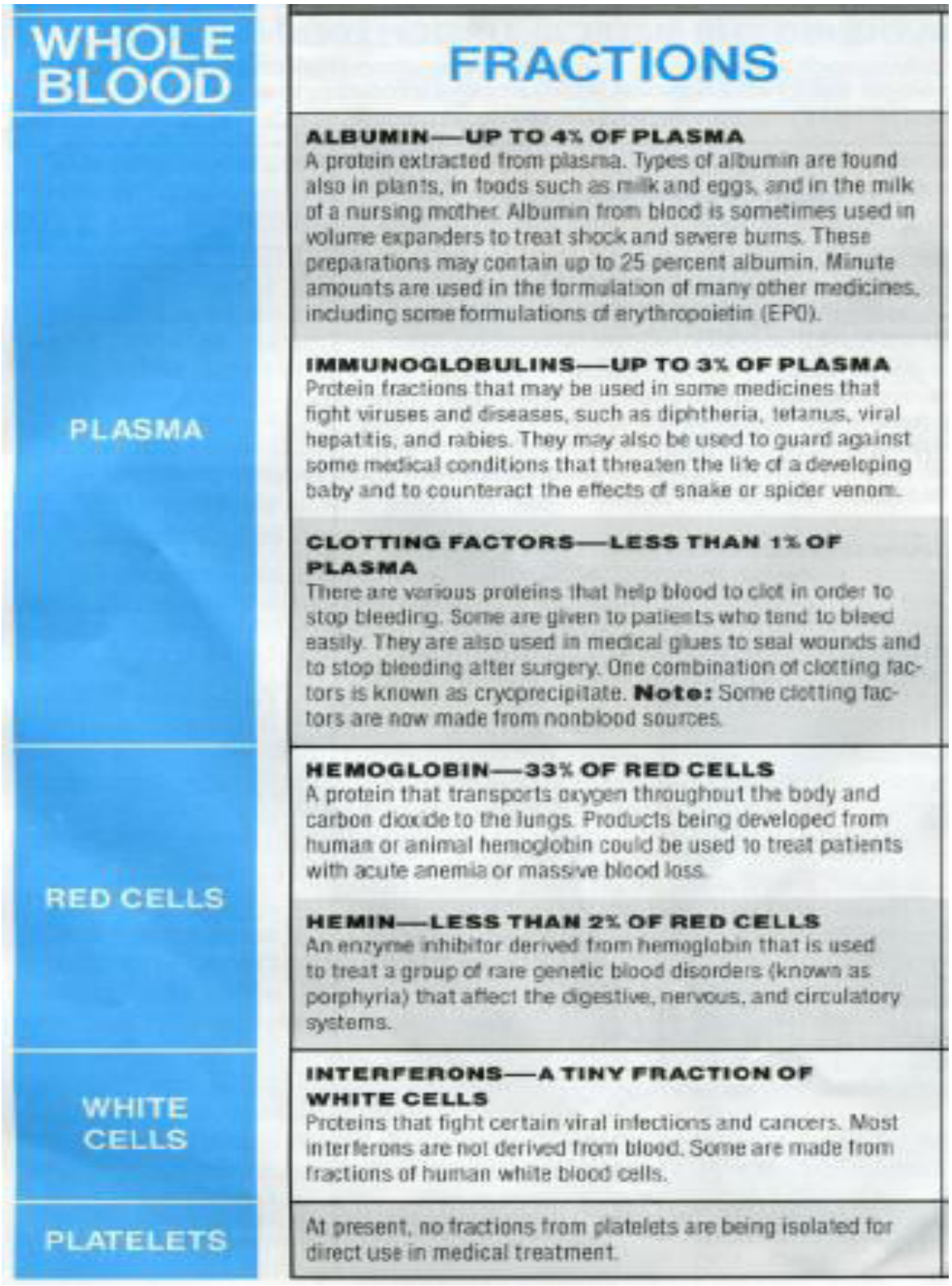
1. FAST may be considered as the initial diagnostic modality to exclude hemoperitoneum. In the presence of a negative or indeterminate FAST result, DPL and CT have complementary roles.
2. When DPL is used, clinical decisions should be based on the presence of gross blood on initial aspiration (ie, 10 mL) or microscopic analysis of lavage effluent.
3. In hemodynamically stable patients with a positive DPL, followup CT scan should be considered, especially in the presence of pelvic fracture or suspected injuries to the genitourinary tract, diaphragm or pancreas.
4. Exploratory laparotomy is indicated in hemodynamically unstable patients with a positive FAST. In hemodynamically stable patients with a positive FAST, follow-up CT permits nonoperative management of select injuries.
5. Surveillance studies (ie, DPL, CT, repeat FAST) are required in hemodynamically stable patients with indeterminate FAST results.

C. Level III

1. Objective diagnostic testing (ie, FAST, DPL, CT) is indicated for patients with abnormal mentation, equivocal findings on physical examination, multiple injuries, concomitant chest injury, or hematuria.
2. Patients with seatbelt sign (SBS) should be admitted for observation and serial physical examination. Detection of intraperitoneal fluid by FAST or CT in a patient with SBS mandates either DPL to determine the nature of the fluid or exploratory laparotomy.
3. CT is indicated for the evaluation of suspected renal injuries.
4. A negative FAST should prompt follow-up CT for patients at high risk for intra-abdominal injuries (eg, multiple orthopedic injuries, severe chest wall trauma, neurologic impairment).
5. Splanchnic angiography may be considered in patients who require angiography for the evaluation of other injuries (eg, thoracic aortic injury, pelvic fracture).

10. Role of blood components in surgery.

Answer.



- To decrease the incidence of subsequent refractoriness to platelet transfusion caused by HLA alloimmunization in patients requiring long-term platelet support

The resulting components are:

- A clear solution of blood plasma in the upper phase (which can be separated into its own fractions, see Blood plasma fractionation),
- The buffy coat, which is a thin layer of leukocytes (white blood cells) mixed with platelets in the middle, and
- Erythrocytes (red blood cells) at the bottom of the centrifuge tube.

Suggested Transfusion Guidelines for Red Blood Cells

Hemoglobin<8 g/dL or acute blood loss in an otherwise healthy patient with signs and symptoms of decreased oxygen delivery and two or more of the following:

- Estimated or anticipated acute blood loss of >15% of total blood volume (750 mL in a 70-kg male)
- Diastolic blood pressure <60 mm Hg
- Systolic blood pressure drop >30 mm Hg from baseline
- Tachycardia (>100 beats/min)
- Oliguria/anuria
- Mental status changes

Hemoglobin<10 g/dL in patients with a known increased risk for coronary artery disease or pulmonary insufficiency who have sustained or are expected to sustain significant blood loss

Symptomatic anemia with any of the following:

- Tachycardia (>100 beats/min)
- Mental status changes
- Evidence of myocardial ischemia, including angina
- Shortness of breath or dizziness with mild exertion
- Orthostatic hypotension

Unfounded/questionable indications:

- To increase wound healing
- To improve the patient's sense of well-being
- Hemoglobin between 7 and 10 g/dL (or hematocrit from 21%-30%) in an otherwise stable, asymptomatic patient
- Mere availability of predonated autologous blood without medical indication

Indications for leukocyte-reduced blood components:

- To provide blood components with reduced risk for transmission of cytomegalovirus (CMV)
- To prevent subsequent febrile nonhemolytic transfusion reactions in patients who have had one documented episode
- To decrease the incidence of HLA alloimmunization in nonhepatic solid-organ transplant candidates.

Granulocyte transfusions have been used for profound granulocytopenia (<500/mm^3) with evidence of infection (e.g., positive blood culture, persistent temperature higher than 38.5°C) unresponsive to antibiotic therapy. Daily transfusions are given until the infection is under control or the granulocyte count is greater than 1000/mm^3.

Suggested Transfusion Guidelines for Platelets

- Recent (within 24 hours) platelet count <10,000/mm^3 (for prophylaxis)
- Recent (within 24 hours) platelet count <50,000/mm^3 with demonstrated microvascular bleeding ("oozing") or a planned surgical/invasive procedure
- Demonstrated microvascular bleeding and a precipitous fall in the platelet count
- Adult patients in the operating room who have had complicated procedures or have required more than 10 units of blood *and* have microvascular bleeding. Giving platelets assumes that adequate surgical hemostasis has been achieved
- Documented platelet dysfunction (e.g., prolonged bleeding time >15 minutes; abnormal platelet function tests) with petechiae, purpura, microvascular bleeding ("oozing"), or a surgical/invasive procedure

Unwarranted indications:

- Empirical use with massive transfusion when the patient is not exhibiting clinically evident microvascular bleeding ("oozing")
- Prophylaxis in patients with thrombotic thrombocytopenic purpura/hemolytic-uremic syndrome or idiopathic thrombocytopenic purpura
- Extrinsic platelet dysfunction (e.g., renal failure, von Willebrand's disease)

Suggested Transfusion Guidelines for Plasma

Treatment of multiple or specific coagulation factor deficiency with an abnormal prothrombin time and/or activated partial thromboplastin time

Abnormal specific factor deficiency in the presence of one of the following:

- Congenital deficiency of antithrombin III; prothrombin; factors V, VII, IX, X, and XI; protein C or S; plasminogen or antiplasmin

- Acquired deficiency related to warfarin therapy, vitamin K deficiency, liver disease, massive transfusion, or disseminated intravascular coagulation
- Also indicated as prophylaxis for the above if a surgical/invasive procedure is planned

Unwarranted indications:

- Empirical use during massive transfusion if the patient does not exhibit clinical coagulopathy
- Volume replacement
- Nutritional supplement
- Hypoalbuminemia

Cryoprecipitate is useful in treating factor deficiency (hemophilia A), von Willebrand's disease, and hypofibrinogenemia and may help treat uremic bleeding. Each 5- to 15-mL unit contains more than 80 units of factor VIII and about 200 mg of fibrinogen. Because the proteins mentioned previously are in relatively high concentration, a smaller volume may be given than would be required if plasma were used. Cryoprecipitate is usually administered as a transfusion of 10 single units.

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2020

March, 2020

PAPER II

Time Allowed: 3 Hours **Full Marks: 100**

Attempt all questions

1. **Discuss clinical features, staging and treatment outline of carcinoma penis. 3+3+4**
2. **Discuss treatment of Hydatid disease. 10**
3. **Idiopathic granulomatous mastitis and Tubercular mastitis are they synonymous? Discuss. 10**
4. **Discuss the management of mastalgia. 10**
5. **Discuss various complications of Axillary dissection and their management. 10**
6. **What are the causes of oesophageal perforation? Discuss its management. 5+5**
7. **Complications of chest injury. 10**
8. **Retroperitoneal sarcoma. 10**
9. **Discuss the different lymph node levels in the neck. 10**
10. **Laparoscopic biliary injury and its management. 10**

Answers.

1. Carcinoma penis

Presentation:

- **A hard, painless lump on the glans penis is the most common presentation.**
- **A bloody discharge may be confused with haematuria.**
- **Rarely, a groin mass or urinary retention are presenting symptoms.**
- **Examination reveals a solid non-tender mass or ulcer beneath or involving the foreskin.**
- **There is usually evidence of local infection.**
- **In more advanced disease, prepuce, glans, shaft, scrotum, and even perineum are replaced by tumour.**
- **The inguinal lymph nodes are examined. They may be enlarged, fixed, or even ulcerate overlying skin.**

Staging of penile SCC:

Tumor (T):
TX: The primary tumor cannot be evaluated.
T0: There is no tumor.
Tis: An early, noninvasive precancerous growth. This is also called carcinoma in situ.
Ta: A noninvasive squamous cell carcinoma located in only 1 area.
T1: The tumor has grown into 1 of more outer layers of the penis. Depending on where on the penis the cancer is growing, these may include the lamina propria, the layer of skin

called the dermis, the dartos fascia, or the connective tissue underneath the skin. This stage may also be divided into 2 substages based on the grade of the tumor and whether it has grown into blood vessels, lymph vessels, or nerves:

- **T1a: The tumor has not grown into blood vessels, lymph vessels, or nerves and is not high grade or G3 (see above).**

- **T1b: The tumor has grown into blood vessels, lymph vessels, and/or nerves and is high grade (G3).**

T2: The tumor has grown into the corpus spongiosum, an internal chamber of the penis. It may or may not have grown into the urethra.
T3: The tumor has grown into the corpora cavernosum, an internal chamber of the penis. It may or may not have grown into the urethra.

T4: The tumor has grown into other nearby structures such as the pubic bone, the scrotum, or the prostate.

Node (N)

pNX: The regional lymph nodes cannot be evaluated.
pN0: Cancer has not spread to the regional lymph nodes.
pN1: Cancer has spread to 2 or fewer inguinal lymph nodes on the same side of the body. The inguinal lymph nodes are located in the groin.
pN2: Cancer has spread to 3 or more inguinal lymph nodes on 1 or both sides of the body.
pN3: The cancer has grown from the inguinal lymph nodes into the surrounding tissue in the groin, and/or the cancer has spread to lymph nodes in the pelvis.

Metastasis (M)

M0: There is no distant metastasis.
M1: There is metastasis to parts of the body other than the penis and the regional lymph nodes.
Cancer stage grouping:

Stage I: A low-grade cancer that has grown just below the surface layer of skin but not to nerves, lymph vessels, or blood vessels. It has not spread to lymph nodes or distant parts of the body (T1a, N0, M0).

Stage IIA: The cancer is high grade or has grown into blood vessels, lymph vessels, or nerves. Or it has grown into the corpus spongiosum and may or may not have grown into the urethra. It has not spread to lymph nodes or distant parts of the body (T1b or T2; N0, M0).
Stage IIB: The cancer has grown into the corpora cavernosum and may or may not have grown into the urethra. It has not spread to lymph nodes or distant parts of the body (T3, N0, M0).
Stage IIIA: The tumor has not grown beyond the penis and urethra. It has spread to 1 to 2 groin lymph nodes but not to distant parts of the body (T1, T2, or T3; N1, M0).
Stage IIIB: The tumor has not grown beyond the penis and urethra but has spread to 3 or more groin lymph nodes. It has not spread outside the groin lymph nodes, to the pelvic lymph nodes, or to distant parts of the body (T1, T2, or T3; N2, M0).
Stage IV: Any of the following:

- **The cancer has grown into nearby tissues such as the pubic bone, the scrotum, or the prostate (T4, any N, any M).**

- **The cancer has grown from the groin lymph nodes into the surrounding tissue (any T, N3, any M).**

- **The cancer has spread to 1 or more of the pelvic lymph nodes (any T, N3, any M).**

- **The cancer has spread to distant parts of the body (any T, any N, M1).**

Investigations:

• **A biopsy is indicated**	• **Chest radiology**	**Pelvic CT scan**	**Serum calcium**	**Liver function tests**

Treatment:

The primary tumour:

- **The first-line treatment of penile cancer, regardless of the inguinal node status, is surgery.**
- **Circumcision is appropriate for preputial lesions, but local recurrence observed in.**
- **Penis-preserving wide excision of glanular lesions with skin graft glanular reconstruction may be suitable for smaller tumours, giving good cosmetic and functional results.**
- **Alternatives to surgery include laser or cryoablation, radiotherapy or brachytherapy, photodynamic therapy, or topical 5-fluorouracil.**
- **For more advanced tumours, partial or total penile amputation is required, depending on the extent of the tumour. Partial amputation is preferable, provided a 2cm margin of palpably normal shaft can be obtained.**
- **Local recurrence occurs in 10%, if the excision margin is positive.**

Total amputation involves excision of the scrotum and its contents, with formation of a perineal urethrostomy. The most common complication is urethral meatal stenosis.

Radiotherapy remains an alternative, but disadvantages include radio-resistance, leading to reported recurrence rates of 30-60%; tissue necrosis and damage leading to urethral stricture, fistula, and pain.

Lymphadenopathy:

- **Six weeks of broad-spectrum antimicrobials are given after the primary tumour has been removed. Nodes become clinically insignificant in 50% of patients, who may then be followed-up.**
- **For those with persistent inguinal lymphadenopathy, in the absence of demonstrable pelvic or metastatic disease, bilateral inguinal lymphadenectomy should be considered.**

Radiotherapy and chemotherapy are alternative or adjuvant treatments for metastatic nodal disease in unfit, elderly, or inoperable patients.

- **Prophylactic lymphadenectomy is currently practised for tumours exhibiting vascular invasion, high grade, or stages T2-4.**
- **Distant metastatic disease is treated using single-agent systemic chemotherapy: cisplatin, bleomycin, or methotrexate.**
- **Experience with combination chemotherapy is increasing.**

2. **Hydatid disease is a zoonotic parasitic disease most frequently caused by Echinococcus granulosus and the liver is the most commonly involved organ in two third of pts.**

Diagnosis: It is based on careful history, imaging and serology, and a high index of suspicion in at risk population

Symptoms:

- **Small and uncomplicated cysts usually are asymptomatic and detected incidentally**
- **Acute abd pain usually indicates an infected hydatid cyst or rupture into peritoneal cavity**
- **C/f of rupture into biliary tree are recurrent colicky pain and jaundice, with or without resultant fever and chills, mimicking obstructing bile duct stones**

Laboratory tests

- **ALP and GGT can be mildly elevated in 1/3rd of pts**
- **Elevated bilirubin (>1mg/dl) and increased ALP are s/o cystobiliary communication**
- **WBC are elevated only if cyst has become secondarily infected**
- **Serum Ig levels are elevated in 31% of pts**

Radiology

- **USG and CT are standard inv for diagnosis, percutaneous treatment, and post treatment f/up of hydatid cysts**
- **USG is the preferred 1st line imaging f/b CT which gives more precise information regarding morphology of cyst including size, location, no and relationship to adjacent structures.**
- **Hydatid cysts appear as well defined circumscribed cystic lesion with clear membrane**
- **Cysts are staged according to content patterns**

CYST TYPE	STATUS	USG FEATURES
CL	Active	Signs not pathognomic, unilocular, no cyst wall
CE1	Active	Cyst wall, Hydatid sand
CE2	Active	Multivesicular, Cyst wall, Rosette like
CE3	Transitional	Detached laminated membrane, water lily sign
CE4	Inactive	Heterogenous Hypo/hyperechoic contents. No daughter cysts
CE5	Inactive	Thick, calcified wall

On MRI, Hydatid liver cysts may have a low signal intensity rim. This is a characteristic sign of hydatid disease

MRI is more specific than CT, especially if intracystic fat density is present which suggests cystobiliary communication.

Serology: used for

- **Differential diagnosis of a cystic liver mass**
- **Epidemiological surveillance**
- **Post treatment follow up**

The sensitivity and specificity of tests depend on quality of antigens

Immunoelectrophoresis

The diagnostic value ranges from 91-94% for hepatic cysts. It is used for post treatment follow up.

ELISA

Sensitivities ranges from 64-100% depending on antigens used. IgG remain positive for 4 yrs after treatment so not suitable for f/up. IgM have been reported to be negative after 6 months of treatment.

Blotting

Allows molecular weight analysis of antigens detected by pts serum. Western blotting used in diagnosis and post treatment f/up.

Treatment Options include

- **Surgery**
- **Percutaneous aspiration**
- **Medical treatment**

Conservative Management:

Asymptomatic and small (<5cm) cysts can be f/up with wait and see policy. Also densely calcified hydatid cysts are accepeted as dead cysts and can be monitored without any specific therapy

Surgical treatment:

- **Conservative: involves inactivation of protoscolices and removal of cyst contents – Cystectomy.**
- **Radical: includes total excision of cyst and pericyst layers along with portion of surrounding liver – Pericystectomy/ Liver resection**

The principles of liver hydatid surgery include:

- **Inactivation of protoscolices within cyst fluid**
- **Evacuation of cyst contents**
- **Prevention of spillage of cyst contents**
- **Secure closure of any cystobiliary communication**
- **Mx of residual cyst cavity**

Post operative complications:

- **Biliary fistula**
- **Biliary stricture**
- **Recurrence**

Pulmonary hydatid disease:

Diagnosis

In the majority of cases, a combination of imaging and serological methods usually yields the diagnosis of cystic echinococcosis. A patient who has lung cysts should be investigated for associated liver cysts.

Surgery remains the treatment of choice for hydatid cysts of the lung, and a parenchyma-saving operation is usually possible.

Medical treatment

Medical therapy with benzimidazoles is valuable in disseminated disease, including secondary lung or pleural hydatidosis, poor surgical risk patients and when there is intraoperative spillage of hydatid fluid

3. **Idiopathic granulomatous mastitis (IGM), also known as nonpuerperal mastitis or granulomatous lobular mastitis, is a rare benign chronic inflammatory breast disease that was first described by Kessler and Wolloch.**

IGM is characterized by sterile noncaseating lobulocentric granulomatous inflammation. It usually has a recurrent or prolonged natural disease course that eventually leads to lesion burnout . IGM usually affects parous premenopausal women with a history of lactation and frequently is clinically associated with hyperprolactinemia.

The clinical and radiologic findings of IGM are noted to frequently overlap with those of breast cancer and several benign inflammatory breast conditions and thus can often lead to misdiagnosis and delayed treatment.

IGM is a rare disease of the breast, and its true prevalence is not well established.

Anecdotal explanations for inflammatory ductal or lobulocentric disease in males include gynecomastia as a predisposing factor and trauma, smoking, and autoimmunity as exacerbating agents.

Anecdotal explanations for inflammatory ductal or lobulocentric disease in males include gynecomastia as a predisposing factor and trauma, smoking, and autoimmunity as exacerbating agents.

There is a strong association between IGM and history of pregnancy and lactation, with most patients reporting having a pregnancy within 5 years before the diagnosis or being diagnosed with IGM within 2 months to 20 years after a pregnancy.

The manifestation of IGM during pregnancy and lactation is uncommon. Hyperprolactinemic states, either drug induced or caused by an intracranial lesion, have been associated with the development of IGM. This association lends support for the use of bromocriptine as an optional conservative second-line therapy for patients with IGM. The resolution of breast symptoms after the use of antiprolactinemic drugs and the correlation of markedly high prolactin levels with treatment-resistant and highly symptomatic IGM support such an association.

An association between IGM and Hispanic ancestry in the continental United States was studied in a case control study.

The most common clinical manifestation of IGM is a tender palpable unilateral breast mass of variable size (1–20 cm).

Synchronous bilateral breast findings were estimated to be seen in 1% of cases.

A ttender palpable mass with skin erythema and edema (in 11%–31% cases) and isolated skin induration (in 20% of cases) as less common clinical manifestations. Investigators in a smaller retrospective study involving 20 cases reported peau d'orange skin changes in 40% of patients and asymmetric breast heaviness or enlargement in approximately 20% of patients. These findings are also seen with inflammatory breast cancer (IBC).

IGM may manifest with abscess formation, with or without draining skin sinuses, at a variable prevalence of 6.6%–54.0%.

Core-Needle Biopsy with or without Fine-Needle Aspiration

Ultrasonographically (US)-guided fine-needle aspiration (FNA) and core-needle biopsy, with or without aspiration of fluid collections, are breast imaging interventions commonly performed in patients with IGM. FNA can be used to render a histopathology-based diagnosis; however, its usefulness and reliability have been widely debated

At imaging, granulomatous mastitis can manifest with a variety of nonspecific appearances , which often mimic the appearances of malignancy. Much of the variability in the imaging appearances of IGM might be related to varying histopathologic features, including inflammatory reaction, abscess, and fibrosis .

4. **Severe breast pain or mastalgia is a common symptom, affecting up to 70% of the female population at some time in their lives. It accounts for approximately 50% of referrals to a specialised breast clinic, two-thirds of patients having cyclical and one-third experiencing noncyclical mastalgia, or pain arising from the chest wall deep to the breast. After exclusion of breast cancer and proper reassurance, 85% of patients can be**

discharged from the clinic without specific treatment. In only 15% of patients is the pain severe enough to affect their lifestyle and warrant drug therapy.

Diagnosis involves breast examination, with medical imaging if only a specific part of the breast hurts.[1] Medical imaging by ultrasound is recommended for all ages, well in those over 30 it is recommended together with mammography.

In more than 75% of people the pain resolves without any specific treatment. Otherwise treatments may include paracetamol or NSAIDs. A well fitting bra may also help. In those with severe pain tamoxifen or danazol may be used.

Bromocriptine may be used as well.

Spironolactone, low dose oral contraceptives, and low-dose estrogen have helped to relieve pain. Topical anti-inflammatory medications can be used for localized pain. Vitamin E is not effective in relieving pain nor is evening primrose oil. Vitamin B_6 and vitamin A have not been consistently found to be beneficial. Flaxseed has shown some activity in the treatment of cyclic mastalgia.

Pain may be relieved by the use of nonsteroidal anti-inflammatory drugs or, for more severe localized pain, by local anaesthetic. Pain may be relieved by reassurance that it does not signal a serious underlying problem, and an active life style can also effect an improvement.

Danazol can also be used.

Information regarding how the pain is real but not necessarily caused by disease can help to understand the problem.

Counseling can also be to describe changes that vary during the monthly cycle.

Women on hormone replacement therapy may benefit from a dose adjustment.

Another non-pharmacological measure to help relieve symptoms of pain may be to use good bra support.

Breasts change during adolescence and menopause and refitting may be beneficial.

Applying heat and/or ice can bring relief.

Dietary changes may also help with the pain.

Methylxanthines can be eliminated from the diet to see if a sensitivity is present.

Patients with severe recurrent or refractory mastalgia may require treatment with tamoxifen, goserelin or testosterone, but the short and long term adverse effects of these drugs preclude their use as first-line agents. Chest wall pain is usually self-limiting, but symptomatic relief can often be obtained using steroidal and local anaesthetic injections or nonsteroidal anti-inflammatory drugs.

5. Various complications of axillary dissection:

- **The patient may feel discomfort and soreness at the wound site, which is generally managed by taking mild analgesics.**
- **A slight risk of wound infection exists after breast surgery, which may result in wound breakdown.**

- **Hematoma generally develops within 24 hours after the operation. It is a very rare complication.**
- **Patients may notice swelling of the wound site and bruising over the breast or axilla.**
- **The observed rates of seroma after axillary surgery range from 2.5% to 51%. It may necessitate needle drainage on one or multiple occasions.**
- **Shoulder stiffness is a temporary and self-limited side effect. Physiotherapy can be beneficial.**
- **Lymphedema of the arm and breast constitutes a significant long-term sequelae to axillary dissection. This is minimized by limiting the dissection superior to the axillary vein. Studies of reverse axillary mapping may modify the approach to the axilla in the future.**
- **A numb patch on the upper arm may be caused by division of intercostobrachial nerve.**

Care should be taken to ensure the long thoracic nerve is visible and protected as the dissection proceeds to the apex of the axilla. It is often retracted away from chest wall towards the specimen with the traction applied.
In cases with excessive nodal involvement, an approach through the interpectoral space is useful. The pectoralis minor is retracted laterally and the pectoralis major medially with the dissection carried out through this space to reach level III. Small vessels at the apex are carefully taken with diathermy.

The patient can be taught a full range of shoulder exercises preoperatively. The range of shoulder movement should be assessed preoperatively.
Postoperatively, the same exercises are encouraged to ensure full mobility. Patients are generally advised to avoid any heavy lifting with the arm on the side of the cancer, which will potentially reduce risk of lymphedema and also avoid any unnecessary trauma, including iatrogenic intervention on that arm to reduce risk of infection.

6. **The most common cause of esophageal perforation is injury to the esophagus during another medical procedure.**

Causes are:

- **Iatrogenic:**
  - **Post instrumentation or post thoracic surgery (most common ~80% of cases)**
  - **Complication of acute radiation-induced esophagitis**
- **Trauma: both blunt (crush-type injury) and penetrating**
  - **Occurs in <0.1% of blunt chest trauma**
- **Foreign body ingestion**
- **Corrosive material ingestion**
- **esophageal cancer**
- **Spontaneous rupture post vomiting (Boerhaave syndrome)**

Treatment:
Surgery will depend on the location and size of the perforation. If surgery is needed, it is best done within 24 hours.
Treatment may include:

- **Fluids given through a vein (IV)**
- **IV antibiotics to prevent or treat infection**
- **Draining of fluid around the lungs with a chest tube**
- **Mediastinoscopy to remove fluid that has collected in the area behind the breastbone and between the lungs (mediastinum)**
  A stent may be placed in the esophagus if only a small amount of fluid has leaked. This may help avoid surgery.

A perforation in the uppermost (neck region) part of the esophagus may heal by itself if you do not eat or drink for a period of time. In this case, you will need a stomach feeding tube or another way to get nutrients.

Surgery is often needed to repair a perforation in the middle or bottom portions of the esophagus. The leak may be treated by simple repair or by removing the esophagus, depending on the extent of the problem.

7. **Complications of chest trauma:**
   - **Chest wall injury :**
     Sucking wound & open pneumothorax
     ribs – pain, haemothorax, flail chest, deformed chest, respiratory distress
   - **Lung injury -Lung contusion, haemothorax, pneumothora (usually haemo pneumothorax),**
     Empyema thoracis
   - **Major air way injury – Surgical emphysema, massive pneumothorax**
   - **Esophageal injury- Mediastinal sepsis, septicemia, pneumothorax**
   - **Cardiac injury - Cardiac temponade, myocardial contusion/ laceration**
   - **Great vessel injury- Hypovolemia, shock**
   - **Terminal complication – ARD**

8. **Retroperitoneal sarcomas occur in the retroperitoneum. This is an area behind the peritoneum, the lining of the abdominal space that covers the abdominal organs. The retroperitoneum is deep in the abdomen and pelvis, behind the abdominal lining, where organs such as the major blood vessels, kidneys, pancreas and bladder are located.**

The main types of sarcoma that occur in the retroperitoneum are:

Liposarcoma – cancer of the fatty tissues

Leiomyosarcoma – cancer of the involuntary muscle

Other less common types in the retroperitoneum include solitary fibrous tumour, pleomorphic sarcoma, malignant nerve sheath tumour, synovial sarcoma and Ewing's sarcoma.

Signs and symptoms: Symptoms of retroperitoneal sarcoma can vary depending on the size and location of your tumour.

They may include:

- **A noticeable lump in the abdomen**
- **Increase in abdominal girth**
- **Dull pain in the abdomen or back**
- **Intense abdominal pain with bleeding**

    - **Other rare symptoms include early satiety (meaning feeling full after eating a small amount of food), weight loss, hernia or anaemia.**
    - **A diagnosis of retroperitoneal sarcoma may start with a visit to your GP who will then refer you to a specialist doctor. Some retroperitoneal sarcomas are discovered through investigations for another medical condition or are diagnosed after surgery for a different problem.**

Following tests to be done:

- **Physical examination – looking at and feeling any lump**
- **A scan – taking pictures of the inside of the body using ultrasound, x-ray, CT, EUS, PET or MRI**
- **A biopsy – taking and testing a tissue sample.**
  Types of diagnostic scans and tests
    - **Ultrasound: A scan that uses sound waves to create images from within the body.**
    - **CT: The Computer Tomography (CT) scan takes a number of x-rays to make a 3D image of an affected area.**
    - **MRI: Magnetic Resonance Imaging (MRI) uses magnets to create an image of the tissues of the body.**
    - **Histopathology: Examination of a tissue sample by a pathologist under a microscope to identify disease.**
    - **Blood test**

Grading

- **Low-grade means the cancer cells are slow-growing, look quite similar to normal cells, are less aggressive, and are less likely to spread**
- **Intermediate-grade means the cancer cells are growing slightly faster and look more abnormal**
- **High-grade means cancer cells are fast growing, look very abnormal, are more aggressive and are more likely to spread**
  Staging

Most sarcomas are staged by looking at:

- **The size and grade of the tumour**
- **Whether the tumour is deep in the body or superficial. This means closer to the surface.**
- **Whether it has spread to another part of the body**

Most retroperitoneal sarcomas are more than 5cm in size and deep in the body. This makes the grade of the cancer a more important factor when finding out the stage of your cancer.

- **Stage 1 means the cancer is low grade, small (less than 5cm) and has not spread to other parts of the body**
- **Stage 2 means the cancer is of any grade, usually larger than stage one but has not spread to other parts of the body**
- **Stage 3 means a high grade cancer that has not spread to other parts of the body**
- **Stage 4 means a cancer of any grade or size that has spread to any other part of the body.**

Surgery

Surgery is the main treatment for this type of sarcoma.

As retroperitoneal sarcomas can sometimes touch or press on surrounding organs, the surgeon will aim to remove the tumour along with any organs next to it 'en bloc' meaning, as a whole. This is to ensure they remove all cancer cells including those that are not clearly visible.

9. The cervical lymphatic nodal basins contain between 50 and 70 lymph nodes per side and are divided into seven levels .

1. **Level I is subdivided.**

   Level IA is bounded by the anterior belly of the digastric muscle, the hyoid bone, and the midline.

   Level IB is bounded by the anterior and posterior bellies of the digastric muscle and the inferior border of the mandible. Level IB contains the submandibular gland.

2. **Level II is bounded superiorly by the skull base, anteriorly by the stylohyoid muscle, inferiorly by a horizontal plane extending posteriorly from the hyoid bone, and posteriorly by the posterior edge of the sternocleidomastoid muscle. Level II is further subdivided.**

   Level IIA is anterior to the spinal accessory nerve.

   Level IIB, or the so-called submuscular triangle, is posterior to the nerve.

3. **Level III begins at the inferior edge of level II and is bounded by the laryngeal strap muscles anteriorly, by the posterior border of the sternocleidomastoid muscle posteriorly, and by a horizontal plane extending posteriorly from the inferior border**

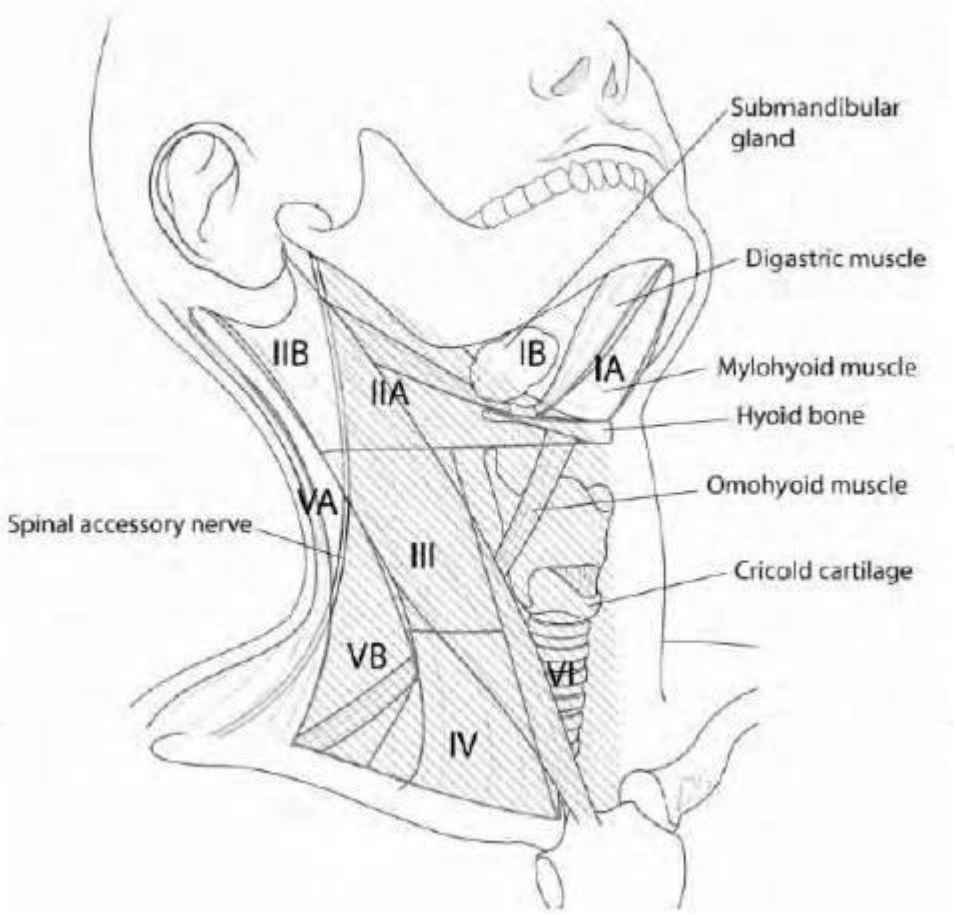
of the cricoid cartilage.

4. **Level IV begins at the inferior border of level III and is bounded anteriorly by the strap muscles, posteriorly by the posterior edge of the sternocleidomastoid muscle, and inferiorly by the clavicle.**

5. **Level V is posterior to the posterior edge of the sternocleidomastoid muscle, anterior to the trapezius muscle, superior to the clavicle, and inferior to the base of skull.**

6. **Level VI is bounded by the hyoid bone superiorly, the common carotid arteries laterally, and the sternum inferiorly. Although level VI is large in area, the few lymph nodes that it contains are mostly in the paratracheal regions near the thyroid gland.**

7. **Level VII (superior mediastinum) lies between the common carotid arteries and is superior to the aortic arch and inferior to the upper border of the sternum.**



10. LC has been associated with a higher incidence of IA bile duct injuries

- **LC—0.4 to 0.8%**
- **Traditional OC—0.1-0.3%**

- **Association:**
  - **Increased mortality and morbidity**
  - **Reduced long-term survival**
  - **Reduced quality of life**
- **Infrequent—but among the leading sources of malpractice claims against surgeons.**
- **Between 34% and 49% of surgeons are expected to cause such an injury during their career.**
- **Awareness and preventative methods are of clinical importance to surgeons.**

- **Risk Factors**
  - **Anatomical**
    - **Anatomical variations (biliary and vasculature)**
    - **Bleeding, scarring, obesity**
  - **Laparoscopic**
    - **Lack of Depth Perception, Tactile Feedback, Full Manual Maneuverability**
  - **Improper surgical approach**
    - **Improper Lateral retraction (insufficient or excessive)**
    - **0 degree scope**
    - **Approach plane too deep**

  Lack of conversion to OC during difficult cases.

Mechanism of injury:

Initially…Surgeon's Learning Curve –Steady

- **Anatomical Misidentification: excision, incision, or transection of biliary anatomy**
  - **Injuries: common bile duct, common hepatic duct, right and left hepatic ducts, right hepatic artery, ducts draining hepatic segments**
  - **Anatomical variations (biliary and vasculature)**
  - **Electrocautery, thermal injury: stricture of CBD or hepatic ducts, bile leak**
  - **Mechanical trauma: stricture of the biliary ducts, bile leaks**
  - **Improper surgical approach.**

Thermal injuries:

- **Inappropriate use of electrocautery near biliary ducts**
- **May lead to stricture and/or bile leaks**
- **Mechanical trauma can have similar effects.**

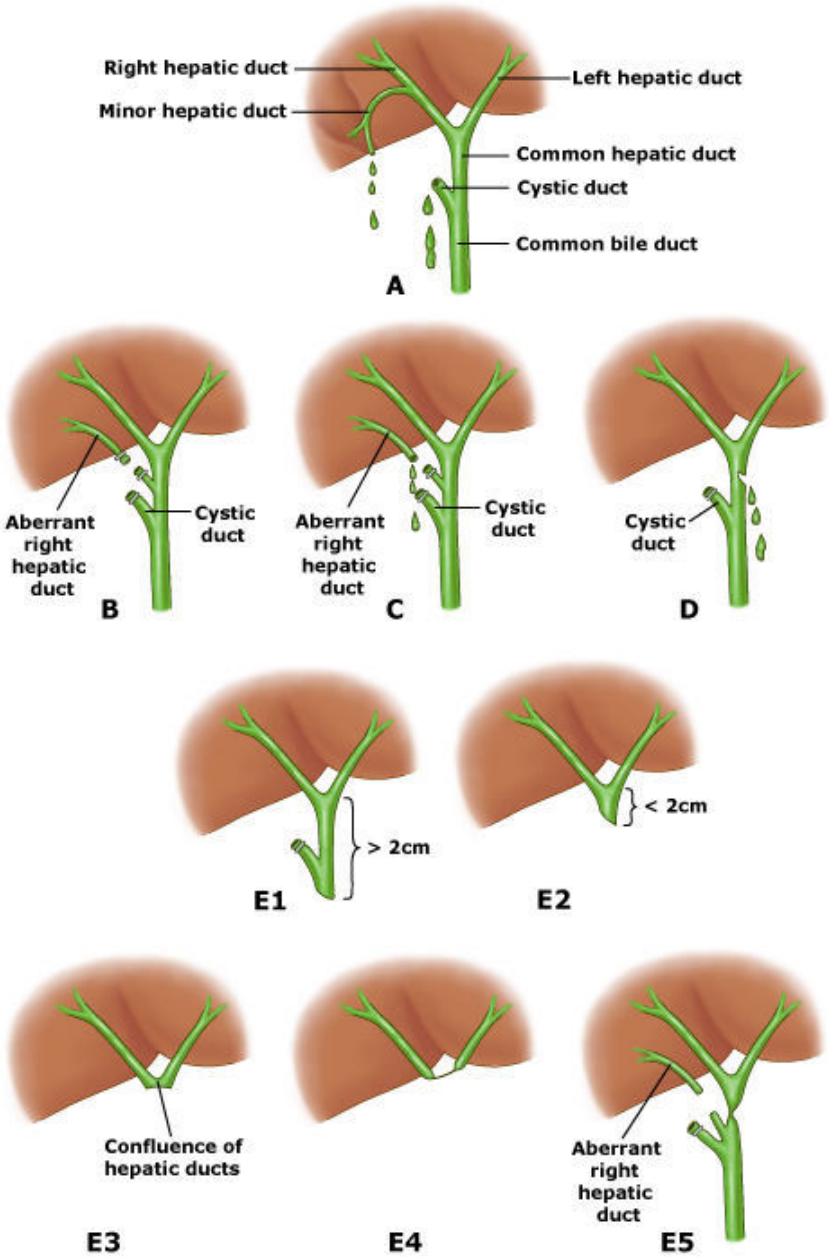
Strasburg Classification:

- **Type A Cystic duct leaks or leaks from small ducts in the liver bed**
- **Type B Occlusion of a part of the biliary tree, almost invariably the aberrant right hepatic ducts**
- **Type C Transection without ligation of the aberrant right hepatic ducts**

- **Type D Lateral injuries to major bile ducts**
- **Type E Subdivided as per Bismuth classification into E1 to E5**

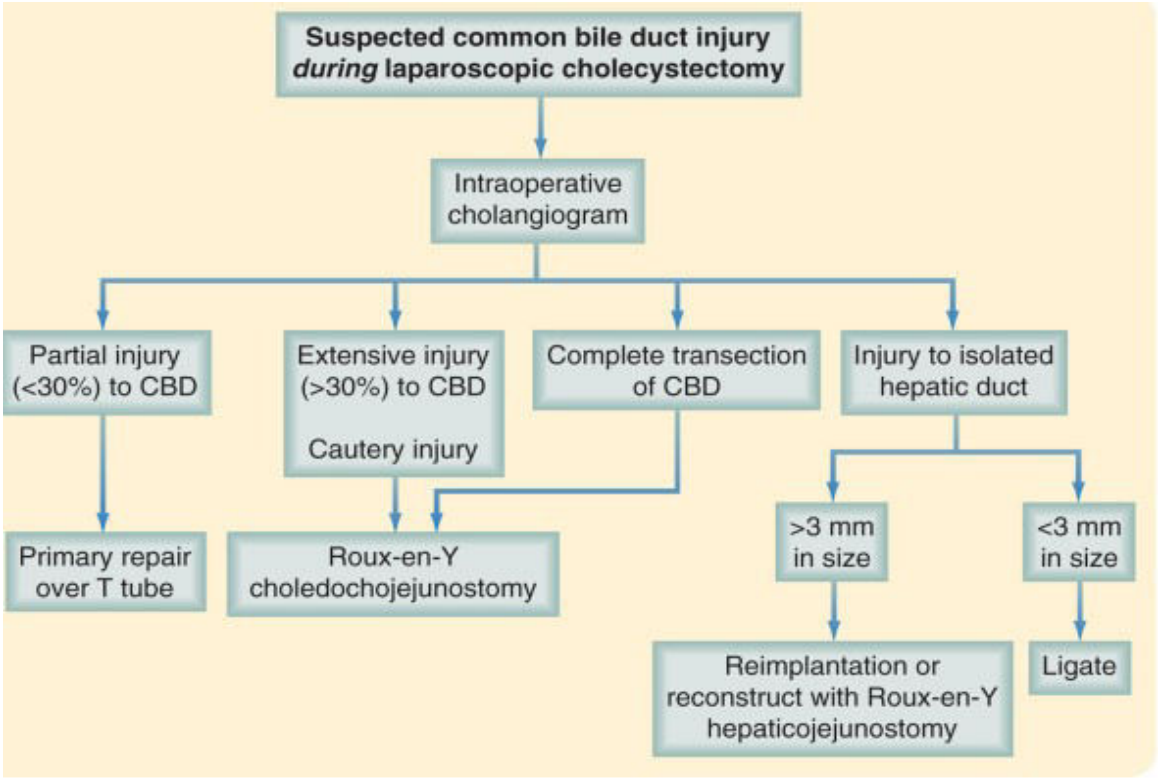
E: injury to main duct (Bismuth)

- **E1: Transection >2cm from confluence**
- **E2: Transection <2cm from confluence**
- **E3: Transection in hilum**
- **E4: Seperation of major ducts in hilum**
- **E5: Type C plus injury in hilum**



Management:

- **Only 25-33% of injures are recognized intraoperatively**
- **If experienced, convert to Open Procedure and perform Cholangiography (determine extent of injury)**
- **If not experienced, perform the cholangiogram laparoscopically with intent of referring patient (placement of drains)**
- **Consult an experienced hepatobiliary surgeon**
- **Acute Management**
  - **Biliary catheter for decompression of biliary tract and control of bile leaks**
  - **Percutaneous drainage of intraperitoneal bile collection**



THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2019

PAPER II

1. **Principles of management of colorectal injuries. 10**
2. **Approach to diagnosis of liver SOL. 10**
3. **Enumerate causes and pathophysiology of acute biliary pancreatitis? 10**
4. **Clinical presentation and diagnosis of Abdominal Tuberculosis. 10**
5. **Management of intestinal fistula. 10**
6. **Clinical presentation diagnosis and management of congenital hypertrophic pyloric stenosis. 10**
7. **Describe MEN syndrome and management of medullary carcinoma of thyroid. 10**
8. **Management of esophageal variceal bleeding. 10**
9. **Clinical features and management of strangulated inguinal hernia. 10**
10. **Pathophysiology and management of carcinoid tumour. 10**

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2019

PAPER II

1. **Principles of management of colorectal injuries. 10**

Answer. Principles of management of colorectal injuries:

Etiology:

- Penetrating trauma: This is the most common type of trauma seen, and is usually due to

– High velocity missiles.
– Rectal impalement injuries result when a patient falls on a penetrating object or using foreign bodies for sexual satisfaction.
– Iatrogenic injuries due to uterine perforation during curettage of the uterus, use of endoscopies whether diagnostic or during polypectomies or other rectal instrumentations.
– During surgical operations for urologic or gynecologic operations.

- Blunt trauma: This is rare due to the protected situation of the anus and rectum and it is usually associated with fracture pelvis. The commonest cause is motor vehicle accidents followed by falls and crush injuries.

Diagnosis: Intra-abdominal injuries are diagnosed as any abdominal trauma by the presence of manifestations of peritoneal irritation, free intraperitoneal fluid or air, and/or by assuring the presence of penetration into the peritoneal cavity.
Rectal, anal canal and perineal trauma are diagnosed by proper inspection and per rectal examination of the patient.

- The presence of bleeding per rectum is a very important sign.
- The presence of different types of uretheral injuries as well as different types of fracture pelvis should stimulate the surgeon to properly examine and even sigmoidoscope the rectum and the pelvic colon.

Investigations:

- Recently CT abdomen and to a lesser extent the ultrasound examination are the initial investigations of choice.
- Sigmoidoscope (the preferred method of investigation) the rectum and the pelvic colon.
- If an enema is to be used, water soluble contrast (gastrographin) is a must and barium should never be used.
- Again a CT abdomen and pelvis with double or at least I.V. contrast is indispensable for proper diagnosis.

Treatment:

Direct laceration closure: This necessitates the presence of the following conditions
– Small tear less than 2 cm after debridement of the large bowel wound.
– Minor spillage reaching to a distance less than 5 cm all around the lacerating wound
– Interference in a time less than 8 hours from wound inflection
– Unloaded colon
– No other large bowel injuries
– No other organ injuries

– No hemodynamic shock or a status of imperfect tissue perfusion
(e.g. septic shock)

- Contraindications of primary closure:
  - Patient is or has been in shock (systolic less than 80 mm Hg)
  - The interval between injuries and closure is more than 8 hours
  - More than one organ injured
  - Injuries at two different locations of the large bowel
  - Massive colonic destruction
  - Massive contamination
  - Presence of prosthetic material or the necessity of its insertion.

- Resection of the injured area with direct anastomosis of the small bowel to the transverse colon. This is only valid in right sided lesions where direct closure is contraindicated.
- Other rare option for cecal injuries is - end ileostomy with long Hartmann closure nfor the distal bowel.
- Double barrel colostomy at the site of injury (instead of exteriorization of the repaired injured colon) is done in transverse colon or the sigmoid colon if the injury is in a mobile area with long mesentery.
- Resection with end colostomy and mucosal fistula or Hartmann pouch: This is done if the injury is at a site where mobility of the distal limb is limited while mobility of the proximal limb is free.
- Suture closure with proximal diversion.

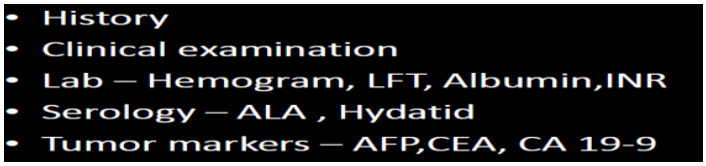
Principles of management of rectal injuries:
• The injury in the rectum is detected by a through endoscopic examination preferably done by a rigid sigmoidoscope in the left lateral or lithotomy position to determine the injury's location whether in the intraperitoneal segment or in the extraperitoneal one.
• The extraperitoneal space for the rectum is divided into retroperitoneal high up in the abdomen and sub peritoneal low in the presacral space. Also using the scope removal of the retained feces with irrigation is done.

- Direct per rectal repair is done in low injuries (sub peritoneal spaces) with possible drainage of the presacral space through an incision situated midway between the coccyx and the anus. This is specially indicated in posterior injuries.
- Direct repair through abdominal exploration is done in injuries of the intraperitoneal segment or in the retroperitoneal segment, with possible use of suction drainage of the presacral space if the injury is posteriorly located, and drainage of the Duoglas pouch if it is anteriorly located as is usually the case. A proximal complete fecal diversion is a must in all situations

• Ensure removal of all retained feces by irrigation through either the distal limb of the colostomy or better still through the rectum.

1. **Approach to diagnosis of liver SOL. 10**

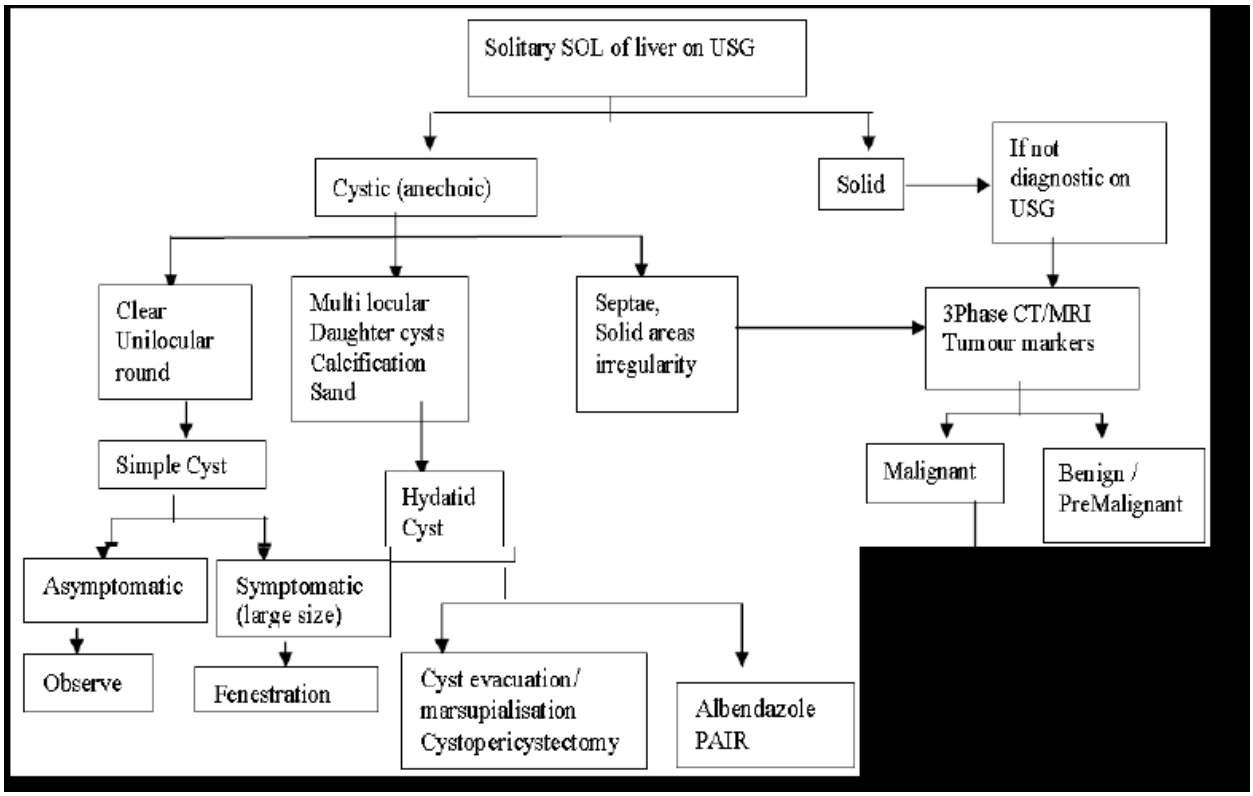
Answer.



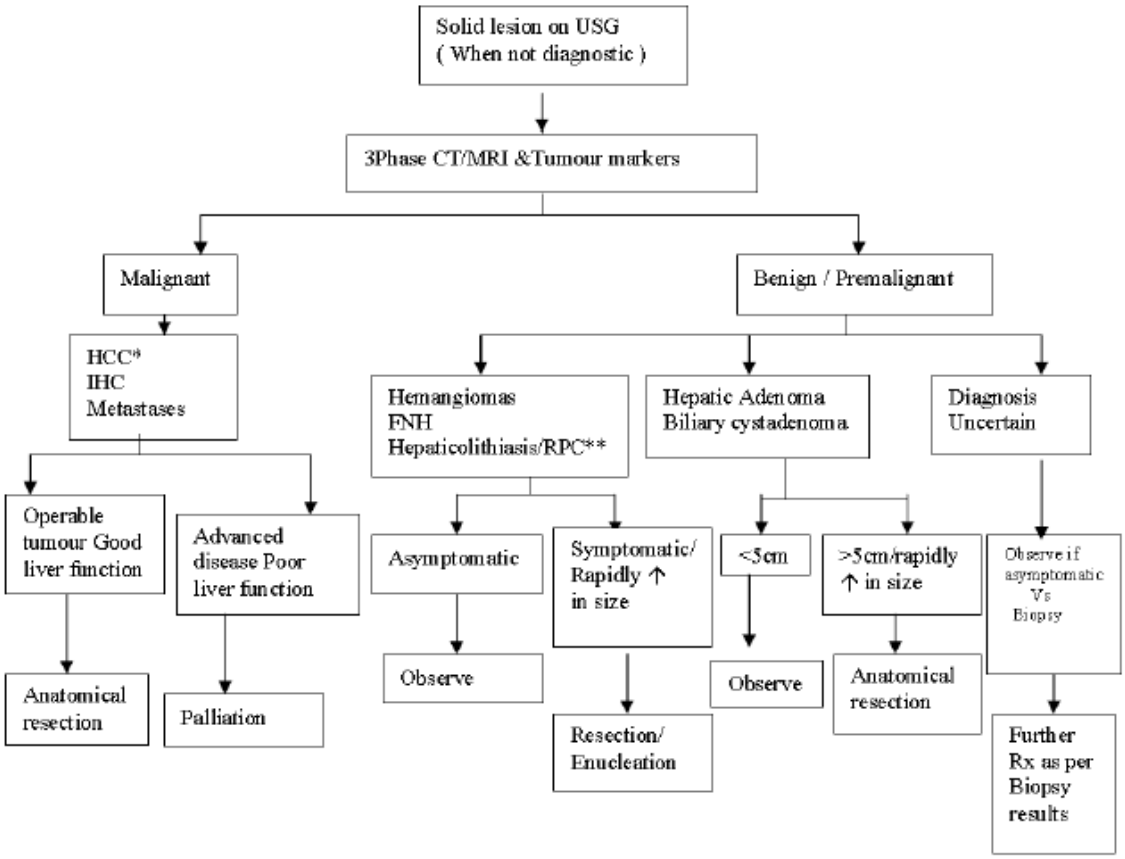
Presentation:

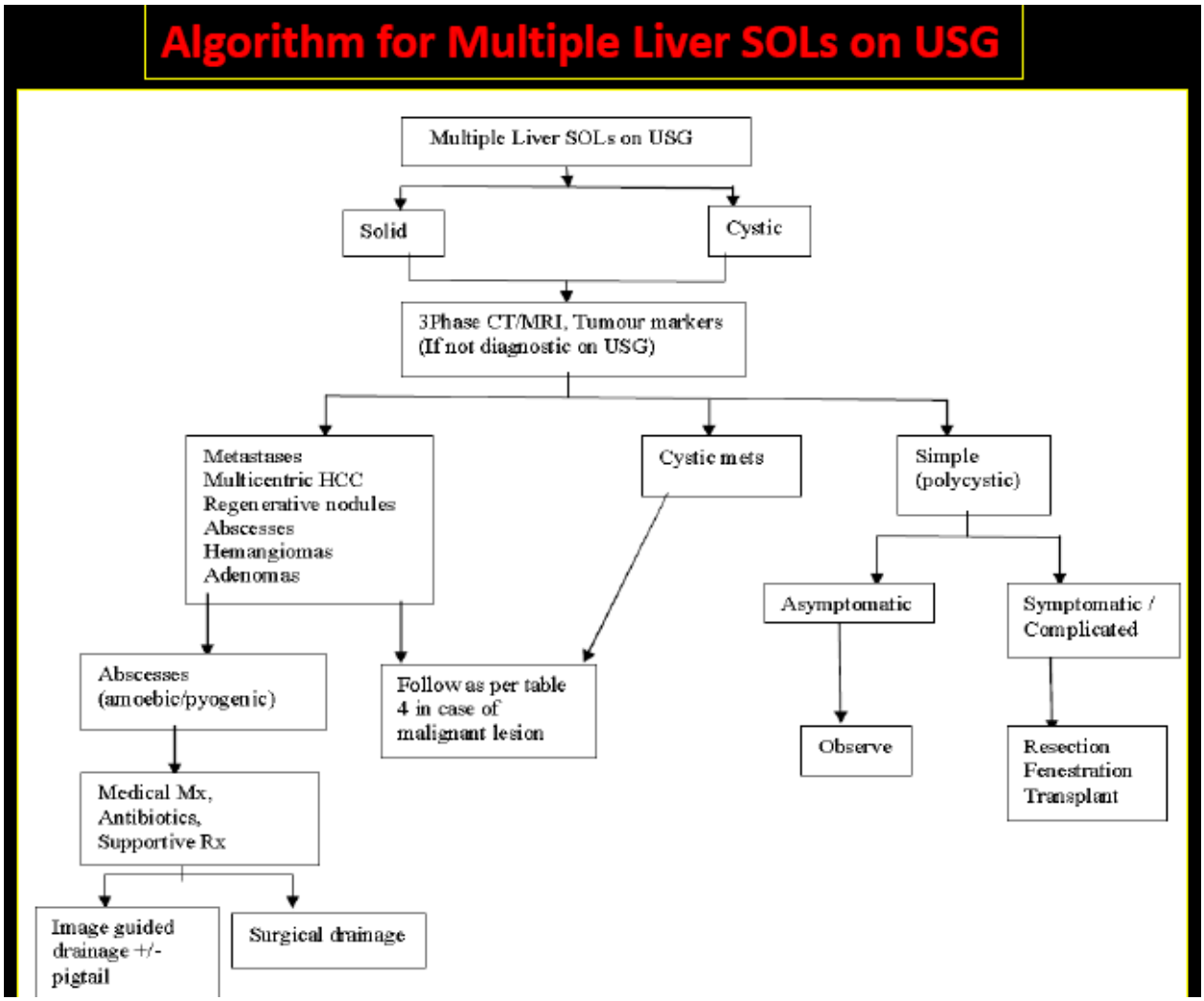
- Asymptomatic
- Nodule on screening in cirrhotic patients
- Presenting with pain and fever
- SOL in a known patient of extrahepatic malignancy

Algorithm for solitary SOL of Liver in USG



Algorithm for Solid lesions on USG



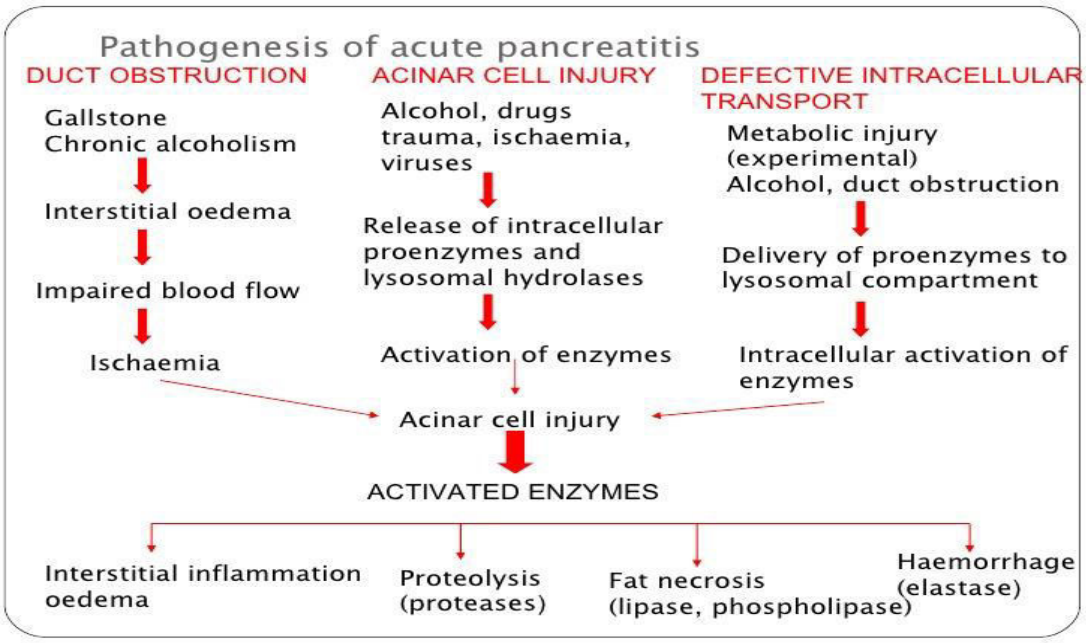


3. Enumerate causes and pathophysiology of acute biliary pancreatitis? 10.

Answer. Causes and pathophysiology of acute biliary pancreatitis:

Aetiologies of acute pancreatitis:

Metabolic	Mechanical	Vascular	Infection
○ Alcohol ○ Hyperlipoproteinemia ○ Hypercalcemia ○ Drugs ○ Genetics ○ Scorpion venom	○ Cholelithiasis ○ Postoperative ○ Pancreas divisum ○ Post-traumatic ○ Retrograde pancreatography ○ Pancreatic duct obstruction: pancreatic tumor, ascaris infestation ○ Pancreatic ductal bleeding ○ Duodenal obstruction	○ Postoperative (cardiopulmonary bypass) ○ Periarteritis nodosa ○ Atheroembolism	○ Mumps ○ Coxsackie B ○ Cytomegalovirus ○ Cryptococcus



Effect of acute pancreatitis on other organ system:

- Lung: Pleural effusion, acute lung injury.
- Kidney: acute renal failure
- Common bile duct: obstructive jaundice.
- Colon: Colonic ischaemia
- SIRS
- MODS

4. Clinical presentation and diagnosis of Abdominal Tuberculosis. 10

Answer. Because of varied clinical manifestations, one or the other form of abdominal tuberculosis may mimic any one of the followings:

- Malignant neoplasms, e.g. lymphoma, carcinoma
- Inflammatory bowel disease
- Cirrhosis of the liver especially peritoneal tuberculosis
- Ileocaecal mass may mimic appendicular lump or malignancy caecum or other conditions.

A high degree of suspicion combined with proper use of diagnostic modalities will help in the timely diagnosis of the disease.

Type	*Clinical presentations*
1.Ulcerative	Chronic diarrhea, malabsorption, intestinal perforation (occasional). Rectal bleeding is rare but reported occasionally in colonic tuberculosis.
2. Hypertrophic	Intestinal obstruction or an abdominal (ileocaecal) lump
3. Stricturous / constrictive	Recurrent subacute intestinal obstruction (e.g. vomiting, constipation, distention and colicky pain). There may be associated gurgling sounds or feeling of moving ball of wind in the abdomen and visible distended intestinal loops with visible peristalsis. These symptoms get relieved with passage of flatus / stool. Sometimes, acute intestinal obstruction may develop.
4. Anorectal	Stricture or fistula-in-ano
5. Gastroduodenal	Peptic ulcer with or without gastric outlet obstruction or perforation
6. Liver and spleen	Hepatosplenomegaly usually a part and parcel of disseminated tuberculosis is accompanied with fever, night sweats and decreased or loss of appetite Microscopic involvement shows granulomatous hepatitis.
7. Peritoneum	Abdominal distention and ascites, sometimes there may be a soft cystic lump due to loculated ascites
8. Lymph node	As a mass or lump of matted lymph nodes in the central abdomen or as vague abdominal pain. There is associated fever, night sweats and malaise.

Diagnosis:

- The isolation of acid fast bacilli (AFB) is the gold standard for diagnosis of pulmonary tuberculosis but may not be possible for establishing the diagnosis of various forms of abdominal tuberculosis.
- So far the diagnosis of abdominal tuberculosis has been made either on the histological evidence of TB in the tissue (e.g. evidence of tubercles with caseation or demonstration of AFB in a lesion) or typical operative findings suggestive of TB or animal inoculation or tissue culture yielding the growth of *M. tuberculosis*.
- Now with the advent of better radio-imaging procedures, new criteria for the diagnosis were suggested:
  i. Clinical manifestations suggestive of TB
  ii. Imaging evidence indicative of abdominal TB
  iii. Histopathological or microbiological evidence of TB
  and/or
  iv. Therapeutic response to treatment.

  Investigations:
  - Blood examination may show varying degree of anemia, leucopenia and raised ESR
  - Serum biochemistry: Serum albumin level may be low. Serum transaminases are normal. A high level of serum alkaline phosphatase may be observed in hepatic tuberculosis.
  - PPD skin testing/mantoux test: This gives supportive evidence to the diagnosis of abdominal tuberculosis in 55 to 70% patients if positive, however, a negative tuberculin test may also be observed in one-third of patients.
  - Imaging Techniques:

o Plain X-ray abdomen and chest: Plain X-ray of abdomen (erect and supine films) is useful simple investigation. It may show presence of multiple air fluid levels and dilated loops of gut in case there is subacute or acute intestinal obstruction.

- Calcification in the abdominal lymph nodes also indicate tuberculosis.
- Barium Studies:

Findings of barium meal follow through study in intestinal tuberculosis

Group I	*Highly suggestive of intestinal tuberculosis if one or more of the following features are present.* • Deformed ileocaecal valve with dilated ileum • Contracted caecum with abnormal ileocaecal valve or terminal ileum • Stricture of ascending colon with shortening or involvement of ileocaecal region
Group II	*Suggestive of intestinal tuberculosis if one of the following is present:* • Contracted caecum • Ulceration or narrowing of terminal ileum • Stricture of ascending colon • Multiple sites of narrowing and dilatation leading to formation of small bowel loops
Group III	*Non-specific changes* Features of adhesions, dilatation and mucosal thickening of small bowel loops
Group IV	*Normal study*

- USG:
  - The barium studies are sensitive and most useful for diagnosis of intestinal tuberculosis while ultrasonography (USG) is beneficial in extraintestinal (peritoneal, lymph nodes) tuberculosis.
  - The USG of abdomen may show a mass of matted loops of small bowel with thickened walls, rolled up or diseased omentum, and loculated ascites.
  - Fine septae (complete or incomplete), echogenic debris (seen as fine strands and particulate matter) may be seen within tubercular ascites. These septae are due to high fibrin content of the exudative ascitic fluid.
  - However, these findings are not specific to tuberculosis as they may be observed in malignant ascites. Peritoneal thickening and nodularity are the other ultrasonographic findings of peritoneal tuberculosis.
- Computed Tomography (CT):
  - Abdominal CT scan is better than ultrasound for detecting high density ascites, lymphadenopathy with caseation, bowel wall thickening and irregular soft tissue densities in the omental area.
  - Abdominal lymphadenopathy is the commonest manifestation of tuberculosis on CT. Contrast enhanced CT (CECT) is better than plain CT, shows four patterns of contrast enhancement, i.e.

(i) peripheral enhancement,
(ii) non homogenous enhancement,
(iii) homogenous enhancement and
(iv) Homogenous non-enhancement.

- Though not pathognomic, the pattern of peripheral rim enhancement could be highly suggestive of tuberculosis. A similar pattern is seen in metastatic lymphadenopathy. The presence of calcification in the lymph nodes in the absence of a known primary tumor suggests tubercular lymphadenitis. Tuberculosis involves predominantly the omental, mesenteric and upper para-aortic lymph nodes; while lower para-aortic lymph nodes are commonly involved in Hodgkin's and Non-Hodgkin's lymphoma.

- MRI: MRI when compared to CT has no added advantage,in the diagnosis of abdominal tuberculosis, hence, its utility in abdominal tuberculosis is limited.

- Endoscopy: Endoscopy visualizes the tubercular lesion directly, hence, is a useful tool in the diagnosis of colonic and gastro-duodenal tuberculosis; and helps in the confirmation of the diagnosis by obtaining histopathological evidence of tuberculosis.
- Laparoscopy: Laparoscopy examination is an effective method of diagnosing tubercular peritonitis because (i) it directly visualizes the inflamed thickened peritoneum studded with whitish-yellow miliary tubercles and (ii) biopsy of the peritoneum confirms the diagnosis. Laparoscopyfacilitates an accurate diagnosis in 80-90% of patients.
- Ascitic Tap (Paracentesis):
- The ascitic fluid in tuberculosis is exudative (protein >3 g%) with serum-ascites albumin gradient <1.1 g%.
- Ascitic fluid WBC count is 150-4000 cell/mm3 and consists of predominant lymphocytes. Neutrophils may be seen in early stages of the disease. RBCs, sometimes, may also be seen.
- Ascitic fluid reveals AFB only in <3% of the cases and culture for M. tuberculosis is positive only in 20% of patients.
- Adenosine deaminase (ADA) activity in ascitic fluid is a sensitive and specific marker for tuberculosis. Ascitic fluid to serum ADA ratio >0.985 was also found to be suggestive of tuberculosis. Falsely low levels of ADA can be found in immunocompromised individuals.
- Interferon-γ (INF-γ) is an important immuneregulator, is produced by T-lymphocytes in response to stimulation with specific antigens and is capable of activating the macrophages, increasing their bactericidal activity against M. tuberculosis. High levels of INF-γ have been found in ascites due to tuberculosis than nontubercular.
- Serodiagnosis:
  - Conventional histological and microbiological methods are often inadequate for the diagnosis of abdominal tuberculosis as it is a paucibacillary disease.
  - A number of serological tests based on the detection of antibody to a variety of mycobacterial antigens developed but all of them have a low predictive value. Polymerase chain reaction (PCR) assay for detection of M. tuberculosis in endoscopic biopsy specimens has shown promising results.
- Soft Tissue Biopsy and Culture:
  - Invasive diagnostic procedures are indicated with suspected abdominal tuberculosis. In addition to specimens of involved sites (lymph node, intestine, peritoneum, liver biopsy), bone marrow aspiration for culture may be useful and have a good diagnostic yield in disseminated (military) tuberculosis particularly in HIV infected patients.

5. Management of intestinal fistula? 10

Answer.

Laboratory Studies

Although laboratory tests do not help diagnose or confirm the presence of intestinal fistulas, they are important for defining the patient's clinical condition and guiding treatment.

A complete blood count (CBC) should be obtained. An elevated white blood cell (WBC) count suggests associated infection. Abscesses, soft-tissue infection adjacent to an enterocutaneous fistula, bacteremia, or bloodstream infection may be present. Elderly patients or those who are severely nutritionally depleted may not manifest an elevated WBC count as an indicator of infection.

An electrolyte panel is helpful. Electrolyte imbalances and dehydration are common in patients with high-output enterocutaneous fistulas because of intestinal fluid loss. Hypokalemia, hypochloremia, and metabolic alkalosis are observed in patients with high-output gastric fistulas. Patients with pancreatic and small-bowel fistulas have associated hyponatremia, hypokalemia, and metabolic acidosis. Nephroenteric fistulas are often associated with decreased renal function, which manifests as elevated creatinine and blood urea nitrogen (BUN) and a reduced glomerular filtration rate (GFR).

Serum albumin levels are used to predict fistula closure and mortality. In one study, a serum albumin level higher than 3.5 mg/dL was associated with no mortality, whereas a level below 2.5 mg/dL was associated with a mortality of 42%. Higher levels of short-turnover proteins (eg, serum transferrin, prealbumin, retinol-binding protein) are used to predict fistula closure. A serum transferrin level higher than 200 mg/dL is associated with a higher rate of fistula closure and a lower mortality and vice versa.

Imaging Studies

Computed tomography (CT) allows identification as well as guided drainage of associated abscesses or fluid collection. CT with oral contrast can also identify the site of the fistula.

Gastric, duodenal, and proximal small-bowel fistulas can be readily identified. The presence or absence of distal bowel obstruction can be revealed; if intraluminal contrast passes distal to the fistula site, then distal obstruction is unlikely. Passage of the oral contrast, as well as the early presence of contrast within the colonic lumen, can demonstrate the gastrocolic fistula tract. The presence of periaortic inflammation, air collection, or fluid collection characterizes aortoenteric fistulas.

Fistulography is performed to confirm and define the location of an enterocutaneous fistula. Closed-suction drainage catheters are placed under radiologic guidance to drain abscesses or fluid collections. If the drainage contents are clearly enteric, the area is allowed to drain adequately for 7-10 days. This period allows a tract to form.

The patient is stabilized with correction of electrolyte imbalances and administration of antibiotics. Water-soluble contrast is injected via the drainage catheter under fluoroscopy or during CT. Intraluminal passage of contrast confirms the presence and defines the origin of the fistula. A complete contrast study of the gastrointestinal (GI) tract should follow fistulography.

Small-bowel follow-through contrast radiography often identifies enteroenteric fistulas in patients with Crohn disease and chronic radiation enteritis. The study is obtained to evaluate nonspecific complaints of abdominal pain, cramping, diarrhea, and anorexia. All of these symptoms and signs are attributable both to the primary disease and to internal fistulas.

Medical Therapy:

Initial treatment of intestinal fistulas is medical, including resuscitation, control of sepsis, local control of fistula output, nutritional support, pharmacologic management, and radiologic investigations. The final therapeutic step, if necessary, is definitive surgery to restore gastrointestinal (GI) tract continuity.

Early surgery is infrequently required but may be necessary in the following circumstances:

- Sepsis or abscess formation not amenable to percutaneous drainage
- Complete distal intestinal obstruction
- Uncontrolled bleeding from fistula
- Removal of mesh or other foreign bodies
- Inability to control the fistula without surgical drainage
- Aortoenteric fistulas (definitively managed by means of emergency surgery as soon as the diagnosis is made)

Delayed surgery is most commonly indicated in patients whose fistulas have not healed after several (typically 4-8) weeks of comprehensive conservative treatment. Specific indications include the following:

- Continued high output from fistula after patient has been given nothing by mouth and started on parenteral nutrition
- Continued signs of infection after institution of adequate antibiotic therapy and drainage of associated abscesses
- Uncontrolled bleeding

Surgical Therapy

The surgical procedure for intestinal fistula treatment depends on the structures involved. The basic surgical principles for treatment of all intestinal fistulas include the following:

- The procedure involves resection of the intestinal segment, fistula tract, and the adjacent part of the involved structure
- In the absence of extensive infection or inflammation, primary anastomosis of the divided intestinal segments is done to reestablish GI continuity and repair of the involved structure to maintain function
- In the presence of extensive infection or inflammation, the divided intestinal segments are exteriorized and the surgical procedure is modulated to allow replacement or maximal preservation of function
- A staged procedure is performed after the infection and inflammation subsides to reestablish GI continuity and reconstruction of the affected structure

6. Clinical presentation diagnosis and management of congenital hypertrophic pyloric stenosis. 10

Answer. Clinical presentation:

- Occurs generally in neonates who are 2 to 5 weeks of age.
- Vomiting
  - Characteristically forceful or projectile and occurs 30 to 60 minutes after feeding.
  - Formula intolerance initially suspected but does not resolve with change of feeds.
- Dehydration
  - Lethargy.
  - Absence of tears.
  - Sunken anterior fontanelle.
  - Dry mucous membranes.
  - Decreased urine output.
- The “olive” mass
  - Mass palpated to the right and above the umbilicus.
  - Approximately 2 cm in diameter, firm, and mobile.

Diagnosis:

Abdominal ultrasonography:

- Pyloric diameter greater than 14 mm,
- muscular thickness greater than 4 mm,
- and pyloric length greater than 16 mm
  are diagnostic of pyloric stenosis .

Upper GI contrast study:

- Enlarged stomach.
- Poor gastric emptying.
- Elongated, narrow pyloric channel or "string sign."

Management:

- Preoperative fluid resuscitation
  - 20-mL/kg bolus.
  - 5% dextrose in normal saline to achieve urine output of 2 mL/kg/hour.
  - Addition of potassium and changing to 5% dextrose in 0.45% normal saline occurs when urine output is adequate.
- Correction of the hypochloremic hypokalemic metabolic alkalosis.
- Operative intervention
- Indicated only after adequate resuscitation and correction of metabolic alkalosis.
- Pyloromyotomy
  - Division of the hypertrophied pyloric muscle, leaving the mucosa intact.
  - Open or laparoscopic technique.
- Postoperative feeding
  - Begin electrolyte solution by mouth 6 hours after pyloromyotomy.
  - Over the next 12 hours, formula or pumped breast milk can be started and should reach goal within 24 hours.
  - Parents should be advised that vomiting may occur postoperatively as a result of swelling at the pyloromyotomy, but this problem is self-limited.
  - If the pyloric mucosa is perforated and repaired during surgery, nasogastric drainage is recommended for 24 hours.

7. Describe MEN syndrome and management of medullary carcinoma of thyroid. 10

Answer.

Introduction:

- Multiple Endocrine Neoplasia (MEN) syndromes are familial conditions characterized by the occurrence of tumors involving two or more endocrine glands in a patient and family members.

- There are two major forms of MEN, namely MEN-type 1 (MEN1, →Wermer‘s syndrome) and MEN-type 2(MEN2, Sipple‘s syndrome); each form is characterized by the development of tumors of specific endocrine glands.
- The MEN syndromes are uncommon, but because they are inherited as autosomal dominant disorders, the finding of MEN in a patient has important implications for other family members. First degree relatives of a patient with known MEN have about a 50% risk of developing the disease.
- Occasionally, the MEN syndromes may arise sporadically (*i.e.* without a family history).

MEN 1:

- Autosomal dominant.
- The MEN1 gene was originally mapped to chromosome 11q13 by a combination of genetic linkage studies and tumor deletion mapping. It encodes a protein merlin.
- The MEN1 gene consists of 10 exons spanning 9 kb of genomic DNA and encodes a 610–amino acid protein product termed menin.

Features of MEN 1

Major disease components	Associated tumors
• Primary hyperparathyroidism • Pancreatic endocrine tumors (PET) • Anterior pituitary tumor	• Facial angiofibroma • Collagenoma • Adrenal cortical tumor • Lipoma • Foregut carcinoid

Components of MEN-1 with estimated penetrance (in parentheses) at age 40 year:

Endocrine features	Non-endocrine features
PHPT- Parathyroid hyperplasia (90%)	Lipomas (30%)
Entero-pancreatic tumor 1. **Gastrinoma** (40%) 2. Insulinoma (10%) 3. Non-functioning (**NF**) including **pancreatic polypeptide** (20%) 4. Other rare types: (2%) **glucagonoma** **VIPoma** **somatostatinoma** *etc.*	Facial angiofibromas (85%) Collagenomas (70%) Ependymoma (1%)
Foregut carcinoid **Thymic carcinoid** NF (2%) **Bronchial carcinoid** NF (2%)	
Gastric entero-chromaffin-like tumor NF (10%)	
Anterior pituitary tumor Prolactinoma (20%) Other: GH + PRL, GH, NF (each 5%) ACTH (2%), TSH (rare)	
Adrenal cortex NF (25%)	
Pheochromocytoma (<1%)	

- Parathyroid gland tumours. By age 40, 95% of patients have hypercalcaemia which is the commonest manifestation.
- Pancreatic islet cell tumours.
    - Prevalence of 30-75%.
    - Usually multicentric, slow-growing.
    - Secrete multiple polypeptides (insulin and gastrin commonest).
    - Gastrinoma leads to Zollinger-Ellison syndrome (recurrent and multiple peptic ulcers, severe reflux oesophagitis, and diarrhoea).
    - Rarer tumours are VIPoma, glucagonoma, somatostatinoma.
- Anterior pituitary tumours.
    - Detected in 15-40%.
    - Commonest is prolactinoma.
    - Rarer are GH- (causes acromegaly) or ACTH- (causes Cushing's disease) secreting tumours.

Carcinoid tumours (thymus, lungs, foregut), adrenal tumours, lipomas, and pinealomas have also been reported to appear in MEN-1 patients.

MEN 2A	MEN2B
Medullary thyroid carcinoma	Medullary thyroid carcinoma
Pheochromocytoma	Pheochromocytoma
Hyperparathyroidism	Marfanoid body habitus
Lichen planus amyloidosis	Mucosal neuromas
Hirschsprung's disease	Ganglioneuromatosis of the gastrointestinal tract

MEN 2:
Clinical Features of Sporadic MTC, MEN 2A, MEN 2B, and FMTC:

CLINICAL SETTING	FEATURES OF MTC	INHERITANCE PATTERN	ASSOCIATED ABNORMALITIES	GENETIC DEFECT
Sporadic MTC	Unifocal	None	None	Somatic *RET* mutations in >20% of tumors
MEN 2A	Multifocal, bilateral	Autosomal dominant	Pheochromocytomas, hyperparathyroidism	Germline missense mutations in extracellular cysteine codons of *RET*
MEN 2B	Multifocal, bilateral	Autosomal dominant	Pheochromocytomas, mucosal neuromas, megacolon, skeletal abnormalities	Germline missense mutation in tyrosine kinase domain of *RET*
FMTC	Multifocal, bilateral	Autosomal dominant	None	Germline missense mutations in extracellular or intracellular cysteine codons of *RET*

Treatment:
Surgical treatment:
MEN-1

- Parathyroidectomy.
- Pancreatic tumours: enucleation of individual tumours in the head of the pancreas and distal pancreatectomy for tumours in the tail/body.
- Hypophysectomy and external beam irradiation are considered for pituitary tumours.

MEN-2

- Total thyroidectomy (TT) indicated in patients identified by genetic screening. Symptomatic patients need TT and cervical nodal dissection for the lymph nodes on the involved side.
- Laparoscopic adrenalectomy for phaeochromocytoma.
- Parathyroidectomy for MTC in patients belonging to families in which hyperparathyroidism is frequently associated.

Medical treatment:
MEN-1 Prolactinomas can be treated with dopamine agonists (bromocriptine/cabergoline).

Management of Medullary carcinoma thyroid:

8. Management of esophageal variceal bleeding. 10

Answer. The goals of treatment are to:

- Prevent more liver damage.
- Prevent varices from bleeding.
- Control bleeding if it occurs.

Preventing liver damage

People who have liver disease need to avoid toxins that cause additional stress on the liver and more damage to it. Some suggestions for maintaining a healthier liver include:

- Avoid alcoholic beverages of any kind.
- Limit use of household cleaners and chemicals.
- Eat a healthier diet that is low in fat and high in fruits and vegetables, whole grains and lean proteins.
- Maintain a healthy body weight (excess body fat puts stress on the liver).

Preventing bleeding

Medications to reduce blood pressure in the portal vein can reduce the risk of bleeding. The most commonly used medications are a group called beta blockers. These include propranolol, nadolol and carvedilol.

Patients with a high risk of bleeding may undergo preventive treatment with the same techniques that are used to stop bleeding. The most commonly used technique is variceal ligation.

Controlling bleeding

Bleeding from esophageal varices is an emergency that requires immediate treatment. In the hospital, patients receive large amounts of fluid and blood to replace what has been lost.

Two different, non-surgical treatments are available to stop variceal bleeding--variceal ligation performed through an endoscope, and transjugular intrahepatic portosystemic shunt (TIPS) done by a radiologist using x-ray.

- Variceal ligation: In this procedure, tiny elastic bands are wrapped around the varices to cut off blood flow through the varices.
- Transjugular intrahepatic portal-systemic shunting (TIPS): This is a procedure to reduce portal blood pressure that can be used in patients who have esophageal varices that bleed due to severe cirrhosis..

Treatment of acute variceal haemorrhage

- Titrate fluid resuscitation to a systolic blood pressure of 80–90 mm Hg only
- Endotracheal intubation in patients with grade III–IV encephalopathy to protect airway

- Prophylactic antibiotics increases short term survival in cirrhotic patients with acute variceal haemorrhage
- Terlipressin, somatostatin, and octreotide control bleeding in approximately 80%–90%
- Variceal ligation appears to be equally as effective as sclerotherapy in controlling acute variceal haemorrhage
- Balloon tamponade has a high complication rate, its use should be restricted to patients with massive bleeding not controlled by initial therapy
- TIPS is the treatment of choice in patients unresponsive to endoscopic management

Prevention of rebleeding

- β-Blockers indicated in all patients after variceal bleed
- Overall β-blockers reduce the risk of rebleeding by about 40% and mortality by 20%
- Reduced incidence of rebleeding and death if β-blockers combined with endoscopic eradication of varices
- Variceal ligation requires fewer sessions to obliterate varices and results in fewer complications compared with sclerotherapy
- Sclerotherapy may be necessary after successful ligation therapy to eradicate small residual varices and prevent recurrence of varices

Liver transplantation is the definitive treatment for patients with advanced liver disease who have bled and should be considered in all such patients.

9. Clinical features and management of strangulated inguinal hernia. 10

Answer.

Clinical features:

- One common indication of a strangulated hernia is an easily visible bulge in the areas of the abdomen or pelvis.
- Sudden pain that can quickly become excruciating
- Fever
- General fatigue
- Inflammation and color changes in the skin near the hernia
- Burning feeling around the hernia
- Nausea
- Vomiting
- Severe constipation or an inability to have a bowel movement
- Bloody stools
- Tachycardia

Emergency management

- Resuscitation:
  - Establish IV access. Consider giving crystalloid fluid if there is a suspicion of a complicated hernia.

- Catheterize and place on a fluid balance chart if hypotensive.
- Blood for FBC (Hb, WCC), Urea, Creatinine & Electrolytes (Na, K).

Definitive management:

Surgery:

- Opening up the sac – examination of bowel – if colour is changed – apply 100% oxygen and hot mop – if colour changes to normal with return of peristalsis – reduction of hernia content with repair of hernia.
- If viability of gut is not restored – resection anastomosis and repair of hernia.

10. Pathophysiology and management of carcinoid tumour. 10

Answer. Pathophysiology:

Carcinoid tumors produce several vasoactive substances, most prominently serotonin. It is commonly thought that serotonin is the cause of the flushing, but this is only partially correct.The flushing also results from secretion of kallikrein, the enzyme that catalyzes the conversion of kininogen to lysyl-bradykinin. The latter is further converted to bradykinin, one of the most powerful vasodilators known.

Other components of the carcinoid syndrome are diarrhea (probably caused by the increased serotonin, which greatly increases peristalsis, leaving less time for fluid absorption), a pellagra-like syndrome (probably caused by diversion of large amounts of tryptophan from synthesis of the vitamin B_3 niacin, which is needed for NAD production, to the synthesis of serotonin and other 5-hydroxyindoles), fibrotic lesions of the endocardium, particularly on the right side of the heart resulting in insufficiency of the tricuspid valve and, less frequently, the pulmonary valve and, uncommonly, bronchoconstriction.

The pathogenesis of the cardiac lesions and the bronchoconstriction is unknown, but the former probably involves activation of serotonin 5-HT2B receptors by serotonin. When the primary tumor is in the gastrointestinal tract, as it is in the great majority of cases, the serotonin and kallikrein are inactivated in the liver; manifestations of carcinoid syndrome do not occur until there are metastases to the liver or when the cancer is accompanied by liver failure (cirrhosis). Carcinoid tumors arising in the bronchi may be associated with manifestations of carcinoid syndrome without liver metastases because their biologically active products reach the systemic circulation before passing through the liver and being metabolized.

In most patients, there is an increased urinary excretion of 5-HIAA (5-hydroxyindoleacetic acid), a degradation product of serotonin. The biology of these tumors differs from many other tumor types.

Diagnosis and management: With a certain degree of clinical suspicion, the most useful initial test is the 24-hour urine levels of 5-HIAA (5-hydroxyindoleacetic acid), the end product of serotonin metabolism. Patients with carcinoid syndrome usually excrete more than 25 mg of 5-HIAA per day.

Imaging:

For localization of both primary lesions and metastasis, the initial imaging method is Octreoscan, where indium-111 labelled somatostatin analogues (octreotide) are used in scintigraphy for detecting tumors expressing somatostatin receptors. Median detection rates with octreoscan are about 89%, in contrast to other imaging techniques such as CT scan and MRI with detection rates of

about 80%. Gallium-68 labelled somatostatin analogues such as ^{68}Ga-DOTA-Octreotate (DOTATATE), performed on a PET/CT scanner is superior to conventional Octreoscan.

Usually, on a CT scan, a spider-like/crab-like change is visible in the mesentery due to the fibrosis from the release of serotonin. ^{18}F-FDG PET/CT, which evaluate for increased metabolism of glucose, may also aid in localizing the carcinoid lesion or evaluating for metastases. Chromogranin A and platelets serotonin are increased.

Localization of tumour:

Tumour localization may be extremely difficult. Barium swallow and follow-up examination of the intestine may occasionally show the tumor. Capsule video endoscopy has recently been used to localize the tumour. Often laparotomy is the definitive way to localize the tumour. Another form of localizing a tumor is the Octreoscan. A tracer agent of Indium 111 is injected into a vein where then the tumors absorb the radionuclide Indium 111 and become visible on the scanner. Only the tumors absorb the somatostatin agent Indium 111 making the scan highly effective.

Treatment: For symptomatic relief of carcinoid syndrome:

- Octreotide (a somatostatin analogue which decreases the secretion of serotonin by the tumor and, secondarily, decreases the breakdown product of serotonin (5-HIAA))
- Telotristat ethyl (Xermelo) along with a somatostatin analogue in patients not responding to somatostatin analogue monotherapy. It is a tryptophan hydroxylase inhibitor and reduces the production of serotonin.
- Peptide receptor radionuclide therapy (PRRT) with lutetium-177, yttrium-90 or indium-111 labeled to octreotate is highly effective
- Methysergide maleate (antiserotonin agent but not used because of the serious side effect of retroperitoneal fibrosis)
- Cyproheptadine (an antihistamine drug with antiserotonergic effects)

Alternative treatment for qualifying candidates:

- Surgical resection of tumor and chemotherapy (5-FU and doxorubicin)
- Endovascular, chemoembolization, targeted chemotherapy directly delivered to the liver through special catheters mixed with embolic beads (particles that block blood vessels), used for patients with liver metastases.

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2018

PAPER II

1. **Discuss the role of TME and TEM in colorectal cancer. 6+4**
2. **How are impalpable breast cancers managed? 10**
3. **How would you manage a patient of gastric malignancy with outlet obstruction? 10**
4. **Discuss the role of stoma creation versus primary anastomosis after gut resection. 10**
5. **Mention the types of laparoscopic bile duct injuries. How are they managed? 6+4**
6. **Discuss the role of component separation technique for repair of complex or large ventral hernia. 10**
7. **What is post exposure prophylaxis for HIV? How is it implemented? 3+7**
8. **Discuss the management protocol for hepatic hydatid disease. 10**
9. **Discuss in brief the pathology, staging and management of soft tissue sarcoma. 2+3+5**
10. **Discuss the merits and demerits of different types of mesh used in hernia surgery. 10**

1. **Discuss the role of TME and TEM in colorectal cancer. 6+4**

Answer. Role of TME in colorectal cancer:
The concept of total mesorectal/mesocolic excision (TME), proposed by Heald over 20 years ago. The mesocolon and retroperitoneum are separated by two mesothelial layers with a connective tissue layer between them corresponding to the TME plane of dissection (The "holy" embryological plane). The colonic mesentery contains the blood and lymphatic vessels and nodes emanating from and going to the corresponding colonic segments. Central vascular ligation (CVL) is the cornerstone of radical excision principles. The goal of CVL is to remove as much lymph nodes and associated vascular structures in a vertical or ascending direction potentially removing lymph node metastases, as well as vascular and neural invasion of the regional drainage area.

- TME (which can be defined as complete excision of visceral mesorectum to the level of the levator, with the preservation of the pelvic nerves) is the gold standard for the treatment of rectal cancers and the middle lower third of the rectum.
- Local recurrence arises mainly as a result of incomplete surgical resection. Mesorectal tissue seems to be an ideal substrate for the spreading of tumor. In rectal cancer, local recurrence is present in the absence of distant metastases.
- Macroscopic examination of the mesorectal surface helps us evaluate the quality of the surgical specimen. Mesorectal defects are classified into three categories: (a) complete: mesorectum is intact, smooth with only minor irregularities without defect 1 5 mm; (b) moderate: moderate bulk to mesorectum but irregularity of the mesorectal surface; muscularis propria is not visible with the exception of the area of insertion of levator muscles, and (c) incomplete: little bulk to mesorectum with defects down into muscularis propria.
- Several studies have proved that total mesorectal excision (TME) has reduced the local recurrence rates.
- TME can eradicate lymphatic spread in high-grade carcinomas (more than 5 cm above the dentate line), but it cannot achieve complete removal of the lymphatic spread of lower rectal neoplasms (less than 5 cm from the dentate line).
- (Wide - WME) wide -mesorectum excision, which keeps the distal rectum and improves the postoperative anal function. Thus, the rule is that TME for all tumors is 8 cm or less from the anterior anal edge, for tumors above 8 cm, WME should be performed.
- TME can result in a 20% improvement in the 4-year survival rate, and the Norwegian Rectal Cancer Group showed a greater improvement.

Quirke, West and collaborators have developed a grading system based on the grading system used in the MRC CR07 trial for rectal cancer.

- Mesocolic plane of resection: "Good" surgery, performed along mesofascial interface; producing intact, inviolate mesocolon with a smooth peritoneal surface;
- Intramesocolic plane of resection: "Moderate" characterized by irregular breaches in the mesocolon, none reaching the muscularispropria of the colon;
- MuscularisPropria plane of resection: "Poor" characterized by disruption of the mesocolon, with breaches the visceral muscularispropria.

The quality of mesorectum excision according to Procare criteria:

The quality of mesorectumexcision in TME samles proposed by PROCARE guide. Samples and whole(fresh)and transverse cross-sections (after fixation) should be examined to adequately evaluate mesorectum excision.	
Smooth, regular	Intact mesorectum with only minor irregularities on a smooth mesorectum surface No defect deeper than 5 mm There is no cone at the distal margin of the sample Smooth circumferential resection limit on the incision
Slightly irregular	Moderate volume of mesorectum, but irregularity of the mesorectum surface Moderate coning of the sample Muscularis propria is not visible at all places, with the exception of the levator insertion
Very irregular	A small volume of mesorectum with defects down to muscularis propria and/ or very irregular circumferential resection margin on the incision

- The elements of the pathology report consist of completeness of mesorectum, the CRM, type and grade of the carcinoma, the number of positive lymph nodes and vascular invasion. The newer MRI techniques may play a role in determining preoperatively mesorectum and the CRM in order to select patients with a high risk of CRM involvement and for those patients preoperative radiochemotherapy is the treatment of choice. PET scanning may have a role in determining locally advanced tumor response to neoadjuvant chemotherapy.

Role of TEM in colorectal cancer:

Transanal endoscopic microsurgery (TEM) was developed by Professor Gerhard Buess 30 years ago at the dawn of minimally invasive surgery. TEM utilizes a closed proctoscopic system whereby endoluminal surgery is accomplished with high-definition magnification, constant CO_2 insufflation, and long-shafted instruments. TEM offers several advantages over conventional transanal excision. It provides better exposure, visualization, and access to reach lesions higher in the rectum than standard transanal excision. It is associated with less morbidity and quicker recovery time than a radical transabdominal approach. A combined multifunctional endosurgical unit regulates suction, irrigation, intrarectal pressure, and gas insufflation. Suction removes fluid, blood, waste, and smoke. Irrigation helps to maintain a relatively clean operative field and can rinse the end of the scope. CO_2 insufflation maintains distention of the rectum throughout the procedure and flow can be increase as high as 6 L/min. The intrarectal pressure is set at a desired level (usually 10–15 cm H_2O) and the four functions mentioned above are regulated to achieve a constant steady state at that level.

TEM can be used as

- In selected patients with rectal cancer of lesions smaller than 3 cm.
- Anatomically accessible lesions localized to the bowel wall (T1N0)
- Lesions confined to the extraperitoneal region of the rectum
- Lesions occupying less than 40% of the circumference of the bowel lumen; Well-differentiated or moderately differentiated lesions.
- Lesions not associated with lymphovascular invasion.
- Mobile lesions.
- Polypoidal lesions.

- Operating time, blood loss, length of hospital stay, and analgesic requirement associated with TEM were significantly less than those associated with abdominal resection. The recurrence rates of tumors following TEM have been reported to range from 2.4% to 16%.
- The use of TEM as palliative surgery for advanced rectal lesions is also acceptable for patients with comorbid conditions and disseminated disease who are otherwise unfit for more radical surgery.

Contraindications for TEM include the following:
- Positive lymph nodes
- Distant metastasis
- Ulcerated tumor
- Large tumor extending into muscularis propria (contraindicated owing to the increased risk of lymph node invasion)
- Poorly differentiated tumor
- Lymphovascular invasion

- TEM excision of favorable pT1 cancers is safe as sole therapy, outcome is not necessarily compromised if prompt radical surgery is performed after TEM, TEM alone is not appropriate for T2 or greater lesions, and most patients who experience recurrence after TEM can be salvaged with radical surgery.

2. How are impalpable breast cancers managed? 10

Answer. Breast cancer is the most common cancer diagnosed in the United States, after skin cancer. It is the second leading cause of cancer deaths in women today, after lung cancer. Patients seek medical attention most commonly for an abnormal screening mammogram, a palpable breast mass, breast pain, nipple discharge or skin changes over the breast.

- In most cases, there is a palpable breast lump at presentation, which is discovered by the patient during self breast examination and confirmed by imaging techniques and core needle biopsy as a part of triple assessment.
- There are some early malignant lesions, which are not palpable at presentation, but detected only on imaging. These are known as non palpable Ca Breast (NPCB).
- NPCB includes mammographic abnormalities like clustered micro calcifications and areas of abnormal density (architectural distortions and asymmetries) that have not yet produced a palpable finding.
- To avoid unnecessary biopsies for low suspicion non palpable mammographic findings, probably benign lesions are designated as BIRADS 3 and are monitored with short interval mammograms for over a 2 yr period during which biopsies are performed for only those lesions which progress during the follow up.
- Almost 75 to 80 % of patients for whom diagnostic biopsy of a non palpable mammographic lesion is recommended, have benign findings. Hence, less invasive and less costly image-guided core needle biopsy approach is preferred whenever feasible.

If the diagnosis is not concordant with imaging findings or there is Atypical Ductal Hyperplasia in a field of microcalcifications that may represent Ductal Carcinoma In Situ (DCIS), most patients should proceed to excisional biopsy for definitive diagnosis.

- To ensure that the abnormality is completely excised, it should be localized with either a localizing wire or ^{125}I (radioactive Iodine) seed that can be placed adjacent to the lesion under mammographic or ultrasound guidance.

- Depending on the size of the lesion and the degree of suspicion of malignancy, generally a border of normal tissue around the lesion is also excised to ensure complete removal with a negative margin.
- After excision, the specimen is sent for specimen radiography to confirm that the targeted lesion has been excised. Patients who have a diagnosis of benign findings on excision should undergo new baseline mammography 4 to 6 months after the surgical procedure.
- Although wire localization is the most common technique used to localize nonpalpable lesions to facilitate surgical resection, the technique has limitations, including patient discomfort, risk of wire displacement, and a logistic problem because the wire must be placed on the day of surgery.
- Other techniques have been developed to facilitate resection of nonpalpable lesions, including radioactive seed localization, which involves positioning 4.5-mm ^{125}I seeds in the breast tissue, deployed from a preloaded needle under mammographic or ultrasound guidance. Images with the seed in place guide the surgeon.
- In the operating room, a gamma probe, which detects technetium-99m (99mTc), commonly used for sentinel lymph node dissection (SLND), and ^{125}I, can be used to guide the resection. After excision, the specimen is sent for specimen radiography to confirm that the targeted lesion and radioactive seed have been excised.
- In a single-institution report of an initial experience using radioactive seed localization, it was reported that compared with use of localizing wires, use of seeds improved operating room efficiency, and the volume of tissue excised and rates of negative margins were comparable for wire and seed localisation.

After biopsy confirmation of the suspicious lesion, we stage the patient appropriately and then can proceed for a definitive surgical plan.

- The selection of surgical procedures takes into account patient characteristics and other clinical and pathologic variables. Patient characteristics, including age, family history, menopausal status, and overall health, are assessed.
- Some patients may undergo genetic testing for BRCA gene mutations at the time of diagnosis. Patients with a known mutation are generally counseled toward bilateral mastectomy for treatment of the index breast and reduction of the risk of contralateral breast cancer.
- The location of the tumor within the breast and tumor size relative to breast size are evaluated. Patient preferences for breast preservation versus mastectomy are determined. For patients considering mastectomy, options for immediate reconstruction are discussed.
- Usually in NPCB, the preferred approach is Breast Conservation Surgery (BCS) with SLND ± Axillary clearance followed by Adjuvant Radiotherapy.
- Adjuvant chemotherapy needs to be added if there is axillary lymph node involvement. The breast specimen that is removed is oriented and its edges are inked before sectioning.
- Specimen radiography should be performed for all nonpalpable lesions or if there are microcalcifications associated with the palpable tumor. If a margin appears to be close or is positive histologically on intraoperative assessment (frozen section biopsy), reexcision to remove more tissue frequently achieves a clear margin and allows conservation of the breast.
- Orientation of the surgical specimen allows focal reexcision of involved margins rather than global reexcision and improves the cosmetic result by reducing the amount of normal breast parenchyma that is excised.
- The surgical defect created after lumpectomy is closed in cosmetic fashion, after placing metal clips in the cavity to guide the future radiotherapy.
- There is increasing interest in the use of advancement flap closure and other oncoplastic surgical techniques to maximize the cosmetic result.

3. How would you manage a patient of gastric malignancy with outlet obstruction? 10

Answer. Initial Management:

- Nasogastric (NG) tube to decompress the stomach. Occasionally, a large tube is required because the undigested food blocks tubes with small diameters.
- Correction of dehydration : Normal Saline is the fluid of choice
- Potassium deficits are corrected after repletion of volume status and after replacement of chloride.
- Metabolic alkalosis is usually corrected after correction of chloride levels
- Correction of Anemia : Blood transfusion
- Correction of nutritional status : Parenteral nutrition, Albumin infusion

Diagnosis of Gastric Carcinoma:

- Routine blood investigations : Hemogram, Sodium, Potassium, Albumin.
- Upper GI Endoscopy with Biopsy: Reveals presence of endoluminalgrowth . At least 10 biopsies are taken

Radiological Investigations :

- Endoscopic Ultra Sound: EUS has shown to be very useful for detecting the depth of gastric cancer invasion, with a T staging accuracy of approximately 80%–90%.[3] In this regard, some meta-analyses have reported a high accuracy, especially for differentiating T1–2 from T3–4 gastric cancers, with an overall sensitivity of 86% and a specificity of 91%.The advent of EUS-fine-needle aspiration (FNA) has improved the accuracy of EUS for N staging to a promising level.
- Contrast Enhanced CTscan with oral and I.V contrast :
  - CT is used preoperatively primarily to determine the stage and extragastric spread of a gastric carcinoma. This information is vital in deciding between palliative surgery and curative radical surgery (ie, identifying patients who would not benefit from radical surgery). Additionally, CT is used to monitor a patient's response to treatment.The early arterial phase is used to assess enhancement of the gastric wall; the later portal venous phase is used to assess the liver parenchyma for metastases.
  - Positron Emission Tomographic scan : To detect distant metastasis

Management of Gastric Carcinoma :

National Comprehensive Cancer Network®

NCCN Guidelines Version 2.2019
Gastric Cancer

NCCN Guidelines Index
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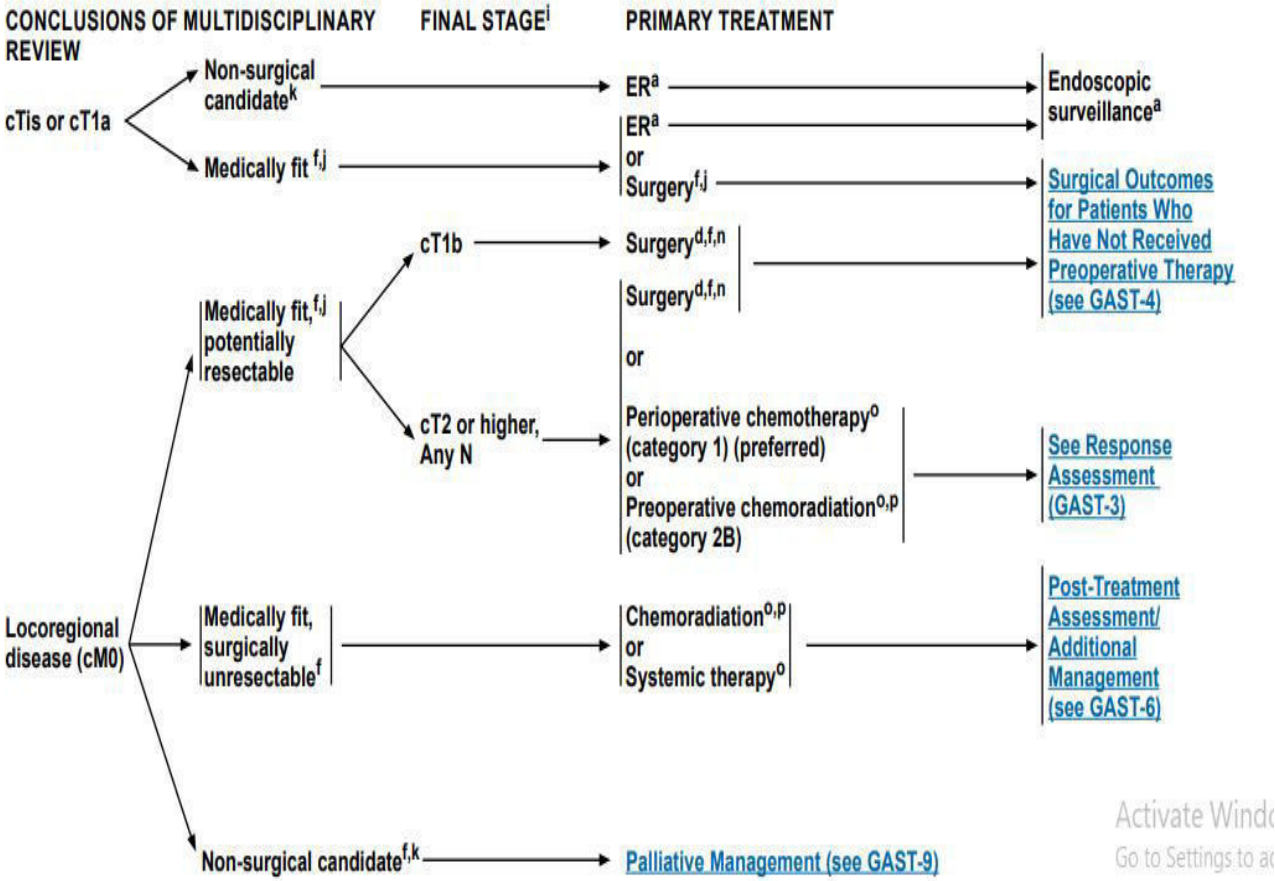


Endoscopic treatment :

PRINCIPLES OF ENDOSCOPIC STAGING AND THERAPY

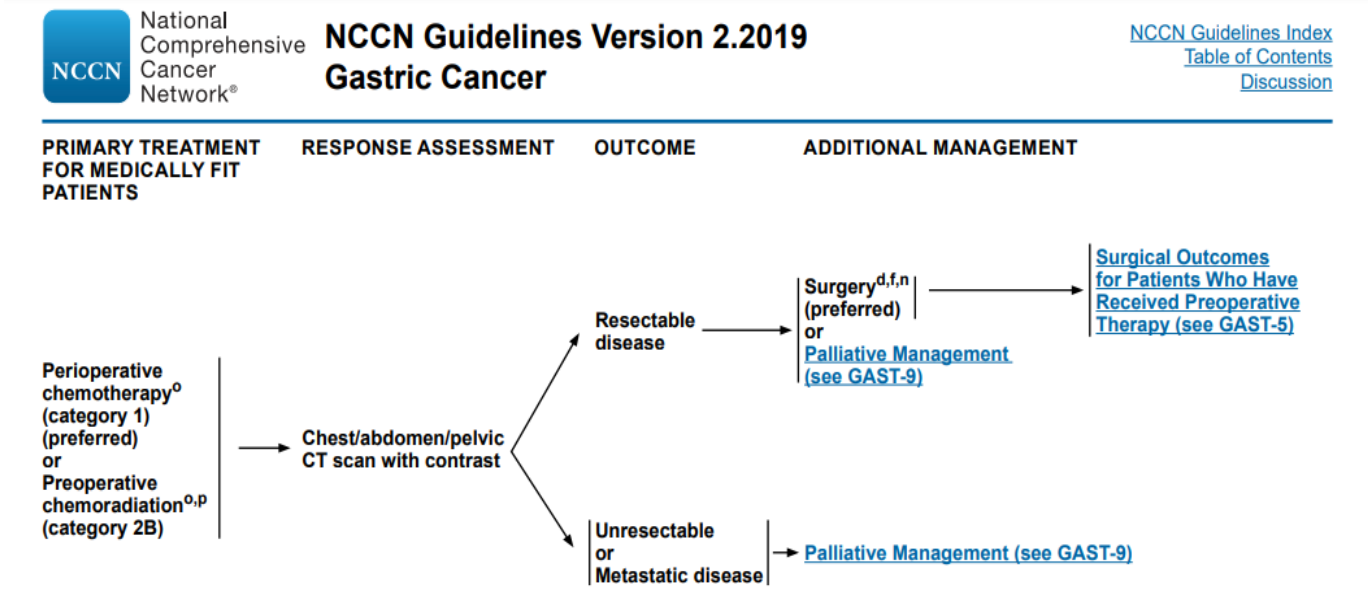
Treatment

- EMR or ESD of early-stage gastric cancer can be considered adequate therapy when the lesion is ≤2 cm in diameter, is shown on histopathology to be well or moderately well differentiated, does not penetrate beyond the superficial submucosa, does not exhibit LVI, and has clear lateral and deep margins. En-bloc excision of small gastric lesions by ESD has been shown to be more effective than EMR in curing *small* early-stage gastric cancer, but requires greater skills and instrumentation to perform and has a significant risk of complications including perforation.
- Japanese Gastric Cancer guidelines recommend that EMR or ESD should be considered for early-stage gastric cancer lesions ≤2 cm in diameter without associated ulcer formation.
- EMR or ESD of gastric cancers that are poorly differentiated, harbor evidence of LVI, invade into the deep submucosa, have positive lateral or deep margins or lymph node metastases, should be considered to be incomplete. Additional therapy by gastrectomy with lymphadenectomy should be considered.
- EUS performed after chemotherapy or radiation therapy has a reduced ability to accurately determine the post-treatment stage of disease. Similarly, biopsies performed after chemotherapy or radiation therapy may not accurately diagnose the presence of residual disease but still provide useful information.
- Endoscopic tumor ablation can be performed for the short-term control of bleeding. Endoscopic insertion of expandable metal stents is effective in long-term relief of tumor obstruction at the EGJ or the gastric outlet, though surgical gastrojejunostomy may be more efficacious for those with longer-term survival
- Long-term palliation of anorexia, dysphagia, or malnutrition may be achieved with endoscopic- or radiographic-assisted placement of a feeding gastrostomy tube in carefully selected cases where the distal stomach is uninvolved by tumor, or the placement of a feeding jejunostomy tube.

Post-Treatment Surveillance

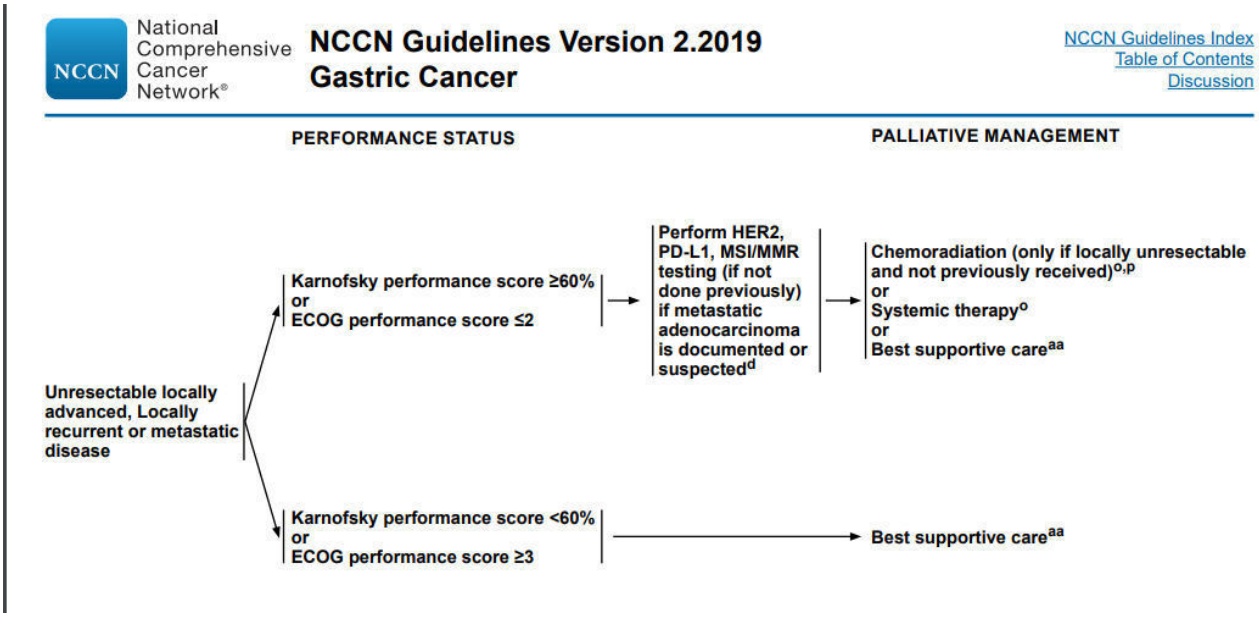
- Endoscopic surveillance following definitive treatment of gastric cancer requires careful attention to detail for mucosal surface changes, and multiple (4–6) biopsies of any visualized abnormalities. Strictures should be biopsied to rule out neoplastic cause. EUS performed in conjunction with endoscopy exams has a high sensitivity for detecting recurrent disease EUS-guided FNA should be performed if suspicious lymph nodes or areas of wall thickening are seen.

Treatment Protocol after Pre/Perioperative chemotherapy:



Palliative Treatment: The primary goal of palliative therapy of gastric cancer patients is to improve quality, not necessarily length, of life. Four main modalities of palliative therapy for advanced gastric cancer are:

- Resection: For bleeding tumours
- Bypass : Gastrojejunostomy in the form of an antecolic, loop Gastrojejunostomy
- Stenting : self expanding metallic stents
- Chemotherapy.



4. Discuss the role of stoma creation versus primary anastomosis after gut resection. 10

Answer. Following intestinal resection the surgeon faces a decision of stoma formation or primary anastomosis. The conventional view is that it is safer to exteriorize the bowel ends because the presence of peritonitis, inflammation of the bowel wall, and reduced intestinal blood supply unfavorable factors for the healing of the anastomosis which are present mainly in the emergent settings. The stoma also allows for adequate healing and rests the distal bowel before subsequent reanastomosis. However, stoma formation does not always provide a straightforward solution. Stomas may be complicated by poor weight gain, electrolyte imbalance due to high intestinal output, stenosis, prolapse, and excoriation of the surrounding skin. restoration o fintestinal continuity involves a second anesthetic and is usually performed once the patient has fully recovered from the acute stage of the illness.

The alternative to stomaformationis resectionfollowed by primary anastomosis. This was once considered a hazardous option because of the risk ofanastomoticleakage due to poor healing of intraperitoneal anastomoses, but in recent years, several centers have published encouraging reportsin support of this technique. Rates of anastomotic leakageand stricturedonot seem to be as high as anticipated, and primary anastomosis has been reported as a valid treatment option after bowel resection.

Stomas can also be created in a patient undergoing primary anastomosis in order to create a faecal diversion, so as to allow rest to the distal bowel

Advantages of Primary anastomosis over stoma creation:

- Avoids second operation (Stoma reversal)
- Less morbid for the patient who otherwise would have had to deal with a stoma
- Avoidance of complications of stoma formation like electrolyte and fluid imbalance, skin excoriation.

Advantages of stoma creation over primary anastomosis :

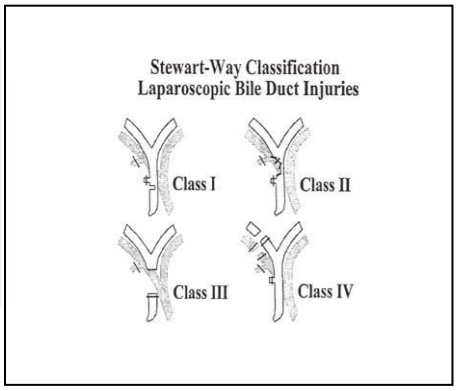
- It's a safe option in case of grossly contaminated cases where there is high incidence of anastomotic leak.
- It's a safer option in case of nutritionally debilitated patients.
- A loop stoma can also be used as a diversion to protect distal anastomosis.

5. Mention the types of laparoscopic bile duct injuries. How are they managed? 6+4

Answer.

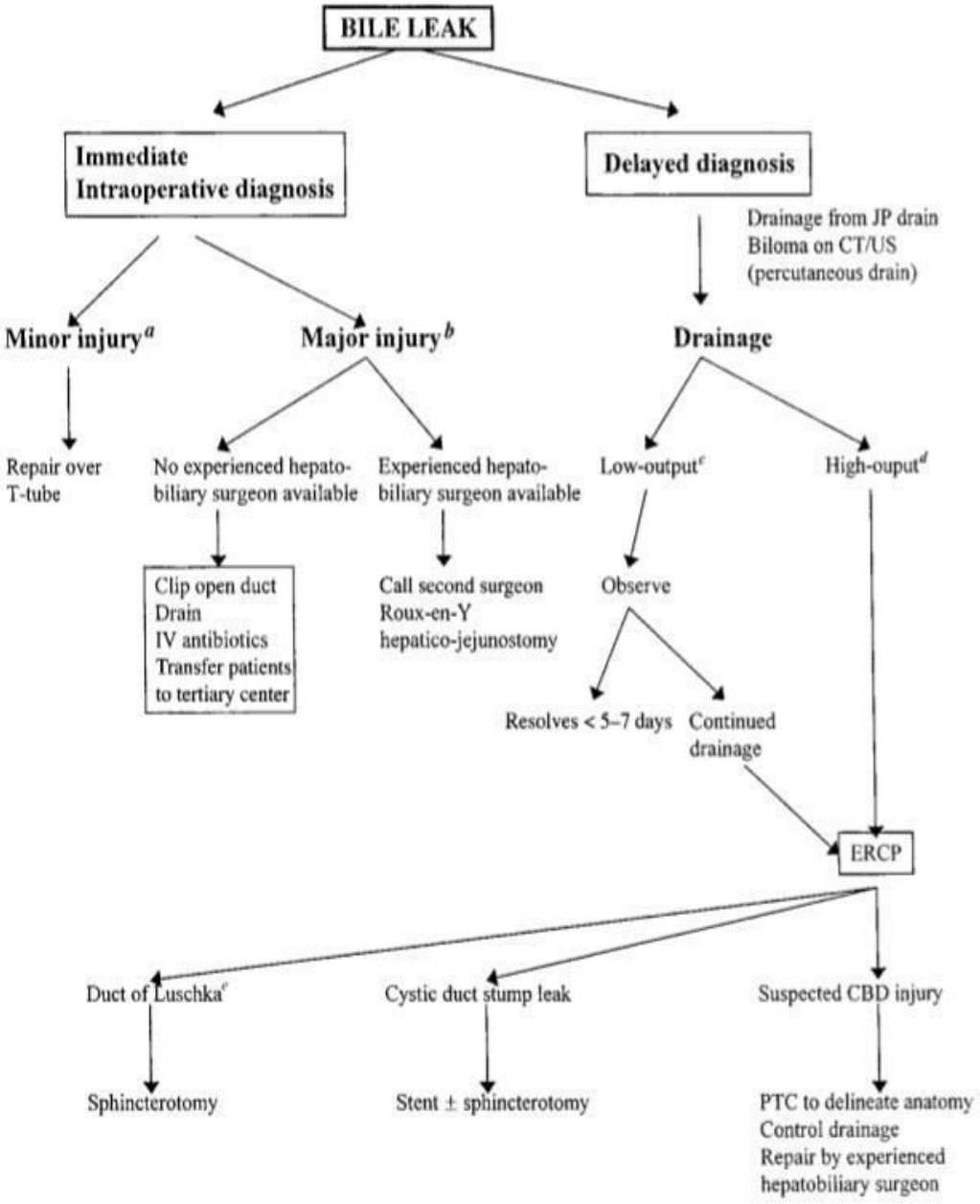
Mechanism of Common Bile Duct Injury (Stewart–Way Classification)

Class I	CBD mistaken for cystic duct, but recognized Cholangiogram incision in cystic duct extended into CBD
Class II	Lateral damage to the CHD from cautery or clips placed on duct Associated bleeding, poor visibility
Class III	CBD mistaken for cystic duct, not recognized CBD, CHD, R, L hepatic ducts transected and/or resected
Class IV	RHD mistaken for cystic duct, RHA mistaken for cystic artery, RHD and RHA transected Lateral damage to the RHD from cautery or clips placed on duct



Goals of therapy in bile duct injury:

1. Control of infection, limiting inflammation
   - Parenteral antibiotics
   - Percutaneous drainage of periportal fluid collections
2. Clear and thorough delineation of entire biliary anatomy
   - MRCP or PTC
   - ERCP (especially if cystic duct stump leak is suspected)
3. Reestablishment of biliary-enteric continuity
   - Tension-free, mucosa-to-mucosa anastomosis
   - Roux-en-Y hepaticojejunostomy
   - Long-term transanastomotic stents if bifurcation or higher is involved



[a] Minor CBD injury: injury less than 50% duct circumference (intact ductal anatomy)
[b] Majory CBD injury: injury over 50% duct circumference (includes ligation, transection, avulsion)
[c] Low-output drainage: less than 300 cc/day
[d] High-output drainage: over 300 cc/day
[e] Bile duct of Luschka: supravesicular duct in the gallbladder bed (no drainage of liver parenchyma)

6. Discuss the role of component separation technique for repair of complex or large ventral hernia. 10

Answer. A ventral hernia is defined by a protrusion through the anterior abdominal wall fascia. These defects can be categorized as spontaneous or acquired or by their location on the abdominal

wall. Acquired hernias typically occur after surgical incisions and are therefore termed incisional hernias. Although not a true hernia, diastasis recti can present as a midline bulge. Based on national operative statistics, incisional hernias account for 15% to 20% of all abdominal wall hernias; umbilical and epigastric hernias constitute 10% of hernias. Incisional hernias are twice as common in women as in men.

- One of the underlying principles of abdominal wall reconstruction is to re-establish the linea alba. Restoring the linea alba to the midline provides the advantage of a functional abdominal wall, often protects the mesh from superficial wound issues, and might result in a more durable repair. Functions of abdominal wall include protection of the abdominal organs, maintenance of upright posture and support the spine, assist bodily functions requiring generation of Valsalva maneuver like coughing, urination or defecation and provide aesthetic body image. Also, absence of an intact abdominal wall results in loss of the mechanical endpoint of satiety leading to unintentional weight gain.
- There are many different techniques that have been developed for the repair of the incisional hernia. The central theme of each repair has become midline re-approximation of the autologous tissue (usually rectus muscles) with physiologic tension and proper mesh reinforcement. Suture repair alone is associated with unacceptable recurrence rates and should not be the primary objective. Either intraperitoneal or retrorectus placement of the prosthetic mesh is usually advocated by most of the literature, with higher recurrence rates seen with an onlay positioning of the mesh.
- For very large or complex ventral hernia, we adopt the component separation technique (CST). The neurovascular anatomy of the abdominal wall allows for a bilateral myofascial medial advancement of the rectus muscles while maintaining the dynamic functionality of the abdominal wall.

Principle of CST: Unilateral or bilateral release of one of the three muscles of the abdominal wall through a long relaxing incision leads to weakening of the traction on the remaining wall. This firstly helps to slide & advance the remaining vascularised, innervated musculofascial layers of abdomen medially, facilitating midline closure, and secondly increases the total abdominal capacity thereby compensating for the domain loss in very large ventral hernias.

Types of CST based on approach:

1) Open approach:
   I. Anterior CST: Release of external oblique aponeurosis
   II. Posterior CST: Release of transverse abdominis aponeurosis (TAR)
2) Endoscopically assisted Ant. CST: Release of external oblique aponeurosis
3) Hybrid (combination of open & lap) Release of external oblique aponeurosis.

After CST further procedure: May include augmentation with Meshplasty.

INDICATIONS FOR CST

- Only CST: Large midline ventral hernias in the presence of infection, patients who are also having a colostomy reversal and prophylaxis/treatment of abdominal compartment syndrome.
- CST reinforced with Mesh: Large midline ventral hernia, midline hernia with multiple defects, multiple failed repairs of incisional hernias and patients with loss of domain.

OPEN COMPONENT SEPARATION TECHNIQUES

Ramirez's Classical Anterior CST (1990): The most commonly employed technique involves an anterior or external oblique release described by Ramirez in 1990. The procedure is begun with the elevation of subcutaneous flaps from the underlying abdominal musculature to expose the linea semilunaris. It is critical to preserve the large peri-umbilical perforators to prevent ischemia of the skin flaps. The external oblique fascia is then incised 1 cm lateral to its insertion into the rectus sheath from above the costal margin to the inguinal ligament. This allows for the development of an avascular plane between the external oblique aponeurosis and internal oblique muscle as far as the posterior axillary line. The developed myofascial complex allows for an 8- to 10-cm advancement at the waist; 3- to 5-cm advancement in the upper and lower abdomen. Additional 2-cm advancement can be achieved if the rectus muscle is elevated off of the posterior sheath. Upto 20 cm defect can be closed. However, it is associated with high morbidity including hematoma, seroma, infection & skin necrosis. It is important that patients understand that a lateral bulge can occur after release of the external oblique aponeurosis.

Rives-Stoppa-Wantz- Posterior CST (Retro-Rectus Repair) (1989): This procedure involves Opening of the anterior rectus sheath bilaterally to redevelop the posterior facial wall. This is followed by reconstruction of the facial wall and insertion of the prosthetics behind the rectus muscle plane in partial contact with the subcutaneous tissue.

Novitsky- Open posterior CST –Transverse abdominis release (TAR) (2012): This novel technique of transversus abdominis muscle release (TAR) for posterior component separation during major abdominal wall reconstructions is a modification of the classic retro muscular Stoppa technique to facilitate dissection beyond the lateral border of the rectus sheath. Briefly, the retromuscular space is developed laterally to the edge of the rectus sheath. The posterior rectus sheath is incised 0.5-1 cm medial to the linea semilunaris to expose the medial edge of the transversus abdominis muscle. At this location, the posterior leaflet of the internal oblique and the transversus abdominis muscle are incised to gain access to the space anterior to the transversalis fascia, i.e. the preperitoneum. This plane can be extended to the retroperitoneum and eventually to the psoas muscle if necessary. Very large sheets of prosthetic mesh can be placed in this location with wide defect coverage. The posterior rectus fascia then is advanced medially. The mesh is placed as a sublay and the linea alba is restored ventral to the mesh. It was associated with low perioperative morbidity and a low recurrence rate. The most significant advantage of posterior CST is the avoidance of large subcutaneous skin flaps potentially leading to a reduction in wound morbidity. The second advantage is the necessity of creating the retro-rectus space for mesh placement, which isolates the prosthetic from the viscera. The dissection of the plane between the transverses abdominis and transversalsis fascia allows for a wide piece of mesh to be utilized. The disadvantage is the

decreased advancement of the rectus muscles compared to the anterior release, which can be problematic in large defects. It is important to emphasize that the surgeon cannot perform an anterior release in this situation as the abdominal wall would be severely compromised.

LAPAROSCOPIC COMPONENT SEPARATION TECHNIQUES:

LeBlanc first described a laparoscopic ventral hernia repair (LVHR) in 1993. The indications for an LVHR are similar to those for an open procedure. However, not all patients are candidates for the procedure. There are two major disadvantages to LVHR. The first is that it requires almost complete lysis of adhesions for trocar placement and wide mesh overlap. LVHR is generally avoided in patients with densely incarcerated viscera to prevent iatrogenic bowel injury. The second major disadvantage is the inability to close the defect in larger hernia. The basic principle of a minimally invasive component separation is to gain direct access to the lateral abdominal wall without creating a lipocutaneous flap. Typically, this is performed by a direct cut down through a 1-cm incision off the tip of the 11th rib overlying the external oblique muscle. The external oblique is split in the line of its fibres, and a standard bilateral inguinal hernia balloon dissector is placed in between the external and internal oblique muscles, toward the pubis. Three laparoscopic trocars are placed in the space created, and the dissection is carried from the pubis to several centimetres above the costal margin. The linea semilunaris is carefully identified, and the external oblique is incised from beneath the muscle, at least 2 cm lateral to the linea semilunaris. The muscle is released from the pubis to several centimetres above the costal margin. This procedure is performed bilaterally. Synthetic or biologic mesh can be used to reinforce the repair of the midline closure. These relatively new techniques are feasible, but long-term data demonstrating equivalency to open techniques are lacking. It has been shown in several studies that laparoscopic incisional hernia repair results in fewer postoperative complications, lower infection rate, and decreased hernia recurrence.

7. What is post exposure prophylaxis for HIV? How is it implemented? 3+7

Answer. "Post exposure prophylaxis" (PEP) refers to the comprehensive management given to minimize the risk of infection following potential exposure to blood-borne pathogens (HIV, HBV, HCV).

This includes:

I. First aid
II. Counseling
III. Risk assessment
IV. Relevant laboratory investigations based on informed consent of the source and exposed person
V. Depending on the risk assessment, the provision of short term (4 weeks) of antiretroviral drugs
VI. Follow up and support

"Exposure" which may place an Health Care Provider (HCP) at risk of blood-borne infection is defined as:

- Per cutaneous injury (e.g. needle-stick or cut with a sharp instrument),
- Contact with the mucous membranes of the eye or mouth,
- Contact with non-intact skin (particularly when the exposed skin is chapped, abraded, or afflicted with dermatitis), or
- Contact with intact skin when the duration of contact is prolonged (e.g. several minutes or more) with blood or other potentially infectious body fluids.

- Body fluids considered being "at risk": Blood, Semen, Vaginal secretions, Cerebrospinal fluid, Synovial, pleural, peritoneal, pericardial fluid, Amniotic fluid, Other body fluids contaminated with visible blood.
- Body fluids considered being "not at risk": Tears, sweat, saliva, urine and faeces unless these secretions are visibly contaminated with blood.

The risk of transmission of HIV via different modes of exposure is given in a tabular form below:

HIV transmission risk of different routes

Exposure route	HIV
Blood transfusion	90–95%
Perinatal	20–40%
Sexual intercourse	0.1 to 10%
Vaginal	0.05–0.1%
Anal	0.065–0.5%
Oral	0.005–0.01%
Injecting drugs use	0.67%
Needle stick exposure	0.3%
Mucous membrane splash to eye, oro-nasal	0.09%

Note: Needle-stick exposure for HBV is 9–30% and for HCV is 1–10%

Step 1: Management of exposure site- First Aid

For skin-If the skin is broken after a needle-stick or sharp instrument: Immediately wash the wound and surrounding skin with water and soap, and rinse. Do not scrub. Do not use antiseptics or skin washes (bleach, chlorine, alcohol, betadine). Do not squeeze the wound to bleed it. Do not put the pricked finger in mouth.

After a splash of blood or body fluids:

To unbroken skin:

- Wash the area immediately
- Do not use antiseptics

For the eye:

- Irrigate exposed eye immediately with water or normal saline.

- Sit in a chair, tilt head back and ask a colleague to gently pour water or normal saline over the eye.
- If wearing contact lens, leave them in place while irrigating, as they form a barrier over the eye and will help protect it.
- Once the eye is cleaned, remove the contact lens and clean them in the normal manner. This will make them safe to wear again.
- Do not use soap or disinfectant on the eye.

For mouth:

- Spit fluid out immediately.
- Rinse the mouth thoroughly, using water or saline and spit again. Repeat this process several times.
- Do not use soap or disinfectant in the mouth.
- Consult the designated physician of the institution for management of the exposure immediately.

Step 2: establish eligibility for PEP

Assessment of the nature of exposure and risk of transmission

The HIV sero-conversion rate of 0.3% after an accidental epithelial breach (AEB) (for percutaneous exposure) is an average rate. The real risk of transmission depends on the amount of HIV transmitted (=amount of contaminated fluid and the viral load). A designated person/trained doctor must assess the risk of HIV transmission following an AEB. This evaluation must be made rapidly, so as to start any treatment as soon as possible after the accident (Ideally within 2 hours but certainly within 72 hours). This assessment must be made thoroughly (because not every AEB requires prophylactic treatment). The first dose of PEP should be administered within the first 72 hours of exposure and the risk re-evaluated as soon as possible. If the risk is insignificant, PEP could be discontinued, if already commenced. Two main factors determine the risk of infection:

- The nature of exposure and
- The status of the source patient.

The nature of exposure can be classified into three categories: mild, moderate and severe, as shown below in a tabular form.

Categories of exposure	
Category	**Definition and example**
Mild exposure :	mucous membrane/non-intact skin with small volumes E.g. : a superficial wound (erosion of the epidermis) with a plain or low calibre needle, or contact with the eyes or mucous membranes, subcutaneous injections following small-bore needles
Moderate exposure:	mucous membrane/non intact skin with large volumes **OR** percutaneous superficial exposure with solid needle E.g. : a cut or needle stick injury penetrating gloves
Severe exposure :	percutaneous with large volume e.g. : • an accident with a high calibre needle (≥18 G) visibly contaminated with blood; • a deep wound (haemorrhagic wound and/or very painful); • transmission of a significant volume of blood; • an accident with material that has previously been used intravenously or intra-arterially.
The wearing of gloves during any of these accidents constitutes a protective factor. *Note* : In case of an AEB with material such as discarded sharps/needles, contaminated for over 48 hours, the risk of infection becomes negligible for HIV, but still remains significant for HBV. HBV survives longer than HIV outside the body.	

Assessment of the HIV status of the source of exposure

PEP needs to be started as soon as possible after the exposure and within 72 hours. In animal studies, initiating PEP within 12, 24 or 36 hours of exposure was more effective than initiating PEP 48 hours or 72hours following exposure. PEP is not effective when given more than 72 hours after exposure. A baseline rapid HIV testing should be done before starting PEP. Initiation of PEP where indicated should not be delayed while waiting for the results of HIV testing of the source of exposure. Informed consent should be obtained before testing of the source as per national HIV testing guidelines.

Categories of situations depending on results of the source	
Source HIV Status	**Definition of risk in source**
HIV negative	Source is not HIV infected but consider HBV and HCV
Low risk	HIV positive and clinically asymptomatic
High risk	HIV positive and clinically symptomatic (see WHO clinical staging)
Unknown	Status of the patient is unknown, and neither the patient nor his/her blood is available for testing (e.g. injury during medical waste management the source patient might be unknown). The risk assessment will be based only upon the exposure (**HIV prevalence in the locality can be considered**)

Assessment of the exposed HCP:The exposed individual should have confidential counseling and assessment by an experienced physician. The exposed individual should be assessed for pre-existing HIV infection intended for people who are HIV negative at the time of their potential exposure to HIV. Exposed individuals who are known or discovered to be HIV positive should not receive PEP. They should be offered counseling and information on prevention of transmission and referred to clinical and laboratory assessment to determine eligibility for antiretroviral therapy (ART). Besides the medical assessment, counseling exposed HCP is essential to allay fear and start PEP (if required) at the earliest.

Step 3: prescribing PEP regimen:There are two types of regimens:

- Basic regimen: 2-drug combination
- Expanded regimen: 3-drug combination

The decision to initiate the type of regimen depends on the type of exposure and HIV sero status of the source person.

HIV Post-exposure Prophylaxis evaluation

Exposure	Status of source		
	HIV+ and asymptomatic	HIV+ and Clinically symptomatic	HIV status unknown
mild	Consider 2-drug PEP	Start 2- drug PEP	Usually no PEP or consider 2-drug PEP
moderate	Start 2-drug PEP	Start 3-drug PEP	Usually no PEP or consider 2-drug PEP
severe	Start 3-drug PEP	Start 3-drug PEP	Usually no PEP or consider 2-drug PEP

HIV testing of the source patient should not delay the decision about whether or not to start PEP. Start 2-drugs first if required, then send for consultation or refer. In the case of a high risk exposure from a source patient who has been exposed to or is taking antiretroviral medications, consult an expert to choose the PEP regimen, as the risk of drug resistance is high.

Dosages of the drugs for PEP

Medication	2-drug regimen	3-drug regimen
Zidovudine (AZT)	300 mg twice a day	300 mg twice a day
Stavudine (d4T)	30 mg twice a day	30 mg twice a day
Lamivudine (3TC)	150 mg twice a day	150 mg twice a day
Protease Inhibitors		1st choice : Lopinavir/ritonavir (LPV/r) 400/100 mg twice a day or 800/200 mg once daily with meals 2nd choice : Nelfinavir (NLF) 1250 mg twice a day or 750 mg three times a day with empty stomach 3rd choice : Indinavir (IND) 800 mg every 8 hours and drink 8–10 glasses (≥ 1.5 litres) of water daily

Note: If protease inhibitor is not available and the 3rd drug is indicated, one can consider using Efavirenz (EFV 600 mg once daily). Monitoring should be instituted for side effects of this drug eg CNS toxicity such as nightmares, insomnia etc.

* Fixed Dose Combination (FDC) are preferred, if available. Ritonavir requires refrigeration.

PEP regimens to be prescribed by health centers

	Preferred	Alternative
2-drug regimen (basic PEP regimen)	**1st choice:** Zidovudine (AZT) + Lamivudine (3TC)	**2nd choice:** Stavudine (d4T) + Lamivudine (3TC)
3-drug regimen (expanded PEP regimen) - consult expert opinion for starting 3rd drug eg LPV/r, NLF or IND		
Not recommended	ddI + d4T combination NNRTI such as Nevirapine should not be used in PEP	

More information on alternative schedules is available in the latest update USPHS guidelines issued 30 September 2005. (http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5409a1.htm) or www.who.int

If the exposed person is pregnant, the decision to use any antiretroviral drug during pregnancy should involve discussion between the woman and her health-care provider(s) regarding the potential benefits and risks to her and her foetus. There is a clear contraindication for Efavirenz (first 3 months of pregnancy) and Indinavir (pre natal). In conclusion, for a female HCP considering PEP, a pregnancy test is recommended if there is any chance that she may be pregnant. Pregnant HCP are recommended to begin the basic 2-drug regimen, and if a third drug is needed, Nelfinavir is the drug of choice.

Possible side-effects occur mainly at the beginning of the treatment and include nausea, diarrhea, muscular pain and headache. The person taking the treatment should be informed that these may occur and should be dissuaded from stopping the treatment as most side-effects are mild and transient, though possibly uncomfortable. Anemia and/or leucopenia and/or thrombocytopenia may occur during the month of treatment. A complete blood count and liver function tests (transaminases) may be performed at the beginning of treatment (as baseline) and after 4 weeks. It is important that side effects should be explained before initiating PEP so that the symptoms are not confused with symptoms of sero conversion to HIV. Adherence information is essential with psychological support. More than 95% adherence is important in order to maximize the efficacy of the medication in PEP.

Step 5: laboratory evaluation

The reason for HIV testing soon after an occupational exposure is to establish a "baseline" against which to compare future test results. When offered HIV testing, the exposed person should receive standard pre-test counselling according to the national HIV testing and counselling guidelines, and should give informed consent for testing. Confidentiality of the test result must be ensured.

Step 6 : Follow up

Whether or not PEP prophylaxis has been started, follow up is indicated to monitor for possible infections and provide psychological support. In addition, in the weeks following an AEB,the exposed person must be monitored for the eventual appearance of signs indicating an HIV seroconversion: acute fever, generalized lymphadenopathy, cutaneous eruption, pharyngitis, non-specific flu symptoms and ulcers of the mouth or genital area. These symptoms appear in 50%-70% of individuals with an HIV primary (acute) infection and almost always within 3 to 6 weeks after exposure. When a primary (acute) infection is suspected, referral to an ART centre or for expert opinion should be arranged rapidly. An exposed person should be advised to use precautions (e.g., avoid blood or tissue donations, breastfeeding, unprotected sexual relations or pregnancy) to prevent secondary transmission, especially during the first 6-12 weeks following exposure. Condom use is essential.

Follow-up HIV testing: exposed persons should have post-PEP HIV tests. Testing at the completion of PEP may give an initial indication of sera-conversion outcome if the available antibody test is very sensitive. However, testing at 4-6 weeks may not be enough as use of PEP may prolong the time to seroconversion; and there is not enough time to diagnose all persons who sero

convert. Therefore, testing at 3 months and again at 6 months is recommended. Very few cases of sera conversion after 6 months have been reported. Hence, no further testing is recommended if the HIV test at 6 months is negative.

8. Discuss the management protocol for hepatic hydatid disease. 10

Answer. Hydatid disease is a zoonotic parasitic disease most frequently caused by Echinococcus granulosus and the liver is the most commonly involved organ in two third of pts.

Diagnosis: It is based on careful history, imaging and serology, and a high index of suspicion in at risk population

Symptoms:

- Small and uncomplicated cysts usually are asymptomatic and detected incidentally
- Acute abd pain usually indicates an infected hydatid cyst or rupture into peritoneal cavity
- C/f of rupture into biliary tree are recurrent colicky pain and jaundice, with or without resultant fever and chills, mimicking obstructing bile duct stones

Laboratory tests

- ALP and GGT can be mildly elevated in 1/3rd of pts
- Elevated bilirubin (>1mg/dl) and increased ALP are s/o cystobiliary communication
- WBC are elevated only if cyst has become secondarily infected
- Serum Ig levels are elevated in 31% of pts

Radiology

- USG and CT are standard inv for diagnosis, percutaneous treatment, and post treatment f/up of hydatid cysts
- USG is the preferred 1st line imaging f/b CT which gives more precise information regarding morphology of cyst including size, location, no and relationship to adjacent structures.
- Hydatid cysts appear as well defined circumscribed cystic lesion with clear membrane
- Cysts are staged according to content patterns

CYST TYPE	STATUS	USG FEATURES
CL	Active	Signs not pathognomic, unilocular, no cyst wall
CE1	Active	Cyst wall, Hydatid sand
CE2	Active	Multivesicular, Cyst wall, Rosette like
CE3	Transitional	Detached laminated membrane, water lily sign
CE4	Inactive	Heterogenous Hypo/hyperechoic contents. No daughter cysts
CE5	Inactive	Thick, calcified wall

On MRI, Hydatid liver cysts may have a low signal intensity rim. This is a characteristic sign of hydatid disease

MRI is more specific than CT, especially if intracystic fat density is present which suggests cystobiliary communication.

Serology: used for

- Differential diagnosis of a cystic liver mass
- Epidemiological surveillance
- Post treatment follow up

The sensitivity and specificity of tests depend on quality of antigens

Immunoelectrophoresis

The diagnostic value ranges from 91-94% for hepatic cysts. It is used for post treatment follow up.

ELISA

Sensitivities ranges from 64-100% depending on antigens used. IgG remain positive for 4 yrs after treatment so not suitable for f/up. IgM have been reported to be negative after 6 months of treatment.

Blotting

Allows molecular weight analysis of antigens detected by pts serum. Western blotting used in diagnosis and post treatment f/up.

Treatment Options include

- Surgery
- Percutaneous aspiration
- Medical treatment

Conservative Management:

Asymptomatic and small (<5cm) cysts can be f/up with wait and see policy. Also densely calcified hydatid cysts are accepeted as dead cysts and can be monitored without any specific therapy

Surgical treatment:

- Conservative: involves inactivation of protoscolices and removal of cyst contents – Cystectomy.
- Radical: includes total excision of cyst and pericyst layers along with portion of surrounding liver – Pericystectomy/ Liver resection

The principles of liver hydatid surgery include:

- Inactivation of protoscolices within cyst fluid
- Evacuation of cyst contents
- Prevention of spillage of cyst contents
- Secure closure of any cystobiliary communication
- Mx of residual cyst cavity

Post operative complications:

- Biliary fistula
- Biliary stricture
- Recurrence

Percutaneous Aspiration

Indications:

- Univesicular cysts
- Univesicular cysts with detached membrane
- And some multiple cysts

Contraindications:

- Inaccessible to puncture
- Cysts in which puncture may damage important vascular structures
- Peripheral cysts that do not have sufficient layer of hepatic tissue to promote safe transhepatic puncture
- Cysts that have ruptured into bile duct, peritoneum or pleural space

Techniques:

- PAIR
- Catheterization technique
- PEVAC

Chemotherapy: There are 4 objectives of medical Rx

  - Definite cure
  - Reduction in cyst viability
  - Pre-operative treatment
  - Peri-operative prophylaxis

- Peri-operative prophylaxis should start 1 week before the procedure.
- Post treatment prophylaxis- 3-8 wks for uncomplicated cases, 3-6 months for complicated cases.
- Treatment is usually administered in 3-4 courses lasting 4 wks separated by 2 wk interval
- Albendazole is the drug of choice.

9. Discuss in brief the pathology, staging and management of soft tissue sarcoma. 2+3+5

Answer. Soft tissue sarcomas (STS) are a heterogeneous group of solid neoplasm's arising from cells of mesenchymal origin. There are more than 50 subtypes, but pleomorphic sarcoma, liposarcoma, leiomyosarcoma, synovial sarcoma, and malignant peripheral nerve sheath tumor account for 75%. Approximately 50 % arise in the extremities, but the trunk wall, retroperitoneum and head and neck are also fairly common locations.

Predisposing Factors for Sarcomas

Genetic Predisposition

Neurofibromatosis (von Recklinghausen's disease)
Li-Fraumeni syndrome
Retinoblastoma
Gardner's syndrome (familial adenomatous polyposis)

Radiation Exposure

Therapeutic radiation in the orthovoltage and megavoltage range

Trauma

Postparturition status
Extremity

Lymphedema

Postsurgical
Postirradiation
Parasitic infection
(filariasis)

Chemical

2,3,7,8-Tetrachlorodibenzodioxin (TCDD)
Polyvinyl chloride
Hemochromatosis
Arsenic

Genetic alterations that play a role in the development of soft tissue sarcoma segregate into two major types.

i) Sarcomas with specific genetic alterations that result in simple karyotypes, including fusion genes secondary to reciprocal translocations and specific point mutations such as *KIT* mutations in gastrointestinal stromal tumors (GISTs) and *APC*/b-catenin mutations in desmoid tumors.

ii) Sarcomas with nonspecific genetic alterations and typically complex unbalanced karyotypes representing numerous genetic losses and gains.

Histologic type:		
❖ Synovial sarcoma	❖ Dermatofibrosarcoma protuberans	❖ Atypical lipomatous tumor/well-differentiated liposarcoma
❖ Myxoid/round cell liposarcoma	❖ Desmoplastic small round cell tumor	❖ Leiomyosarcoma
❖ Ewing's sarcoma	❖ Clear cell sarcoma	❖ Malignant fibrous histiocytoma .
❖ Alveolar rhabdomyosarcoma	❖ Infantile fibrosarcoma	❖ Malignant peripheral nerve sheath tumor.

❖ Extraskeletal myxoid chondrosarcoma	❖ Alveolar soft part sarcoma	

Staging:

G, Histologic Grade	T, Primary Tumor Size	N, Regional Nodes	M, Distant Metastasis
GX: Grade cannot be assessed	TX: Primary size cannot be assessed	NX: Regional nodes cannot be assessed	MX: Presence of distant metastasis cannot be assessed
G1: Well differentiated	T0: No evidence of primary tumor	N0: No regional lymph node metastasis	M0: No distant metastasis
G2: Moderately differentiated	T1: Tumor less than 5 cm	N1: Regional lymph node metastasis	M1: Distant metastasis present
G3: Poorly differentiated	T1a: Superficial tumor		
G4: Undifferentiated	T1b: Deep tumor		
	T2: Tumor 5 cm or greater		
	T2a: Superficial tumor		
	T2b: Deep tumor		

Pre-operative biopsy is required to determine the grade and histological subtype of sarcoma. Generally, it is recommended that, any soft tissue mass that is symptomatic or enlarging, any superficial mass that is larger than 5 cm (unless an obvious subcutaneous lipoma) and all deep-seated masses irrespective of size should be sampled. Inappropriate biopsy scar can turn a limb salvage surgery into amputation so outmost care should be given when performing the biopsy.

Biopsy incision or core track should be placed in a way that it can be removed en bloc during surgery without sacrificing extra skin or any vital structure.

Role of core needle/tru-cut biopsy: For most soft tissue masses, core needle/tru-cut biopsy (USG or CT guided) is usually preferred. Core-needle biopsy has a diagnostic accuracy of 93% and now is the preferred modality for taking biopsy, and can be then advocated as the first step in the diagnostic armamentarium. The high diagnostic accuracy, ease of performance, low cost, and low complication rate make this technique attractive.
Role of incisional biopsy: guidelines recommend incisional biopsy when core needle biopsy cannot produce adequate tissue for diagnosis or when findings on core needle biopsy are non-diagnostic. The disadvantages of incisional biopsy include the need to schedule the procedure, the need for general anesthesia, and high costs. In addition, inappropriately placed incisions can necessitate more extensive definitive resection to encompass the biopsy site.

Role of Excisional biopsy: Excision biopsyis recommended only for small cutaneous or subcutaneous tumors, usually smaller than 3 cm, in which a wide re-excision (if required) is usually straight forward.
IMAGING: Imaging should be done before any biopsy attempt as it helps in better targeting from representative area and sometimes helps pathologist in difficult situations.
MRI is usually the preferred procedure for imaging extremity soft tissue masses. MRI enhances the contrast between tumor and adjacent structures and provides excellent three-dimensional definition of fascial planes. MRI infrequently can predict histologic diagnosis and biologic behavior reliably.
CT is a predominantly anatomic imaging modality. Therefore, CT plays mainly a complementary role to MRI in evaluation of the extent of tumor. MRI, with its superior soft tissue contrast resolution, is the dominant imaging modality for the evaluation of extremity sarcomas. CT is useful for evaluation of the tumor matrix, especially for small calcifications and the evaluation of subtle cortical involvement. MRI is limited in the detection of small calcifications within a mass because calcium distorts the magnetic field. CT may also be useful in patients for whom MRI is contraindicated or cannot be tolerated. Once the diagnosis and grade are known, evaluation for sites of potential metastasis can be performed.
Lymph node metastases occur in less than 3% of adult soft tissue sarcomas. Lymph node metastasis are present in certain histological types of childhood sarcoma. For extremity lesions, the lung is the principal site for metastasis; for visceral lesions and some histologic types of retroperitoneal sarcoma, the liver is the principal site. Thus, CT is the most commonly and minimally used modality to evaluate pulmonary metastases. Patients with visceral and retroperitoneal lesions should have their liver imaged as part of the initial abdominal CT.
Newer techniques, such as 18-fluorodeoxyglucose positron emission tomography (FDG-PET), are being used to evaluate distant metastases and, when combined with CT and conventional imaging, may improve the diagnostic accuracy of preoperative staging. The current role of PET seems to be primarily in the identification of unsuspected sites of metastasis in patients with recurrent high-grade tumors, given the high rate of metastatic disease in this setting. PET may also become useful for determining early responses to systemic therapy for soft tissue sarcoma.

PROGNOSTIC FACTORS IN EXTREMITY SARCOMA:
Factors that increased risk of local recurrence were age, recurrent presentation, positive margin, and fibrosarcoma, mPNST, or leiomyosarcoma histology. Factors that increased distant recurrence rates were large tumor size, high histologic grade, deep location, recurrent disease at presentation, and histologic subtype of leiomyosarcoma. Liposarcoma was associated with decreased distant recurrence compared with other histologic types. Factors that increased the risk of disease-specific

death were recurrent presentation, size greater than 5 cm, tumor depth and grade, positive margin, and mPNST or leiomyosarcoma histology. Prognosis is related to the site of origin, resectability, presence of metastasis, number of metastatic sites, and histopathological features. Grade is a dominant factor in early metastasis, but in late recurrence initial size becomes equally important. Best prognosis is seen in extremity STS and best prognostic factor of extremity STS is grading. Death from local recurrence is uncommon in those with extremity lesions but occurs frequently in patients with retroperitoneal liposarcoma. Most common cause of death in extremity STS is metastasis.

MANAGEMENT:

Recommendations for the management of soft tissue masses: Soft tissue tumors that are enlarging or greater than 3 cm should be evaluated with radiologic imaging (ultrasonography or computed tomography [CT]), and a tissue diagnosis should be made using core needle biopsy.

Once a sarcoma diagnosis is established, obtain imaging (magnetic resonance imaging for extremity lesions and CT for other anatomic locations) and evaluate for metastatic disease with chest CT for intermediate- or high-grade (grade 2 or 3) or large (T2) tumors.

A wide local excision with 1- to 2-cm margins is adequate therapy for low-grade lesions and T1 tumors.

Radiation therapy plays a critical role in the management of large (T2), intermediate- or high-grade tumors.

Patients with locally advanced high-grade sarcomas or distant metastases should be evaluated for chemotherapy.

An aggressive surgical approach should be taken in the treatment of patients with an isolated local recurrence or resectable distant metastases.

Surgery:

Surgery remains the principal therapeutic modality in STS, the extent of surgery required, along with the optimum combination of radiotherapy and chemotherapy, remains controversial.

Wide en bloc resection is used most often. Historical attempts to resect all muscle bundles from origin to exertion have been supplanted by an encompassing resection, aiming to obtain a 1- to 2-cm margin of uninvolved tissue in all directions.

The limiting factor is usually neurovascular or, occasionally bony juxtaposition. Because very few soft tissue sarcomas invade bone directly, only rarely does bone need to be resected. Similarly, few soft tissue sarcomas involve the skin, and so major skin resection should be limited. If a primary or recurrent tumor does involve the skin or if the tumor is so extensive that skin is involved, then the surgeon should consider free flap or rotational flap closure, particularly in those patients who are candidates for subsequent adjuvant radiation therapy.

Primary tumors with no evidence of distant metastasis are managed with surgery alone or, when wide pathologic margins cannot be achieved because of anatomic constraints and/or the grade is high, surgery plus radiation therapy. The type of surgical resection is determined by several factors, including tumor location, tumor size, depth of invasion, involvement of nearby structures need for skin grafting or autogenous tissue reconstruction, and the patient's performance status

Wide Local Excision: The preferred treatment for extremity sarcomas is wide local excision that includes resection of the biopsy site. The goal of wide local excision is to remove the tumor with approximately 1 to 2 cm of surrounding normal soft tissue, but narrower margins may be necessary

to preserve uninvolved critical neurovascular structures and may be adequate for patients undergoing radiation therapy. If the tumor is adjacent to or displacing major neurovascular structures, these do not need to be resected, but the adventitia or perineurium should be removed. Surgical clips should be placed to delineate the extent of the resection bed for patients likely to require postoperative radiation therapy. Recent reports demonstrate encouraging results following radical en bloc resection with vascular reconstruction in the lower extremities. While en bloc resection with vascular reconstruction has been associated with increased rates of postoperative complications.

In cases of bone invasion, bone resection is required to obtain an adequate surgical margin and to achieve local control. Although tumor resection and repair of skeletal defects are possible, the likelihood of postoperative complications may be increased, and functional outcomes may be less favorable.

Soft tissue sarcomas abutting bone and in the absence of frank cortical bone penetration, periosteum was an adequate surgical margin in patients treated with wide local excision and radiation. Soft tissue sarcomas arising in the distal extremities, particularly the hands and feet, present unique technical challenges.

Amputation remains a reasonable option for patients with soft tissue sarcomas of the distal extremities when acceptable oncologic or functional outcomes cannot be achieved using available limb salvage techniques. All patients undergoing resection of extremity sarcomas should undergo physical therapy beginning immediately after surgery and continuing until maximum function is achieved.

Locoregional Lymphadenectomy:

Patients with clinically or radiologically suspicious regional nodes should have metastases confirmed before radical lymphadenectomy.

Ultrasound-guided fine-needle aspiration of lymph nodes in selected patients with suspicious clinical or radiologic findings can be done.

Amputation:

the addition of radiation therapy to less radical surgical resection has made limb salvage possible in most cases. The local recurrence rate was significantly higher in the surgery and adjuvant radiation therapy group: 8% versus 0% in the amputation group. A randomized trial proved that although local recurrence is greater in those undergoing limbsparing operation plus irradiation than in those undergoing amputation, disease free survival is not different.

Radiation Therapy: Radiation therapy is part of the standard treatment for intermediate or high-grade extremity and trunk wall STS either in the pre or postoperative setting. Patients with low-grade tumors or small, superficial high-grade tumors that have been resected with adequate margins may safely avoid radiation therapy. The standard treatment guidelines required radiation therapy after surgery for all patients with intermediate- or high-grade tumors of any size. However, small tumors (≤5 cm) have not generally been associated with local recurrence, and radiation therapy for such tumors may not be necessary. The optimal mode of radiation therapy (external-beam radiation therapy [EBRT], brachytherapy, or intensity-modulated radiation therapy [IMRT]) and timing of radiation therapy (preoperative, intraoperative, or postoperative) have yet to be

defined. External-beam radiation therapy[EBRT] can be delivered using photons or particle beams (electrons, protons, pions, or neutrons). Conventional fractionation is usually 1.8 to 2 Gy per day.. The optimal radiation margin is not well defined: a margin of 5 to 7 cm is standard, but some centers advocate wider margins for tumors larger than 15 cm. At most institutions, the typical preoperative dose is 50 Gy given in 25 fractions, and resection is performed 4 to 8 weeks after completion of radiation therapy to allow acute radiation changes to subside. Postoperative radiation therapy planning is based on tumor site, tumor grade, and surgical margins. The entire surgical scar and drain sites should be included in the field so that a near-full dose can be administered to the superficial skin. Metallic clips placed in the tumor bed during surgery can help define the limits of the resection and aid in radiation therapy planning. Doses of 60 to 70 Gy are usually necessary for postoperative treatment. No consensus exists on the optimal sequence of radiation therapy and surgery. For some radiosensitive histologic subtypes, such as myxoid liposarcoma, preoperative radiation therapy may shrink the tumor, facilitating resection with negative margins. Furthermore, a tissue bed undisturbed by resection has better tissue oxygenation and can be successfully treated with lower doses of radiation. In addition, preoperative radiation fields are smaller than postoperative radiation fields and that the average number of joints included in the field is lower with preoperative than postoperative radiation therapy, which may result in improved functional outcome. Critics of preoperative radiation therapy cite the difficulty of pathologic assessment of margins and the increased rate of postoperative wound complications. However, reconstructive surgical techniques with advanced tissue transfer procedures are being used more often in these high-risk wounds and reportedly result in better outcomes. The higher doses generally required for postoperative radiation therapy have also been shown to be associated with greater long-term functional impairment.

Late radiation toxic effects (e.g., fibrosis, joint stiffness, and edema) were more common with postoperative than preoperative radiation therapy because of higher postoperative radiation doses and larger treatment field sizes.

Brachytherapy involves the placement of multiple radioactive seeds through catheters inserted in the tumor resection bed. The primary benefit of brachytherapy is the shorter overall treatment time of 4 to 6 days, compared to the 4 to 6 weeks generally required for preoperative or postoperative radiation therapy regimens.

Chemotherapy:

The chemo sensitivity of STS varies by histological subtype. Synovial sarcoma, myxoid/round cell liposarcoma, and uterine leiomyosarcoma are sensitive to chemotherapy, whereas pleomorphic liposarcoma, myxofibrosarcoma, epithelioid sarcoma, leiomyosarcoma, mPNSTs, angiosarcomas, and desmoplastic round cell tumors have intermediate sensitivity to chemotherapy.

Relatively chemo resistant histological subtypes include clear cell sarcoma, endometrial stromal sarcoma, alveolar soft part sarcoma, and extra skeletal myxoid chondrosarcoma.

Doxorubicin and ifosfamide are the two most active agents against soft tissue sarcoma.

The European guidelines recommend doxorubicin 75 mg/m2 every 3 weeks as first-line treatment for advanced disease. Treatment duration is based on response, but a maximum of six cycles is generally recommended because of the risk of cumulative cardio toxicity.

Ifosfamide is the recommended second-line treatment and is recommended for first-line treatment in patients with cardiac morbidity. The standard dose of ifosfamide is 9 to 10 g/m2. Synovial sarcomas have been shown to be particularly sensitive to ifosfamide. Ifosfamide-associated toxic effects include hemorrhagic cystitis, neurotoxicity, and renal tubular acidosis. Historically, combination therapy with doxorubicin plus ifosfamide, dacarbazine, or both has resulted in increased response rates but no improvement in overall survival

Other Systemic Therapies:

Novel Chemotherapeutic Agents: Trabectedin, a marine derived alkaloid that binds DNA, affecting transcription and inducing the formation of DNA double-strand breaks, has shown benefit in the treatment of advanced soft tissue sarcomas, particularly leiomyosarcoma, myxoid liposarcoma, and other translocation-related sarcomas.

Trabectedin is generally well tolerated but can be associated with prolonged and severe neutropenia, thrombocytopenia, and hepatic toxic effects.

Palifosfamide is a stabilized formulation of the active metabolite of ifosfamide that has been reported to be better tolerated than ifosfamide.

Pazopanib is an oral angiogenesis inhibitor that targets vascular endothelial growth factor receptors, platelet-derived growth factor receptor (PDGFR), and c-kit. Inhibitors of the mammalian target of rapamycin pathway, including temsirolimus, Everolimus, and ridaforolimus, have also shown activity against some soft tissue sarcomas (i.e., PEComas).

Management of Recurrent Sarcoma:

For patients with extremity sarcomas, achieving negative margins on resection of recurrent disease frequently requires amputation. However, in some patients with recurrent extremity sarcoma, function-preserving resection combined with additional radiation therapy, with or without chemotherapy, can produce acceptable rates of local.

Management of Recurrent and Distant Metastatic Sarcoma: In selected individuals with distant metastatic disease, surgical resection of a primary soft tissue sarcoma may be appropriate as a palliative procedure. The decision should be based on the patient's symptoms, which often include pain; ability to achieve local tumor control; co morbidities; anticipated morbidity of the surgical procedure; and the extent of metastases.

The most common initial site of distant metastasis of soft tissue sarcomas is the lung. Selected patients with a limited number of pulmonary nodules (less than four nodules), long disease- free intervals, and no endobronchial invasion may become long-term survivors after pulmonary resection; 15% to 40% of patients with complete resection of metastatic disease confined to the lung are long-term survivors.

Favorable prognostic factors included microscopically tumor-free margins, age younger than 40 years, and grade 1 or 2 tumor. For patients who are surgical candidates, pulmonary resection alone can be more effective than watchful waiting, chemotherapy, or chemotherapy plus surgery.

Chemotherapy for Distant Metastatic Sarcoma: Doxorubicin, either alone or combined with other agents, has been the primary treatment modality for patients with advanced or distant metastatic

sarcomas for several decades. Although most patients with metastatic disease are not curable, some patients with limited disease experience stabilization of disease with multidisciplinary treatment, which often includes surgery and radiation therapy in addition to chemotherapy. Several factors predict better outcome for patients with recurrent metastatic sarcoma undergoing chemotherapy, including good performance status, previous response to chemotherapy, younger age, and absence of hepatic metastases, low-grade tumor, and long disease-free interval.
Isolated liver metastases, if stable over several months, may be amenable to resection, radiofrequency ablation, or chemo-embolisation. As data accumulate regarding the sensitivity of sarcoma subtypes to particular chemotherapies, it is critical that histology driven treatment approaches be used. New therapies are also being identified based on the unique molecular signatures of sarcomas.
Palliative Surgery: In cases of metastatic settings a palliative resection or amputation is required in cases of bleeding, fungation, infection or intractable pain.
Palliative Radiation Therapy: Definitive radiation therapy can be considered when no acceptable surgical option is available (e.g., in patients with significant medical co-morbidities). In this setting, radiation doses greater than 63 Gy yielded superior tumor control, but doses greater than 68 Gy resulted in increased rates of major complications.

10. Discuss the merits and demerits of different types of mesh used in hernia surgery. 10

Answer. The mesh materials have been classified based on its biological response and handling characteristics into:

i. Non-absorbable and synthetic
ii. Non-absorbable and synthetic with barrier
iii. Synthetic and partially absorbable
iv. Combined
v. Biological

i. NON-ABSORBABLE AND SYNTHETIC MATERIAL

These include:

1. Polypropylene(PP)

Advantages:

- High tensile strength
- Non-polar
- Highly hydrophobic
- Electrostatically neutral
- Resistant to biological degradation
- Infections can be treated themselves without removal of mesh

Diadvantages:

- Heavy weight nature
- More foreign body reaction
- Formation of thick scar
- Contraction of mesh/ shrinkage
- Hernia recurrence

- Chronic pain
- Intestinal adhesions
- Discomfort

2. Polyester

- Composed of polyethylene terephalate(PET)
- Multifilament
- Slightly polar
- More hydrophilic and hygroscopic

Advantages:

- Coated with collagen
- Prevents adhesion
- Can be used for intraperitoneal repair
- Improves conformability and tissue ingrowth with abdominal wall

Diadvantages:

- Thick scar formation
- Hernia recurrence
- Degrades over time
- Chronic pain

3. Expanded polytetrafluoroethylene (ePTFE)

Not widely used

Advantages:

- Less adhesion formation
- Inert nature
- Smaller pore size
- Less tissue ingrowth
- Minimal inflammatory reaction
- Lower scar density

Diadvantages:

- Weaker hernia repair

ii. NON ABSORBABLE AND SYNTHETIC WITH A BARRIER

Advantages:

- Prevents bowel adhesion when placed intraperitoneally
- Minimal biological response
- Inhibition of inflammatory cascade

- Reduced activation of inflammatory cytokines and cells

Barriers used:

- ePTFE
- polyurethane
- oxidized regenerated cellulose
- omega-3-fatty acid
- collagen
- beta glucan

Literature is scarce regarding their observed clinical behavior in re-operation

iii. SYNTHETIC AND PARTIALLY ABSORBABLE

Advantages:

- Reduces density of biomaterial
- Less inflammatory reaction
- Less fibrosis
- Less structural changes
- Larger pores
- Less chronic inflammation
- Less pain
- Less discomfort

Diadvantages:

- Differences in variety of inflammatory markers
- Weaker hernia repair

Ex:

- Polygalactin 910 and poliglecaprone 25
- Poly(L-lactide-co-glycolide) and PP

iv. COMBINED MESHES

Main purpose is to prevent complications by taking advantages of best traits from 2 different meshes

In case of polyester and PTFE, the former allows abd wall tissue ingrowth while the latter prevents occurrence of intestinal adhesions

Synthetic meshes use only a temporary adhesion barrier, hence the use of absorbable polymer coatings.

Advantages:

- Absorbable mesh can be used in contaminated fields
- Benefit of non-removal

- Formation of collagen upon healing
- Can be placed in direct contact with bowel

Disadvantages:

- Hernia recurrence and catastrophic failure
- Weak collagen formation
- Non-promising as a standalone procedure

v. BIOLOGICAL MESHES

Advantages:

- Overcome problems of synthetic meshes
- Provide mechanical support
- Tissue remodelling along mesh scaffold
- New vascular access to hernia site
- Impeded inflammatory response and immune-mediated rejection
- Wound healing response
- Potentially resist infection
- Good success rate in salvaging contaminated fields
- Resistance to adhesion formation

Diadvantages:

- Connective tissue formed is only 70-80% strong
- Greater chance of hernia recurrence
- Higher mechanical failure
- Disease transmission
- High cost

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2017

PAPER- II

Time Allowed: 3 Hours **Full Marks: 100**

1. **What are the adaptive changes in the retained bowel in small bowel syndrome? What are the factors deciding the outcome of short bowel syndrome? Discuss the treatment of short bowel syndrome. 1+3+6**
2. **Enumerate the pigmented lesions of the skin. Briefly discuss the roll of immunotherapy/biological therapy in malignant melanoma. 6+4**
3. **What are the cutaneous manifestations of carcinoma breast? Enumerate the molecular subtypes of carcinoma breast. How will you manage a case of DCIS? 3+3+4**
4. **Treatment plan for carcinoma Tongue anterior 2/3 and management of secondary in neck from with occult primary. 6 + 4**
5. **Causes and management of postoperative Pancreatic fistula. 4+6**
6. **Classify Abdominal Aortic Aneurysm and discuss its management. 10**
7. **Management of lower oesophageal cancer. 10**
8. **Pathophysiology and treatment of Rectal Prolapse. 10**
9. **What are the extra adrenal sites of Pheochromocytoma? Name the genetic factors predispose to pheochromocytoma. How will you investigate a case of pheochromocytoma and differentiate between benign and malignant tumor? 2+1+4+3**
10. **Enumerate the steps of whipple operation with reference to "artery first approach". 10**

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1. **What are the adaptive changes in the retained bowel in small bowel syndrome? What are the factors deciding the outcome of short bowel syndrome? Discuss the treatment of short bowel syndrome. 1+3+6**

Answer. Adaptive Changes in the Small Bowel Following Extensive Resection:

- Increased bowel circumference.
- Increased bowel wall thickness
- Increased bowel length
- Increased villus height
- Increased crypt depth
- Increased cell proliferation and migration to villus tip.

The adaptation phase has the following characteristics:

- Begins within 48 hours of resection and lasts up to 1-2 years
- Approximately 90% of the bowel adaptation takes place during this phase
- Enterocyte hyperplasia, villous hyperplasia, and increased crypt depth occur, resulting in increased surface area; intestinal dilatation and lengthening also occur
- Luminal nutrition is essential for adaptation and should be initiated as early as possible; parenteral nutrition is also essential throughout this period.

Factors determining the outcome of short bowel syndrome:

- Short Bowel Syndrome has a highly variable prognosis depending on the type and extent of surgical resection. The bowel generally gains absorptive capacity with time, a process called intestinal adaptation.
- Approximately 50% of patients are able to be weaned from parenteral nutrition (PN) within 2 years.
- Prognosis is directly related to length of bowel and dependency on PN. The highest-risk patients are those with less than 50 cm of remaining bowel, those with proximal jejunostomies, and those with mesenteric thrombosis or radiation enteritis as an underlying etiology.
- Some patients have lived up to 35 years or more; 5-year survival rate in patients with no malignancy is approximately 85%

Adults

- Limited small bowel resection: Patients with greater than 100 cm of residual bowel and an intact small bowel-colonic anastomosis have an excellent prognosis. Intestinal adaptation and dietary instruction allows these patients to eventually live normal lives with relatively little morbidity or mortality.
- Terminal ileum resection: Intestinal adaptation cannot replace the terminal ileum's role in bile salt and vitamin B12 absorption. While prognosis is still excellent, lifelong management of bile salt and vitamin malabsorption is required.
- Extensive bowel resection: Weaning from PN is more difficult in patients with 100 cm or less of residual small bowel, particularly in those who lack a colon or colonic anastomosis.
- Intestinal transplantation: Mortality and morbidity rates are significant, but are improving due to an increase in surgical experience and improved immunosuppression regimens. Short-term survival approaches 90% (similar to liver transplantation), but 5-year survival is closer to 50%. The prognosis becomes much worse if patients remain PN dependent.

Children: Children usually acquire SBS because of a congenital abnormality or a catastrophic event such as midgut volvulus. It remains one of the most morbid conditions of infancy and childhood, with survival rates from 73% to 89%. Younger children may have a more adaptable intestine than adults; there are anecdotal reports of children living independent of PN with as little as 10 cm of residual small intestine. However, if children become dependent on PN, the risk of liver failure is much greater than in adults.

Treatment may include:

- nutritional support
- medications
- surgery
- intestinal transplant

Nutritional Support: The main treatment for short bowel syndrome is nutritional support, which may include the following:

- Oral rehydration.
- Parenteral nutrition
- Enteral nutrition.
- Vitamin and mineral supplements. Special diet.
    - small, frequent feedings
    - avoiding foods that can cause diarrhea, such as foods high in sugar, protein, and fiber
    - avoiding high-fat foods

Medications

- Antibiotics to prevent bacterial overgrowth
- H2 blockers to treat too much gastric acid secretion
- Proton pump inhibitors to treat too much gastric acid secretion
- Choleretic agents to improve bile flow and prevent liver disease
- Bile-salt binders to decrease diarrhea
- Anti-secretin agents to reduce gastric acid in the intestine

- Hypomotility agents to increase the time it takes food to travel through the intestines, leading to increased nutrient absorption
- Growth hormones to improve intestinal absorption
- Teduglutide to improve intestinal absorption

Surgery: The goal of surgery is to increase the small intestine's ability to absorb nutrients. Approximately half of the patients with short bowel syndrome need surgery. Surgery used to treat short bowel syndrome includes procedures that

- Prevent blockage and preserve the length of the small intestine
- Narrow any dilated segment of the small intestine
- Slow the time it takes for food to travel through the small intestine
- Lengthen the small intestine

Long-term treatment and recovery, which for some may take years, depend in part on

- What sections of the small intestine were removed
- How much of the intestine is damaged
- How well the muscles of the intestine work
- How well the remaining small intestine adapts over time

Intestinal Transplant:

- An intestinal transplant is surgery to remove a diseased or an injured small intestine and replace it with a healthy small intestine from a person who has just died, called a donor. Sometimes a living donor can provide a segment of his or her small intestine.
- A successful intestinal transplant can be a life-saving treatment for people with intestinal failure caused by short bowel syndrome.

One has to tailor treatment to the severity of the patient's disease:

- Treatment for mild short bowel syndrome involves eating small, frequent meals; drinking fluid; taking nutritional supplements; and using medications to treat diarrhea.
- Treatment for moderate short bowel syndrome is similar to that for mild short bowel syndrome, with the addition of parenteral nutrition as needed.
- Treatment for severe short bowel syndrome involves use of parenteral nutrition and oral rehydration solutions. Patients may receive enteral nutrition or continue normal eating, even though most of the nutrients are not absorbed. Both enteral nutrition and normal eating stimulate the remaining intestine to work better and may allow patients to discontinue parenteral nutrition.
- Some patients with severe short bowel syndrome require parenteral nutrition indefinitely or surgery.

2. Enumerate the pigmented lesions of the skin. Briefly discuss the roll of immunotherapy/biological therapy in malignant melanoma. 6+4

Answer. Classification of Pigmented lesions of skin.

1. Non-melanocytic lesions

A. Inflammatory
    1. Post-inflammatory hyperpigmentation
    2. Dermatofibroma
B. Hamartomas
    1. Collagenous nevus, papillary dermal type
    2. Nevoid hyperkeratosis of the nipple
C. Benign neoplasms
    1. Solar lentigo, including lichen planus-like keratosis
    2. Seborrheic keratosis
D. Malignant neoplasms
    1. Basal cell carcinoma, pigmented
    2. Solar keratosis, pigmented

2. Melanocytic lesions
A. Benign
    1. Melanosis
    2. Simple lentigo
    3. Nevus of Ota, nevus of Ito
    4. Nevi
        a. Congenital
            1. Classic acral
            2. Superficial
            3. Superficial and "deep"
            4. Masson's blue neuronevus
            5. Common blue (Jadassohn-Tieche)
            6. Combined
            7. Miescher's
            8. Unna's
            9. Nevus spilus
            10. Persistent
            11. Special site
            12. Yet to be classified

                - Superficial congenital nevus, probable

        b. Acquired
            1. Clark's
            2. Spitz's
            3. Reed's
            4. Yet to be classified
                a. Clark-like
                b. Spitz-like
                c. Reed-like
B. Malignant
    1. Melanoma
        a. In situ
        b. No longer in situ ("invasive")
        c. Persistent
        d. In association with a nevus
        e. Metastatic

Immunotherapy:

- Interleukin-2 (IL-2): The first type of immunotherapy approved in the treatment of melanoma was high-dose interleukin 2 (HD IL-2), which provided a "proof-of-principle" for the use of immunotherapy in melanoma.

Interleukin-2 plays a central role in the activation and stimulation of T lymphocytes and natural killer (NK) cells. In response to IL-2 stimulation these cells acquire cytolytic properties which is believed to enhance their anti-tumoral properties.

It can be used in:

  - Metastatic malignant melanoma.
  - Advanced melanoma.
  - Intralesional IL-2 for in –transit lesions.

- Interferon α: The immunotherapeutics approved by the FDA for the adjuvant treatment of melanoma are inter-feron α-2b and peginterferon α-2b.

Adoptive Immunotherapy

- The adoptive cell therapy (ACT) approach utilizes ex vivo cultured autologous lymphocytes. These lymphocytes can be derived from resected metastasis or from peripheral blood. The optimizationof the host environment prior to cell transfer appears to be very important for the success of this procedure: high dose chemotherapy is needed to induce lymphodepletion to eliminate immune regulatory elements (both cellular and humoral) that could affect homing and activity of transferred cells. Recent advances in ACT involve the use of autologous engineered T cells that express T-cell receptors specific for various tumor-associated antigens (such as MART-1-TCG genes), or that secrete specific cytokines.

Biological therapy:

- Anti-CTLA-4: The cytotoxic T-lymphocyte antigen 4 (CTLA-4) is a receptor that interacts with CD80 (B7-1) and CD86 (B7-2) and downregulates T-cell response.

Ipilimumab and tremelimumab (CP-675206) are monoclonal antibodies that block CTLA-4 and allow CD28 to bind to B7-1 receptors, which leads to IL-2 secretion, cytotoxic T-cell activation and proliferation.

  - Anti-CTLA-4 antibodies in metastatic melanoma: Clinical studies confirm that the CTLA-4 inhibitor ipilimumab can induce durable responses and improve overall survival in patients with advanced melanoma.
  - Also used in adjuvant therapies.

- Anti-PD-1 and PDL-1: Programmed death-1 (PD-1) receptor, also known as CD279, is a protein receptor that is inducibly expressed on CD4+ T cells,CD8+ T cells, natural killer T cells, and B cells. PD-1, interacting with programmed death ligand 1 (PDL-1) and PDL-2 negatively regulates immune responses.
  Nivolumab is a human monoclonal antibody targeting PD-1.
  Pembrolizumab is also PD-1 inhibitor.
- CD 40 agonist: CD40 is a co-stimulatory molecule expressed on dendritic cells, B cells, and monocytes. Its ligand, CD40L, is expressed on CD4+ T cells.
  It can be used in metastatic melanoma.
- CD137 agonist: CD137 is an inducible T-lymphocyte surface molecule of the tumor necrosis factor (TNF) receptor superfamily. Its ligand, CD137L, can be expressed by most immune and many nonimmune cells as a transmembrane protein. CD137 signaling enhances T-lymphocyte proliferation and T-helper-1 cytokine
  production, protecting CD8+ T-lymphocytes from apoptosis.

It can be used in metastatic melanoma.

- Agonistic antibodies targeting OX40: OX40 and its ligand, OX40L, are key TNF members that augment T-cell expansion, cytokine production, and cell survival. OX40 is a co-stimulatory molecule expressed transiently on the surface of T cells. Agonistic antibodies targeting OX40 have been shown to have antitumor activity.
- Agonistic antibodies targeting OX40: OX40 and its ligand, OX40L, are key TNF members that augment T-cell expansion, cytokine production, and cell survival. OX40 is a co-stimulatory molecule expressed transiently on the surface of T cells. Agonistic antibodies targeting OX40 have been shown to have antitumor activity.
- Anti-TIM-3 antibody: T-cell immunoglobulin mucin-3 (TIM-3) is another inhibitory receptor expressed on a subset of tumor reactive T cells. Blockage of TIM-3 has been shown to improve the function.
  It can be used in malignant melanoma.

3. What are the cutaneous manifestations of carcinoma breast? Enumerate the molecular subtypes of carcinoma breast. How will you manage a case of DCIS? 3+3+4

Answer. Cutaneous manifestations of breast carcinoma:

- Nodules are the most common clinical manifestations of breast cancer.
- Assessment of cutaneous metastatic disease can be perplexing because the clinical presentation appears similar to other skin maladies such as cellulitis or lymphedema. Patients present with a variety of symptoms ranging from firm, indurated skin to tiny, seed-like solid papules and large egg-sized lesions.
- Lymphedema is a chronic condition characterized by swelling and recurrent skin infections. Characteristic dermatologic findings in cellulitis, a complication of lymphedema, include erythema, edema, tenderness, and warmth. Fibrosis associated with axillary lymph node dissection and radiation therapy reduces lymphatic flow from the breast and ipsilateral upper extremity, impairing the ability to clear bacteria and, therefore, predisposing patients to infection.
- Cutaneous metastases present similarly to cellulitis and lymphedema. Diagnostic expertise recognizes the manifestation of progressive disease, thus allowing for appropriate treatment interventions.
- Carcinoma erysipelatoides is frequently observed in carcinoma breast

Molecular subtypes of breast carcinoma:

Most studies divide breast cancer into four major molecular subtypes:

- Luminal A
- Luminal B
- Triple negative/basal-like
- HER2 type

Luminal A

Luminal tumor cells look the most like cells of breast cancers that start in the inner (luminal) cells lining the mammary ducts.

Luminal A tumors tend to be:

- Estrogen receptor-positive (ER-positive)
- HER2 receptor-negative (HER2-negative)
- Tumor grade 1 or 2

- About 30-70 percent of breast cancers are luminal A tumors.
- Of the four subtypes, luminal A tumors tend to have the best prognosis, with fairly high survival rates and fairly low recurrence rates.
- Because luminal A tumors tend to be ER-positive, treatment for these tumors often includes hormone therapy.

Luminal B

- Luminal tumor cells that look like those of breast cancers that start in the inner (luminal) cells lining the mammary ducts.
- Luminal B tumors tend to be ER-positive. They may be HER2-negative or HER2-positive.
- Women with luminal B tumors are often diagnosed at a younger age than those with luminal A tumors.

Compared to luminal A tumors, they also tend to have factors that lead to a poorer prognosis including:

- Poorer tumor grade
- Larger tumor size
- Lymph node-positive

- About 10-20 percent of breast cancers are luminal B tumors.
- Women with luminal B tumors tend to have fairly high survival rates, although not as high as those with luminal A tumors

Triple negative/basal-like

Triple negative breast cancers are:

- Estrogen receptor-negative (ER-negative)
- Progesterone receptor-negative (PR-negative)
- HER2-negative

  - There are several subsets of triple negative breast cancer.
  - One subset is basal-like. Basal-like tumors have cells that look similar to those of the outer (basal) cells surrounding the mammary ducts.
  - Most triple negative tumors are basal-like and most basal-like tumors are triple negative.

  HER2 type

- The molecular subtype HER2 type is not the same as HER2-positive and is not used to guide treatment.
- Although most HER2 type tumors are HER2-positive (and named for this reason), about 30 percent are HER2-negative.

- HER2 type tumors tend to be:
    - ER-negative
    - PR-negative
    - Lymph node-positive
    - Poorer tumor grade

- About 5-15 percent of breast cancers are HER2 type.
- Women with HER2 type tumors may be diagnosed at a younger age than those with luminal A and luminal B tumors.
- HER2 type breast cancers that are HER2-positive can be treated with anti-HER2 drugs such as trastuzumab (Herceptin).

	Molecular subtype		
	Luminal	***HER2***	***Basal***
Gene expression pattern	High expression of hormone receptors and associated genes (luminal A>luminal B)	High expression of HER2 and other genes in amplicon Low expression of ER and associated genes	High expression of basal epithelial genes, basal cytokeratins Low expression of ER and associated genes Low expression of HER2
Clinical features	~70% of invasive breast cancers ER/PR positive Luminal B tend to be higher histological grade than luminal A Some overexpress HER2 (luminal B)	~15% of invasive breast cancers ER/PR negative More likely to be high grade and node positive	~15% of invasive breast cancers Most ER/PR/HER2 negative ('triple negative') *BRCA1* dysfunction (germline, sporadic) Particularly common in African-American women
Treatment response and outcome	Respond to endocrine therapy (but response to tamoxifen and aromatase inhibitors may be different for luminal A and luminal B) Response to chemotherapy variable (greater in luminal B than in luminal A) Prognosis better for luminal A than luminal B	Respond to trastuzumab (Herceptin) Respond to anthracycline-based chemotherapy Generally poor prognosis	No response to endocrine therapy or trastuzumab (Herceptin) Appear to be sensitive to platinum-based chemotherapy and PARP inhibitors Generally poor prognosis (but not uniformly poor)

Molecular subtype	***Biomarker profile***
Luminal A	ER+ and/or PR+, HER2−, and low Ki67 (<14%)
Luminal B	ER+ and/or PR+ and HER2+ (luminal-HER2 group) ER+ and/or PR+, HER2−, and high Ki67 (>14%)
HER2	ER−, PR−, and HER2+
Basal-like	ER−, PR−, HER2−, and CK5/6 and/or EGFR+

In most cases, treatment options for DCIS include:

- Lumpectomy and radiation therapy
- Simple mastectomy

In some cases, treatment options may include:

- Lumpectomy only
- Lumpectomy and the drug tamoxifen

An SN procedure should be considered in the case of:

- Patients with the preoperative diagnosis DCIS, for whom a mastectomy is indicated in relation to size
- Patients with a small DCIS who are eligible for BCT, in which there are risk factors for an invasive component:
    - Younger than 55 years
    - Solid component on the mammogram
    - Suspicion on the basis of histological biopsies
    - Moderate or poorly differentiated DCIS in biopsies

The treatment of DCIS is mastectomy or BCT, consisting of microscopic complete tumour excision and radiotherapy, in which a boost may be considered, particularly for younger patients.

Contraindications for BCT:

- Multicentricity (the presence of DCIS in multiple quadrants of the breast)
- Residual disease: mammographic evidence or tumour-positive resection margin

- Axillary staging is not indicated with pure DCIS in the excision sample.
- If postoperative invasive foci are encountered that are larger than 5 mm, lymphogenous staging is recommended.
- Adjuvant (hormonal) treatment after breast-conserving treatment (R0 resection and radiotherapy) is not recommended.

4. Treatment plan for carcinoma Tongue anterior 2/3 and management of secondary in neck from with occult primary. **6 + 4**

Answer. Treatment:

Surgery, radiotherapy,chemotherapy.

Surgery:

- Wide excision with 1 cm clearance in margin and depth is done in tumour less than 1 cm in size or in carcinoma in situ. Laser (CO_2 / diode) can be used.
- Tumour between 1-2 cm in size, partial glossectomy is donewith 2 cm clearance from the margin with removal of 1/3rd of anterior two-third of the tongue.
- Tumour larger than 2 cm, hemiglossectomy is done with removal of anterior 2/3rd of tongue on one side up to sulcus terminalis. Raw area in these procedures can be left alone when area is wide allowing it to granulate and heal by epithelialisation.
- If area is small like in wide excision it can be closed by primary suturing. Wide raw area can also be covered with PMMF or quilted split-skin-graft.

- Larger primary tumour can be given preoperat ive radiotherapy, then later hemiglossectomy is done.
- Same side palpable, mobile lymph nodes are removed by radical neck block dissection.
- Bilateral mobile lymph nodes are dealt with one side radical block and other side functional block dissection with essentially retaining internal jugular vein (on opposite side) to maintain the cerebral venous blood flow.
- Other option is doing same side radical neck dissection and on opposite side supraomohyoid block dissection.

5. Causes and management of postoperative Pancreatic fistula. 4+6

Answer. Four final definitions summarizing the current pancreatic fistula concept according to the literature:

i. Output>10mL/d of amylase-rich fluid postoperative (postop)day 5 or for>5days.
ii. Output>10mL/d of amylase-rich fluid after postop day 8or for>8days.
iii. Output between25mL/d and100mL/d of amylase-rich fluid after postop day 8 or for>8days.
iv. Output>than50mL/d of amylase-rich fluid after postop day11or for>11days.

POPF commonly occur following either Pancreaticoduodenectomy or distal pancreatectomy (DP)

RISK FACTORS FOR POPF
Risk factors can be classified as
• Patient factors
• Disease related factors

Patient Factors:
- Though male sex is seen to be associated with increased risk for POPF, no specific reason has been found for this phenomenon. Similarly age greater than 70 years is associated with increased risk for POPF.
- Other risk factors for POPF that have been evaluated in various studies include duration of jaundice, creatinine clearance and intraoperative blood loss. But none of these are found to have a definitive relation with POPF.

Disease Related Factors:
- Pancreatic texture, pancreatic pathology, high pancreatic juice output, pancreatic duct size and biochemical parameters are factors seen to contribute towards POPF.
- Pancreatic Texture: The texture of pancreas is usually related to the underlying disease process. It is widely accepted that a fibrotic pancreatic remnant in chronic pancreatitis holds the pancreatic anastomosis well, while a soft friable pancreas found in pancreatic or periampullary cancer usually betrays.
- High Pancreatic Juice Output: In the setting of a nondilated duct in a soft textured pancreas, a high pancreatic juice output has been considered as an important factor contributing to POPF.
- Size of the Pancreatic Duct: A small sized pancreatic duct has been suggested as a risk factor for POPF.
- Biochemical Parameters: Various biochemical parameters like serum bilirubin, serum albumin, blood urea nitrogen (BUN), serum amylase and N-benzoyl-L-tyrosyl-p-aminobenzoic acid (BT-PABA) excretion test values have been evaluated as risk factors for POPF. A normal preoperative BT-PABA test value has been suggested as a risk factor for POPF.

Grading system to assess the severity of POPF:

Grade	A	B	C
Clinical conditions	Well	Often well	Ill appearing/ Bad
Specific treatment	No	Yes/No	Yes
Ultrasonography/ Computed tomography	Negative	Negative/ Positive	Positive
Persistent drainage	No	Usually yes	Yes
Reoperation	No	No	Yes
Death related to POPF	No	No	Possibly yes
Signs of infections	No	Yes	Yes
Sepsis	No	No	Yes
Readmission	No	Yes/ No	Yes/ No

Classification scheme for grading complications arising after PD applicable to all complications arising from PD and not just postoperative pancreatic fistula (POPF)

Grade	Definition
I	Any definition from the normal post-operative course without pharmacologic treatment or surgical, endoscopic and radiological interventions. Allowed therapeutic regimens are drugs such as antiemetics, antipyretics, analgesics, diuretics, electrolytes and physiotherapy. This grade also includes wound infections opened at the bed side.
II	Requiring pharmacologic treatment with drugs other than ones allowed for grade I complications. Blood transfusion and total parenteral nutrition are also included
III -IIIa -IIIb	Requiring surgical, endoscopic or radiologic intervention. Intervention not under general anesthesia. Intervention under general anesthesia.
IV -IVa -IVb	Life threatening complication requiring Intermediate care/ Intensive care unit management. Single-organ dysfunction Multiorgan dysfunction
V	Death of a patient

Appropriate management of the pancreatic remnant has been one of the core issues regarding prevention of POPF. Some of the recommended methods for the management of pancreatic remnant include

- Pancreatic duct ligation.
- Pancreatic duct obliteration.
- Pancreaticojejunostomy (PJ)
- Pancreaticogastrostomy (PG

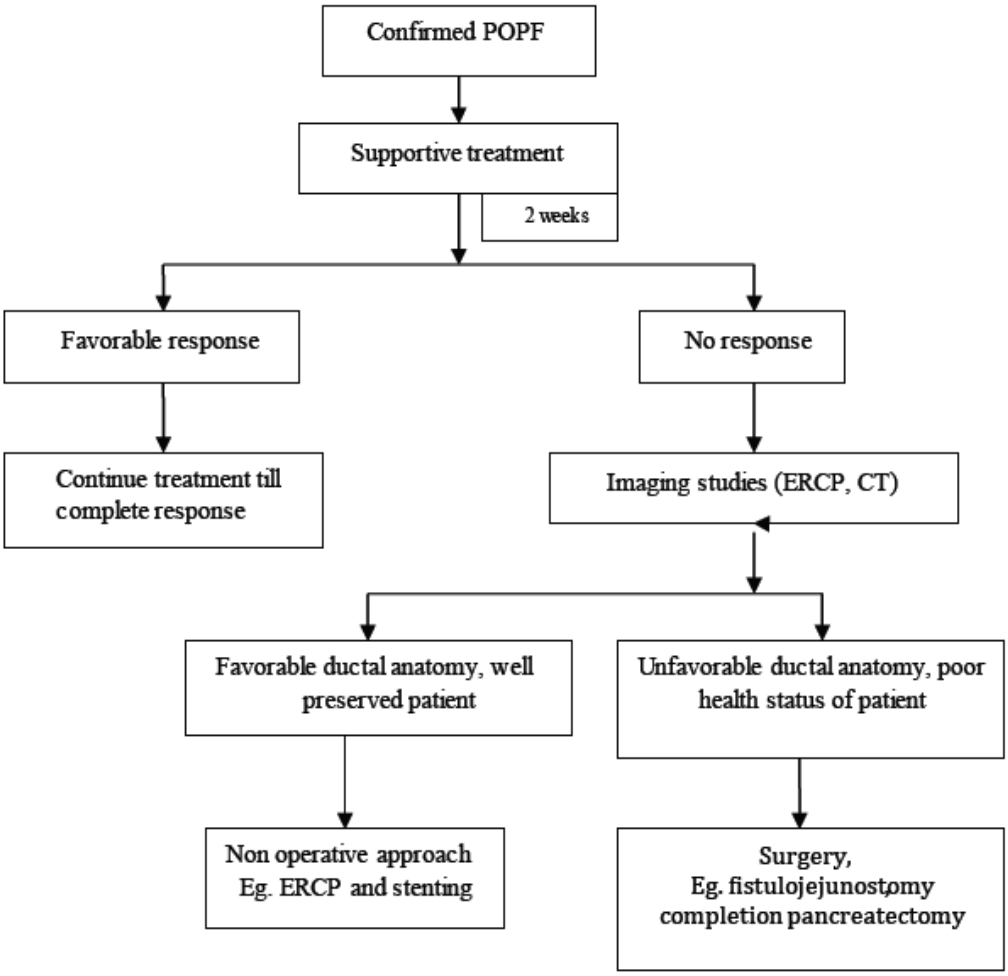
PREVENTION OF POPF:
The measures recommended to prevent POPF following PD can be considered under following categories

• Pharmacological measures
• Preoperative irradiation
• Modifications in operative techniques

- Pharmacological Measures:

A high pancreatic juice output in a soft pancreas is an important risk factor for POPF. Hence it appears rational to hypothesize that inhibition of exocrine pancreatic secretion in the postoperative period may reduce the incidence of POPF. Somatostatin and its octapeptide analogue have been used by various groups to reduce the pancreatic juice secretion and thereby prevent POPF.

- Preoperative Irradiation:Preoperative irradiation of the pancreas reduces the exocrine function, as the pancreatic acinar cells are very sensitive. This forms the basis for the concept of preoperative irradiation to reduce the incidence of POPF.
- Technical Modifications to Prevent POPF:
  - Pancreatic Duct Stent or Drainage
  - Fistulation Method



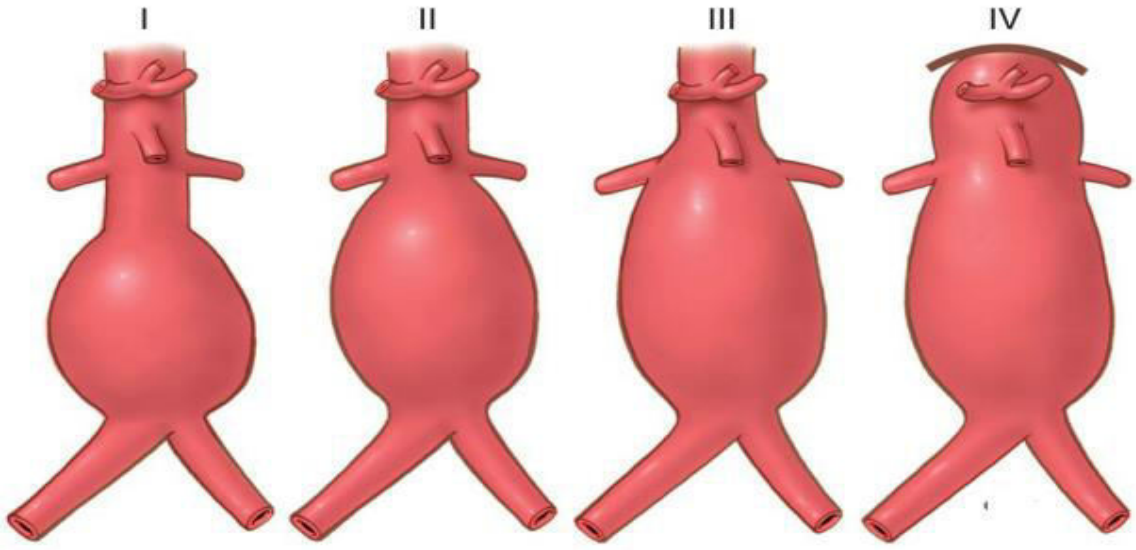
Treatment:

- Control of sepsis.
- Maintenance of Fluid and Electrolyte Balance and Nutrition
- Skin protection
- Somatostatin analogues

- Percutaneous Treatment
- ERCP
- Fistulojejunostomy
- Surgical options
    - Completion pancreatectomy.
    - Drainage of the anastomosis.
    - Reconstruction of anastomosis.

6. Classify Abdominal Aortic Aneurysm and discuss its management. 10

Answer. infrarenal (I), juxtarenal (II), pararenal (III), and suprarenal (IV).



Risk Factors for Rupture of Abdominal Aortic Aneurysm:

RISK FACTOR	LOW RISK	AVERAGE RISK	HIGH RISK
Diameter	<5 cm	5-6 cm	>6 cm
Expansion	<0.3 cm/yr	0.3-0.6 cm/yr	>0.6 cm/yr
Smoking, COPD	None, mild	Moderate	Severe/steroids
Family history	No relatives	One relative	Numerous relatives
Hypertension	Normal blood pressure	Controlled	Poorly controlled
Shape	Fusiform	Saccular	Very eccentric
Gender		Male	Female

Role of imaging

- detection of AAA
- monitoring of growth rate

- pre-operative planning
- post-operative follow-up

Plain radiograph

An aneurysm may be visible as an area of curvilinear calcification in the paravertebral region on either abdominal or lumbar spine radiographs performed for alternative indications. Radiographs are not optimal for detection or follow-up.

Ultrasound

Ultrasound assessment is simple, safe and inexpensive. It has a reported sensitivity of 95% and specificity close to 100%. It is usually the preferred choice for the monitoring of small aneurysms. The measurement error for ultrasound evaluation of AAA is 4 mm [12]; keep in mind that an aneurysm never decreases in size.

CT :CT angiography (CTA) is considered the imaging gold standard but exposes the patients to high radiation doses. It is excellent for pre-operative planning as it accurately delineates the size and shape of the AAA and its relationship to branch arteries and the aortic bifurcation. Oblique reformations enable accurate measurements in non-orthogonal planes. CTA is superior to ultrasound in detecting and measuring common iliac artery aneurysms.

Signs of frank rupture include:

- retroperitoneal haematoma
- para-aortic fat stranding
- contrast extravasation from the aorta into the retroperitoneum

Signs of impending rupture or contained leakage:

- draped aorta sign (contained rupture)
- high-attenuation crescent sign
- thrombus fissuration
- focal discontinuity of intimal calcification
- tangential calcium sign

An increasing diameter of the aneurysmal sac of 10 mm over a 12-month interval or a diameter of 7 cm are also considered to be at high risk for rupture and warrant urgent repair.

MR angiography: Offers lack of ionising radiation, but is more costly, less widely available, and the examination is substantially lengthier.

Angiography: Digital subtraction angiography (DSA) does not show the true aneurysm size if there is a mural thrombus but is superb at delineating branch vessels. Barring certain contraindications, endovascular repair of AAA is usually the first treatment choice.

Treatment and prognosis:

- The natural history of abdominal aortic aneurysms is that of slow expansion, with possible eventual rupture having devastating consequences.
- The risk of rupture is proportional to the size of the aneurysm and the rate of growth. Differing rates of rupture for a given aneurysm size have been reported in the literature, but the general consensus is that aneurysms greater than 5.0 cm in diameter in women and 5.5 cm in men carry a significantly increased risk of rupture and should be treated. Furthermore, aneurysms that expand at a rate greater than 10 mm per annum are also at significant risk of rupture and are considered for treatment even when less than 5.0 cm.
- In patients with a connective tissue disorder, especially those with a bicuspid aortic valve, surgical treatment may be considered even with a diameter smaller than 5.0 cm.
- Follow-up intervals for imaging an enlarged infrarenal abdominal aorta from initial detection.

    - <2.5 cm: follow up not needed
    - 2.5-2.9 cm: 5 year interval
    - 3.0-3.4 cm: 3 year interval
    - 3.5-3.9 cm: 2 year interval
    - 4.0-4.4 cm: 1-year interval
    - 4.5-4.9 cm: 6-month interval
    - 5.0-5.5 cm: 3-6 month interval
    - >5.5 cm: treatment

Management options include:

- Endovascular aneurysm repair (EVAR)
- Open surgical repair: Open repair is indicated in young patients as an elective procedure, or in growing or large, symptomatic or ruptured aneurysms. The aorta must be clamped off during the repair, denying blood to the abdominal organs and sections of the spinal cord; this can cause a range of complications. It is essential to make the critical part of the operation fast, so the incision is typically made large enough to facilitate the fastest repair. Recovery after open AAA surgery takes significant time. The minimums are a few days in intensive care, a week total in the hospital and a few months before full recovery.

7. Management of lower oesophageal cancer. **10**

Answer. Treatment of esophageal cancer varies according to stage—locoregional (stages I-III) versus metastatic cancer (stage IV)—and histologic subtype—squamous cell carcinoma (SCC) versus adenocarcinoma.

National Comprehensive Cancer Network (NCCN) treatment recommendations for esophageal cancer include the following:

- Endoscopic therapy (endoscopic mucosal resection, endoscopic submucosal dissection and/or ablation) is preferred for high-grade dysplasia (HGD) or T1a tumors ≤2 cm; ablation alone is a primary treatment option for patients with HGD.
- Select pT1a or pT1b tumors can be treated with endoscopic resection (ER); ablation of residual Barrett esophagus should follow ER.

- Additional ablation may be needed after ER if multifocal HGD is present elsewhere in the esophagus but may not be needed for tumors that are completely resected.
- Esophagectomy is indicated for patients with extensive HGD or pT1a adenocarcinoma with nodular disease that is not adequately controlled by ER with or without ablation; a transhiatal or transthoracic, or minimally invasive approach may be used; gastric reconstruction preferred; for postoperative nutritional support, feeding jejunostomy is preferred to gastrostomy.
- Primary treatment options for patients with SCC T1b, N+ tumors and locally advanced resectable tumors (T2-T4a, any regional N) include preoperative chemoradiation (for non-cervical esophagus tumors), definitive chemoradiation (recommended for cervical esophagus tumors) or esophagectomy (for non-cervical esophagus tumors).
- For patients with adenocarcinoma T1b, N+ tumors and locally advanced resectable tumors (T2-T4a, any regional N) preoperative chemoradiation is preferred; definitive chemoradiation is indicated only for non-surgical patients; esophagectomy is an option for patients with low-risk, <2 cm, well-differentiated lesions.
- Tumors in the submucosa (T1b) or deeper may be treated with esophagectomy.
- For patients with SCC, no postoperative treatment is indicated if no residual disease is present at surgical margins (R0 resection).
- For patients with adenocarcinoma who have not received preoperative therapy, postoperative fluoropyrimidine-based chemoradiation (following R0 resection) is indicated for all patients with Tis, T3-T4 tumors, node-positive T1-T2 tumors, and selected patients with T2, N0 tumors with high-risk features.
- Chemotherapy following R0 resection is indicated for all patients with adenocarcinoma, irrespective of the nodal status.
- Chemoradiation may be offered to all patients with residual disease at surgical margins (R1 and R2 resections).
- Definitive chemoradiation is preferred for all T4b (unresectable) tumors.
- Fluoropyrimidine- or taxane-based regimens are indicated for preoperative and definitive chemoradiation.
- Trastuzumab should be added to first-line chemotherapy (category 1 for combination with cisplatin and fluoropyrimidine; category 2B for combination with other chemotherapy agents) for patients with HER2-overexpressing advanced or metastatic adenocarcinoma (a tumor immunohistochemistry [IHC] score of 3+ or 2+ with the evidence of HER2 amplification by fluorescent in situ hybridization [FISH]).
- Ramucirumab, either as a single agent or in combination with paclitaxel, was approved in 2014 by the US Food and Drug Administration (FDA) for the treatment of patients with advanced esophagogastric junction (EGJ) adenocarcinoma refractory to or progressive following first-line therapy with platinum- or fluoropyrimidine-based chemotherapy.
- Esophageal resection (esophagectomy) remains a critical component of multimodality therapy for patients with tumors of any stage. Endoscopic mucosal resection is an experimental approach to patients with T1a disease or high-grade dysplasia that is limited to certain centers and performed only under protocol. Esophagectomy is no longer is used for palliation of symptoms because other treatment modalities have become available for relieving dysphagia.
- An esophagectomy can be performed by using an abdominal and a cervical incision with blunt mediastinal dissection through the esophageal hiatus (ie, transhiatal esophagectomy [THE]) or by using an abdominal and a right thoracic incision (ie, transthoracic esophagectomy [TTE]).

Transthoracic esophagectomy:

There are two types of TTE, as follows:

- Ivor Lewis esophagectomy (right thoracotomy and laprotomy)
- McKeown esophagectomy (right thoracotomy followed by laprotomy and cervical anastomosis)

Transhiatal esophagectomy:

For THE, the preoperative details are similar to those of TTE, except that a single-lumen, rather than a double-lumen, endotracheal tube is used. The neck is prepared in the operative field.

Minimally invasive esophagectomy:

The use of laparoscopic and thoracoscopic techniques has revolutionized the treatment of benign esophageal disorders such as achalasia and gastroesophageal reflux disease (GERD). Advantages of minimally invasive surgery include a shorter hospital stay, less postoperative discomfort, and much faster recovery time than with open surgery. Minimally invasive esophagectomy (MIE) is finding a place in the treatment of esophageal cancer.

8. Pathophysiology and treatment of Rectal Prolapse. 10

Answer. The pathophysiology of rectal prolapse is not completely understood or agreed upon. There are two main theories, which essentially are different ways of expressing the same idea.

The first theory postulates that rectal prolapse is a sliding hernia through a defect in the pelvic fascia. The second theory holds that rectal prolapse starts as a circumferential internal intussusception of the rectum beginning 6-8 cm proximal to the anal verge. With time and straining, this progresses to full-thickness rectal prolapse, though some patients never progress beyond this stage.

The pathophysiology and etiology of mucosal prolapse most likely differ from those of full-thickness rectal prolapse and internal intussusception. Mucosal prolapse occurs when the connective tissue attachments of the rectal mucosa are loosened and stretched, thus allowing the tissue to prolapse through the anus. This often occurs as a continuation of long-standing hemorrhoidal disease and is treated as such.

Often, prolapse begins with an internal prolapse of the anterior rectal wall and progresses to full prolapse.

Etiology: The precise cause of rectal prolapse is not defined; however, a number of associated abnormalities have been found. As many as 50% of prolapse cases are caused by chronic straining with defecation and constipation.

Other predisposing conditions include the following:

- Pregnancy
- Previous surgery
- Diarrhea
- Benign prostatic hypertrophy
- Chronic obstructive pulmonary disease (COPD)
- Cystic fibrosis

- Pertussis (ie, whooping cough)
- Pelvic floor dysfunction
- Parasitic infections – Amebiasis, schistosomiasis
- Neurologic disorders - Previous lower back or pelvic trauma/lumbar disk disease, cauda equina syndrome, spinal tumors, multiple sclerosis
- Disordered defecation (eg, stool withholding)

Treatment:

Nonoperative Management

- Generally, a prolapsed rectum can be reduced with gentle digital pressure; an incarcerated rectal prolapse is rare. Several maneuvers to help reduce the prolapse have been described and include sedation, field block with local anesthetic, and sprinkling the prolapse with either salt or sugar to decrease the edema and to reduce the prolapse.
- Although no medical treatment is available for rectal prolapse, internal prolapse should always be first treated medically with bulking agents, stool softeners, and suppositories or enemas. Biofeedback may be helpful if paradoxical pelvic floor contraction also exists.
- Contributing factors, such as constipation and diarrhea, should be addressed and eliminated if possible. Supportive care should be provided according to the clinical picture, particularly in the presence of an irreducible prolapse and with gangrene or rupture of the rectal mucosa. Obtain a prompt surgical evaluation if anal incontinence is present.
- If the prolapse cannot be reduced and the viability of the bowel is in question, emergency resection is required. Rupture of the rectum also constitutes a surgical emergency.

Surgical Options: Contraindications for surgical correction of rectal prolapse are based on the patient's comorbidities and his or her ability to tolerate surgery. Surgical treatments can be divided into two categories according to the approach used to repair the rectal prolapse: abdominal procedures and perineal procedures. The choice between an abdominal procedure and a perineal procedure is mainly dictated by the patient's age and comorbidities.

❖ Abdominal Surgical Procedures

- As noted, abdominal repairs are typically performed in younger, healthier patients, whose life expectancy is longer. For these patients, procedures with lower recurrence rates but higher morbidities are most appropriate. The choice of abdominal procedure is often dictated by the extent of the associated constipation and by the surgeon's preference.
- Laparoscopic surgical rectopexy procedures have been developed that have outcomes as good as those of open abdominal procedures but are associated with shorter hospital stays and greater patient comfort.

Anterior resection

- Patients with rectal prolapse and constipation often have a redundant colon, and some surgeons believe that resection of this alleviates constipation and decreases recurrence of rectal prolapse.
- In an anterior resection for rectal prolapse, the rectum is mobilized to the level of the lateral ligaments, and the redundant colon (sigmoid) is resected. The left colon is then anastomosed to the top of the rectum. This anastomosis is performed without laxity in the colon so that the rectum is

held in place and can no longer prolapse. At present, few colorectal surgeons perform this procedure, because it is not thought to address anatomic abnormalities such as poor rectal fixation.

- Marlex rectopexy: In a Marlex rectopexy (Ripstein procedure), the entire rectum is mobilized down to the coccyx posteriorly, the lateral ligaments laterally, and the anterior cul-de-sac anteriorly (see the image below). A nonabsorbable material (eg, Marlex mesh or an Ivalon sponge) is fixed to the presacral fascia. The rectum is placed on tension, and the material is partially wrapped around the rectum to keep it in position. To prevent a circumferential obstruction, the anterior rectal wall is not covered with the sponge or mesh.
- Perineal Surgical Procedures: Perineal procedures have higher recurrence rates but lower morbidities and are often performed in elderly persons or in patients for whom general anesthesia is contraindicated.

Anal encirclement

- With anal encirclement (Thiersch wire), a nonabsorbable band is placed subcutaneously around the anus. The purpose of this procedure is to keep the rectum from prolapsing by restricting the size of the anal lumen. Although the procedure was initially described as using a wire, it now employs other materials (eg, Silastic tubing and nonabsorbable suture material) instead. Anal encirclement is effective in mechanically preventing the rectum from prolapsing, but it does not treat the underlying disorder.
- Complications from this procedure include obstruction with fecal impaction and erosion of the wire with infection. Anal encirclement is no longer commonly performed; it is usually reserved for only the most debilitated patients and for patients with the highest surgical risks, in whom palliation is the goal. Anal encirclement carries a very high risk of fecal impaction.

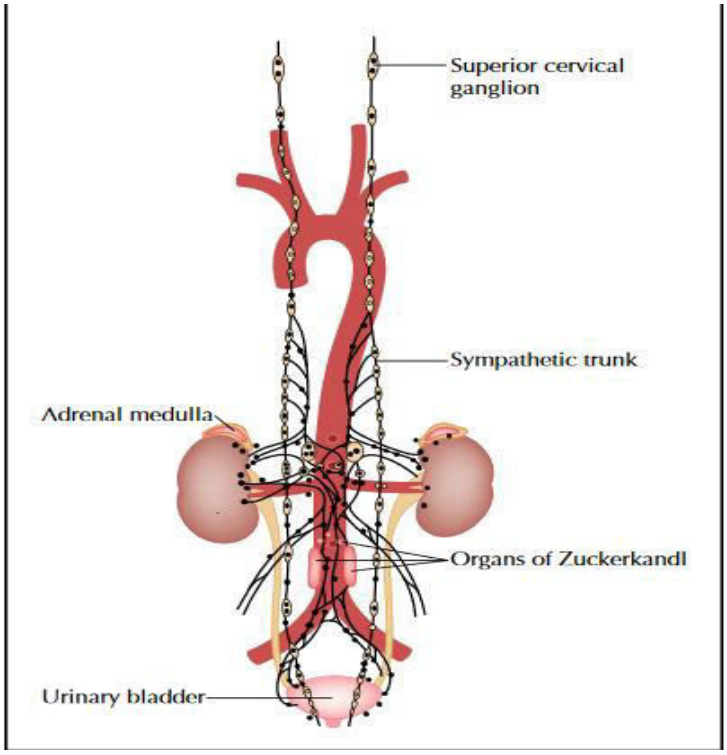
Delorme mucosal sleeve resection: In a Delorme mucosal sleeve resection (see the image below), a circumferential incision is made through the mucosa of the prolapsed rectum near the dentate line; with the electrocautery, the mucosa is stripped from the rectum to the apex of the prolapse and excised. The denuded prolapsed muscle is then pleated with a suture and reefed up like an accordion, and the transected edges of the mucosa are sutured together. This procedure is often used for small prolapses but may also be used for large ones.

Altemeier procedure: The Altemeier procedure (Perineal rectosigmoidectomy) for rectal prolapse provided excellent results across all age groups with minimal morbidity, allowing for short hospital stays and periods of convalescence.

9. What are the extra adrenal sites of Pheochromocytoma? Name the genetic factors predispose to pheochromocytoma. How will you investigate a case of pheochromocytoma and differentiate between benign and malignant tumor? 2+1+4+3

Answer. A classification system for EAPs proposed by Glenner and Grimley in 1974 divided the tumors into four groups based on location: branchiomeric, intravagal, aorticosympathetic, and visceroautonomic.
The branchiomeric and intravagal tumors occur in the head and neck, are rarely functional, and generally stain negative for chromaffin.
The aorticosympathetic group is found along the length of the aorta, between the renal arteries, around the iliac bifurcation, and includes the organ of Zuckerkandl.

The visceroautonomic division occurs in association with blood vessels or visceral organs like the bladder.
The latter two groups tend to be functional and usually are chromaffin positive.



Extra-adrenal paraganglioma

- Carotid body
- Jugulotympanic
- Vagal
- Laryngeal
- Aortico-pulmonary
- Gangliocytic
- Caudaequine
- Orbital Nasopharyngeal

Extra-adrenal sympathetic paraganglioma

- Superior and inferior para-aortic paraganglioma
- Urinary bladder
- Intrathoracic and cervical paravertebral

GENE(S)	ASSOCIATED FINDING(S)	SYNDROME NAME
SDHA, SDHAF2, SDHB, SDHC, SDHD	Paraganglioma, pheochromocytoma, kidney cancer, thyroid cancer, and gastrointestinal stromal tumors (GISTs)	Hereditary Paraganglioma and Pheochromocytoma syndrome
VHL	Pheochromocytoma, kidney cancer, kidney and pancreatic cysts, retinal angiomas and hemangioblastomas	Von Hippel Lindau syndrome
RET	Pheochromocytoma, medullary thyroid cancer, mucosal and gastrointestinal neuromas	Multiple Endocrine Neoplasia syndrome Type II (MEN2)
NF1	Pheochromocytoma, breast cancer, neurofibromas and other non-cancerous findings	Neurofibromatosis Type I
MAX	Pheochromocytoma	
TMEM127	Paraganglioma, pheochromocytoma	

Investigations: The Endocrine Society, the American Association for Clinical Chemistry, and the European Society of Endocrinology have released clinical practice guidelines for the diagnosis and management of pheochromocytoma and paraganglioma (jointly referred to as PPGL).

- Biochemical testing via measurement of plasma free metanephrines or urinary fractionated metanephrines should be performed in patients suspected of having PPGL.
- Patients with a known germ-line mutation that predisposes to PPGL should undergo periodic biochemical testing.
- Computed tomography (CT), rather than magnetic resonance imaging (MRI), is recommended as the first-line imaging technique.
- Blood pressure, heart rate, and glucose levels should be monitored immediately after surgery.
- Patients with PPGLs should participate in shared decision-making for genetic testing.

- Catecholamines produced by pheochromocytomas are metabolized within chromaffin cells. Norepinephrine is metabolized to normetanephrine and epinephrine is metabolized to metanephrine. Because this process occurs within the tumor, independently of catecholamine release, pheochromocytomas are best diagnosed by measurement of these metabolites rather than by measurement of the parent catecholamines.
- Guidelines from the North American NeuroEndocrine Tumor Society (NANETS) recommend biochemical testing for pheochromocytoma in the following cases:

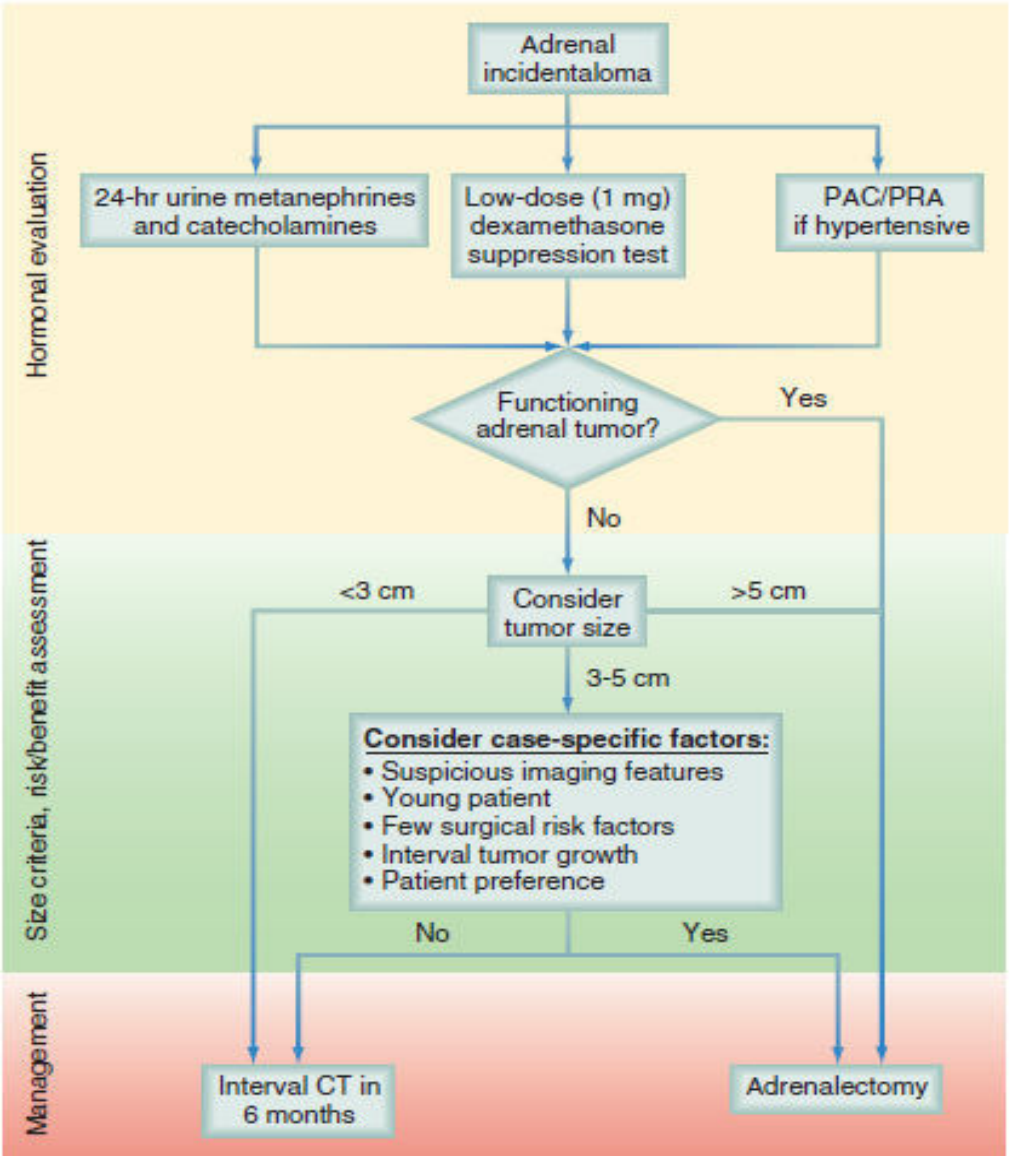
    - Symptomatic patients

- Patients with an adrenal incidentaloma
- Patients who have a hereditary risk for developing a pheochromocytoma or paraganglioma (extra-adrenal pheochromocytoma)

- The choice of diagnostic test should be based on the clinical suspicion of a pheochromocytoma.
- General laboratory features of pheochromocytoma include the following:

- Hyperglycemia
- Hypercalcemia
- Erythrocytosis

Imaging studies should be performed only after biochemical studies have confirmed the diagnosis of pheochromocytoma. Computed tomography (CT) scanning or magnetic resonance imaging (MRI) can be used for detection of the disorder. Scintigraphy may be used when these techniques fail to localize the tumor. Positron emission tomography (PET) scanning has shown promising results as an imaging modality for pheochromocytoma.



Algorithm for the management of an adrenal incidentaloma. Adrenalectomy is recommended for all patients with functional tumors. For nonfunctioning tumors, the risk for malignancy is assessed according to size. Tumors larger than 5 cm on CT carry a >25% risk for malignancy and need to be removed. Those <3 cm can be safely observed.

Case-specific factors must be considered for intermediate sized tumors. PAC, Plasma aldosterone concentration, in ng/ dL; PRA, plasma renin activity, in ng/(mL • hr).

Now to differentiate malignant from benign pheochromocytoma:

i. Vascular invasion, cellular atypia, and even local recurrence do not definitively identify a pheochromocytoma as malignant. Currently, a malignant pheochromocytoma is defined only by the presence of metastasis.
ii. A younger age at diagnosis has been suggested to be a clinical risk factor for malignant.

iii. PASS was proposed as a scoring system for malignancy risk. However, there have been conflicting reports regarding its reliability in predicting malignancy. Thompson et al. found that tumors with a PASS >4 exhibited increased metastatic potential.
iv. Norepinephrine- or dopamine-producing tumors have a higher risk of malignancy.
v. Extra-adrenal paragangliomas are more commonly malignant than intra-adrenal paragangliomas.

Things to be noted:

- Age and gender.
- Primary tumor location (If multiple tumors are present, the tumor that is >5 cm and/or associated with local spread or regional positive lymph nodes is considered the primary tumor).
- Hormone- and tumor-related symptoms, including hypertension, constipation, and pain.
- Serum chromogranin A levels and urinary and/or plasma metanephrine, normetanephrine, and methoxytyramine levels indexed to urinary creatinine levels.
- Genetic syndrome.
- Best scintigraphic imaging among 18F-fluorodeoxyglucose positron emission tomography, metaiodobenzylguanidine scintigraphy, and somatostatin receptor scintigraphy.
- Bone, lung, liver, and lymph node tumor burden determined by head and neck, thoracic, abdominal, and pelvic computed tomography and/or magnetic resonance imaging in early arterial phase and guided computed tomography and/or magnetic resonance imaging.
- Morphological tumor progression at 3 months, without therapy if feasible.

10. Enumerate the steps of whipple operation with reference to "artery first approach". 10

Answer. The technique of pancreatoduodenectomy (PD) has evolved. Previously, non-resectability was determined by involvement of the portal vein–superior mesenteric vein. Because venous resection can be achieved safely and with greater awareness of the prognostic significance of the status of the posteromedial resection margin, non-resectability is now determined by involvement of the superior mesenteric artery (SMA). This change, with a need for early determination of resectability before an irreversible step, has promoted the development of an 'artery-first' approach.

Steps:
Incision: Abdomen is opened from the Bilateral Subcostal incision. (Chevron's Incision)
Chevron Incision.
Exploration: Abdominal cavity is explored for metastasis especially in liver, base of mesentary, mesocolon and pelvis.

Now the actual Whipple Procedure steps begin:
Dissection

- Kocher's maneuver is performed and duodenum along with the head of pancreas mobilized to the midline. This step exposes the IVC.
- Cattell braasch maneuver is the next step and hepatic flexure of colon is brought down completely expsoing the retroperitoneum and separating hepatic flexure of colon from the liver.
- Superior Mesenteric Vein is seen passing from the mesentary to its course to join the portal vein.
- Creation of Tunnel of Love: At this step attempt may be made to try and create the tunnel between the Superior mesenteric vein and pancreas but if it is problematic it may be attempted

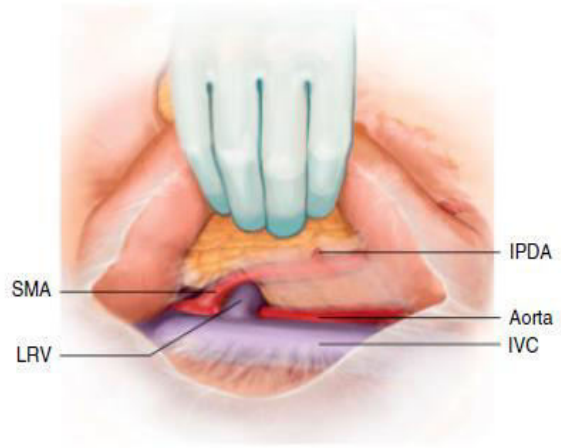
at the later stage. It is at this crucial time the resectability for Pancreaticoduodenectomy is decided.

- Dissection is started at the free border of lesser sac and Common bile duct, Right hepatic artery and portal vein are identified. At this step special care is taken to identify and safeguard accessory or replaced Right hepatic artery. This artery is easily found posterolateral to the portal vein.
- Gall bladder is dissected from the liver bed and followed onto the cystic duct, Common bile duct is divided at the junction with the cystic duct. The Right hepatic artery is traced back and just above the duodenum Gastro duodenal artery is tied off.
- The hepatoduodenal ligament is dissected easily as it is avascular and next after clearing the lesser curve of stomach and greater curve, stomach is usually transected.
- The portal vein is now seen clearly and the tunnel between it and pancreas is fashioned.
- The pancreas is now cut and separated from the portal vein.
- Pancreaticojejunostomy can be done duct to mucosa
- Hepaticojejunostomy is next- Done in single layer and can be performed in interrupted or continuous fashion.
- Gastrojejunostomy is the final step of reconstruction.
- Drains may or may not be placed depending on surgeon's experience and abdomen is closed.

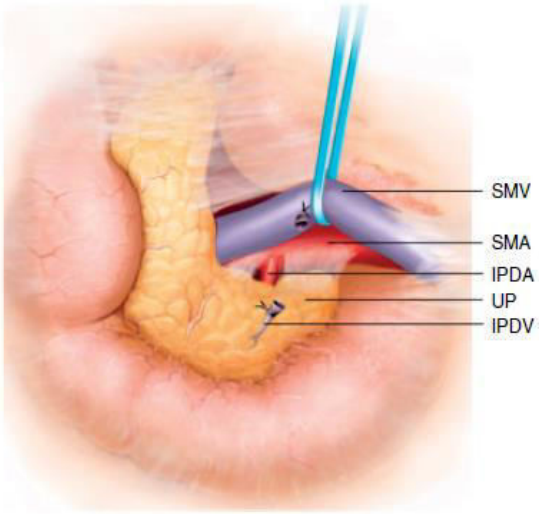
Summary of indications, advantages and disadvantages of various artery-first approaches

Approach	Indication(s)	Advantages	Disadvantages
Posterior	Posteromedial tumour in head/neck, especially involving PV–SMV Periampullary tumour extending from body to head	Early identification of SMA involvement Identification of replaced RHA Enables adequate retropancreatic lymphadenectomy Early identification of SMV involvement and facilitates *en bloc* resection	Difficult in patients with peripancreatic inflammation and adhesions around head of pancreas
Medial uncinate	Malignant tumours of uncinate process	Early identification of SMA involvement at uncinate Early ligation of IPDA minimizes bleeding Useful approach in peripancreatic inflammation with difficulty tunnelling above PV Useful approach for total pancreatectomy as mobilization can be achieved without transecting gland	Late identification of replaced RHA
Inferior infracolic (mesenteric)	Locally advanced tumours with questionable infiltration of SMA at its origin from aorta Malignant tumours of uncinate and ventral pancreas	Early identification of replaced RHA Allows better exposure and dissection of region posterior to SMA Early ligation of IPDA minimizes bleeding	Difficult in morbidly obese patients Difficult exposure in patients with high origin of SMA
Left posterior	Tumours along uncinate and ventral pancreas	Facilitates skeletonization of SMA in retroperitoneum without kocherization of duodenum Early ligation of IPDA	Extensive dissection of SMA requiring antidiarrhoeals
Inferior supracolic (anterior)	Tumours along inferior border of pancreas	Facilitates better retroperitoneal dissection, especially with locally advanced tumours with neoadjuvant treatment 'No-touch' technique with *en bloc* kocherization theoretically prevents tumour cell dissemination	Early division of stomach and neck of pancreas
Superior	Malignant tumours of superior border of pancreas	Early identification of CHA, coeliac and SMA involvement	Difficult exposure in patients with low origin of SMA

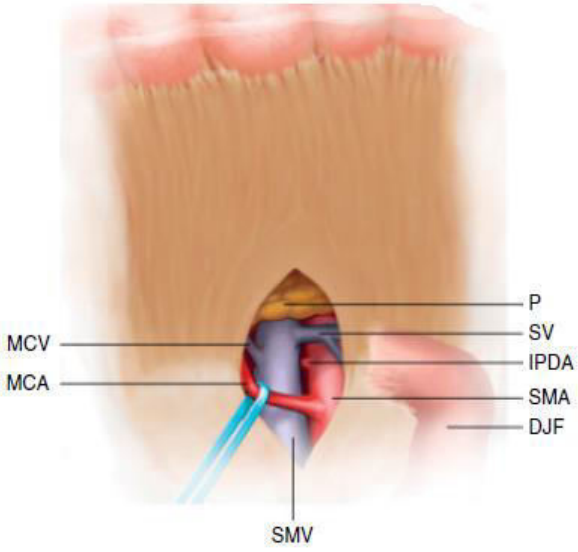
PV, portal vein; SMV, superior mesenteric vein; SMA, superior mesenteric artery; RHA, right hepatic artery; IPDA, inferior pancreatoduodenal artery; CHA, common hepatic artery.



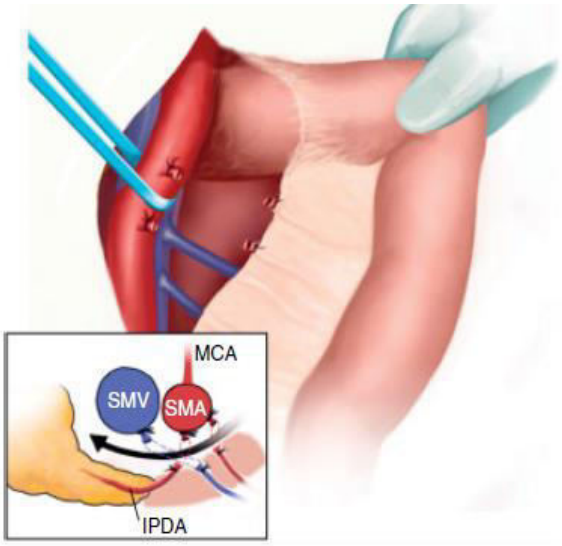
Posterior approach, exposing the origin of superior mesenteric artery (SMA) in front of the left renal vein after kocherization. For clarity the SMA has been made more apparent. IPDA, inferior pancreatoduodenal artery; LRV, left renal vein; IVC, inferior vena cava



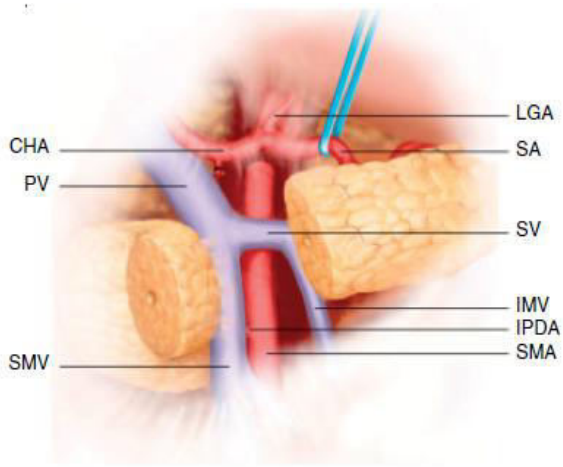
Medial uncinate approach, demonstrating the uncinate process (UP), inferior pancreatoduodenal artery (IPDA) and vein (IPDV), superior mesenteric artery (SMA) and vein (SMV) after kocherization and mobilization of the duodenojejunal flexure



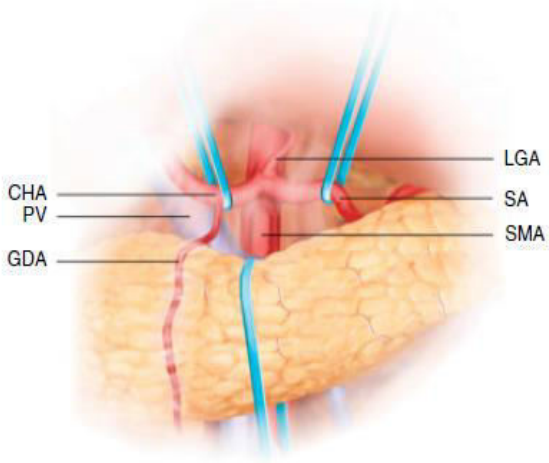
Inferior infracolic approach (mesenteric approach) exposing the superior mesenteric artery (SMA) and vein (SMV) and branches after dividing the peritoneum to the right of the duodenojejunal flexure (DJF) in the transverse mesocolon. P, pancreas; SV, splenic vein; MCV, middle colic vein; IPDA, inferior pancreatoduodenal artery; MCA, middle colic artery



Left posterior approach, exposing the first and second jejunal arteries at their origin on the superior mesenteric artery (SMA) in the transverse mesocolon. Further traction on the proximal jejunum produces a counterclockwise rotation to the SMA that allows identification and division of the inferior pancreatoduodenal artery (IPDA) arising from the posterior surface of the SMA (inset). MCA, middle colic artery; SMV, superior mesenteric vein



Inferior supracolic approach (anterior approach), demonstrating the superior mesenteric artery (SMA) and vein (SMV), splenic vein (SV) and coeliac axis and its branches after division of the neck of the pancreas. LGA, left gastric artery; CHA, common hepatic artery; SA, splenic artery; PV, portal vein; IMV, inferior mesenteric vein; IPDA, inferior pancreatoduodenal artery



Superior approach demonstrating the coeliac axis and its branches and the superior mesenteric artery (SMA) in the lesser sac above the neck of the pancreas. LGA, left gastric artery; CHA, common hepatic artery; SA, splenic artery; PV, portal vein; GDA, gastroduodenal artery

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2016

PAPER - II

Time Allowed: 3 Hours **Full Marks: 100**

Attempt all questions (ten marks for each question)

1. **Write down the classification of post operative biliary stricture and their management.**
2. **Discuss the investigations and management of carcinoma urinary bladder.**
3. **Clinical presentation, diagnosis and work up of carcinoma stomach.**
4. **Indications and advantage of diagnostic laparoscopy.**
5. **Discuss diagnosis and management of hydatid cyst of liver.**
6. **What is type -3 intestinal failure ? Discuss the management policy.**
7. **Work up and diagnosis of solitary thyroid nodule.**
8. **Discuss the role of radical neck dissection for the management of head and neck cancer.**
9. **Discuss the current trends of management of colorectal liver metastasis.**
10. **Discuss the management of acute pancreatitis. What are the indications of operative intervention?**

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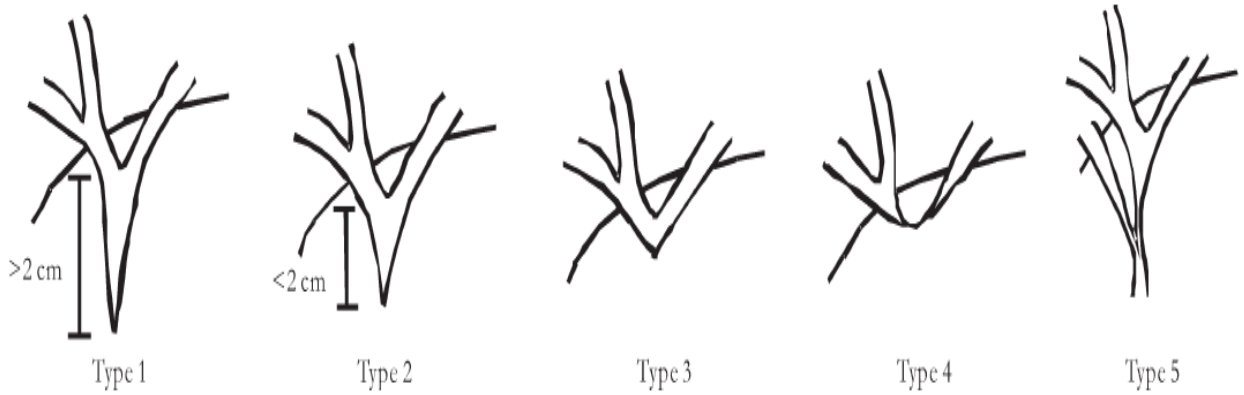
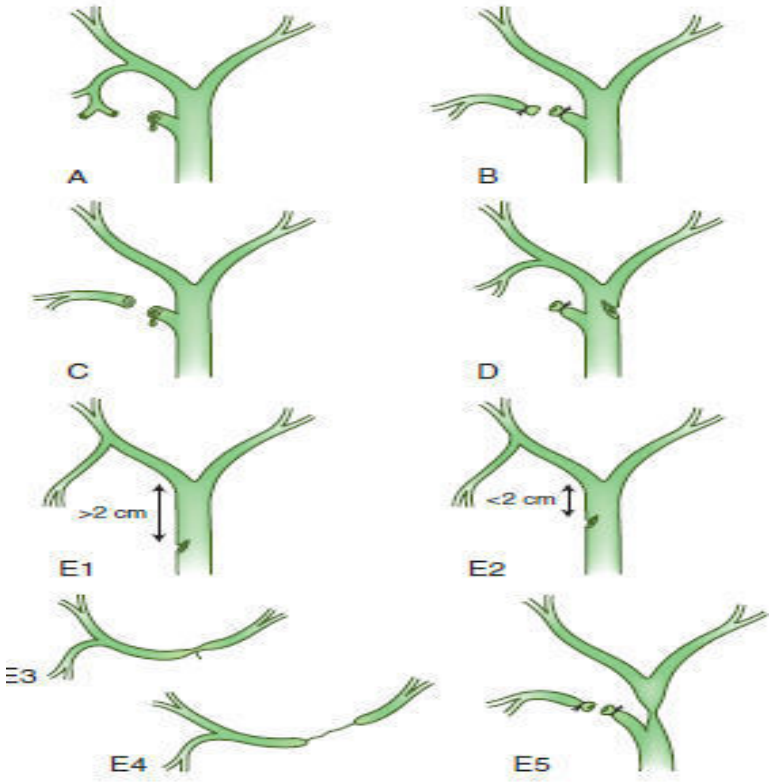
1) **Write down the classification of post operative biliary stricture and their management.**

Bismuth classification of benign bile duct strictures:



Type	Criteria
1	Low CHD stricture, with a length of the common hepatic duct stump of >2 cm
2	Proximal CHD stricture-hepatic duct stump <2 cm
3	Hilar stricture, no residual CHD, but the hepatic ductal confluence is preserved
4	Hilar stricture, with involvement of confluence and loss of communication between right and left hepatic duct
5	Involvement of aberrant right sectorial hepatic duct alone or with concomitant stricture of the CHD

Strasberg classification of post operative biliary stricture:



Type A	Cystic duct leaks or leaks from small ducts in the liver bed
Type B	Occlusion of part of the biliary tree, typically clipped and divided right hepatic ducts
Type C	Transection (but not ligation) of the aberrant right hepatic ducts
Type D	Lateral injuries to major bile ducts
Type E1	Common hepatic duct division, >2cm from bifurcation
Type E2	Common hepatic duct division, <2cm from bifurcation
Type E3	Common bile duct division at bifurcation
Type E4	Hilar stricture, involvement of confluence and loss of communication between right and left hepatic duct
Type E5	Involvement of aberrant right hepatic duct alone or with concomitant stricture of the CHD

Management:

- Treat/Relieve complications: Sepsis, obstruction, fistula
- Characterize bile duct injury
- Treat injury
- Follow-up

If pain, fever, sepsis, no jaundice (i.e. likely A) – US or CT to evaluate & drain collection
If bile is found – can use HIDA to see if leak is active
 If leak is active, then ERCP will characterize it and treat it (stent, sphincterotomy)
If jaundice – start with ERCP +/- US
 ERCP won't characterize proximal biliary tree
 PTC is invaluable
May be difficult if no dilation

Can drain effectively -> temporize
 If already draining bile – fistulogram

When to operate:

Intraoperatively, C, D, or E injuries are seen
 If recognized, need to convert to open

Ideally, intraoperatively at first operation or ASAP
 Otherwise, if no experience - drain and refer

If injury took place > 72h, try to temporize at least 8 weeks, ideally 12 weeks.
 Let inflammation settle and :thermal/devascularization injury to manifest itself fully
 If uncontrolled sepsis – then no delay

Type A:

Endoscopic internal stenting:

Reduces pressure gradient
 procedure of choice for treating bile duct leaks
 7 & 10 Fr stents can be inserted without sphincterotomy
 prompt therapeutic response seen
 cessation of bile extravasation in 70-95% of cases within a period of 1-7 days.

Type B

Most asymptomatic
 Usually present late or discovered incidentally
 If affected segment small – no Tx
 If large and cholangitis – consider hepaticojejunostomy vs segmental resection

Type C:

Oversew if duct is less then 2 mm
Otherwise, enteric anastomosis

Type D:

Some can be treated with stent
 Repair over a T tube
  Intubate or separate stab
  drain

Type E:

Hepaticojejunostomy
 Hepaticoduodenostomy
  Usually avoided – too much tension
 End-to-end
  If no loss of length and clean cut
  Higher incidence of stricture…
  Some do not recommend due to ischemia of CBD

Principle of repair:

- Tension free
- Mucosa to mucosa
- Adequate diameter

Follow up:

- **LFT**

- **USG**
- **HIDA**
- **MRCP.**

2. Discuss the investigations and management of carcinoma urinary bladder.

Answer. Diagnosis:

- After a urinary tract infection has been excluded or treated, all patients with microscopic or macroscopic haematuria require investigation of their upper tracts, bladder, and urethra.
- Renal **ultrasound** and **flexible cystoscopy**, performed under local anaesthetic, are first-line investigations.
- If these fail to find a cause, an **IVU** or **CTU** and **urine cytology** are justified second-line investigations.
- Patients with predominantly filling-type LUTS, suprapubic pain, or recurrent UTI/pneumaturia should also be treated with **urine cytology** and **cystoscopy**.
- **CTU** before and after IV contrast is becoming **the first-line radiological investigation of haematuria**.
    - It is faster and more sensitive than ultrasound or IVU in the detection of renal (parenchymal and urothelial) and ureteric tumours.
    - CTU also detects some bladder tumours, but may overcall bladder wall hypertrophy as tumour and will miss flat CIS and urethral pathology.
    - Thus it cannot replace cystoscopy.

If all investigations are normal, consideration should be given to nephrological disorders that may cause haematuria, such as glomerulonephritis. **Cross-referral to a renal physician is advised in patients with persisting microscopic haematuria, especially those with associated proteinuria or hypertension**.

- **Transurethral resection of bladder tumour (TURBT)** usually provides definitive histological diagnosis .
- This is usually undertaken under general or spinal anaesthesia;
- Bimanual examination is mandatory before and after bladder tumour resection, to assess size, position, and mobility.
- The pathologist should report on the tumour type, grade, and stage; in particular, the presence or absence of muscularis propria should be noted, since its absence will preclude reliable T staging.
- Red patches are biopsied separately; the prostatic urethra is biopsied if radical reconstructive surgery is under consideration.
- Care is taken in resecting tumours at the dome, since intraperitoneal bladder perforation may occur, especially in women with thin-walled bladders.

Staging investigations are usually reserved for patients with biopsy-proven muscle-invasive bladder cancer unless clinically indicated, since superficial TCC and CIS disease are rarely associated with metastases.

- Pelvic CT or MRI may demonstrate extra-vesical tumour extension or iliac lymphadenopathy, reported if **>8mm** in maximal diameter.
- Chest X-ray

- Isotope bone scan (positive in 5-15% of patients with muscle-invasive TCC) is obtained in cases being considered for radical treatment.
- Staging lymphadenectomy (open or laparoscopic) may be indicated in the presence of CT-detected pelvic lymphadenopathy if radical treatment is under consideration.

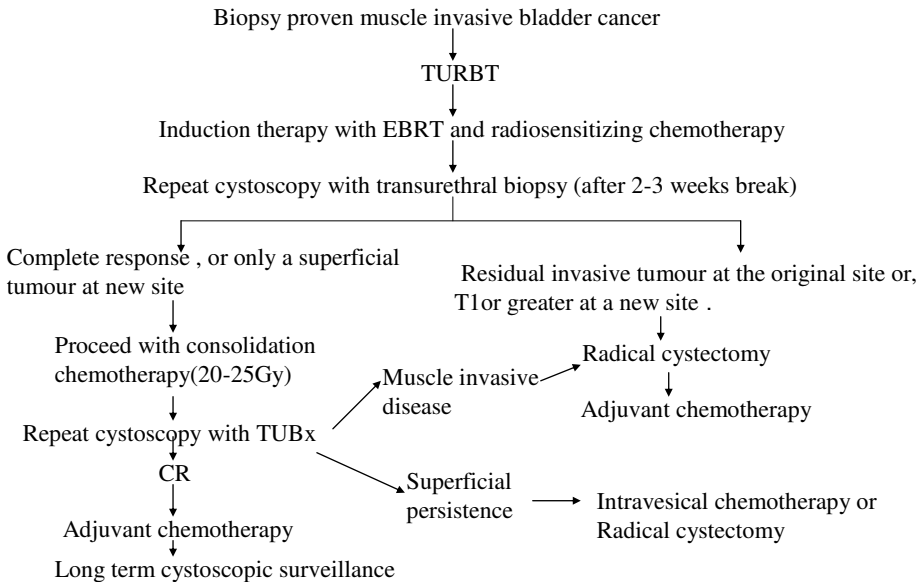
Muscle-invasive bladder cancer: surgical management of localized (pT2/3a) disease:

This is a dangerous disease; untreated 5-year survival is 3%. In the absence of prospective randomized trials comparing the surgical and non-surgical treatments, the options for a patient with newly diagnosed confined muscle-invasive bladder cancer are:

Bladder preserving

- Radical transurethral resection of bladder tumour (TURBT) plus systemic chemotherapy: little data, not mainstream
- Palliative TURBT+ palliative radiotherapy (RT): for elderly/unfit patients
- Partial cystectomy ± neoadjuvant systemic chemotherapy
- TURBT plus definitive RT : poor options for SCC and adenocarcinoma as they are seldom radiosensitive

Treatment algorithm for muscle invasive bladder cancer showing bladder sparing approach.



Radical cystectomy with

- Ileal conduit urinary diversion
- Ureterosigmoidostomy urinary diversion
- Continent urinary diversion

- Neoadjuvant chemotherapy: some evidence of benefit
- Neoadjuvant RT: some evidence of benefit.

Post-operative care

- Many patients will spend the first 24h in the high-dependency unit or ITU.
- Daily clinical evaluation, including inspection of the wound (and stoma if present), plus monitoring of blood count and creatinine/electrolytes, is mandatory.
- Broad-spectrum antimicrobial prophylaxis and thromboembolic prophylaxis with TED stockings, pneumatic calf compression, and subcutaneous heparin are standard.
- Mobilization after 24h is ideal.
- Chest physiotherapy and adequate analgesia is especially important in smokers and patients with chest comorbidity.
- Oral intake is restricted until bowel sounds are present; some patients may require parenteral nutrition in the presence of gastrointestinal complications.
- Drains are usually sited in the pelvis and near the uretero-diversion anastomosis, plus ureteric catheters passing from the renal pelves through the diversion and exiting percutaneously, plus a catheter draining the diversion (except in the case of ileal conduit) exiting urethrally or suprapubically.
- Most patients stay in hospital 10 - 14 days.

Salvage radical cystectomy is technically a more difficult and slightly more morbid procedure. Relatively few patients who have failed primary RT are suitable for this second chance of a cure; fit patients with clinically localized disease.

TNM staging of bladder carcinoma

Tx Primary tumour cannot be assessed

T0 No evidence of primary tumour

Ta Non-invasive papillary carcinoma

Tis Carcinoma in situ

T1 Tumour invades subepithelial connective tissue

T2 Tumour invades muscularispropria (detrusor): T2a inner half; T2b outer half

T3 Tumour invades beyond muscularispropria into perivesical fat: T3a = microscopic; T3b = macroscopic

T4a Tumour invades any of: prostate, uterus, vagina, bowel

T4b Tumour invades pelvic or abdominal wall

Nx Regional (iliac and para-aortic) lymph nodes cannot be assessed

N0 No regional lymph node metastasis

N1 Metastasis in a single lymph node <2cm in greatest dimension

N2 Metastasis in a single lymph node 2 - 5cm or multiple nodes <5cm

N3 Metastasis in a single lymph node or multiple nodes >5cm in greatest dimension

Mx Distant metastasis cannot be assessed

M0 No distant metastasis

M1 Distant metastasis present

Diagnosis:

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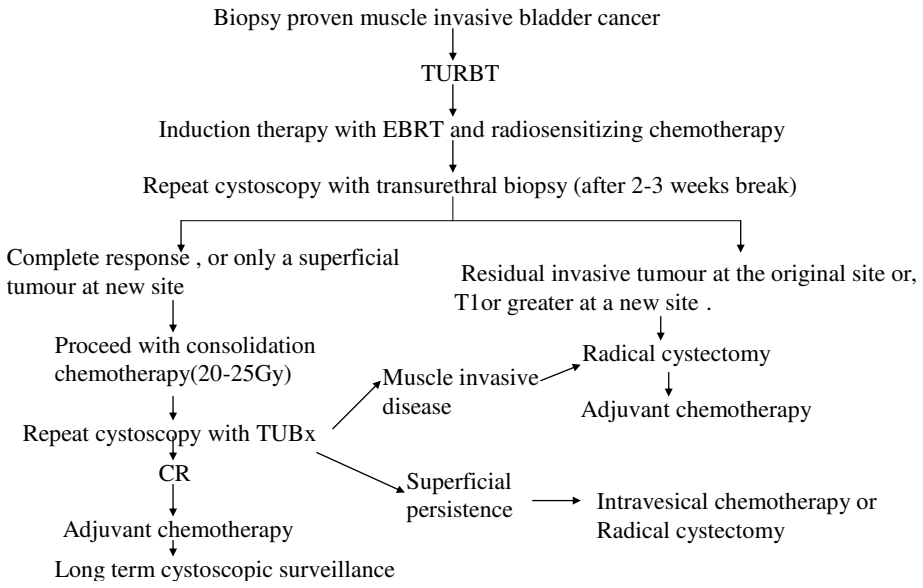

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3. Clinical presentation, diagnosis and work up of carcinoma stomach.

Answer. Clinical presentation

It often produces no specific symptoms when it is superficial and potentially surgically curable, although up to 50% of patients may have nonspecific gastrointestinal complaints such as dyspepsia.

Patients may present with anorexia and weight loss (95%) as well as abdominal pain that is vague and insidious in nature. Nausea, vomiting, and early satiety may occur with bulky tumours that obstruct the gastrointestinal lumen or infiltrative lesions that impair stomach distension.

There are several nodal metastases with eponymous names associated with gastric cancer has been described:

- Sister Mary Joseph's node

- Virchow's node
- Krukenberg's node
- Irish node

Diagnosis can be made by double-contrast upper GI barium contrast studies or by EGD. Endoscopy is generally the diagnostic method of choice because it permits direct visualization and biopsy of suspicious lesions. Screening examination by endoscopy or contrast studies is not cost-effective for the general U.S. population, given the low incidence, but may be warranted in high-risk individuals, such as patients more than 20 years post–partial gastrectomy, patients with pernicious anemia or atrophic gastritis, immigrants from endemic areas, and patients with familial or hereditary gastric cancer. Mass screening in Japan, a country with a high incidence of gastric cancer, resulted in an increase in the detection of gastric cancer confined to mucosa and led to improvements in 5-year survival rates.

Once the diagnosis of gastric cancer is established, computed tomography (CT) and endoscopic ultrasonography (EUS) are the primary modalities employed for staging.

- CT scan of the abdomen and pelvis is the best noninvasive modality for detecting metastatic disease in the form of malignant ascities or hematogenous spread to distant organs, most commonly the liver. Overall accuracy for tumor staging is 60% to 80% depending on the protocol used, but accuracy for determining nodal involvement is more limited and variable.
- EUS adds to the preoperative evaluation of gastric cancer in several ways. It is superior to CT in delineating the depth of tumor invasion in the gastric wall and adjacent structures and identifying perigastric lymphadenopathy. EUS is the most accurate method available for T staging of gastric cancer, and accuracy for N staging approaches 70%. Addition of fine needle

aspiration (FNA) of suspicious nodes increases accuracy even further and brings specificity to near 100%.

- Positron emission tomography (PET)/CT combines the spatial resolution of CT with the contrast resolution of PET. It is most useful for its specificity in detecting nodal and distant metastatic disease not apparent on CT scan alone. Preliminary studies suggest that the use of PET/CT in staging patients with gastric cancer leads to upstaging in 6% and downstaging in 9% of patients.
- Laparoscopy significantly enhances the accuracy of staging in patients with gastric cancer. Routine use of laparoscopy has been shown to detect small-volume peritoneal and liver metastases in 20% to 30% of patients believed to have locoregional disease, thereby avoiding unnecessary laparotomy in these patients.
- Routine blood investigations:

  Complete heaemogram- haemoglobin percentage may be reduced.

  LFT – may be altered.

  Renal function test is also assessed.

4. Indications and advantage of diagnostic laparoscopy.

Answer. Diagnostic laparoscopy is often done for the following:

- Find the cause of pain or a growth in the abdomen and pelvic area when x-ray or ultrasound results aren't clear.
- After an accident to see if there is injury to the abdomen.
- Before procedures to treat cancer to find out if the cancer has spread. If so, treatment will change.

It is done to examine the following organs:

- Appendix
- Gallbladder
- Liver
- Pancreas
- Small and large bowel
- Spleen
- Stomach
- Pelvic or reproductive organs

It can detect:

- An abdominal mass or tumor
- Fluid in the abdominal cavity
- Liver disease
- The effectiveness of certain treatments
- The degree to which a particular cancer has progressed

Risks:

- Stomach pain that becomes more intense over time
- Chills
- Fever
- Redness, swelling, bleeding, or drainage at the incision sites
- Continuous nausea or vomiting
- Persistent cough
- Shortness of breath
- Inability to urinate
- Lightheadedness

Abnormal results may be due to a number of different conditions, including:

- Scar tissue inside the abdomen or pelvis (adhesions)
- Appendicitis
- Cells from inside the uterus grow in other areas (endometriosis)
- Inflammation of the gallbladder (cholecystitis)
- Ovarian cysts or cancer of the ovary
- Infection of the the womb, ovaries, or fallopian tubes (pelvic inflammatory disease)
- Signs of injury
- Spread of cancer
- Tumors
- Noncancerous tumors of the womb (uterine fibroids)

5. Discuss diagnosis and management of hydatid cyst of liver.

Answer. Diagnosis

Clinical feature: After infection with Echinococcus granulosus, humans are usually asymptomatic for a long time. The growth of the cyst in the liver is variable, ranging from 1 mm to 5 mm in diameter per year. Most primary infections consist of a single cyst, but up to 20%-40% of infected people have multiple cysts. The symptoms depend not only on the size and number of cysts, but also on the mass effect within the organ and upon surrounding structures.

Non complicated cysts:

Hydatid cyst of the liver is frequently silent and only diagnosed incidentally during abdominal investigation for other pathology. The clinical signs appear gradually with the increase volume of the cyst. The most common symptom, when it occurs, is right upper quadrant or epigastric pain and the most common findings on examination are an enlarged liver and a palpable mass. Pressure effects are initially vague. They may include non-specific pain, cough, low-grade fever, and the sensation of abdominal fullness. As the mass grows, the symptoms become more specific because the mass impinges on or obstructs specific organs.

Complicated cysts:

Patients may also present with complications of the cyst such as biliary communication, intraperitoneal rupture (spontaneous or post-traumatic) and, rarely, intrathoracic or intrapericardial rupture.

Cyst rupture can be associated with anaphylaxis secondary to the highly antigenic content

of the cyst fluid or may be silent and present with multiple intraperitoneal cysts.
With secondary infection, tender hepatomegaly, chills, and spiking temperatures occurs. Urticaria and erythema occur in cases of generalized anaphylactic reaction. With biliary rupture the classic triad of jaundice, biliary colic and urticaria occurs.
The diagnosis is most easily set by ultrasound or other imaging techniques such as CTscan or MRI, combined with case history.
Serology tests such as ELISA or immunoblotting can be used in addition, being 80-100% sensitive for liver cysts but only 50-56% for lungs and other organs. False positive reactions may occur in persons with other tapeworm infections, cancer, or chronic immune disorders. Whether the patient has detectable antibodies depend on the physical location, integrity and viability of the cyst. Patients with senescent, calcified or dead cysts usually are seronegative. Patients with alveolar echinococcosis have most of the time detectable antibodies.

Investigations

Considering that the early stages of infection are usually asymptomatic, the diagnosis of liver hydatid cyst may often be incidental, associated with an abdominal ultrasonography performed for other clinical reasons. In endemic areas, the presence of symptoms suggestive of hydatid liver cyst in a person with a history of exposure to sheep and dogs supports the suspicion of hydatidosis.
The definitive diagnosis of liver echinococcosis requires a combination of imaging, serologic, and immunologic studies.
Routine laboratory tests are rarely abnormal occasionally eosinophilia may be present in the presence of cyst leakage, or may be normal. Serum alkaline phosphatase levels are raised in one third of patients.

Serology and immunological tests.

Serological tests detect specific antibodies to the parasite and are the most commonly employed tools to diagnose past and recent infection with E. granulosus. Detection of IgG antibodies implies exposure to the parasite, while in active infection high titers of specific IgM and IgA antibodies are observed. Detection of circulating hydatid antigen in the serum is of use in monitoring after surgery and pharmacotherapy and in prognosis. ELISA is used most commonly, but alternate techniques are counter-immuno-electrophoresis and bacterial co-agglutination.
Elisa techniques have a high sensitivity above 90% and are useful in mass scale screening. The counter-immuno-electrophoresis has the highest specificity (100%) and high sensitivity (80 – 90%). CASONI TEST has been used most frequently in the past but is at present considered only of historical importance and has largely been abandoned because of low sensitivity.
Tests of humoral immunity are still widely used to confirm the diagnosis. The sensitivity and specificity of any humoral test depends largely on the quality of the antigens utilised.
Antigens can be derived from the whole parasites or organelles, or soluble antigens from cyst fluid. Indirect immunofluorescence assay (IFA) is the most sensitive test (95%) in patients with hepatic CHD.
The sensitivity and specificity of enzyme-linked immunosorbent assay (ELISA) is highly dependent on the method of antigen preparation, and cross-reactions with other helminthic diseases occur if crude antigens are used. Purified fractions may yield high sensitivities (95%) and specificity (100%).

Imaging techniques

Imaging modalities range from simple to complex and invasive. Ultrasonography (US) is the screening method of choice.
CT scan is an important preoperative diagnostic tool to determine vascular, biliary or extra

hepatic extension, to recognize complications, such as rupture and infections, and therefore to assess respectability

However, diagnostic tests such as CT and MRI are mandatory in liver hydatidosis because they allow thorough knowledge regarding lesion size, location, and relations to intrahepatic vascular and biliary structures, providing useful information for effective treatment and decrease in post-operative morbidity

The right lobe is the most frequently involved portion of the liver. Imaging findings in hepatic hydatid disease depend on the stage of cyst growth (whether the cyst is unilocular, contains daughter vesicles, contains daughter cysts, is partially calcified, or is completely calcified.

Plain Radiographs

Plain radiographs of the abdomen and chest may reveal a thin rim of calcification delineating a cyst, or an elevated hemi diaphragm. Both signs are non-specific.

Calcification is seen at radiography in 20%–30% of hydatid cysts and usually manifests with a curvilinear or ringlike pattern representing calcification of the pericyst. During the natural evolution toward healing, dense calcification of all components of the cyst takes place. Although the death of the parasite is not necessarily indicated by calcification of the pericyst, it is implied by a complete calcification.

Gharbi Classification on Ultrasonography features of Hydatid Cyst:

Type	Ultrasound Appearance
I	Pure fluid Collection
II	Fluid collection with a split wall (detached membrane)
III	Fluid collection with septa and/or daughter cysts
IV	Heterogeneous echo pattern (Hyperechoic with high internal echoes)
V	Reflecting walls (Cyst with reflecting calcified thick wall)

WHO introduced a standardized classification of Ultrasonography images of cystic echinococcosis, to obtain comparable results in patients worldwide and to link disease status with each morphological type of Hydatid cysts:

CL Active; Single cysts. Cysts are developing and are fertile. Cyst wall not visible.
CE1 Active; simple cyst often full of hydatid sand (snow flake sign). Visible cyst wall. Fertile.
CE2 Active; multiple, or multi loculated cysts. May appear honeycomb like with daughter cysts. Fertile.
CE3 Transition; degenerating cysts but still contain viable protoscoleces. Often see floating membranes in fluid filled cysts
CE4 Inactive; degeneration is advanced. Cysts may be calcified. Not likely to be fertile. Heterogeneous appearance with few or no daughter cysts.
CE5 Inactive. Often calcified. Usually infertile.

Computed Tomographic scan
Multi detector row computed tomography has the highest sensitivity of imaging of the cyst (100%). It is the best mode to detect the number, size, and location, of the cysts. It may provide clues to presence of complications such as infection, and intrabiliary ruptures.
It is also helpful in identifying exogenous cysts, and the volume of the cyst can be estimated.
CT is an important investigation when there is a diagnostic uncertainty on ultrasound (Type I and IV of Gharbi), when planning surgical intervention or when recurrent disease is diagnosed. In case of peritoneal hydatidosis, CT scan is indicated before surgery to assess the number and the exact localisations of the cysts.
In case of ruptures in the thorax, the CT-scan allows a better study of the lung parenchyma and ensures a percutaneous drainage of the pleural collection.
Magnetic resonance Imaging (MRI scan) - MRI delineates the cyst capsule better than CT scan, as a low intensity on both T1 and T2 weighted images. However, CT scan is better in demonstrating mural calcifications, cysts less than 3 cm may not show any specific features and small peritoneal cysts may be missed.
Endoscopic retrograde cholangiopancreatography (ERCP) remains an important tool in cases where a rupture into the biliary tree has occurred, allowing both the diagnosis of major biliary communication and clearance of the common bile duct (CBD) prior to surgery or intervention by the means of sphincterotomy.
Direct cholangiography: intra-operative cholangiography is performed through a cystic drain or a T-Tube in a suspected intrabiliary rupture and bile duct obstruction. This method is used to detect post-operative complications following surgery.

Treatment:
General considerations
Surgery remains the gold standard treatment for hydatid liver disease. The aim of surgical intervention is to inactivate the parasite, to evacuate the cyst along with resection of the germinal layer, to prevent peritoneal spillage of scolices and to obliterate the residual cavity. It can be performed successfully in up to 90% of patients if a cyst does not have a risky localisation. However, surgery may be impractical in patients with multiple cysts localised in several organs and if surgical facilities are inadequate. The introduction of chemotherapy and of the PAIR technique (puncture - aspiration - injection - respiration) offers an alternative treatment, especially in inoperable patients and for cases with a high surgical risk. Cysts with homogeneously calcified cyst walls need, probably, no surgery but only a 'wait and observe' approach.
The choice of an optimal treatment should be carefully assessed in each case.
The principles of hydatid surgery are

- Total removal of all infective components of the cysts;
- the avoidance of spillage of cyst contents at time of surgery;
- management of communication between cyst and adjacent structures;management of the residual cavity;
- Minimize risks of operation.

All the surgical procedures can be divided into two large groups, a conservative group and a radical one. The conservative technique communication between cyst and adjacent structures;
Conservative procedures are safe and technically simple, and are useful in the management of uncomplicated hydatid cysts. Marsupialization was the most common used procedure because it is quick and safe. However, their main disadvantage is the high frequency of postoperative complications, the most common being bile leak from a cyst-biliary communication, bilomas and bile peritonitis (4%-28%).
Radical surgical procedures

Radical surgical procedures include cystectomy, pericystectomy, lobectomy and hepatectomy. Radical procedures have lower rate of complications and recurrences but many authors consider them inappropriate, claiming that intraoperative risks are too high for a benign disease.

- The rapid development of laparoscopic techniques has encouraged surgeons to replicate principles of conventional hydatid surgery using a minimally invasive approach. Several reports have confirmed the feasibility of laparoscopic hepatic hydatid surger
  The Criteria to exclude laparoscopic treatment of hydatid cyst of liver are
  - Rupture of the cyst in biliary tract
  - Central localization of the cyst
  - Cysts dimension > 15 cm
  - Number of cysts > 3
  - Thickened or calcified walls
  - Opening of bile ducts that leak bile

Percutaneous treatment of hydatid cyst

PAIR (puncture, aspiration, injection, and reaspiration) is a percutaneous treatment technique for hydatid disease.

1. Indications for PAIR

Nonechoic lesion greater than or equal to 5 cm in diameter
Cysts with daughter cysts and/or with membrane detachment
Multiple cysts if accessible to puncture
Infected cysts
Patients who refuse surgery.
Patients who relapse after surgery.
Patients in whom surgery is contraindicated:
Patients who fail to respond to chemotherapy alone
Children over 3 years.
Pregnant women

2. Contraindications for PAIR

Non cooperative patients
Inaccessible or risky location of the liver cyst
Cyst in spine, brain, and/or heart
Inactive or calcified lesion
Cyst communicating with the biliary tree
Patients should be followed clinically after PAIR treatment. Recurrence is increased in more complicated cysts, including those with multiple daughter cysts.

Endoscopic management of hydatid cyst

The ERCP is effective in diagnosing biliary tree involvement from the cyst.
The Endoscopic management is useful in presence of intrabiliary rupture, which requires exploration and drainage of the biliary tract and also after surgery in presence of residual hydatid material (membranes and daughter cyst) left in biliary tree. During the endoscopic exploration the biliary tree is cleared of any hydatid material with a balloon catheter or a dormia basket. The endoscopic sphincterotomy is also performed to facilitate drainage of the common bile duct.

Chemotherapy for hydatid disease of liver

Medical treatment of hydatid liver cysts, is based on benzoimidazole carbamates, such as mebendazole and albendazole. It has been proposed that these agents contribute to clinical improvement of the disease by diminishing the size of the cyst. The factors for success seem to be the ability of the drug to penetrate the cyst wall.

6) What is type -3 intestinal failure? Discuss the management policy.

Answer. Type 3 intestinal failure: Intestinal failure is defined as the reduction of gut function below the minimum necessary for the absorption of macronutrients and/or water and electrolytes, such that intravenous supplementation is required to maintain health and/or growth.
Type III - chronic condition, in metabolically stable patients, requiring intravenous supplementation over months or years. It may be reversible or irreversible.

Type III IF is a chronic condition (CIF) in a metabolically stable patient, which usually requires long-term HPN. CIF may be the evolution of a type II acute IF, the result of progressive and devastating gastrointestinal or systemic benign diseases, often requiring multiple intestinal resections (such as Crohn's disease, radiation enteritis, familiar polyposis, chronic intestinal pseudo-obstruction, intestinal lymphangectasia, or systemic sclerosis), the main clinical
feature of congenital digestive diseases (such as gastroschisis, intestinal atresia, microvillous inclusion disease and intestinal epithelial dysplasia), or the end stage of intra-abdominal or pelvic cancer.
Management of home parenteral nutrition for benign chronic intestinal failure
1. The aims of an HPN programme include provision of evidence-based therapy, prevention of HPN related complications such as catheter-related infections and metabolic complications and ensure quality of life is maximized.(Grade of evidence:very low)
2. Regular audit of therapy and outcomes against standards to ensure safety and efficacy of an HPN programme. (Grade of evidence: very low)
The aim of a safe and effective HPN programme for CIF has been considered in national strategic planning of IF services.

- Home parenteral nutrition is indicated when the gastrointestinal tract is unable to maintain normal nutrition and hydration and the patient is otherwise clinically stable and ready for discharge from the hospital.
- Diet therapy for patients with SBS depends in large part on whether the patient has the colon or part of it in continuity with the small bowel. After recovery from massive small bowel resection, patients who have difficulty maintaining fluid balance should be instructed on the liberal use of salt and 1 to 2 L of oral rehydration solution sipped between meals. If negative fluid balance persists, the patient should continue to receive intravenous hydration and nil by mouth for 24 hours. During the next 48 to 72 hours, the patient should be slowly weaned off intravenous fluids, as small portions of appropriate foods and fluids are reintroduced with the goal of maintaining urine output of greater than 800 mL/d. Within 4 to 6 weeks after resection, patients with an enterostomy should gradually resume eating fibrous foods and begin soluble fiber supplementation as tolerated to add bulk and prolong transit time through the remaining bowel. Patients unable to consume adequate nutrition orally may benefit from enteral nutrition infused at a slow rate into the gastrointestinal tract through a nasogastric feeding tube or a percutaneous endoscopic gastrostomy tube.
- Pharmacologic treatment of short bowel includes antidiarrheal (eg, loperamide hydrochloride, diphenoxylate and atropine, codeine, paregoric, and tincture of opium) and antisecretory agents (eg, histamine$_2$-blockers, proton pump inhibitors, octreotide acetate, and clonidine). Bile acid–binding therapy, such as cholestyramine resin, is usually only indicated for limited distal ileal resection. Antimicrobials (eg, metronidazole, ciprofloxacin, and rifaximin) are all of value in treating patients with bacterial overgrowth. Growth factors such as recombinant human growth hormone and glucagonlike peptide 2 have been shown to enhance intestinal adaptation during short periods, but their long-term efficacy has not as yet been documented. Probiotics may also

be of help to patients with SBS. In general, if diarrhea is not improved symptomatically within 14 days at maximum dosage, improvement is unlikely with further use of probiotics. Intestinal adaptation in SBS may take 1 to 3 years after resection, so persistent trials of combination therapeutic approaches may be required for prolonged periods.

- There are multiple strategies for surgical therapy for SBS. They may be divided into strategies restoring intestinal continuity (takedown enterostomy), relieving obstruction and dysmotility (strictureplasty or bowel tapering for dilated bowel segments), lengthening the remaining dilated intestine (Bianchi procedure or serial transverse enteroplasty technique), prolonging transit time (reversed intestinal segments, colonic interposition, or creation of artificial sphincters), or transplanting new intestine.

The indications for intestinal transplantation approved by the US Center for Medicare and Medicaid Services and from the position paper of the American Society of Transplantation are as follows·

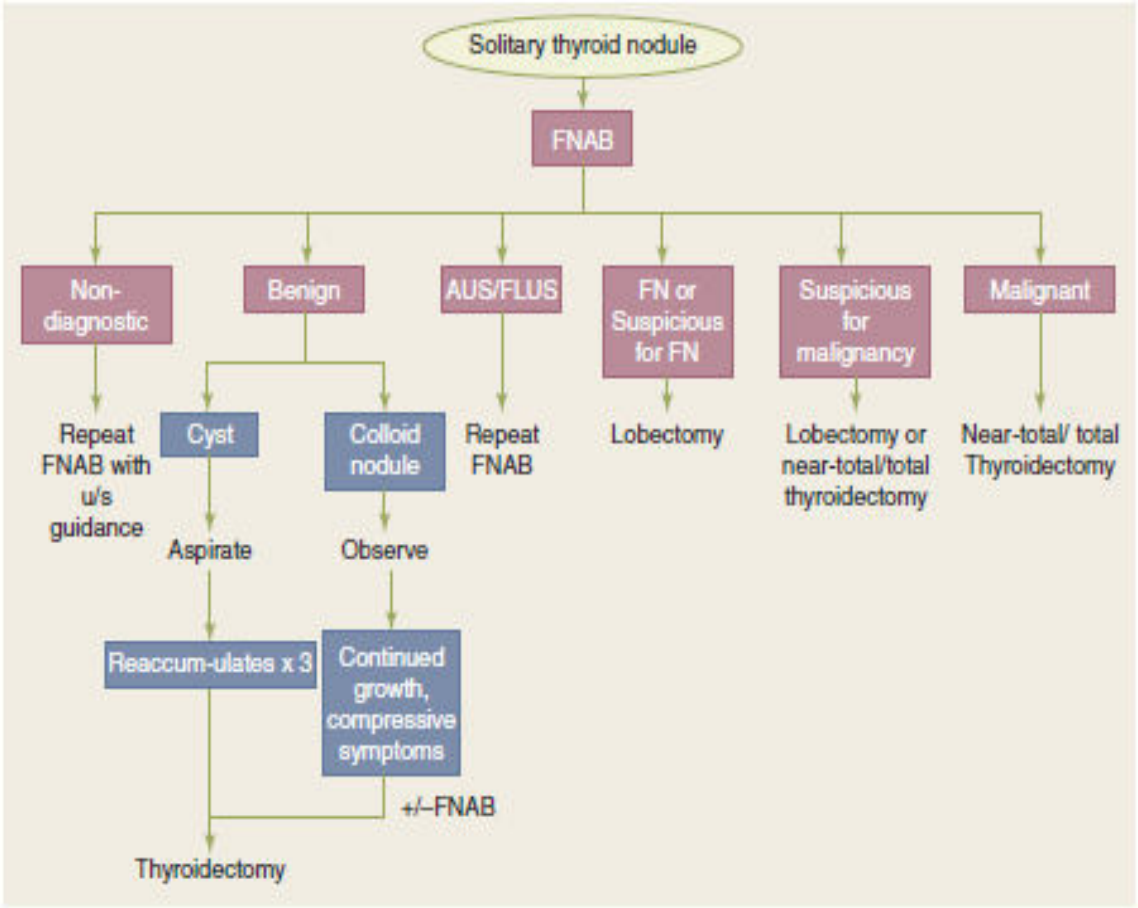
- Failure of HPN (US Center for Medicare and Medicaid Services)
    - Impending or overt liver failure
    - Central venous catheter–related thrombosis of 2 or more central veins
    - Frequent central line sepsis
    - Frequent episodes of severe dehydration
- High risk of death attributable to the underlying disease (American Society of Transplantation)
- Intestinal failure with high morbidity or low acceptance of HPN (American Society of Transplantation).

7. Work up and diagnosis of solitary thyroid nodule.

Answer. Modes of detection:

- Incidentalomas on head/neck CTs and MRIs, carotid ultrasound, PET scans.
- Palpated by primary care physician
- Noticed by patient
- With symptoms of hypo/hyperthyroidism

Solitary thyroid nodule:



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8. Discuss the role of radical neck dissection for the management of head and neck cancer.

Answer.

Classification of Different Types of Neck Dissection with Clinical Indications

Comprehensive	Nodal Levels Removed	Structures Preserved	Indications
Radical neck dissection	Levels I–V	None	N+ neck for SCC where SAN involved
Modified radical neck dissection type type I	Levels I–V	SAN	N+ neck for SCC where SAN free of disease
Modified radical neck	Levels I–V	SAN, SCM	N+ neck for SCC where

dissection type II			IJV involved but SAN free of disease
Modified radical neck dissection type III	Levels I–V	SAN, SCM, IJV	Metastatic differentiated thyroid carcinoma
Selective			
Supraomohyoid neck dissection	Levels I–III	SAN, SCM, IJV	N0 neck for SCC of oral cavity and oropharynx (include level 4); N0 neck maliganant melanoma where primary site is anterior to ear (include parotidectomy for face and scalp)
Extended supraomohyoid neck dissection	Levels I–IV	SAN, SCM, IJV	N0 neck for SCC of lateral tongue
Lateral neck dissection	Levels II–IV	SAN, SCM, IJV	N0 neck for SCC of larynx and hypopharynx
Posterolateral neck dissection	Levels II–V, subocciptial, retroauricular nodes	SAN, SCM, IJV	N0 neck malignant melanoma where primary site is posterior to ear
SAN, spinal accessory nerve; SCM, sternocleidomastoid muscle; IJV, internal jugular vein.			

The cervical lymphatic nodal basins contain between 50 and 70 lymph nodes per side and are divided into seven levels.

1. **Level I is subdivided.**

Level IA is bounded by the anterior belly of the digastric muscle, the hyoid bone, and the midline.

Level IB is bounded by the anterior and posterior bellies of the digastric muscle and the inferior border of the mandible. Level IB contains the submandibular gland.

2. **Level II is bounded superiorly by the skull base, anteriorly by the stylohyoid muscle, inferiorly by a horizontal plane extending posteriorly from the hyoid bone, and posteriorly by the posterior edge of the sternocleidomastoid muscle. Level II is further subdivided.**

   Level IIA is anterior to the spinal accessory nerve.

   Level IIB, or the so-called submuscular triangle, is posterior to the nerve.

3. **Level III begins at the inferior edge of level II and is bounded by the laryngeal strap muscles anteriorly, by the posterior border of the sternocleidomastoid muscle posteriorly, and by a horizontal plane extending posteriorly from the inferior border of the cricoid cartilage.**

4. **Level IV begins at the inferior border of level III and is bounded anteriorly by the strap muscles, posteriorly by the posterior edge of the sternocleidomastoid muscle, and inferiorly by the clavicle.**

5. **Level V is posterior to the posterior edge of the sternocleidomastoid muscle, anterior to the trapezius muscle, superior to the clavicle, and inferior to the base of skull.**

6. **Level VI is bounded by the hyoid bone superiorly, the common carotid arteries laterally, and the sternum inferiorly. Although level VI is large in area, the few lymph nodes that it contains are mostly in the paratracheal regions near the thyroid gland.**

7. **Level VII (superior mediastinum) lies between the common carotid arteries and is superior to the aortic arch and inferior to the upper border of the sternum.**

9. Discuss the current trends of management of colorectal liver metastasis.

Answer. Management of colorectal liver metastasis:

Colorectal cancer (CRC) is the second-most common cause of cancer death in western countries. The liver is the most frequent and often unique site of metastasis in CRC, both at the time of diagnosis (20–25% of cases) or after an apparently radical surgery on the primary tumor (40% of cases).

Investigations to detect colorectal liver metastasis

- **Blood work.** Blood tests may include a complete blood count, hematocrit, platelet count, liver function tests, and Carcinoembriogenic antigen (CEA), which may be elevated in patients with colon cancer.
- **CT scan.** This test identifies the tumor(s) and pinpoints their size and location in the liver, as well as their relation to the vascular / biliary structures. It also helps the doctor to determine the overall health of the liver.
- **MRI.** This test identifies the tumor(s) and pinpoints their size and location in the liver, as well as their relation to the vascular / biliary structures. It also helps the doctor to determine the overall health of the liver. A doctor will determine whether to do a CT scan, an MRI or both.
- **PET scan.** This is a whole body scan that looks for evidence of active cancer throughout the body.
- **Liver biopsy.** A biopsy is the removal of a small amount of tissue for examination under a microscope. The sample removed from the biopsy is analyzed by one of our expert pathologists. Depending on the size of the tumor or mass, your physician may recommend the biopsy be taken one of several ways:

  - By using a minimally invasive surgical technique known as laparoscopy
  - By fine needle or thick needle aspiration (a core biopsy), using a computed tomography (CT or CAT) scan or ultrasound to guide the needle placement.

Hepatic metastases from colorectal adenocarcinoma can potentially be treated with hepatic metastasectomy, since they may be the only site of metastatic disease. Up to 20% of patients undergoing metastasectomy for this indication remain disease-free. Multiple staging systems for disease free survival after metastasectomy have been proposed and are being refined. One of the more frequently used systems (Clinical risk score (CRS), "Fong" score) includes variables such as:

- Node-negative primary
- Single hepatic metastasis
- Hepatic metastasis size <5 cm
- CEA <200 ng/ml
- Disease-free interval >1 year

These variables suggest a better metastasectomy disease-free survival.

Transarterial chemotherapy and radioembolization are other options for treatment for hepatic metastases.

Conventional chemotherapy — The conventional chemotherapy drugs used to treat metastatic colorectal cancer include:

●Fluorouracil (abbreviated FU), which is usually given into the vein with a second drug called leucovorin, which enhances its activity

●Orally active FU-like drugs, such as capecitabine (brand name: Xeloda)

●Oxaliplatin (brand name: Eloxatin), which is given intravenously

●Irinotecan (brand name: Camptosar), also given intravenously

These drugs work by interfering with the ability of rapidly growing cells (like cancer cells) to divide or reproduce themselves. Because most of an adult's normal cells are not actively growing, they are less affected by chemotherapy, with the exception of bone marrow (where the blood cells are produced), the hair, and the lining of the gastrointestinal tract. Effects of chemotherapy on these and other normal tissues cause side effects during treatment.

Targeted therapy — Other drugs that are active against metastatic colorectal cancer work by a different mechanism. These are referred to as "targeted therapy agents" since they are either antibodies (a type of protein) or drugs that work to inhibit specific proteins that are important for the growth and/or survival of colon cancer cells.

Because targeted therapy agents do not directly interfere with rapidly dividing cells, they do not have the usual side effects of conventional chemotherapy. However, targeted chemotherapy has other unique side effects, which are described in detail below. Currently available targeted chemotherapy agents include:

●Bevacizumab (brand name: Avastin) – Bevacizumab binds to a protein called vascular endothelial growth factor (VEGF). VEGF is involved in the development of a blood supply within a growing cancer; this blood supply is essential for the tumor to grow and spread. Bevacizumab enhances the antitumor effect of other chemotherapy drugs. Bevacizumab is not effective when given by itself, but is generally given in combination with other drugs, such as FU (or capecitabine), oxaliplatin, and irinotecan (see below).

●Ramucirumab (brand name: Cyramza) – Ramucirumab is a protein that binds to a receptor for VEGF (VEGFR2), thus targeting signaling through the same pathway that bevacizumab does. Like bevacizumab, ramucirumab enhances the antitumor effect of other chemotherapy drugs. In the United States, it is approved in combination with an irinotecan-based chemotherapy regimen for patients who have previously been treated with bevacizumab plus an oxaliplatin-containing regimen.

●Aflibercept (brand name: Zaltrap) – Intravenous aflibercept represents another method of interfering with a tumor’s blood supply; it is a fusion protein that acts by "trapping" VEGF and preventing it from activating its receptors on the tumor cells. In the United States, aflibercept is approved, in combination with irinotecan-based chemotherapy, for patients whose tumors have progressed while receiving an oxaliplatin-containing chemotherapy regimen, with or without bevacizumab.

●Regorafenib (brand name: Stivarga) – Regorafenib is a pill form of a drug that blocks several VEGF receptors as well as other proteins referred to as kinases. In the United States, regorafenib is approved as a single agent for the treatment of patients who have been previously treated with fluoropyrimidine-, oxaliplatin-, and irinotecan-containing chemotherapy regimens as well as other targeted therapies.

●Cetuximab (brand name: Erbitux) – Cetuximab targets a different protein, the epidermal growth factor receptor (EGFR), which is found in about 80 percent of colorectal cancers. Erbitux is effective even if EGFR is not found in an individual tumor.

Cetuximab does not work for all patients. It depends on whether or not the tumor has specific genetic abnormalities (a mutation in a set of genes called RAS genes or in a separate gene called BRAF).

•If the tumor has a RAS or a BRAF gene mutation, cetuximab does not work.

•If the tumor does not have a RAS or a BRAF mutation, cetuximab might work (ie, it can be effective).

Unlike bevacizumab, cetuximab is active when given alone or in combination with other drugs, like irinotecan.

●Panitumumab (brand name: Vectibix) – Like cetuximab, panitumumab also targets the EGFR. Like cetuximab, it is effective only for tumors that do not have a specific mutation in one of the RAS genes or in BRAF.

●Trifluridine-tipiracil (brand name: Lonsurf) – Trifluridine-tipiracil is an oral agent that contains two components, trifluridine and tipiracil, each of which have different properties. In the United States, trifluridine-tipiracil is approved for the treatment of patients who have been previously treated with fluoropyrimidine-, oxaliplatin-, and irinotecan-containing chemotherapy regimens as well as other targeted therapies.

Monitoring during treatment — A person's response to chemotherapy is monitored with periodic X-ray studies (such as computed tomography [CT] scans) usually every six to eight weeks during therapy. In addition, blood levels of a tumor marker called carcinoembryonic antigen (CEA) are generally measured every one to three months during therapy. CEA levels are typically high in people with advanced colorectal cancer; persistently rising CEA levels suggest that disease is progressing and a change in therapy is warranted.

However, a rising CEA alone is not sufficient evidence to prompt a change in treatment. Disease progression should be confirmed with radiographic testing (eg,CT scan) or a biopsy before changing treatment.

10.Discuss the management of acute pancreatitis. What are the indications of operative intervention?

Answer. Management of acute pancreatitis:

Diagnosis of acute pancreatitis and etiology

- The definition of acute pancreatitis is based on the fulfillment of '2 out of 3' of the following criteria: clinical (upper abdominal pain), laboratory (serum amylase or lipase >3x upper limit of normal) and/or imaging (CT, MRI, ultrasonography) criteria.(GRADE 1B, strong agreement)
- On admission, the etiology of acute pancreatitis should be determined using detailed personal (i.e. previous acute pancreatitis, known gallstone disease, alcohol intake, medication and drug

intake, known hyperlipidemia, trauma, recent invasive procedures such as ERCP) and family history of pancreatic disease, physical examination, laboratory serum tests (i.e. liver enzymes, calcium, triglycerides), and imaging (i.e. right upper quadrant ultrasonography).(GRADE 1B, strong agreement)

- In patients considered to have idiopathic acute pancreatitis, after negative routine work-up for biliary etiology, endoscopic ultrasonography (EUS) is recommended as the first step to assess for occult microlithiasis, neoplasms and chronic pancreatitis. If EUS is negative, (secretin-stimulated) MRCP is advised as a second step to identify rare morphologic abnormalities. CT of the abdomen should be performed. If etiology remains unidentified, especially after a second attack of idiopathic pancreatitis, genetic counseling (not necessarily genetic testing) should be considered.(GRADE 2C, weak agreement)

Prognostication/prediction of severity

- Systemic inflammatory response syndrome (SIRS) is advised to predict severe acute pancreatitis at admission and persistent SIRS at 48 hours.
- During admission, a 3-dimension approach is advised to predict outcome of acute pancreatitis combining host risk factors (e.g. age, co-morbidity, body mass index), clinical risk stratification (e.g. persistent SIRS) and monitoring response to initial therapy (e.g. persistent SIRS, blood urea nitrogen, creatinine).(GRADE 2B, strong agreement)

Imaging

- The indication for initial CT assessment in acute pancreatitis can be:
  1) diagnostic uncertainty,
  2) confirmation of severity based on clinical predictors of severe acute pancreatitis, or
  3) failure to respond to conservative treatment or in the setting of clinical deterioration.
  Optimal timing for initial CT assessment is at least 72-96 hours after onset of symptoms.(GRADE 1C, strong agreement)
- Follow up CT or MR in acute pancreatitis is indicated when there is a lack of clinical improvement, clinical deterioration, or especially when invasive intervention is considered.(GRADE 1C, strong agreement)

PRINCIPLES of Management :

Fluid resuscitation

Nutritional Support

Symptomatic Treatment

Management of Metabolic Complications

Prophylactic Antibiotic Coverage

Monitoring and Reassessment

Role of ERCP

Role of surgery

Fluid therapy

- Ringer's lactate is recommended for initial fluid resuscitation in acute pancreatitis.(GRADE 1B, strong agreement)

- Goal directed intravenous fluid therapy with 5e10 ml/kg/h should be used initially until resuscitation goals (see Q10b) are reached.(GRADE 1B, weak agreement)
- The preferred approach to assessing the response to fluid resuscitation should be based on one or more of the following:
  1) non-invasive clinical targets of heart rate < 120/min, mean arterial pressure between 65-85 mmHg (8.7e11.3 kPa), and urinary output > 0.5e1ml/kg/h,
  2) invasive clinical targets of stroke volume variation, and intrathoracic blood volume determination, and
  3) biochemical targets of hematocrit 35-44%.(GRADE 2B, weak agreement)

Intensive care management

- Patients with severe acute pancreatitis as defined by the revised Atlanta Classification (i.e. persistent organ failure) should be treated in an intensive care setting.(GRADE 1C, strong agreement)
- Management in, or referral to, a specialist center is necessary for patients with severe acute pancreatitis and for those who may need interventional radiologic, endoscopic, or surgical intervention.(GRADE 1C, strong agreement)
- A specialist center in the management of acute pancreatitis is defined as a high volume center with up-to-date intensive care facilities including options for organ replacement therapy, and with daily (i.e. 7 days per week) access to interventional radiology, interventional endoscopy with EUS and ERCP assistance as well as surgical expertise in managing necrotizing pancreatitis. Patients should be enrolled in prospective audits for quality control issues and into clinical trials whenever possible.(GRADE 2C, weak agreement).
- Early fluid resuscitation within the first 24 hours of admission for acute pancreatitis is associated with decreased rates of persistent SIRS and organ failure.(GRADE 1C, strong agreement)
- Abdominal compartment syndrome (ACS) is defined as a sustained intra-abdominal pressure > 20 mmHg that is associated with new onset organ failure.(GRADE 2B, strong agreement)
- Medical treatment of ACS should target
  1) hollow-viscera volume,
  2) intra/extra vascular fluid and
  3) abdominal wall expansion. Invasive treatment should only be used after multidisciplinary discussion in patients with a sustained intra-abdominal pressure >25mmHg with new onset organ failure refractory to medical therapy and nasogastric/ rectal decompression. Invasive treatment options include percutaneous catheter drainage of ascites, midline laparostomy, bilateral subcostal laparostomy, or subcutaneous linea alba fasciotomy. In case of surgical decompression, the retroperitoneal cavity and the omental bursa should be left intact to reduce the risk of infecting peripancreatic and pancreatic necrosis.(GRADE 2C, strong agreement)

Preventing infectious complications

- Intravenous antibiotic prophylaxis is not recommended for the prevention of infectious complications in acute pancreatitis.(GRADE 1B, strong agreement)

INDICATIONS : 1. Infective necrosis
2. Sterile necrosis > 50%
3. Extrapancreatic infections

- **<u>Preferred antibiotics</u> :** 1. Carbapenem (Imipenem+cilastatin)
  2. Quinolones
  3. Metronidazole
  4. 3rd generation cephalosporines

- Probiotic prophylaxis is not recommended for the prevention of infectious complications in acute pancreatitis.(GRADE 1B, strong agreement)

Nutritional support

- Oral feeding in predicted mild pancreatitis can be restarted once abdominal pain is decreasing and inflammatory markers are improving.(GRADE 2B, strong agreement)
- Enteral tube feeding should be the primary therapy in patients with predicted severe acute pancreatitis who require nutritional support.(GRADE 1B, strong agreement)
- Either elemental or polymeric enteral nutrition formulations can be used in acute pancreatitis.(GRADE 2B, strong agreement).
- Enteral nutrition in acute pancreatitis can be administered via either the nasojejunal or nasogastric route.(GRADE 2A, strong agreement)
- Parenteral nutrition can be administered in acute pancreatitis as second-line therapy if nasojejunal tube feeding is not tolerated and nutritional support is required.(GRADE 2C, strong agreement)

Biliary tract management

- ERCP is not indicated in predicted mild biliary pancreatitis without cholangitis.(GRADE 1A, strong agreement). ERCP is probably not indicated in predicted severe biliary pancreatitis without cholangitis (GRADE 1B, strong agreement).
- ERCP is probably indicated in biliary pancreatitis with common bile duct obstruction (GRADE 1C, strong agreement) ERCP is indicated in patients with biliary pancreatitis and cholangitis (GRADE 1B, strong agreement)
- Urgent ERCP (<24 hrs) is required in patients with acute cholangitis. Currently, there is no evidence regarding the optimal timing of ERCP in patients with biliary pancreatitis without cholangitis.(GRADE 2C, strong agreement)
- MRCP and EUS may prevent a proportion of ERCPs that would otherwise be performed for suspected common bile duct stones in patients with biliary pancreatitis who do not have cholangitis, without influencing the clinical course. EUS is superior to MRCP in excluding the presence of small (<5mm) gallstones.

Indications for intervention in necrotizing pancreatitis

Common indications for intervention (either radiological, endoscopical or surgical) in necrotizing pancreatitis are:

1) Clinical suspicion of, or documented infected necrotizing pancreatitis with clinical deterioration, preferably when the necrosis has become walled-off,

2) In the absence of documented infected necrotizing pancreatitis, ongoing organ failure for several weeks after the onset of acute pancreatitis, preferably when the necrosis has become walled-off.(GRADE 1C, strong agreement)

Routine percutaneous fine needle aspiration of peripancreatic collections to detect bacteria is not indicated, because clinical signs (i.e. persistent fever, increasing inflammatory markers) and imaging signs (i.e. gas in peripancreatic collections) are accurate predictors of infected necrosis in the majority of patients.

Although the diagnosis of infection can be confirmed by fine needle aspiration (FNA), there is a risk of false-negative results.(GRADE 1C, strong agreement)

Indications for intervention (either radiological, endoscopical or surgical) in sterile necrotizing pancreatitis are:

1) Ongoing gastric outlet, intestinal, or biliary obstruction due to mass effect of walled-off necrosis (i.e. arbitrarily >4-8 weeks after onset of acute pancreatitis),

2) Persistent symptoms (e.g. pain, 'persistent unwellness') in patients with walled-off necrosis without signs of infection (i.e. arbitrarily >8 weeks after onset of acute pancreatitis),

3) Disconnected duct syndrome(i.e. full transection of the pancreatic duct in the presence of pancreatic necrosis) with persisting symptomatic (e.g. pain, obstruction) collection(s) with necrosis without signs of infections (i.e. arbitrarily >8 weeks after onset of acute pancreatitis).(GRADE 2C, strong agreement)

Timing of intervention in necrotizing pancreatitis: For patients with proven or suspected infected necrotizing pancreatitis, invasive intervention (i.e. percutaneous catheter drainage, endoscopic transluminal drainage/ necrosectomy, minimally invasive or open necrosectomy) should be delayed where possible until at least 4 weeks after initial presentation to allow the collection to become 'walled-off'.(GRADE 1C, strong agreement)**.** The best available evidence suggests that surgical necrosectomy should ideally be delayed until collections have become walled-off, typically 4 weeks after the onset of pancreatitis, in all patients with complications of necrosis. No subgroups have been identified that might benefit from earlier or delayed intervention.(GRADE 1C, strong agreement)

Intervention strategies in necrotizing pancreatitis

- The optimal interventional strategy for patients with suspected or confirmed infected necrotizing pancreatitis is initial image-guided percutaneous (retroperitoneal) catheter drainage or endoscopic transluminal drainage, followed, if necessary, by endoscopic or surgical necrosectomy.(GRADE 1A, strong agreement).
- Percutaneous catheter or endoscopic transmural drainage should be the first step in the treatment of patients with suspected or confirmed (walled-off) infected necrotizing pancreatitis.(GRADE 1A, strong agreement)
- There are insufficient data to define subgroups of patients with suspected or confirmed infected necrotizing pancreatitis who would benefit from a different treatment strategy.(GRADE 2C, strong agreement)
- **Timing of cholecystectomy (or endoscopic sphincterotomy):**Cholecystectomy during index admission for mild biliary pancreatitis appears safe and is recommended. Interval cholecystectomy after mild biliary pancreatitis is associated with a substantial risk of readmission for recurrent biliary events, especially recurrent biliary pancreatitis.(GRADE 1C, strong agreement).

Cholecystectomy should be delayed in patients with peripancreatic collections until the collections either resolve or if they persist beyond 6 weeks, at which time cholecystectomy can be performed safely.(GRADE 2C, strong agreement)

In patients with biliary pancreatitis who have undergone sphincterotomy and are fit for surgery, cholecystectomy is advised, because ERCP and sphincterotomy prevent recurrence of biliary pancreatitis but not gallstone related gallbladder disease, i.e. biliary colic and cholecystitis.(GRADE 2B, strong agreement)

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2020

March, 2020

PAPER III

Time Allowed: 3 Hours **Full Marks: 100**

Attempt all questions

1. **Write short notes on Hypertrophic Pyloric Stenosis of Infancy and Congenital Megacolon. 5+5**
2. **Liver resection for colorectal liver metastasis. 10**
3. **Pouch Surgery. 10**
4. **Indications, types and basic steps of radical neck dissection. 2+3+5**
5. **Staplers in Surgery. 10**
6. **Define Necrotising Fasciitis. Difference between Fournier's gangrene and Meleny's Synergistic gangrene. Management of Necrotising Fasciitis. 2+3+5**
7. **Discuss the surgical options in the management of Empyema Thoracis. 10**
8. **Discuss the surgical options in breast reconstructions. 10**
9. **Write short notes on types and management of fistula in ano. 10**
10. **Describe the different surgical options for the management of varicose vein. 10**

Answers.

1. **Hypertrophic pyloric stenosis (HPS) causes a functional gastric outlet obstruction as a result of hypertrophy and hyperplasia of the muscular layers of the pylorus. In infants, hypertrophic pyloric stenosis is the most common cause of gastric outlet obstruction and the most common surgical cause of vomiting.**

Pathophysiology
Marked hypertrophy and hyperplasia of the 2 (circular and longitudinal) muscular layers of the pylorus occurs, leading to narrowing of the gastric antrum. The pyloric canal becomes lengthened, and the whole pylorus becomes thickened. The mucosa is usually edematous and thickened. In advanced cases, the stomach becomes markedly dilated in response to near-complete obstruction.
The causes of infantile hypertrophic pyloric stenosis are multifactorial.[2] Both environmental factors and hereditary factors are believed to be contributory. Possible etiologic factors include deficiency of nitric oxide synthase containing neurons, abnormal myenteric plexus innervation, infantile hypergastrinemia, exposure to macrolide antibiotics, lack of exposure to vasoactive intestinal peptide in breast milk, and hypersensitivity to motilin.

Epidemiology:

- **The incidence of infantile hypertrophic pyloric stenosis is 2-4 per 1000 live births.**
- **Mortality/Morbidity: Death from infantile hypertrophic pyloric stenosis is rare and unexpected. The reported mortality rate is very low and usually results from delays in diagnosis with eventual dehydration and shock.**

- **Race: Infantile hypertrophic pyloric stenosis is more common in whites than Hispanics, blacks, or Asians. The incidence is 2.4 per 1000 live births in whites, 1.8 in Hispanics, 0.7 in blacks, and 0.6 in Asians. It is also less common amongst children of mixed race parents.**
- **Sex: Infantile hypertrophic pyloric stenosis has a male-to-female predominance of 4-5:1, with 30% of patients with infantile hypertrophic pyloric stenosis being first-born males.**
- **Age: The usual age of presentation is approximately 2 – 6 weeks of life. Approximately 95% of infantile hypertrophic pyloric stenosis cases are diagnosed in those aged 3-12 weeks. Infantile hypertrophic pyloric stenosis is rare in premature infants. In addition, premature infants have a delayed diagnosis secondary to low birth weight and atypical presentation.**

Laboratory Studies:

- **Electrolytes, pH, BUN, and creatinine levels should be obtained at the same time as intravenous access in patients with pyloric stenosis.**
- **Hypochloremic, hypokalemic metabolic alkalosis is the classic electrolyte and acid-base imbalance of pyloric stenosis. This constellation of electrolyte abnormalities is now present in less than 50% of cases given the prompt and timely diagnosis of most infants with pyloric stenosis. However, delayed presentations, or missed cases may lead to persistent emesis. This prolonged vomiting causes progressive loss of fluids rich in hydrochloric acid, which causes the kidneys to retain hydrogen ions in favor of potassium.**
- **The dehydration may result in hypernatremia or hyponatremia and may result in prerenal renal failure.**
- **Elevated unconjugated bilirubin levels may be present.**

Imaging Studies:

- **If the clinical presentation is typical and an olive is felt, the diagnosis is almost certain. However formal ultrasonography is still recommended to evaluate the pylorus and confirm the diagnosis.**
- **Ultrasonography is the imaging modality of choice when evaluating a child for infantile hypertrophic pyloric stenosis (IHPS). The sonographic hallmark of infantile hypertrophic pyloric stenosis is the thickened pyloric muscle.**
- **Criteria for making the diagnosis include pyloric muscle wall thickness equal to or greater than 3 mm, and pylorus length greater than 13mm. The entire pyloric diameter may range from 10-14 mm.**
- **Upper GI imaging (UGI) can help to confirm the diagnosis of infantile hypertrophic pyloric stenosis but is not routinely performed unless ultrasonography is nondiagnostic.**

- **The definitive treatment for infantile hypertrophic pyloric stenosis is corrective surgery.**
- **The Ramstedt pyloromyotomy is the current procedure of choice, during which the underlying antro-pyloric mass is split leaving the mucosal layer intact.**
    - **Traditionally, the pyloromyotomy was performed through a right upper quadrant transverse incision. New studies have compared the operative time, cost, and hospital stay associated with the traditional incision, a circumbilical incision (believed to have improved cosmesis), and a laparoscopic procedure.**

- **Studies have shown laparoscopic pyloromyotomy to have fewer complications, reduced time to full feeds and hospital length of stay compared to open pyloromyotomy.**

Congenital megacolon:

It is a developmental disorder characterized by the absence of ganglia in the distal colon, resulting in a functional obstruction

Clinical features:

- **Failure to pass meconium or stool in first 24 hours post-partum;**
- **Abdominal distention; vomiting; constipation at birth.**
- **Peristalsis is absent in aganglionic segment, causing proximal pseudo-obstruction and gross dilatation, enterocolitis and perforation.**
- **In older children, Hirschsprung disease is characterised by chronic constipation, abdominal distention and stunted growth.**

Radiographic features

Radiograph

- **Findings are primarily those of a bowel obstruction. The affected bowel is of smaller calibre and thus depending on the length of segment affected variable amounts of colonic distension are present.'**
- **In protracted cases marked dilatation can develop, and even progress to enterocolitis and perforation.**

Fluoroscopy

- **A carefully performed contrast enema is indispensable in both the diagnosis of Hirschsprung disease but also in assessing the length of involvement. It should be noted however that the depicted transition zone on the contrast enema is not accurate at determining the transition between absent and present ganglion cells.**
- **The affected segment is of small calibre with proximal dilatation. Fasciculation/saw-tooth irregularity of the aganglionic segment is frequently seen.**

Views of particular importance include:

- **Early filling views that include rectum and sigmoid colon allowing for rectosigmoid ratio to be determined.**
- **Transition zone**

Antenatal ultrasound: In particular cases there may be evidence of fetal colonic dilatation

A definitive diagnosis requires a full thickness rectal biopsy.

Treatment: Treatment of Hirschsprung's disease consists of surgical removal (resection) of the abnormal section of the colon, followed by reanastomosis.

Colostomy: The first stage of treatment used to be a reversible colostomy. In this approach, the healthy end of the large intestine is cut and attached to an opening created on the front of the abdomen. The contents of the bowel are discharged through the hole in the abdomen and into a bag. Later, when the patient's weight, age, and condition are right, the "new" functional end of the bowel is connected with the anus.

Swenson, Soave, Duhamel, and Boley procedures

- **The pull-through procedure repairs the colon by connecting the functioning portion of the bowel to the anus. The pull-through procedure is the typical method for treating Hirschsprung's in younger patients. Swenson devised the original procedure, and the pull-through surgery has been modified many times.**
- **Currently, several different surgical approaches are used, which include the Swenson, Soave, Duhamel, and Boley procedures. The Swenson procedure leaves a small portion of the diseased bowel. The Soave procedure, leaves the outer wall of the colon unaltered. The Boley procedure, is a small modification of the Soave procedure, so the term "Soave-Boley" procedure is sometimes used. The Duhamel procedure, uses a surgical stapler to connect the good and bad bowel.**
- **For the 15% of children who do not obtain full bowel control, other treatments are available. Constipation may be remedied by laxatives or a high-fiber diet. In those patients, serious dehydration can play a major factor in their lifestyles. A lack of bowel control may be addressed by a stoma, similar to a colostomy. The Malone antegrade colonic enema (ACE) is also an option.**
- **If the affected portion of the lower intestine is restricted to the lower portion of the rectum, other surgical procedures may be performed, such as a posterior rectal myectomy.**

The prognosis is good in 70% of cases. Chronic postoperative constipation is present in 7 to 8% of the operated cases. Postoperative enterocolitis, a severe manifestation, is present in the 10–20% of operated patients.

2. **Hepatic resection of metastatic colorectal cancer has become the treatment of choice for selected patients after resection of the primary colorectal cancer. Despite variability in criteria for patient selection, survival outcomes have ranged consistently from 25% to 45%.**

Liver resection for colorectal metastases:

- **The aim of liver resection (resectability) is to remove all macroscopic disease with clear (negative) margins and leave sufficient functioning liver.**
- **Patients with solitary, multiple, and bilobar disease who have had radical treatment of the primary colorectal cancer are candidates for liver resection.**

- **The ability to achieve clear margins (R0 resection) should be determined by the radiologist and surgeon in the regional hepatobiliary unit.**
- **The surgeon should define the acceptable residual functioning volume, approximately one third of the standard liver volume, or the equivalent of a minimum of two segments.**
- **The liver surgeon and anaesthetist should take the clinical decision regarding fitness for surgery.**
- **If deemed medically unfit for surgery, patients should be considered for ablative therapy.**
- **Patients with extrahepatic disease that should be considered for liver resection include:**
    - **Resectable/ablatable pulmonary metastases;**
    - **Resectable/ablatable isolated extrahepatic sites—for example, spleen, adrenal, or respectable local recurrence; and**
    - **Local direct extension of liver metastases to, for example, diaphragm/adrenal that can be resected.**

➢ **Normal contraindications to liver resection would include uncontrollable extrahepatic disease such as:**

- **Non-treatable primary tumour;**
- **Widespread pulmonary disease;**
- **Locoregional recurrence;**
- **Peritoneal disease**
- **Extensive nodal disease, such as retroperitoneal, mediastinal or portal nodes; and**
- **Bone or CNS metastases.**

Tumours borderline for resection

- **Those patients with tumours thought to be borderline for resection may have resectable or ablatable disease and should be referred for discussion with the regional hepatobiliary unit before chemotherapy.**
- **Resectability may be achieved by portal vein embolisation or two stage hepatectomy to increase hepatic functional reserve and also by combinations of surgery and ablation.**

3. **Pouch surgery:Sometimes treating colorectal conditions requires complete or near-complete removal of the colon and rectum. While doing so resolves the disease, it also clearly impacts the GI tract's normal function of absorbing liquids and passing stool. In these cases, surgeons can often reconnect the remaining parts of the**

intestines to create an internal pouch that is joined to the anus and allows for stool to pass naturally, without the need for an external bag to collect waste.

- **Pouch procedures allow for people who have had their colon removed to avoid the need of an external waste-collecting bag.**
- **There are different types of pouches. The most common are called the J-pouch and the K-pouch.**
- **The most frequent complication of pouch procedures is infection of the pouch, known as pouchitis.**

Pouch surgery may be the optimal treatment for people with ulcerative colitis, Crohn's disease, familial adenomatous polyposis (FAP), select patients with Crohn's colitis, or other conditions involving the large intestine and or rectum.

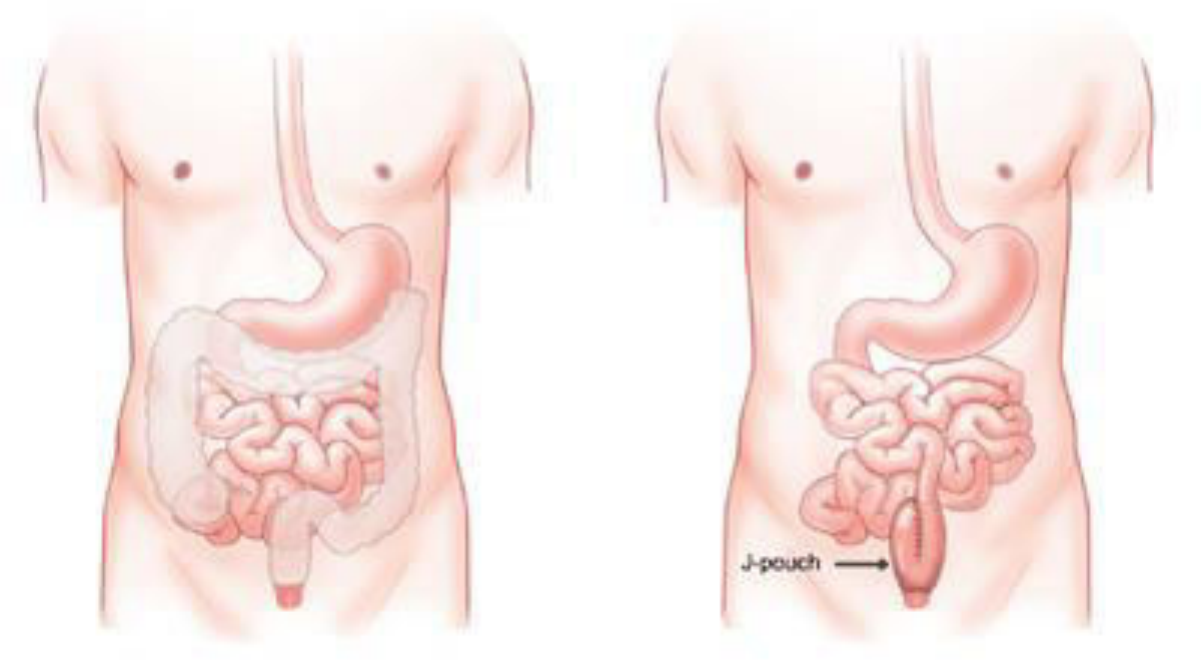
Types of Pouches

J-pouch

The 'J-pouch' may be used to treat people with ulcerative colitis or familial polyposis who need to have their colon and most of the rectum surgically removed. If their anal sphincter is intact, a surgeon can use a part of the ileum (part of the small intestine) to create an internal pouch. The pouch is then connected to the anus just above the sphincter, which is preserved for continence. The connection creates a path in the shape of the letter J, which is why it's called a J-pouch.

A J-pouch may also be called the following names:

- **ileoanal reservoir**
- **ileoanal anastomosis**
- **pull-thru**
- **endorectal pull-through**
- **pelvic pouch**
- **ileal pouch anal anastomosis (IPAA)**



When the large intestine and rectum are removed due to colorectal disease, another pathway must be devised for solid waste to exit the body. A J-pouch, a surgically created "J" shaped reservoir, is an alternate way to store and pass stool.

K-pouch

The K-pouch is an option for people with poor anal sphincter function and those who have had their sphincters previously removed and have a traditional ostomy but wish to avoid the encumbrance of an external appliance.

K-pouch surgery entails connection of the end of the small intestine to the skin of the abdomen. Unlike other ileostomies, which drain continuously into an external appliance (bag), the K-pouch includes a special valve that prevents waste from leaking out. A catheter is inserted when it is time to empty the pouch. The K-pouch thus avoids the need for an external appliance for the collection of intestinal waste for people who do not wish or are not candidates for an ileoanal J pouch.

A K-pouch may also be referred to as:

- **Koch pouch**
- **Continent ileostomy**

K-pouch surgery entails connection of the end of the small intestine to the skin of the abdomen. Unlike other ileostomies, which drain continuously into an external appliance (bag), the K-pouch includes a special valve that prevents waste from leaking out

Pouch failure and pouch repair

Occasionally, a pouch will fail to work properly due to complications like leakage or inflammation. When pouch failure occurs, surgical options may include pouch revision, creation of a redo pouch, or neo-pouch creation. In some circumstances, the conversion of a J-pouch into a K-pouch may be considered to preserve continence and improve patients' quality of life.

Diseases/Disorders of the ileal anal pouch:

- **Surgery related/mechanical complications (examples: fistulas, strictures)**
- **Inflammatory or infections disorders (examples: pouchitis, cuffitis)**
- **Functional disorders (examples: irritable pouch syndrome, pelvic floor dysfunction)**
- **Dysplasia or neoplasia (examples: adenomas , cancers). o Systemic or metabolic disorders (examples: malnutrition, anemia)**

Pouchitis: Pouchitis is an inflammation of the ileo-anal pouch, which occurs particularly in cases where the pouch has been created to manage colitis. The symptoms are normally somewhat similar but less acute than those of colitis, and include (sometimes bloody) diarrhea, urgency or difficulty in passing stools, and, in few cases, pain. The standard treatment for pouchitis is a 7- to 10-day course of a combination ciprofloxacin and metronidazole.

Complication	*Functional manifestation*	*Other manifestations*	*Investigation*
Pouchitis	Liquid stool, blood, urgency	Abdominal pain, fever	Pouchoscopy and biopsy
Chronic intestinal obstruction	Liquid stool	Abdominal pain and distension	Plain or contrast radiology, CT
Evacuation disorders			
Ileoanal stenosis	Frequent, small volume stool		Digital examination, pouchogram
Long distal segment	Frequent, small volume stool. May need to intubate		Pouchogram
'Functional'			
Low capacitance reservoir	Frequent, small volume stool. Urgency		Pouchogram
'Functional' frequency	Phasic frequency		Ambulant pressure monitoring

Merits of pouch:

- **Acts as a reservoir.**
- **Overcomes the difficulty of hand-sewn anastomosis.**
- **Keeps the functional volume of intestine.**
- **Overcomes the post-operative hazards of stoma.**

4. Classification of Different Types of Neck Dissection with Clinical Indications

Comprehensive	**Nodal Levels Removed**	**Structures Preserved**	**Indications**
Radical neck dissection	**Levels I–V**	**None**	**N+ neck for SCC where SAN involved**
Modified radical neck dissection type type I	**Levels I–V**	**SAN**	**N+ neck for SCC where SAN free of disease**
Modified radical neck dissection type II	**Levels I–V**	**SAN, SCM**	**N+ neck for SCC where IJV involved but SAN free of disease**
Modified radical neck dissection type III	**Levels I–V**	**SAN, SCM, IJV**	**Metastatic differentiated thyroid carcinoma**
Selective			
Supraomohyoid neck dissection	**Levels I–III**	**SAN, SCM, IJV**	**N0 neck for SCC of oral cavity and oropharynx (include level 4); N0 neck**

			maliganant **melanoma where primary** **site is anterior to ear** **(include parotidectomy for** **face and scalp)**
Extended supraomohyoid **neck dissection**	**Levels I–IV**	**SAN, SCM, IJV**	**N0 neck for SCC of lateral** **tongue**
Lateral neck dissection	**Levels II–IV**	**SAN, SCM, IJV**	**N0 neck for SCC of larynx** **and hypopharynx**
Posterolateral neck dissection	**Levels II–V, subocciptial,** **retroauricular nodes**	**SAN, SCM, IJV**	**N0 neck malignant** **melanoma where primary** **site is posterior to ear**
SAN, spinal accessory nerve; SCM, sternocleidomastoid muscle; IJV, internal jugular vein.			

The cervical lymphatic nodal basins contain between 50 and 70 lymph nodes per side and are divided into seven
levels .

1. **Level I is subdivided.**

   Level IA is bounded by the anterior belly of the digastric muscle, the hyoid bone, and the midline.

   Level IB is bounded by the anterior and posterior bellies of the digastric muscle and the inferior border of the mandible. Level IB contains the submandibular gland.

2. **Level II is bounded superiorly by the skull base, anteriorly by the stylohyoid muscle, inferiorly by a horizontal plane extending posteriorly from the hyoid bone, and posteriorly by the posterior edge of the sternocleidomastoid muscle. Level II is further subdivided.**

   Level IIA is anterior to the spinal accessory nerve.

   Level IIB, or the so-called submuscular triangle, is posterior to the nerve.

3. **Level III begins at the inferior edge of level II and is bounded by the laryngeal strap muscles anteriorly, by the posterior border of the sternocleidomastoid muscle posteriorly, and by a horizontal plane extending posteriorly from the inferior border of the cricoid cartilage.**

4. **Level IV begins at the inferior border of level III and is bounded anteriorly by the strap muscles, posteriorly by the posterior edge of the sternocleidomastoid muscle, and inferiorly by the clavicle.**

5. **Level V is posterior to the posterior edge of the sternocleidomastoid muscle, anterior to the trapezius muscle, superior to the clavicle, and inferior to the base of skull.**

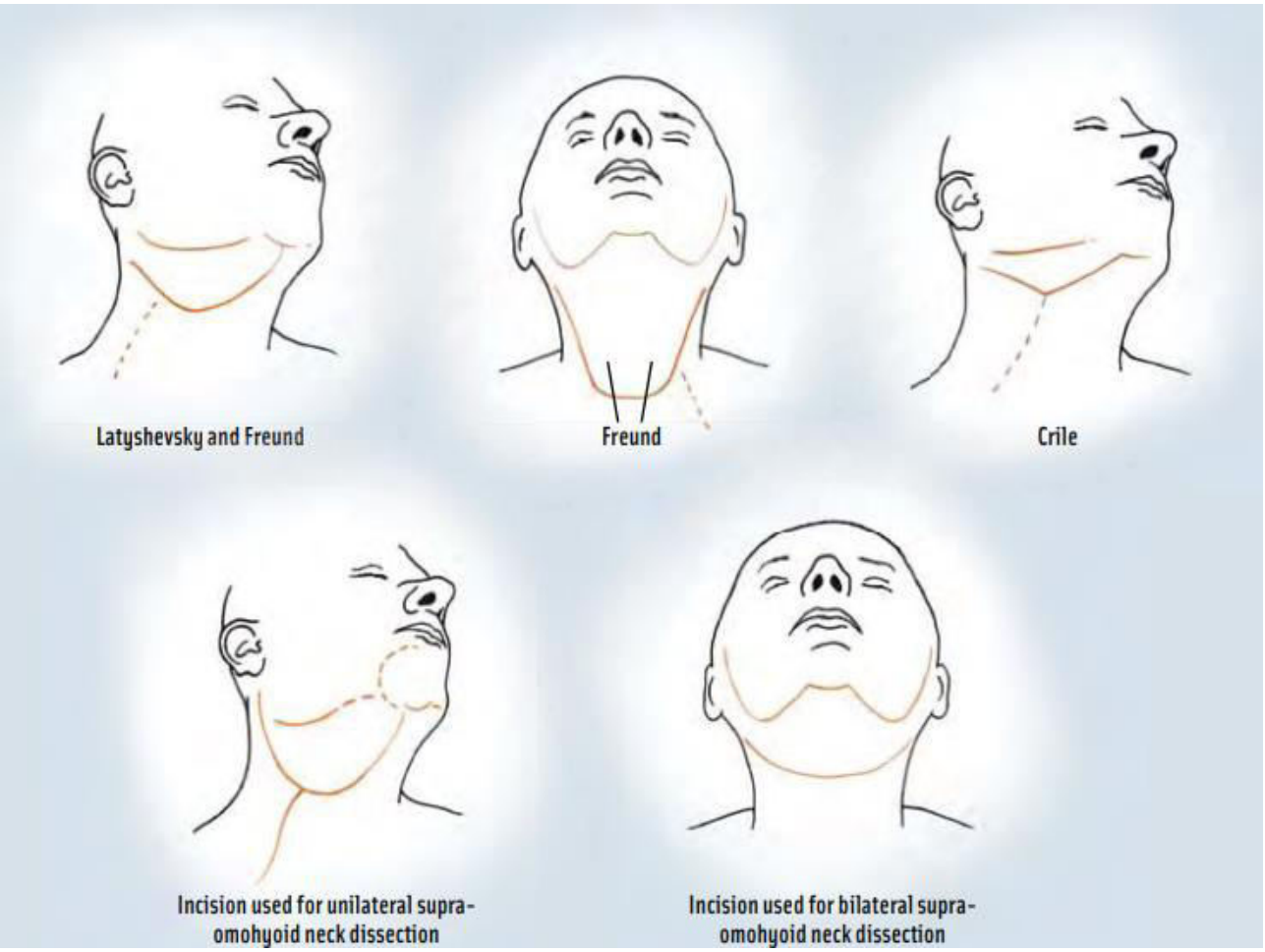
6. **Level VI is bounded by the hyoid bone superiorly, the common carotid arteries laterally, and the sternum inferiorly. Although level VI is large in area, the few lymph nodes that it contains are mostly in the paratracheal regions near the thyroid gland.**

7. **Level VII (superior mediastinum) lies between the common carotid arteries and is superior to the aortic arch and inferior to the upper border of the sternum.**

   Basic steps of radical neck dissection:

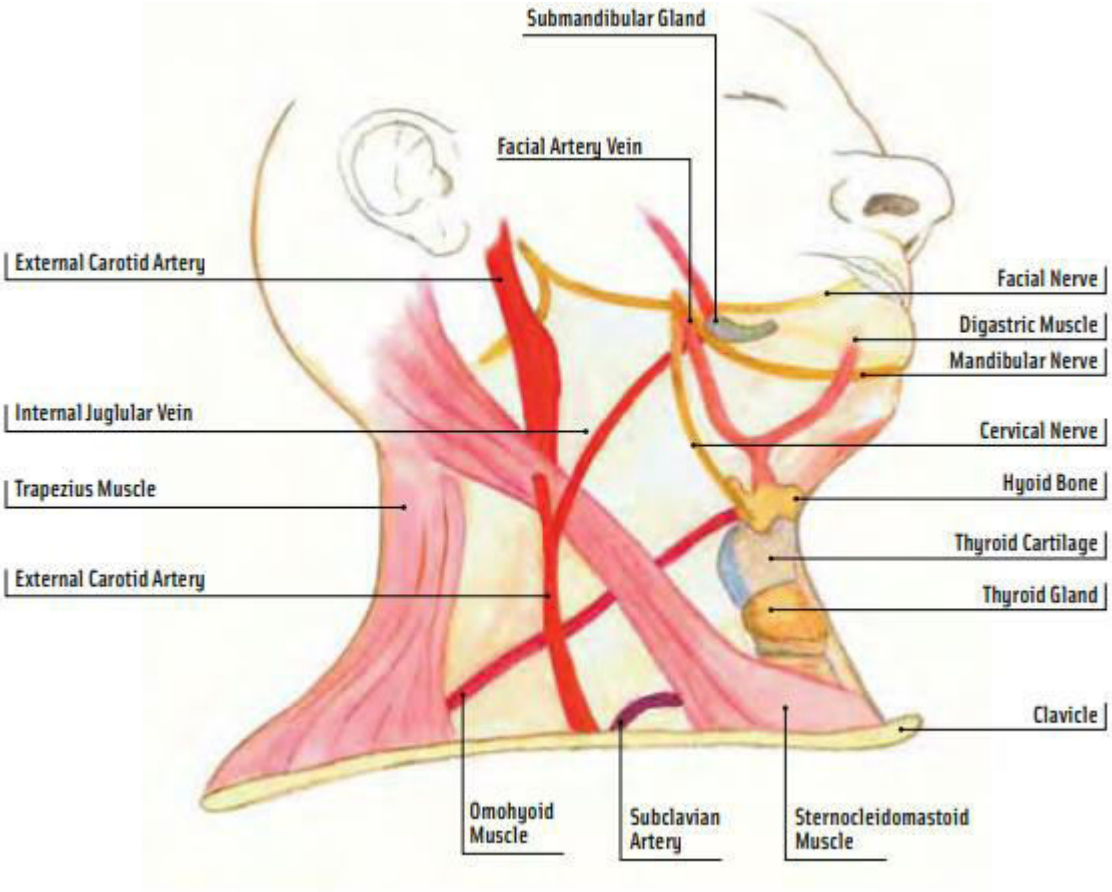
   The surgical incision is made starting at the lateral neck from beneath the jaw to the supraclavicular area (diagram B).

   Diagram B:



Skin flaps are mobilized while hemostasis is achieved using fine hemostats as well as ligatures on bleeding vessels. Once the skin flaps are freed, the surgeon places a traction suture in different areas of the skin flap and then places a hemostat on the end. This is done to retract the skin flap for better exposure. Using curved scissors, the anterior trapezius muscle is exposed, as well as the external jugular vein. The trapezius muscle and the external jugular vein are clamped, ligated and divided. The internal jugular vein is then found, isolated and divided. The omohyoid muscle is identified and transsected. The fatty tissue in the neck houses lymph nodes. These lymph nodes are dissected away from other structures and the common carotid artery and vagus nerve are identified (diagram C).

Diagram C:



The thyrocervical artery is then clamped, divided, and ligated. The posterior triangle are dissected starting at the anterior of the trapezius muscle and continuing to the bra chial plexus, the levator scapulae and the scalene muscles. Branches of the cervical and suprascapular arteries are identified then clamped, ligated, and divided. Once the anterior portion dissection is complete, the omohyoid muscle is severed where it attaches to the hyoid bone. Once hemostasis is controlled, all hemostats are removed. The surgical field is then covered with warm, moist, sterile laparotomy packs. Next, the sternocleidomastoid muscle is cut and retracted out of the way. At this point the submental space is dissected from fatty tissue that houses lymph nodes, starting upward and working down. The fascia that is deep on the lower portion of the mandible is then incised and the facial vessels are then divided and ligated. Entering the submandibular triangle, the submandibular duct is divided and ligated. The submandibular glands that have fatty tissue and lymph nodes surrounding them are dissected going toward the digastrics muscle. The facial branch of the external carotid artery is identified and divided. Parts of the digastrics, as well as the stylohyoid muscles, are then cut where they attach to the hyoid bone and mastoid. The top end of the internal jugular vein is elevated and divided, and the mass is removed. The entire surgical site is checked for any bleeding and irrigated with warm saline solution. If a skin graft is needed, it is placed over the bifurcation of the carotid artery downward about four inches, then sutured using 4-0 absorbable suture on a small cutting needle. Tubing for the Hemovac drain, if that is the surgeon's preference, is placed in the wound. The skin flaps are then approximated and

closed with interrupted, fine non-absorbable sutures or skin staples. A pressure dressing is applied to the neck, which also depends on the surgeon's preference.

5. Staplers in surgery:

Goals of stapler

- **Close abdominal wounds**
- **Join internal organs to restore to normal function**
- **Maintain hemostasis**
- **Reduce tissue trauma**
- **Reduce contamination**
- **Prevent postoperative morbidity and infections**

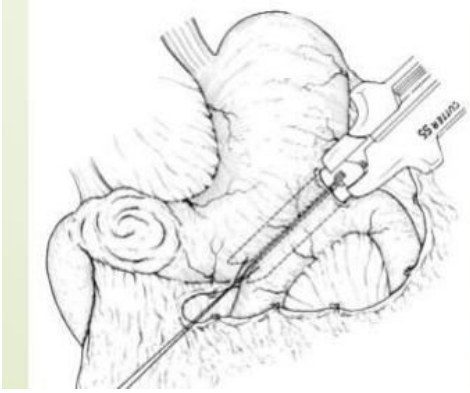
Advantages of stapling:

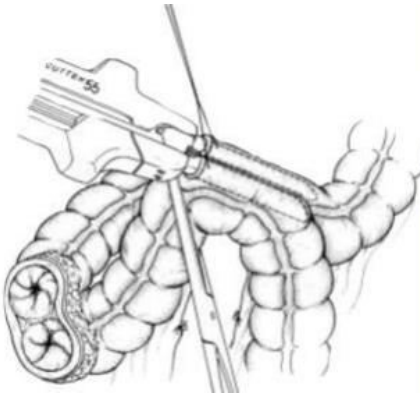
- **Stapling anastomosis is faster than traditional suturing techniques, hence reduced operating time. Reduces tissue trauma by minimizing tissue handling.**
- **Prevents contamination.**
- **The availability of staplers has fostered the development of procedures that were difficult with traditional techniques because of limited access.**
- **Stapled tissue and anastomoses heal as reliably and rapidly as sutured anastomosis.**
- **Not user dependent.**

- **Use of surgical staplers**

Linear staplers:

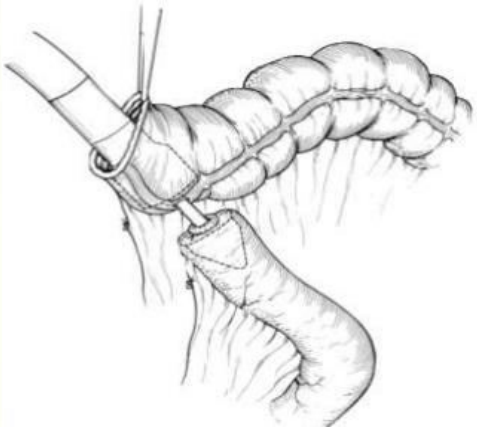
- **Close internal organs prior to transaction**
- **Close the common opening or enterotomy after the creation of an anastomosis**
- **Make side to side or functional end to end anastomosis**
- **Biopsy or wedge resection of the lung and closing of the bronchus and to close pulmonary vessels prior to their division**
- **Resection of solid organs such as liver or pancreas.**

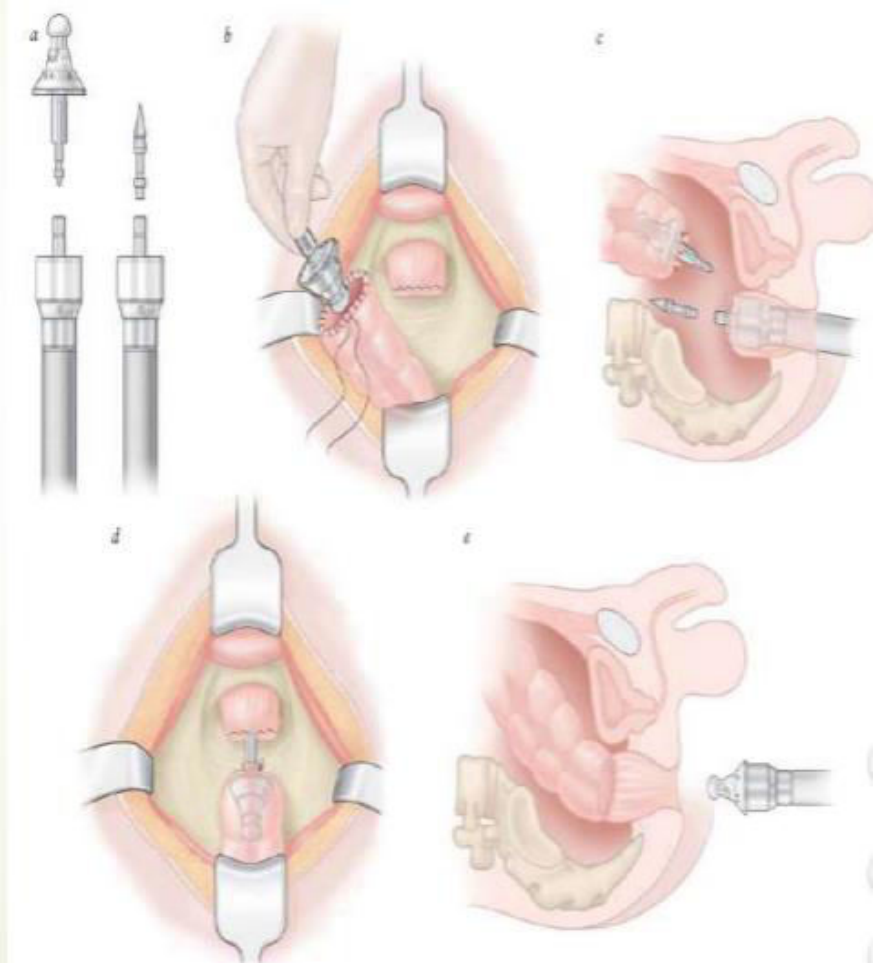




Circular staplers (intraluminal staplers):

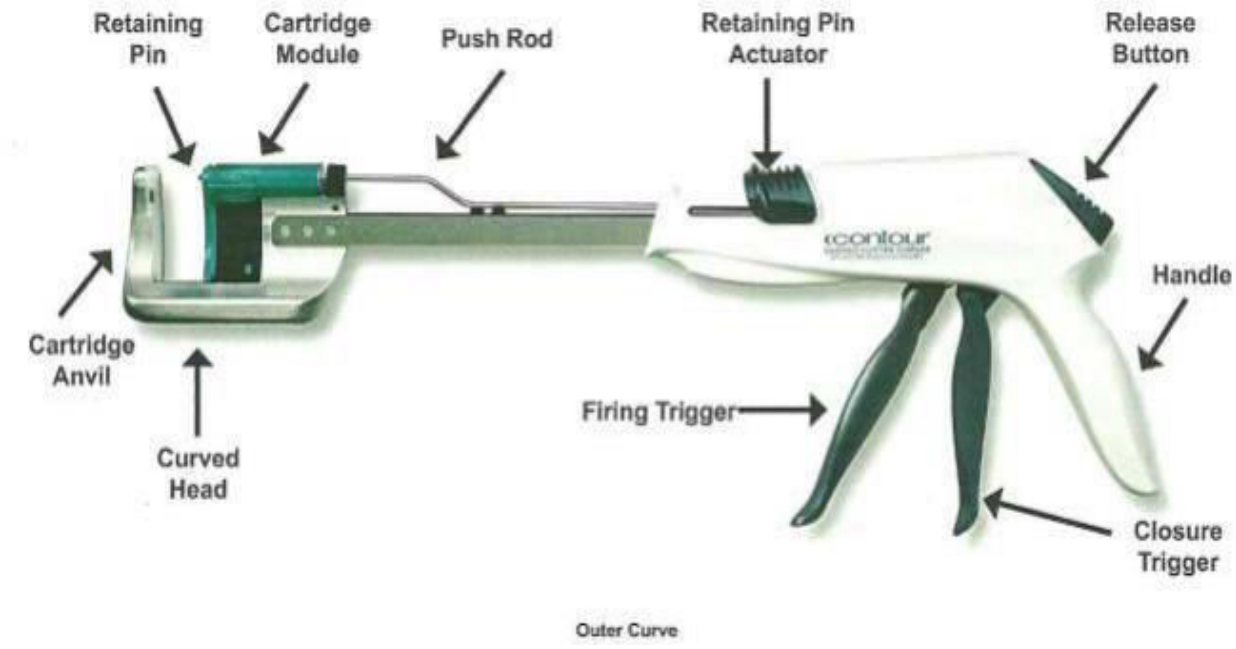
- **End to end anastomosis e.g. colorectal anastomosis× in LAR**
- **End to side anastomosis e.g. illeocolostomy after right hemicolectomy**
- **Side to side anastomosis e.g. side to side× gastrojejunostomy after billroth II gastrectomy**





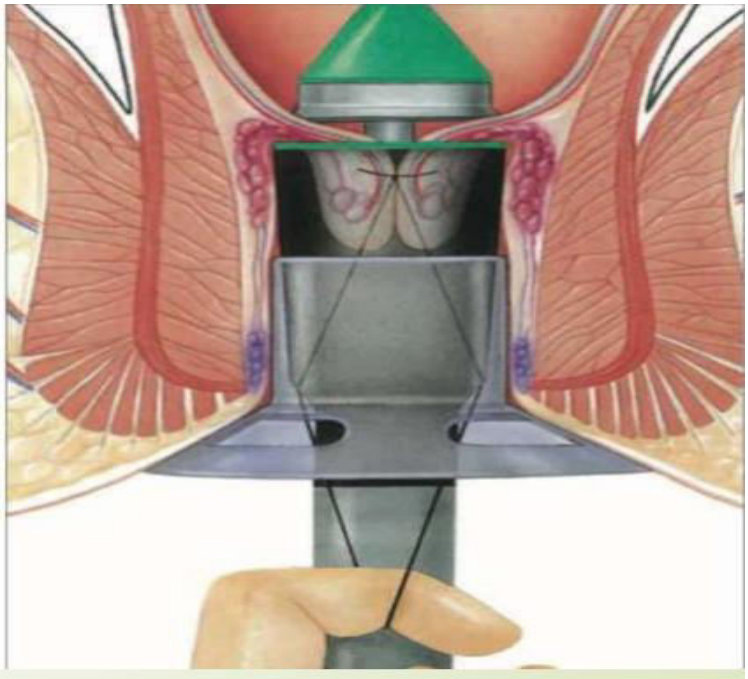
Curvilinear cutting staplers (contour stapler):

- **Transabdominal proctectomy**
- **Very-low- anterior resection of the rectum (as it is able to fit into the narrow confines of× the pelvis)**



Procedure for prolapse and hemorrhoid [PPH] staplers:

Used to excise prolapsed rectal× mucosa at the top of the anal canal as a treatment for prolapsing hemorrhoids.



Side to side anastomosis (Functional end to end anastomosis)

CRITICAL CONCEPTS

- **Non-tension**
- **GIA stapler**
- **Align anti-mesenteric sides of bowel together**
- **Staggered staple lines**

Anastomotic leaks in stapled anastomosis

- **Anastomotic leaks reported may or may not involve the staple-lines, dependent upon the method of surgery used**
- **Anastomotic leaks**
  Major/ manifested leaks
  Minor leaks Etiology of staple line leaks
- **Etiology of staple line leaks:**
  - **Mechanical/ tissue causes –Seen in first two days following surgery.**
  - **More commonly seen in Ischemic causes – ischemic leaks happens 5 to 7 days post operatively.**

6. Necrotising fasciitis (rare plural: necrotising fasciitides) refers to a rapidly progressive and often fatal necrotising soft tissue infection primarily involving and spreading along the fascia.

The most common risk factor is diabetes mellitus, especially in combination with peripheral arterial disease. Other predisposing factors include immunocompromise due to HIV infection, cancer, alcoholism, and organ transplants. However, infections can occur in otherwise healthy individuals following surgery, penetrating trauma, minor wounds such as insect bites or abrasions, or even blunt trauma with no clear portal of entry.

Microbiologically, there are two major recognised forms:

- **Polymicrobial (type i): most common; involves both anaerobic and aerobic organisms, such as *clostridium*, *bacteroides*, and *peptostreptococcus* in the former group, and *enterobacteriaceae* family members and *staphylococcus aureus* in the latter group.**
- **Monomicrobial (type ii): less common (10-15%); most commonly involves group a streptococci, the "flesh-eating bacteria" and may be complicated by toxic shock syndrome. Less commonly due to *staphylococcus aureus***

Type	Aetiology	Clinical presentation	Management
Fournier gangrene is necrotising fasciitis of the perineum. It is a true urological emergency due to the	**Fournier gangrene is typically seen in diabetic men aged 50-70 years, rarely in women.** **Other predisposing**	• **Perineal/scrotal pain, swelling, redness.** • **Crepitus from soft tissue gas (up to 65%).**	**Management options include:** • **Immediate radical surgical debridement of necrotic tissue** • **Intravenous antibiotics**

high mortality rate but fortunately, the condition is rare.	factors include: • Diabetes mellitus • Immunosuppression • Alcoholism • Debility	• Systemically unwell • Fever and leucocytosis	• Hyperbaric oxygen therapy • Testes replaced into the remaining scrotum or covered by skin graft (once infection settled)
Meleney's gangrene is a rare, rapidly spreading destructive subcutaneous tissue infection	• Most commonly occurs at post-surgical sites Caused by staphylococcus aureus and streptococcus organisms • Most patients with post-operative synergistic Gangrene have pre-existing immunosuppressive Conditions such as chronic renal failure,HIV, Diabetes mellitus or are elderly.	• Initial signs are not specific. • One of the identifying symptoms is the presence of extremely painful lesions, which usually form in the second week after surgery or minor trauma. • The ulcers that form at the center of the lesion are usually covered by a black eschar and encircled by a gangrenous margin.	• With introduction of newer antimicrobials zinc oxide was replaced with modern day antibiotics as the choice of treatment. • Surgical debridement is most important. Serial debridements are usually necessary to completely remove the dead devitalised tissue. • Additional treatment measures such as hyperbaric oxygen therapy can be used as an adjunct to this.

Surgery is the primary treatment for necrotizing fasciitis.

Controversy exists regarding how much tissue should be initially excised because the skin may often appear normal. Andreasen et al examined the normal-appearing tissues microscopically and reported that the tissues had extensive early vascular thrombosis as well as vasculitis.

After the initial debridement, the wound must be carefully examined. Hemodynamic instability is usually present after surgery, and it may cause progressive skin necrosis. After debridement, the patient may return as often as necessary for further surgical debridement. The anesthesiologist is an important member of the operative team because continued resuscitative efforts are undertaken during the operative procedure. The surgical regimen can be summarized as follows:

- **Surgical incisions should be deep and extend beyond the areas of necrosis until viable tissue is reached.**
- **The entire necrotic area should be excised**
- **The wound should be well irrigatedHemostasis should be maintained, and the wound should be kept open.**
- **Surgical debridement and evaluations should be repeated almost on a daily basis**
- **The wound should be inspected in the operating room**

Following each debridement of the necrotic tissue, daily antibiotic dressings are recommended.

Antimicrobial Therapy
Empiric antibiotics should be started immediately. Initial antimicrobial therapy should be broad-based, to cover aerobic gram-positive and gram-negative organisms and anaerobes. A foul smell in the lesion strongly suggests the presence of anaerobic organisms. The maximum doses of the antibiotics should be used, with consideration of the patient's weight and liver and renal status.
Antibiotic therapy is a key consideration. Possible regimens include a combination of penicillin G and an aminoglycoside (if renal function permits), as well as clindamycin (to cover streptococci, staphylococci, gram-negative bacilli, and anaerobes).
A more specifically targeted antibiotic regimen may be begun after the results of initial gram-stained smear, culture, and sensitivities are available.
Fluid, Nutritional Support, IVIG
Because of persistent hypotension and diffuse capillary leak, massive amounts of intravenous fluids may be necessary after the patient is admitted to the hospital.
Nutritional support is also an integral part of treatment for patients with necrotizing fasciitis. This supplementation should be initiated as soon as hemodynamic stability is achieved. Enteral feeding should be established as soon as possible to offset the catabolism associated with large open wounds.
Successful use of intravenous immunoglobulin (IVIG) has been reported in the treatment of streptococcal toxic shock syndrome
Hyperbaric Oxygen Therapy
Once other modalities, including surgical debridement and antibiotic administration, have been used, hyperbaric oxygen therapy (HBOT) may be considered, if available.

7. Operations for empyema thoracis are con- ventionally performed by open thoracotomy, whereas the video-assisted thoracic surgery (VATS) approach remains controversial.

- **Thoracoscopy: Thoracoscopy is an alternate therapy for multiloculated empyema thoracis. In patients with multiloculated parapneumonic pleural effusions, the loculations in the pleural space can be disrupted with a thoracoscope, and the pleural space can be drained completely. If extensive adhesions are present or thick pleural peel entraps the lung, the procedure may be converted to open thoracostomy and decortication.**
- **VATS is safe and effective for treatment; earlier intervention with VATS can produce better clinical results. Hope et al reviewed outcomes of surgical treatment for parapneumonic empyema thoracis. The use of VATS was compared with thoracotomy. Morbidity and mortality rates were similar among all groups. VATS debridement had a lower postoperative hospital stay and shorter duration of chest drainage and greater improvement in a subjective dyspnea score.**
- **Wang and colleagues proposed a new technique using an electronic endoscope (bronchoscope or gastroscope) inserted through the chest tube to directly visualize, irrigate, and break down the loculation effectively in various pleural diseases, including 13 cases of empyema thoracis.**
- **Rib resection and open drainage of pleural space**

Open drainage of the pleural space may be used when closed-tube drainage of the pleural infection is inadequate and the patient does not respond to intrapleural thrombolytic agents. This procedure is recommended only when the patient is too ill to tolerate decortication. The resection of one to three ribs overlying the lower part of the empyema thoracis cavity is performed, a large-bore chest tube is inserted into the empyema thoracis cavity, and the tube is drained into a colostomy bag.

Thoracocentesis (tapping)

Drainage
- Simple
  - Empyema tube (von Petzer's drain)
  - Negative passive drain (underwater drain/von Bülau's system/Heimlich's valve)
- Active
  - Intermittent suction
  - Continuous suction
- Irrigation
  - Cyclic (tidal) one tube ore more
  - Continuous suction—irrigation (two or more tubes)
- Chemical decortication (fibrinolysis)

Debridement
- Open
- VATS

Decortication (Fowler-Delorme procedure)

Thoracoplasty without plomb
- With plomb
  - Muscle
  - Omentum
  - Other

Open window thoracostomy
- Eloesser flap and modifications
- Without flap (fenestration)

Combined procedures
- Clagett procedure
- Weder procedure

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8. There are two main techniques for breast reconstruction

- **Implant reconstruction: Inserting an implant that's filled with saline (salt water) or silicone gel.**
- **Autologous or "flap" reconstruction.**

- **And also reconstruction of nipple areola complex after surgery**

Several different types of breast implants can be used to rebuild the breast. Implants are made of a flexible silicone outer shell, and can contain:

- **Saline: These implants are filled with sterile (germ-free) salt water. These types of implants have been used the longest.**
- **Silicone gel: Gel implants tend to feel a bit more like natural breast tissue. Cohesive gel implants are a newer, thicker type of silicone implant. The thickest ones are sometimes called "gummy bear" implants. They are more accurately called form-stable implants, meaning that they keep their shape even if the shell is cut or broken. They are firmer than regular implants and might be less likely to rupture (break), although this still might happen.**

Other types of implants that have different shells and are filled with different materials are being studied, but are only available if you are participating in a clinical trial.

- **A tissue flap procedure (also known as autologous tissue reconstruction) is one way to rebuild the shape of your breast after surgery to remove the cancer. As with any surgery, you should learn as much as possible about the benefits and risks, and discuss them with your doctor, before having the surgery.**

Tissue flap procedures can also have some potential downsides that need to be considered:

- **In general, flaps require more surgery and a longer recovery than breast implant procedures.**
- **Flap operations leave 2 surgical sites and scars – one where the tissue was taken from (the donor site) and one on the reconstructed breast. The scars fade over time, but never go away completely.**
- **Some women can have donor site problems such as abdominal hernias and muscle damage or weakness.**
- **Because healthy blood vessels are needed for the tissue's blood supply, flap procedures may not be the best option for smokers, and for women who have uncontrolled diabetes, vascular disease (poor circulation), or connective tissue diseases.**

Types of tissue flap procedures

The most common types of tissue flap procedures are:

- **TRAM (transverse rectus abdominis muscle) flap, which uses tissue from the abdomen (tummy)**
- **DIEP (deep inferior epigastric perforator) flap, which uses tissue from the abdomen (tummy)**
- **Latissimus dorsi flap, which uses tissue from the upper back**
- **GAP (gluteal artery perforator) flaps (also known as a gluteal free flaps), which uses tissue from the buttocks**
- **TUG (transverse upper gracilis) flaps, which - uses tissue from the inner thigh**

TRAM flap

The TRAM flap procedure uses tissue and muscle from the tummy. Sometimes an implant is used with this type of flap, but some women have enough tissue in this area to shape the breast so that an implant isn't needed. The skin, fat, blood vessels, and at least one abdominal muscle are moved from the belly to the chest. The TRAM flap procedure can tighten the lower belly, resulting in a "tummy tuck," but it can also decrease the strength in your belly muscles. A TRAM flap may not be possible in women who are very thin or who have had abdominal tissue removed before.

There are different types of TRAM flaps:

- **A pedicle TRAM flap leaves the flap attached to its original blood supply and tunnels it under the skin to the chest. It usually requires removing most if not all of the rectus abdominis (6-pack) muscle on that side, which means an increased risk of bulging and/or hernia on one side of the abdomen. This can also mean your abdominal (belly) muscles may not be as strong as before the surgery.**
- **A free TRAM flap moves tissue (and usually less muscle) from the same part of the lower abdomen, but the flap is completely removed and moved up to the chest. The blood vessels (arteries and veins) must then be reattached. This requires the use of a microscope (microsurgery) to connect the tiny vessels, and the surgery takes longer than a pedicle TRAM flap. The blood supply to the flap is usually better than with pedicle flaps, there is less risk of losing abdominal muscle strength, and the donor site (abdomen) often looks better. The main risk is that sometimes the blood vessels get clogged and the flap doesn't work.**

Nipple and areola reconstruction

The nipple and areola are usually the final phase of breast reconstruction. This is a separate surgery done to make the reconstructed breast look more like the original breast. It can be done as an outpatient procedure. It's usually done about 3 to 4 months after surgery after the new breast has had time to heal.

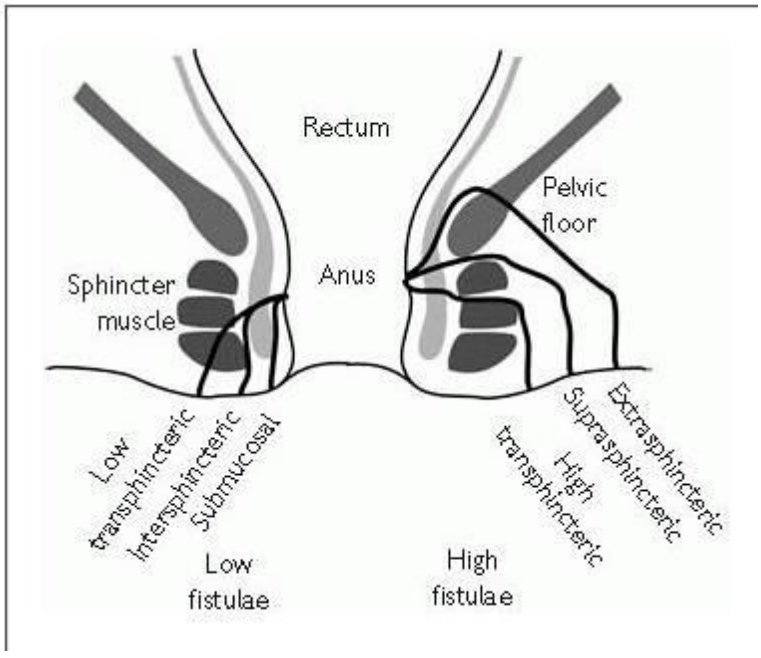
Ideally, nipple and areola reconstruction tries to match the position, size, shape, texture, color, and projection of the new nipple to the natural one (or to each other, if both nipples are being reconstructed). Tissue used to rebuild the nipple and areola comes from the newly created breast or, less often, from skin from another part of your body (such as the inner thigh). If a woman wants to match the color of the nipple and areola of the other breast, tattooing may be done a few months after the surgery.

Nipple prosthetics can also be used.

9. A fistula-*in-ano*, or anal fistula, is a chronic abnormal communication, usually lined to some degree by granulation tissue, which runs outwards from the anorectal lumen (the internal opening) to an external opening on the skin of the perineum or buttock (or rarely, in women, to the vagina).

Types are:

I. **Intersphincteric**
II. **Trans-sphincteric**
III. **Supra-sphincteric**
IV. **Extra- sphincteric**

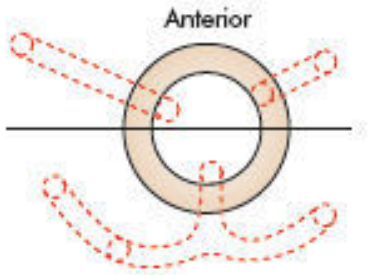


Classification of fistula in ano

Clinical assessment:

- **A full medical (including obstetric, gastrointestinal, anal surgical and continence) history and proctosigmoidoscopy are necessary to gain information about sphincter strength and to exclude associated conditions.**
- **Determine the site of the internal opening; the site of the external opening(s); the course of the primary track; the presence of secondary extensions; and the presence of other conditions complicating the fistula.**

Goodsall's rule relates the external opening of an anal fistula to its internal opening. It states that the external opening situated below the transverse anal line will open into the anal canal in the midline posteriorly. An anterior opening is usually associated with a radial tract. Or in more direct terms, it means that anterior-opening fistulas tend to follow a simple direct course while posterior-opening fistulas may follow a devious, curving path with some even being horseshoe-shaped before opening in the posterior midline.



Diagnosis and investigations: Diagnosis and investigation should aim to confirm the presence of a fistula and identify the course of the track to determine the type of fistula.

- **Examination of the perineum and rectal examination may reveal a palpable fibrous track.**
- **Examination under anaesthetic (EUA) with probing of any external opening to aid identification of the course of the track.**
- **Endoanal ultrasound (sometimes with hydrogen peroxide injected into the track) identifies the course of the track.**
- **MRI scanning is probably the most sensitive method of determining the course of the track and identifying any occult perianal or pelvic sepsis.**
- **Flexible sigmoidoscopy if associated colorectal disease, e.g. Crohn's disease, is suspected.**

Treatment:

Medical treatment:

- **Antibiotics may reduce symptoms from recurrent sepsis but cannot treat the underlying fistula.**
- **Medical treatment of inflammatory bowel disease may dramatically reduce symptoms from associated fistulas.**

Surgical treatment:

Principles of surgical treatment are as follows:

- **Drainage of any acute sepsis if present.**
- **Prevention of recurrent sepsis usually by insertion of a loose seton suture, e.g. silastic sling.**
- **Low fistula in ano. Lay open track, remove all chronic granulation tissue, and allow to heal spontaneously (fistulotomy). Little risk of impairment of continence due to minimal division of sphincter tissues.**
- **High fistula in ano.**
  - **Remove fistula track and close the internal opening (core fistulectomy and endorectal flap advancement).**
  - **Slowly divide the sphincter tissue between the fistula and the perianal skin (cutting seton): low risk of incontinence.**
  - **Fill the fistula with fibrin glue.**

Surgical management:

- **Fistulotomy:**
- **This is the standard treatment for lowsimple anal fistulas, submucosal and low inter-sphincteric fistulas.**
- **The indications are low cryptoglandular fistulas, low chronic fistulas, simple fistulas where 30-50% of the tracts pass through the sphincter, which is not anterior in female, single tract, non recurrent, continent, non chronic.**
- **Fistulotomy is usually a single stage procedure but in complex procedures it can be used as a staged procedure with adjuvant seton or glue therapy. The incontinence rate varies from 0-40% in inter-sphincteric fistulas.**
- **Radiation ablation of tract is another improvement in techniques of fistulectomy. It is known to have decreased gas continence as radiation frequency ablation causes minimal damage to surrounding tissue.**
- **LASER surgery: LASER ablation is limited to the lumen of fistulas making the technique sphincter –saving.**
- **Ultrasound dissection of the fistulous tract is a future advancement. The recurrence rate of fistulotomy is 7-16% after 2 yrs follow up. This recurrence rate increases to 40% after 6 yrs.**
- **Fistulectomy: Studies have shown that the Fistulectomy does not offer any additional advantage over the Fistulotomy procedure.**

Newer modalities:

- **Fibrin Glue - it is amixture of fibrinogen, thrombin and calcium ions which when combined form a soluble clot due to cleavage of fibrinogen to fibrin. This clot seals the fistula tract in 30- 60 seconds. Between days 7 and 14 the tract is replaced by synthesized collagen. The advantages of this procedure are that it is a simple procedure without any learning curve. There is no decrease in level of continence and also other treatment options remain open in case of a failure.**
- **Fibrin Plug -The plug is made up of lypophilized porcine small intestinal submucosa shaped in a conical fashion which increases the mechanical stability thus avoiding dislodgement during straining. The reasons for failure of the plug are improper securing of the plug to the primary opening leading to dislodgement. Multiple fistula tracts have been associated with higher failure rates.**

- **Adipose derived stem cells - have been used in the treatment of complex anal fistulas.**
- **Mucosal Advancement Flap - this a sphincter sparing procedure where endorectal/ endoanal flaps are advanced to close the internal ring with or without closure of the tract.**
- **VAAFT: Video assisted anal fistula treatment**
- **LIFT procedure - It is ligation of the inter sphincteric fistula tract.**

Advanced procedures:

10. Answer.

Different Surgical options for the treatment of varicose veins:

Varicose vein surgery is one of the most common forms of surgery. Varicose veins can be surgically removed or closed off using a number of different techniques. This will not harm the blood supply in the legs, because the blood will re-direct into other healthy veins. Surgery can be done on both superficial and deep veins. In varicose vein surgery, the varicose veins are removed to relieve the symptoms.

The primary goal of surgical therapy is to improve venous circulation by correcting venous insufficiency through the removal of major reflux pathways. Common surgical approaches to large-vein varicose disease include ligation of the saphenofemoral junction with vein stripping, phlebectomy performed through microincisions, endovenous radiofrequency thermal ablation, and endovenous laser thermal ablation. The principal surgical approach to small-vein disease is by microincisional phlebectomy followed by sclerotherapy.

- **Endovenous laser therapy**

Endovenous laser therapy is a thermal ablation technique that uses a laser fiber placed inside the vein.
Seldinger over-the-wire technique is used to place a long catheter along the entire length of the truncal varix to be ablated. A bare laser fiber is passed through the catheter until the end protrudes from the tip of the catheter by about 2 cm and the laser fiber tip is positioned at the saphenofemoral junction just distal to the subterminal valve. The position is confirmed by ultrasonography and by use of the laser guide light.
Under ultrasonographic guidance, very dilute, high volume local tumescent anesthetic is injected around the vessel to be ablated until a halo of tumescence is observed along the entire length of the vessel, separating it from its fascial sheath.
Firm pressure is applied to collapse the vein around the laser fiber, and the laser is fired with settings sufficient to cause irreversible thermal endothelial damage.
The laser may be set for continuous delivery of energy, in which case the fiber and catheter must be withdrawn at a slow and constant rate, or for intermittent pulses, in which case the fiber and catheter are withdrawn about 2 mm after each pulse and the process is repeated along the entire course of the vessel.
One system, using a 1320-nm laser, uses an automatic pullback mechanism.

- **Radiofrequency ablation**

Radiofrequency ablation is a thermal ablation technique that uses a specially developed proprietary RF catheter placed inside the vein.

A cutdown, stab incision with vein exteriorization, or simple needle puncture using a Seldinger over-the-wire technique is used to place an introducer sheath into the truncal varix to be ablated.
A special RF ablation catheter is passed through the sheath and along the vein until the active tip is at the saphenofemoral junction just distal to the subterminal valve. Position of the tip is confirmed by ultrasonography.
Tumescent volumes of local anesthetic are injected in quantities sufficient to separate the vessel from the overlying skin and other delicate tissues along its entire length.
In the old system, metal fingers at the tip of the RF catheter were deployed until they made contact with the vessel endothelium. In the new system, 7 cm of the tip is heated to 120 º C using RF energy. Tissue heating occurs both in and around the vessel to be treated.
Thermal sensors record the temperature within the vessel. Energy is delivered until the tissue temperature is just sufficient to ensure endothelial ablation.
The RF catheter is withdrawn every 7 cm and the process is repeated all along the length of the vein to be treated.
While widely accepted, there remains a lack of long-term, high-quality trials and class 1A evidence comparing RF ablation efficacy with open surgery. [17]

- **The most common ways to surgically remove varicose veins are:**

- **Saphenofemoral ligation and Vein stripping: Two incisions (cuts) are made: One at the top of the leg just below the groin and one behind the knee joint or at the ankle. The vein is then tied or clamped off at the top incision using a technique called vein ligation. A long wire is sent through the lower incision up through the vein, and at the lower end a button-like cap is attached to the wire. This allows the entire vein to be pulled out through the incision near the groin.**

- **Stab-avulsion technique: The stab-avulsion technique (ambulatory phlebectomy) allows removal of short segments of varicose and reticular veins through tiny incisions, using special hooks developed for the purpose. This procedure is extremely useful for treatment of residual clusters after saphenectomy and for removal of nontruncal tributaries when the saphenous vein is competent.**

  With the patient in a standing position, duplex ultrasonography is used to map the locations of all refluxing vessels to be removed. The vessel locations are marked on the skin using an indelible marker. The position of the veins is confirmed with the patient recumbent using a vein illumination device as the position of the vein relative to the skin may change with positioning of the leg.

The leg is prepped, and the patient is draped for the procedure.
A microincision is made over the vessel using a tiny blade or a large needle.
A phlebectomy hook is introduced into the microincision, and the vein is delivered through the incision.
Using traction on the vein, as long a segment as possible is pulled out of the body, tearing it loose from its tributaries and other attachments.
When the vein breaks or cannot be pulled any further, another microincision is made and the process is begun again and repeated along the entire length of the vein to be extracted.
No ligatures are used in the procedure, and no sutures are used to close the microincisions.

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2019

PAPER - III

1. **Functions of skin. How does skin graft survive? 10**
2. **Various features of hypospadias and describe single stage repair. 10**
3. **Clinical features and management of renal cell carcinoma. 10**
4. **Short notes on: 5+5 = 10**
   - **a) Subdural hematoma.**
   - **b) Flail chest.**
5. **Enumerate causes and prevention and management of pressure sore. 3+3+4 = 10**
6. **Describe clinical features, diagnosis and management of spinal cord injury. 3+3+4 = 10**
7. **Describe clinical features, diagnosis and management of congenital diaphragmatic hernia. 3+3+4 = 10**
8. **Write in brief: 5+5 = 10**
   - **a) Principles of cleft lip repair.**
   - **b) Flexor tendon injury in hand.**
9. **Indications of cardiopulmonary bypass and treatment options in Patent Ductus Arteriosus. 5+5 = 10**
10. **Outline the principles of microsurgery. Discuss briefly pectoralis major flap. 5+5 = 10**

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2019

PAPER - III

1. Functions of skin. How does skin graft survive? 10

Answer.

- Protection: an anatomical barrier from pathogens and damage between the internal and external environment in bodily defense. Langerhans cells in the skin are part of the adaptive immune system.
- Sensation: contains a variety of nerve endings that jump to heat and cold, touch, pressure, vibration, and tissue injury
- Thermoregulation: eccrine (sweat) glands and dilated blood vessels (increased superficial perfusion) aid heat loss, while constricted vessels greatly reduce cutaneous blood flow and conserve heat. Erector pili muscles in mammals adjust the angle of hair shafts to change the degree of insulation provided by hair or fur.
- Control of evaporation: the skin provides a relatively dry and semi-impermeable barrier to reduce fluid loss.
- Storage and synthesis: acts as a storage center for lipids and water
- Absorption through the skin: Oxygen, nitrogen and carbon dioxide can diffuse into the epidermis in small amounts. Some medications are absorbed through the skin.
- Water resistance: The skin acts as a water resistant barrier, so essential nutrients are not washed out of the body. The nutrients and oils that help hydrate the skin are covered by the most outer skin layer, the epidermis. This is helped in part by the sebaceous glands that release sebum, an oily liquid. Water itself will not cause the elimination of oils on the skin, because the oils residing in our dermis flow and would be affected by water without the epidermis.
- Camouflage, whether the skin is naked or covered in fur, scales, or feathers, skin structures provide protective coloration and patterns that help to conceal animals from predators or prey.

Graft Survival:

- After graft placement, an initial adherence to the wound bed via a thin fibrin network temporarily anchors the graft until definitive circulation and connective-tissue connections are established.This adherence begins immediately and is probably maximized by 8 hours postgrafting.
- The period of time between grafting and revascularization of the graft is referred to as the phase of plasmatic imbibition. The graft imbibes wound exudate by capillary action through the spongelike structure of the graft dermis and through the dermal blood vessels. This prevents graft desiccation, maintains graft vessel patency and provides nourishment for the graft.
- This process is entirely responsible for graft survival for 2-3 days until circulation is re-established. During this time, the graft typically becomes edematous and increases in weight by 30-50%.

- Revascularization of the graft begins at 2-3 days postgrafting by a mechanism that is not completely understood. Inosculation is the establishment of direct anastomoses between graft and recipient blood vessels.
- Alternatively, some investigators have demonstrated vascular ingrowth of recipient bed vessels into the graft along the channels of previous graft vessels.
- Several important aspects of skin graft healing deserve further discussion.Wound contraction may present serious functional and cosmetic concerns, depending on the location and severity. Contraction probably begins shortly after initial wounding, progressing slowly over 6-18 months following grafting. Myofibroblasts are believed to cause contraction.
- The spectrum of wound contraction from least to most is as follows:
  - Full-thickness skin grafts (FTSG) – Least contraction
  - Thick STSG
  - Thin STSG
  - Open wounds – Most contraction
- Epithelial appendages must be regenerated following grafting. Hair rarely grows from STSG as the follicles are not transferred with the graft. Sweat glands and sebaceous glands initially degenerate following grafting. Because only a portion of the gland is transferred, the remaining portion may not regenerate. Sweat gland regeneration is dependent on reinnervation of the skin graft with recipient bed sympathetic nerve fibers. Once this ingrowth has occurred, the skin graft assumes the sweating characteristics of the recipient site. Sebaceous gland regeneration is independent of graft reinnervation and retains the characteristics of the donor site.
- Reinnervation of the graft occurs from the recipient bed and from the periphery along the empty neurolemma sheaths of the graft. Sensation returns to the periphery of the graft and proceeds centrally. Usually, this process begins during the first month but is not complete for several years following grafting.
- A general recommendation is to keep the graft be protected from direct sunlight for at least 12 months postgrafting.

2. Various features of hypospadias and describe single stage repair. 10

Answer. Various features of hypospadias:

- Hypospadias is a congenital deformity where the opening of the urethra (the meatus) occurs on the underside (ventral) part of the penis, anywhere from the glans to the perineum.
- It is often associated with a hooded foreskin and chordee (ventral curvature of the penile shaft).
- It occurs in 1 in 250 live male births.
- There is an 8% incidence in off-spring of an affected male, and a 14% risk in male siblings.
- Associated anomalies are common and include:
  - Congenital vesico-ureteral reflux
  - Cryptorchidism
  - Inguinal herniation
- Hypospadias can be classified according to the anatomical location of the urethral meatus
  - Anterior (or distal): glandular, coronal, and subcoronal (~50%)
  - Middle: distal penile, midshaft, and proximal penile (~30%)
  - Posterior (or proximal): penoscrotal, scrotal, and perineal (~20%)

Hypospadias repair (single-stage)

Main issues:

- Moving the pee-hole to the tip of the penis, straightening any bend in the penis ("chordee"), and "zipping up" (reconstructing) the open under-side of the foreskin (the skin that should cover the head of the penis).
- Dissolving stitches.
- Very sore to pee, and penis looks swollen and bruised, for several weeks.
- Clinical photographs may be taken under anaesthetic before and after the operation, for his hospital records. If you agree, these may be used elsewhere (eg, for teaching), but it will be done confidentially (so that no one else will be able to identify your son).

Intended benefits:

- Easier to pee when standing.
- Easier sexual intercourse in later life.
- Cosmetic (improved appearance).

Common or serious risks:

- Bleeding (rarely serious).
- Infection (rarely serious).
- Damage to penis or water-pipe (rarely serious).
- About 1 in 5 will develop holding on ("retention"), a leak producing a second stream ("fistula"), or narrowing of the new water-pipe ("stricture"), any of which may need further surgery.
- In about 1 in 100 boys, the stitches will completely undo ("break-down"), so that the repair ends up looking as if no surgery has been done. Another operation will be needed, but it has to be delayed for 6 months, until the tissues have fully recovered from the first operation.
- The final appearance of the skin may be less than ideal as it heals: normally boys "grow into" any bagginess of the skin, so it would be unusual that further minor cosmetic surgery is needed for this.
- In some boys, as the foreskin heals it becomes unable to move back, and he may need a minor operation to release it before he becomes sexually active.
- Anaesthetic problems (rarely serious, but around 1 in 250,000 general anaesthetics in children can be fatal).

Types of Single stage repair:
Meatal advancement and granuloplasty or MAGPI technique

- In this stage, the repair is focused on straightening the penile path while defects examined in the degree of curvature are treated next. Surgery is done either under the perineum or in the scrotum skin. In the first step inside the glans, a traction suture is placed along with a silicone catheter tube inside the bladder of meatus.

- Degloving the meatus lies in the next step, in which a circumferential incision is carried out around the penis skin, which is just beneath the coronal groove. Chordee tissue is then resected in the junction of penoscrotal. A resorbable suture is used (either 6.0 or 7.0).

- With a two layer closure the glans wings are created and glanuloplasty is then performed. For a normal conical strand, ventral aspect of distal stitch is incorporated. When the skin gets peeled off from the shaft, tethered tissue bands are removed, finally resulting in straightening of the penis.

Tubularization techniques

- Tubularized incised plate (TIP) technique: Establishing the graft is done via tubularization technique. For severe hypospadias, the surgery comprises of dissection of the lining of the penis erectile path. The graft can be processed by placing an in-lay next to the hinging mid-line. Glansplasty is usually performed for creation of meatus and deep placement of the neo-meatus. Dissection is performed at the bottom of the penis and in some complex redo cases; tunica vaginalis flap acts as a possible graft to interpret this additional layer. A trans-urethral indwelling catheter is left after this stage and later removed after a week.
- GAP repair technique: This technique is based on the Thiersh Duplay techniques, with the same procedure as in TIP. In this technique, wide urethral plate has been closed alongside the dorsal aspect without relaxing incision.
- Flap technique — Mathieu procedure: This process starts with the measurement of defective location from glans tip to meatus. On the shaft skin of the penis, equal markings are done to make cautious dissection of flaps on subcutaneous tissue.
  The flap is then flipped approximately (around 7–8 mm) to the lateral lines of urethral plate. The width of the flaps is tapered to 5–6 mm at the lateral point of glans. The fibrous joint (suture) is then covered using a flap tissue, and finally lateral stitching is done. The meatus gets developed up to the glans.
  The wings of the glans are approximated and the suture gets covered by dartos flap, a connection tissue found in the penis. Finally, the adjacent blood vessels are dressed appropriately.

- Treating Proximal Hypospadias
  - Single stage repairs: Under single stage repair, the following techniques are performed:

    - ✓ Transverse Island flap (TIP): The process starts with penis degloving and chordee correction. The inner foreskin is inflated like a pedicle graft and then en-covering urethral plate using ventral transpose, as like onlay flap. Stitching can be done by ignoring regular anastomosis in order to avoid a baggy-like structure; however, it is dressed to prevent urethral diverticulum.

    - ✓ One stage repair with KOYONAGI-NONOMURA: In this technique, from the shaft skin a wide graft is harvested so as to make proper stitching in perputial hood. Harvested graft is then tubularized for single stage correction. This technique is an essence of two-stage accomplished in a single stage.

    - ✓ TIP urethroplasty: This is a successful treatment in distal hypospadias that can be used in treatment even in the absence of chordee. The process can be carried out in some complicated operations, as mentioned in distal TIP. Not all the attempts in TIP are as good as acknowledged, but show compromising results after redo.

3. Clinical features and management of renal cell carcinoma. 10

Answer. Clinical features:

Signs and symptoms:

i. The classical presentation is described as triad of gross hematuria, flank pain, and a palpable mass that occurs in only 7–10%% of patients.
ii. Frequently manifests as advanced disease.
iii. Patients may also present with hematuria, dyspnea, cough, and bone pain which are typically symptoms secondary to metastases.
iv. With the routine use of CT scanning for evaluation of nonspecific findings, asymptomatic renal tumors are increasingly detected incidentally (>50%).
v. Paraneoplastic Syndromes: RCC is associated with a wide spectrum of paraneoplastic syndromes.
Overall,these manifestations can occur in 10–40% of patients with RCC.

Paraneoplastic syndromes

Syndrome associated with RCC	Cause
Anaemia	Haematuria, chronic disease
Polycythaemia	Ectopic secretion of erythropoeitin
Hypertension (25%)	Ectopic secretion of renin, renal artery compression, or A-V fistula
Hypoglycaemia	Ectopic secretion of insulin
Cushing's syndrome	Ectopic secretion of ACTH
Hypercalcaemia	Ectopic secretion of parathyroid hormone-like substance
Gynaecomastia, amenorrhoea, reduced libido, baldness	Ectopic secretion of gonadotrophins
Stauffer's syndrome: hepatic dysfunction, fever, anorexia	Unknown; resolves in 60 -70% of patients post-nephrectomy

Investigations: The diagnosis of renal cell carcinoma is often made by CT (and, less frequently, by intravenous urography) performed as an initial step in the workup of hematuria, an enigmatic metastatic lesion, or suspicious laboratory findings.

Laboratory Findings:

- Microscopic urinalysis reveals hematuria in most patients.

- The erythrocyte sedimentation rate may be elevated but is nonspecific.
- Elevation of the hematocrit and levels of serum calcium, alkaline phosphatase, and amino-transferases occur in less than 10% of patients.
- Anemia unrelated to blood loss occurs in 20% to 40% of patients, particularly those with advanced disease.

Imaging studies:

- Ultrasonography:
  - Abdominal ultrasonography can define the mass as a benign simple cyst or a solid mass in 90% to 95% of cases.
  - Abdominal ultrasound can also identify a vena caval tumor thrombus and itscephalad extent in the cava.

- Isotope Scanning: Occasionally, a renal mass is suspected on intravenous urography but is equivocal or not seen on ultrasound. In these cases, a renal cortical isotope scanning agent such as technetium-99m DMSA is helpful.

- CT Scan: CT scan is the diagnostic procedure of choice when a solid renal mass is noted on ultrasound.
  - CT scan accurately delineates renal cell carcinoma in over 95% of cases.
  - CT scan is also helpful in local staging and can reveal tumor penetration of perinephric fat; enlargement of local hilar lymph nodes, indicating metastases; or tumor thrombi in the renal vein or inferior vena cava.
  - CT angiography can delineate the renal vasculature, which is helpful in surgical planning for partial nephrectomies.

- MRI: MRI is not more accurate than CT and is much more expensive. It is, however, the most accurate noninvasive means of detecting renal vein or vena caval thrombi.
  Magnetic resonance angiography (MRA) has become particularly useful for mapping the blood supply and the relationship to adjacent structures in candidates for partial nephrectomy.

- Other Diagnostic or Staging Techniques:
  - Isotopic bone scanning is useful in patients with bone pain, elevated alkaline phosphatase, or known metastases.
  - Chest x-ray is sufficient if negative, but if equivocal, then CT scan of the chest can be used to detect metastases.
  - Occasionally, aspiration cytology of the mass can be useful in an enigmatic case.

Treatment:

- Staging should be done for proper treatment

[TNM staging]

T

- T1
  - T1a: tumour confined to kidney, <4 cm
  - T1b: ltumour confined to kidney, >4 cm but <7 cm
- T2: limited to kidney >7 cm
  - T2a: tumour confined to kidney, >7 cm but not >10 cm
  - T2b: tumour confined to kidney, >10 cm
- T3: tumour extension into major veins or perinephric tissues, but not into ipsilateral adrenal gland or beyond Gerota's fascia
  - T3a: Tumor grossly extends into the renal vein or its segmental (muscle-containing) branches, or tumor invades perirenal and/or renal sinus fat but not beyond the Gerota fascia
  - T3b: spread to infra diaphragmatic IVC
  - T3c: spread to supra diaphragmatic IVC or invades the wall of the IVC
- T4: involves ipsilateral adrenal gland or invades beyond Gerota's fascia

N

- N0: no nodal involvement
- N1: metastatic involvement of regional lymph node(s)

M

- M0: no distant metastases
- M1: distant metastases]

- If the disease is confined within the renal fascia (Gerota's fascia) or limited to nonadherent renal vein or vena caval tumor thrombi (stages T1, T2, and T3a) are best treated by radical nephrectomy. This involves en bloc removal of the kidney and surrounding Gerota fascia (including the ipsilateral adrenal), the renal hilar lymph nodes, and the proximal half of the ureter.
- Para-aortic node dissection has not been proven beneficial and is not routinely performed.
- If the tumour is very large with a normal contralateral kidney, radical nephrectomy is recommended.
- If the renal vein or the inferior vena cava is invaded, early control of the cava above and below the tumour extension is taken. If there is extension into the thorax, the cardiac team may be needed to put the patient on cardiac bypass so that tumour can, if necessary, be removed from the right side of the heart.

❖ Different surgical approaches:
Most common operation for renal cell carcinoma is nephrectomy.
  - The transperitoneal abdominal approach is usually considered superior in renal malignancy for the better access it gives to the great vessels.
  - For very large upper renal tumours, or for retroperitoneal sarcomas, a thoracoabdominal approach, with or without liver mobilization provides very extensive access.
  - Alternatively retroperitoneal loin approach may also be preferable.

Nephrectomy: may involve removing either an entire organ and surrounding tissue or a small part of the kidney.

- *Partial Nephrectomy:* In partial nephrectomy, which is also referred to as kidney-sparing surgery, only the diseased or infected portion of the kidney is removed. The healthy kidney tissue is left in place as much as possible.
- *Radical Nephrectomy:* Radical nephrectomy involves the removal of the entire kidney, the adrenal gland, the ureter and the fatty tissue that surrounds the kidney.
- *Simple Nephrectomy:* Simple Nephrectomy is done for a living donor transplant purposes that requires the removal of the kidney and a section of the attached ureter.
- *Open Nephrectomy:* This is the traditional surgery and the donor or patient may be under general anesthesia. A 10 to 20-inch incision is done in the side or abdomen and a lower rib may be removed.
- *Laparoscopic* Nephrectomy: This is a minimally invasive surgery and entails less blood loss.

Immunotherapy:

❖ Biologic response modifiers:

- Interferon alfa- has had a 15% to 20% response rate.
- Interleukin-2 (IL-2) - a T-cell growth factor. Recombinant IL-2 is the only agent approved by the US Food and Drug Administration for patients with advanced renal carcinoma.

❖ Newer biologic agents:

- Bevacizumabis a monoclonal antibody that binds and inactivates VEGF A. Sunitinib: a multi-targeted receptor tyrosine kinase (RTK) inhibitor yields higher response rates.
- Sorefenibis another agent that can inhibit VEGF and PDGF.
- Temsirolimusis an agent which inhibits mTOR, a kinase involved in the VEGF pathway to promote angiogenesis. Temsirolimus has been demonstrated to prolong survival in patients with advanced renal cancer when used as first-line therapy either alone or in combination with interferon.

4. Short notes on: 5+5 = 10

a) Subdural hematoma.

b) Flail chest.

4. a) Introduction: A subdural hematoma or subdural haematoma, also known as a subdural hemorrhage (SDH), is a type of hematoma, a form of traumatic brain injury. Blood gathers within the outermost meningeal layer, between the dura mater, which adheres to the skull, and the arachnoid mater, which envelops the brain.

Usually resulting from tears in bridging veins which cross the subdural space, subdural hemorrhages may cause an increase in intracranial pressure (ICP), which can cause compression of and damage to delicate brain tissue.

Subdural hematomas are often life-threatening when acute.

Chronic subdural hematomas, however, have better prognosis if properly managed.

Classification: Subdural hematomas are divided into acute, sub-acute, and chronic, depending on their speed of onset.

- Acute subdural hematomas that are due to trauma are the most lethal of all head injuries and have a high mortality rate if they are not rapidly treated with surgical decompression.
- Clinical features: Symptoms of subdural hemorrhage have a slower onset than those of epidural hemorrhages because the lower pressure veins bleed more slowly than arteries.
- Therefore, signs and symptoms may show up in minutes, if not immediately but can be delayed as much as 2 weeks.
- If the bleeds are large enough to put pressure on the brain, signs of increased ICP or damage to part of the brain will be present.
- Other signs and symptoms of subdural hematoma can include any combination of the following:

A history of recent head injury	Numbness	Weakness or lethargy	Ataxia, or difficulty walking
Loss of consciousness or fluctuating levels of consciousness	Headache (either constant or fluctuating)	Nausea or vomiting	Altered breathing patterns
Irritability	Dizziness	Loss of appetite	Hearing loss or hearing ringing (tinnitus)
Seizures	Disorientation	Personality changes	Blurred Vision
Pain	Amnesia	Inability to speak or slurred speech	Deviated gaze, or abnormal movement of the eyes

Pathophysiology: Collected blood from the subdural bleed may draw in water due to osmosis, causing it to expand, which may compress brain tissue and cause new bleeds by tearing other blood vessels. The collected blood may even develop its own membrane.

Substances that cause vasoconstriction may be released from the collected material in a subdural hematoma, causing further ischemia under the site by restricting blood flow to the brain. When the brain is denied adequate blood flow, a biochemical cascade known as the ischemic cascade is unleashed, and may ultimately lead to brain cell death.

The body gradually reabsorbs the clot and replaces it with granulation tissue.

Diagnosis:

Subdural hematomas occur most often around the tops and sides of the frontal and parietal lobes.They also occur in the posterior cranial fossa, and near the falxcerebri and tentorium cerebelli.Unlike epidural hematomas, which cannot expand past the sutures of the skull, subdural hematomas can expand along the inside of the skull, creating a concave shape that follows the curve of the brain, stopping only at thedural reflections like the tentorium cerebelli and falxcerebri.

On a CT scan, subdural hematomas are classically crescent-shaped, with a concave surface away from the skull. However, they can have a convex appearance, especially in the early stage of bleeding.

Treatment: It is important that a patient receive medical assessment, including a complete neurological examination, after any head trauma. A CT scan or MRI scan will usually detect significant subdural hematomas.

Treatment of a subdural hematoma depends on its size and rate of growth.

Some small subdural hematomas can be managed by careful monitoring until the body heals itself.

Other small subdural hematomas can be managed by inserting a temporary small catheter through a hole drilled through the skull and sucking out the hematoma; this procedure can be done at the bedside.

Hematoma type	Epidural	Subdural
Location	Between the skull and the dura	Between the dura and the arachnoid
Involved vessel	Temperoparietal locus (most likely) - Middle meningeal artery Frontal locus - anterior ethmoidal artery Occipital locus - transverse or sigmoid sinuses Vertex locus - superior sagittal sinus	Bridging veins
Symptoms	Lucid interval followed by unconsciousness	Gradually increasing headache and co nfusion
Appearance on CT	Biconvex lens	Crescent-shaped

Large or symptomatic hematomas require a craniotomy, the surgical opening of the skull.

4. b) Flail chest is a life-threatening medical condition that occurs when a segment of the rib cage breaks under extreme stress and becomes detached from the rest of the chest wall. It occurs when multiple adjacent ribs are broken in multiple places, separating a segment, so a part of the chest wall moves independently.

Causes:

- The most common reason for flail chest injuries are vehicle accidents.
- Another main cause of flail chest injuries results from falling which is mainly elderly related.
- In children, the majority of flail chest injuries can be a result of the common blunt force traumas or metabolic bone diseases, one known as osteogenesis imperfecta.

Clinical features:

- Two of the symptoms of flail chest are chest pain and dyspnea.
- The characteristic paradoxical motion of the flail segment occurs due to pressure changes associated with respiration that the rib cage normally resists.
- Results in paradoxical motion of the chest wall. Hypoxia is caused by restricted chest wall movement and underlying lung contusion.

- During normal inspiration, the diaphragm contracts and intercostal muscles pull the rib cage out. Pressure in the thorax decreases below atmospheric pressure, and air rushes in through the trachea. The flail segment will be pulled in with the decrease in pressure while the rest of the rib cage expands.
- During normal expiration, the diaphragm and intercostal muscles relax increasing internal pressure, allowing the abdominal organs to push air upwards and out of the thorax. However, a flail segment will also be pushed out while the rest of the rib cage contracts

Treatment: Treatment of the flail chest initially follows the principles of advanced trauma life support. Further treatment includes:

- Good analgesia including intercostal blocks, avoiding narcotic analgesics as much as possible. This allows much betterventilation, with improved tidal volume, and increased blood oxygenation.
- If the segment is small and respiration is not compromised, nurse patient in HDU with adequate analgesia. Encourage early ambulation and vigorous physiotherapy. Regular blood gas analysis should be done.
- Positive pressure ventilation, meticulously adjusting the ventilator settings to avoid pulmonary barotrauma.
- Chest tubes as required.
- Adjustment of position to make the patient most comfortable and provide relief of pain.
- Aggressive pulmonary toilet.
- In more severe cases, endotracheal intubation with positive-pressure ventilation is required.
- Surgical fixation can help in significantly reducing the duration of ventilatory support and in conserving the pulmonary function.

5. Enumerate causes and prevention and management of pressure sore. 3+3+4 = 10

Answer. Prolonged weight bearing, as in an immobilized or paralyzed patient, can elevate tissue pressure above arterial capillary perfusion pressure (32 mm Hg) and result in compromised oxygenation, ischemia, and eventual tissue necrosis. In models of ischemia, external pressure higher than 60 mm Hg for 2 hours leads to irreversible tissue damage, and clinical studies have confirmed this. The clinical sequelae of this damage are pressure sores with ulceration, infection, and exposure of bone. In order of occurrence, the surfaces most commonly involved are those over the sacrum, calcaneus, ischium, and greater trochanter.

Etiopathogenesis of pressure ulcer:
Extrinsic factors
Pressure from any hard surface (e.g., bed, wheelchair, stretcher)- The intensity and duration of such

pressure govern the severity of the ulcer, pressure over an area for a moderate period (1-2 hours), produces tissue ischemia and increased capillary pressure leading to edema and multiple small vessel thrombosis.
Aninflammatory reaction gives way to ulceration and necrosis of ischemic cells. In turn, necrotic tissue predisposes to bacterial invasion and subsequent infection.
Shearing forces – from involuntary muscle movements, skin moves one way and the bone underneath it moves another way.
Friction- Abrasion- from patient's inability to move well in bed
Moisture - Bowel or bladder incontinence, Excessive perspiration, Wound drainage.
Immobility- Failure of nursing personnel to reposition bedridden
Intrinsic factors:

- Limited mobility-
- Spinal cord injury
- Cerebrovascular accident
- Progressive neurologic disorders (Parkinson disease, Alzheimer disease, multiple sclerosis)
- Pain
- Fractures
- Postsurgical procedures
- Coma or sedation
- Arthropathies
- Poor nutrition-
- Anorexia
- Dehydration
- Poor dentition
- Dietary restriction
- Weak sense of smell or taste
- Poverty or lack of access to food
- Comorbidities-
    - Diabetes mellitus
    - Depression or psychosis
    - Vasculitis or other collagen vascular disorders
    - Peripheral vascular disease
    - Decreased pain sensation
    - Immunodeficiency or use of corticosteroid therapy
    - Congestive heart failure
    - Malignancies
    - End-stage renal disease
    - Chronic obstructive pulmonary disease
    - Dementia
- Aging skin-
    - Loss of elasticity
    - Decreased cutaneous blood flow
    - Changes in dermal Ph
    - Flattening of rete ridges
    - Loss of subcutaneous fat
    - Decreased dermal-epidermal blood flow

Braden Scale has reasonable predictive capacity, with high interrater reliability. This scale accounts forseveral extrinsic and intrinsic causative factors by scoring six subscales—sensory perception, moisture, activity, mobility, nutrition, and friction and shear

Stages of Pressure Ulcers: National pressure ulcer advisory panel staging system
CLASSIFICATION DESCRIPTION
Stage I
Intact skin with nonblanchable redness
Stage II Partial-thickness loss of dermis; may present as blister
Stage III Full-thickness loss of dermis with visible subcutaneous fat (no deeper structures exposed)
Stage IV Full-thickness loss of dermis with exposed bone, tendon, or muscle
Unstageable Full-thickness loss of dermis with ulcer base obscured by eschar
PREVENTION OF PRESSURE SORE:
It is first and foremost. Movement and exercise improve circulation and prevent sores. A healthy diet keeps skin healthy and better able to resist breakdown. Protective skin care should a pressure sore developneeds proper cleansing, treatment, and dressing procedures.
a. Mattresses and cushions: Protection is the best way to prevent ulcers. Patients who are at risk of developing pressure ulcers should have the skin carefully inspected for any damage or redness (particularly over bony areas) twice daily.
The skin should be kept clean and dry. Any pressure causing damage to skin or tissue should be immediately eliminated.
This can be done with the help of special mattresses, cushions andby many protective devices that can relieve the external pressure on vulnerable areas of body limbs. These are foam filled mattresses, air-filled mattresses, fluid-filled mattresses-do not require electrical power, alternating air pressure mattresses or pneumatic ripple beds .
Many soft silicone elastomer based commercially available devices may be effectively used to avoid the pressure from the affected or at risk area of limb. The commonly used are: Partial or full silicone sole, silicone pads and digital caps, toes separators etc.
These specially designed protective devices can be very helpful in patients who thought to be at risk of developing pressure ulcers, or who have pre-existing Grade 1 or 2 pressure ulcers.
b. Two or three times per day, check the skin of bedridden for possible changes in color, turgor, temperature and sensation. Examine an existing ulcer for any change in size or degree of damage.
c. Turning and repositioning – every 2 hours, around the clock as much as possible, should be turned in bed, or repositioned in a wheelchair. Allow to change his own position as long as he can by himself.
d. Range of motion (ROM) exercises – again allow to do as much by himself as he can, but when it becomes evident that he no longer can do it, passively exercise the arms, legs and move the head as well.
e. Provide meticulous skin care. Keep the skin clean and dry without the use of harsh soaps. Gently massage the skin around the affected area, not on it, to promote healing and rub moisturizing lotions into the skin thoroughly to prevent maceration of the skin surface.
f. Change bed linens frequently who are diaphoretic or incontinent
g. Diet Good nutrition is essential to healing ulcers and preventing new ones. Encourage foods rich in protein and certain vitamins and mineral
h. Topical Agents- Gentle soap , Dakins solution, Zinc oxide cream, Absorbable gelatin sponge, Granulated sugar (mechanical irritation to enhance granulation), Dextranomer (inert, absorbing beads), Karaya gum powder , Topical antibiotics (only when infection is confirmed by culture and sensitivity testing of wound exudate) , Silver sulfadiazine cream (antimicrobial agent) for necrotic areas, Water-vapor permeable dressings, Duoderm, tegaderm dressings.

Treatment of pressure sore: Where possible, treatment of ulcers is planned with an aim to reverse the factors that have originally caused the ulcer. Careful assessment is needed before planning for

treatment. In general the possible causative factor should be removed (pressure, shear, friction) and the associated general condition should be taken into the control (like treatment of associated co-morbid illness and improvement in the nutrition).
Wound healing requires adequate protein, iron, Vitamin-C and zinc. Supplements may be prescribed if they are deficient in the diet.
a.Cleaning and debridement
Conventional surgical debridement – Cleaning of the wound and meticulous skin care are the most essential part of the treatment. The process involves removal of surface contamination and meticulous excision of all dead tissue.
Mechanical debridement- which includes use of repeated wet to dry dressings to removes slough, Somemechanical debridement techniques include:
Cleansing and pressure irrigation- Where dead tissue is removed using high-pressure water jets. There is no evidence available to support any specific and effective cleansing techniques or solution, in particular.
Ultrasound- Dead tissue is removed using low-frequency energy waves.
Laser- Dead tissue is removed using focused beams of light.
Enzymatic debridement - using enzymes to liquefy dead tissue in the wound and remove them with the dressings and Biological debridement or maggots and larval therapy - in which the larvae eat all the dead tissue and make the wound clean without harming the living tissues.
Basically, debridement is done for converting the chronic wound into an acute wound so that it can progress through the normal stages of healing.
b. Wound dressings
The dressing used for various stages of wound healing is specialised for every stage; in fact there is a whole range of dressings available to assist with the different stages of wound healing. Dressings are usually occlusive, so the ulcers heal better in a moist environment. If the ulcer is clean and dry, occlusive dressings are usually changed weekly, and more frequent changes are avoided as dressing changes remove healthy cells along with debris. Contaminated or weeping wounds may require more frequent dressing changes, sometimes every few hours. Heavily contaminated ulcers are treated with negative pressure wound therapy (NPWT).
Specialised dressings and bandages are used to protect and speed up the healing process of the pressure ulcers.
These dressings include: Hydrocolloid dressings - These contain a special gel that encourages the growth of new skin cells in the ulcer and keeps the nearby healthy area of skin dry.
Alginate dressings - These are made from seaweed that contains sodium and calcium known to speed up the healing process.
Nano silver dressings - These use the antibacterial property of silver to clean the ulcer.
Creams and ointments - To prevent further tissue damage and help speed up the healing process, topical preparations, such as cream and ointments are frequently used.
c. Antibiotics
All pressure sores do not require antibiotics. Antibiotics are usually only prescribed to treat an infected pressure ulcer and prevent the infection from spreading. If tissue infection exists, antibiotics are necessary to treat the infection, but effort must be made to debride the ulcer thoroughly and leave all viable tissues only, otherwise antibiotics alone will not clean up the ulcer. Antibiotics are adjunct to surgical debridement and not an alternative to it.
Topical antibiotics should be avoided because their use may increase antibiotic resistance and allergy.
Antiseptic cream may also be applied topically to pressure ulcers to clear out any bacteria that may be present.
Biofilm: It has been noticed that the longstanding pressure ulcers are frequently colonised by micro-organisms in a biofilm. The biofilm may be composed of bacteria, fungi or other organisms,

which are embedded in and adherent to the underlying wound. The organisms are protected from the effect of conventional antibiotics; unnecessary prescription of antibiotics may, in fact, select more resistant organisms.

We address the problem of biofilm by changing the pH of the wound — dressing with dilute ascetic acid if it is alkaline, which it usually is and curetting out all the underminings, cracks and crevices of the ulcer or by surgical debridement.

d. Negative pressure wound therapy:

This is an invaluable tool in the management of pressure sores and involves the application of sub-atmospheric pressure to a wound using a computerised unit to intermittently or continuously convey negative pressure to promote wound healing. NPWT, is effective for deep, cavitating, infected and copiously discharging pressure ulcers, particularly with exposed bone.

e. Newer research

There are many supportive therapies to promote healing of pressure ulcers. While some are in clinical use others are in the realm of research. Many products are available to aid wound healing but should be prescribed only under strict medical advice, as they still require further research to determine their effectiveness.

These include:

- Growth factors and cytokines.
- Hyperbaric oxygen (HBO) to increase tissue oxygen tension.
- Skin graft substitutes (bioengineered skin).
- Connective tissue matrix.
- Expanded epidermis.
- Epidermal stem cells.
- Bone marrow (BM) or adipose tissue derived stem cell (ASC) therapy.

f. Reconstructive surgery:

Sometimes the severe pressure ulcer (Grade III or IV) fail to heal, in such cases, surgery is required to fill the wound and prevent any further tissue damage. This is usually done by cleaning the wound and closing it by bringing together the edges of the wound (direct closure), application of various type skin grafts or using local and regional flaps and free tissue transfer.

The available reconstructive options are

- Split thickness skin grafting: When the ulcer is superficial and vital tissues such as bone, vessels, nerves or tendons are not exposed, and the ulcer is not copiously discharging,.
- Local flaps: Local transposition, rotation, limberg flap are the available options.
- Regional flaps: For Sacral pressure sores there - gluteus maximus myo-cutaneous flap, Superior gluteal artery based rotation fascio-cutaneous flap, superior gluteal artery perforator flaps, perforator based V-Y advancement flap, lateral or medial calcaneal flaps, Reverse sural flap, varieties of fascio-cutaneous flaps may provide a huge reconstructive option.
- Microvascular free flaps: Microvascular free flaps are usually reserved for some selected cases where the local and regional flap options are either not available or have failed.

6. Describe clinical features, diagnosis and management of spinal cord injury. 3+3+4 = 10

Answer. Spinal cord injury can manifest as a wide variety of clinical syndromes resulting from damage to the spinal cord or its surrounding structures. It can result from minor injury if the spine is weakened from disease such as ankylosing spondylitis or if there is pre-existing spinal stenosis. It is an emergency which can require urgent surgical intervention to prevent long-term neurological complications of spinal cord injury.

Clinical presentation

Clinical presentation is very variable ranging from minor neurological dysfunction to complete paralysis (e.g. in spinal cord transection). Damage to the cord not only can vary in severity but also only affect certain tracts and result in incomplete cord syndromes.

In addition to neurological signs (e.g. altered sensation, limb weakness, autonomic dysfunction, and sphincter disruption) there is usually pain due to related injury to the musculoskeletal components of the spine.

A complete SCI produces total loss of all motor and sensory function below the level of injury. Nearly 50% of all SCIs are complete. Both sides of the body are equally affected. Even with a complete SCI, the spinal cord is rarely cut or transected. More commonly, loss of function is caused by a contusion or bruise to the spinal cord or by compromise of blood flow to the injured part of the spinal cord.

In an incomplete SCI, some function remains below the primary level of the injury. A person with an incomplete injury may be able to move one arm or leg more than the other or may have more functioning on one side of the body than the other.

SCIs are graded according to the American Spinal Injury Association (ASIA) grading scale, which describes the severity of the injury. The scale is graded with letters:

- ASIA A: injury is complete spinal cord injury with no sensory or motor function preserved.
- ASIA B: a sensory incomplete injury with complete motor function loss.
- ASIA C: a motor incomplete injury, where there is some movement, but less than half the muscle groups are anti-gravity (can lift up against the force of gravity with a full range of motion).
- ASIA D: a motor incomplete injury with more than half of the muscle groups are anti-gravity.
- ASIA E: normal.

The more severe the injury, the less likely a recovery will occur.

Pathology

There are several types of traumatic spinal cord injury:

- Spinal cord swelling
- Spinal cord contusion/oedema
  - Cord oedema only: most favourable prognosis
  - Cord oedema and contusion: intermediate prognosis
  - Cord contusion only: worse prognosis
- Intramedullary haemorrhage
- Extrinsic compression, e.g. From fracture fragment or disc herniation
- Spinal cord transection

Radiographic features

Plain radiograph

These have no real role in traumatic cord injury in patients with significant trauma as they have limited sensitivity for detecting spinal cord trauma and bony injuries associated with it.

CT

This is best for assessing the associated bony injuries which may need concomitant treatment consideration but does not assess the cord itself.

MRI

Apart from routine axial and sagittal T1 and T2 imaging additional sequences should be considered depending on the clinical concern. T2 sequences (e.g. gradient echo, SWI) are more sensitive to haemorrhage, while STIR sequences are more sensitive to associated ligamentous injury.

Treatment depends on severity

Rehabilitation and assistive devices allow many people with spinal cord injuries to lead productive, independent lives. Treatments include drugs to reduce symptoms and surgery to stabilise the spine.

Supportive care

- Hydrotherapy: Using water to relieve pain, treat diseases and maintain health. for example, mineral baths and hot tubs.
- Medications:
  - Steroid: Modifies or simulates hormone effects, often to reduce inflammation or for tissue growth and repair.
  - Blood pressure support: Helps increase blood pressure when it's too low.
  - Muscle Relaxant: Reduces muscle tension and helps relieve muscle pain and discomfort.
- Surgery: Spinal surgery - Correcting abnormalities of the spinal cord or its surrounding bones through surgical methods.
- Therapies:
  - Rehabilitation
- Urinary catheterization
- Traction: Using weights and pulleys to put a broken bone or damaged joint back in position and hold it still.

7. Describe clinical features, diagnosis and management of congenital diaphragmatic hernia. 3+3+4 = 10

Aetiology:

- Incomplete diaphragm development at 8 weeks' gestation results in herniation of abdominal organs into the chest, preventing normal lung development.
- Left leaflet occurs in 90% of cases, and right leaflet in 10%.
- Bochdalek (posterolateral defect; 85% of cases); Morgagni (anterior, parasternal; fewer pulmonary and systemic complications).

- A 1:1 male-to-female ratio.

- Diagnosis
  - Antenatal ultrasound and maternal-fetal magnetic resonance imaging (MRI). Polyhydramnios is detected in up to 80% of cases.
  - Physical examination
    - Cardiorespiratory distress.
    - Asymmetric “funnel” chest.
    - Reduced breath sounds on the affected side.
    - Scaphoid abdomen.
  - Chest x-ray
    - Herniated abdominal viscera within the chest.
    - Mediastinal shift.
- Mortality
  - Approximately 35%.
  - May be higher in patients with severe pulmonary hypoplasia and hypertension or in the presence of associated congenital anomalies.
- Management
  - Immediate postnatal care
    - Supplemental oxygen.
    - Endotracheal intubation is indicated if significant respiratory distress is present. Avoid bag-mask ventilation, which exacerbates gastrointestinal (GI) distention and further impedes lung ventilation.
    - Intravenous access is necessary for the administration of fluids to maintain organ perfusion.
    - GI decompression by orogastric or nasogastric intubation reduces distention of the stomach and within the thoracic cavity.
  - Intensive care
    - Conventional ventilation utilizing permissive hypercapnia to minimize barotrauma.
      - Once stabilized, wean fraction of inspired oxygen (FIO_2) for preductal oxygen saturation greater than 90%.
      - Arterial carbon dioxide tension of 60 to 70 mm Hg is acceptable.
      - Maintain pH greater than 7.20.
      - Peak airway pressures less than 25 cm H_2O.
      - Mean airway pressures less than 12 cm H_2O.
    - High-frequency oscillating ventilator (HFOV)
      - May be used if conventional ventilation failed.
      - Possibly limit barotrauma.
    - Inhaled nitric oxide may decrease severity of pulmonary hypertension.
    - Extracorporeal membrane oxygenation (ECMO) is considered for patients with severe preductal hypoxemia or right-to-left shunting due to high pulmonary hypertension. Patients with overwhelming pulmonary hypoplasia may not be not candidates for ECMO.
  - Operative intervention
    - Usually deferred until the patient's pulmonary status is stable.
    - A subcostal incision on the affected side allows the herniated abdominal contents to be replaced in the peritoneal cavity.
    - Repaired primarily or with a synthetic patch, depending on the size of the defect.
  - Complications: long-term respiratory insufficiency, GI reflux, neurologic sequelae from prolonged hypoxia, recurrence of hernia.

8. Write in brief: 5+5 = 10

a) Principles of cleft lip repair.

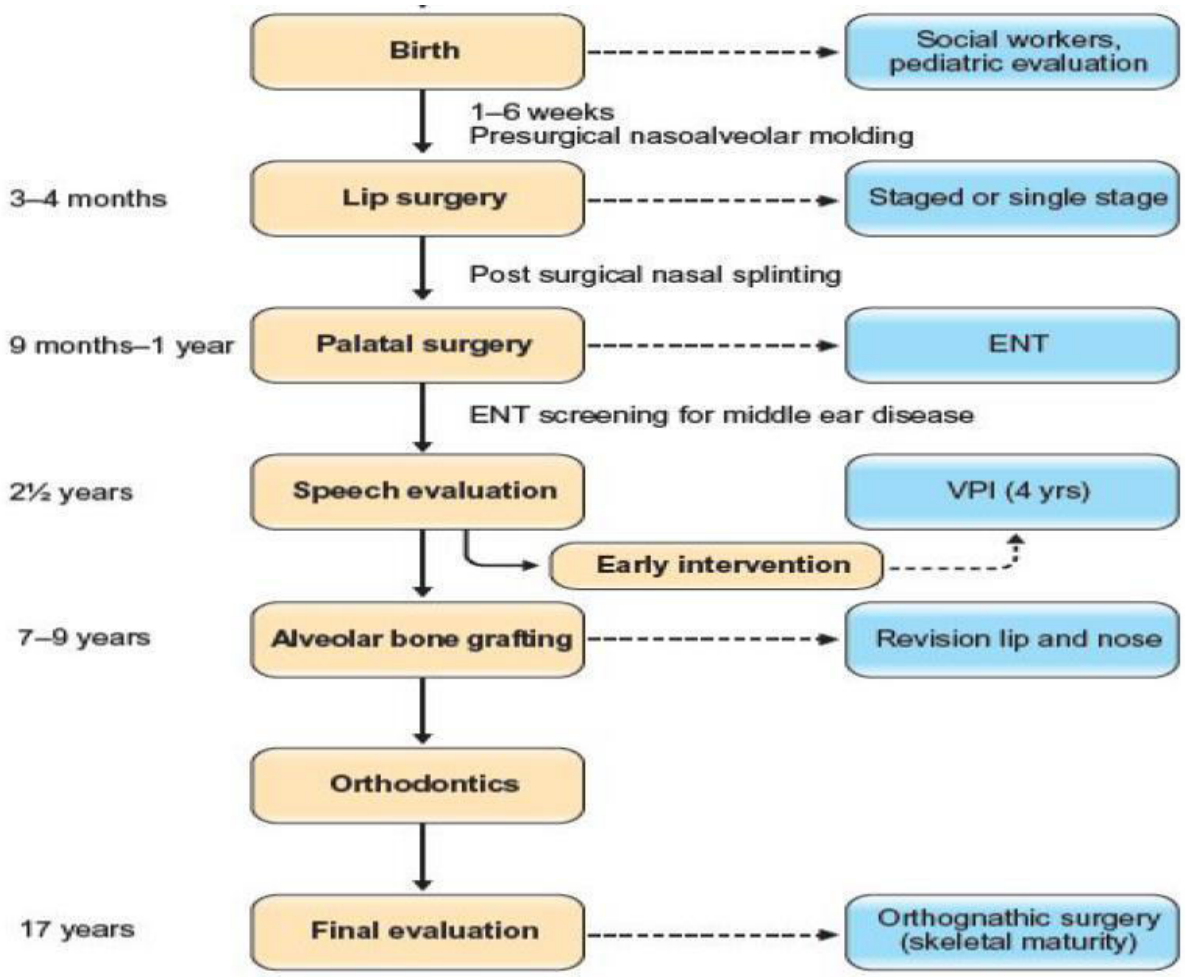
b) Flexor tendon injury in hand.

8.a) Answer. A cleft lip is characterized by a partial or complete lack of circumferential continuity of the lip. Most cleft lips occur at a typical location in the upper lip where one of the philtral columns normally lies, and they extend into the nose. The deformity involves the mucosa, orbicularis oris muscle, and skin. There are many techniques for repair of a cleft lip, but most are a variation of the rotation-advancement repair.

Millard introduced this technique of downward rotation of the medial portion of the lip and advancement of the lateral portion into the defect created by the rotation. The repair is based on the principle that existing elements need to be returned to their normal position to restore the normal anatomy while remaining cognizant of future growth and the effects of surgery on growth.

Timing of the cleft surgery:

- Unilateral / bilateral cleft lip alone, in one stage operation done in 4-6 months.
- Cleft palate alone involving only soft palate, is one stage surgery done in 6 months.
- Cleft palate alone but involving both soft and hard palates – soft palate in 6 months; hard palate in 18 months.
- In combined cleft lip and palate, unilateral or bilateral, done in two stages – cleft lip and soft palate in 6 months; hard palate and gum pad with or without lip revision in 18 months.
- Revisional surgery should be delayed for 2 years after primary lip closure.



Treatment for Cleft Lip:
Millard criteria are used to undertake surgery for cleft lip.
Millard criteria (Rule of `10')
• 10 pound in weight
• 10 weeks old
• 10 gm % hemoglobin
a. Millard cleft lip repair by rotating the local nasolabial flaps.
b. Management of associated primary or secondary cleft palate deformity.
c. Proper postoperative management like control of infection, training for sucking, swallowing and speech.
d. Tenninson's 'Z' plasty (Tenninson-Randall triangular flap)
Principles of cleft lip repair:
• 'Rule of 10' should be fulfilled
• It should be operated before 6 months
• Infection should not be present
• Millard advancement flap is commonly used for unilateral cleft lip repair
• Bilateral cleft lip repair can be done either in single or two stages (with 6 months gap between each stage)
• One stage bilateral cleft lip repair is done using Veau III method / Millard's single stage/Black method

• Proper markings are made prior to surgery and incision should be over full thickness lip
• Often 1:2,00,000 adrenaline injection is used to achieve haemostasis
• Three layer lip repair should be done (mucosa, muscle and skin)
• Cupid's bow should be horizontal
• Continuity of white line should be maintained
• Vermilion notching should not be there

Unilateral cleft lip repair:

- Design a closure interface (scar) that closely mirrors the contralateral philtral ridge in shape and length Limit the total scar burden inherent in the design
- Create a symmetric and natural Cupid's bow
- Match the volume of vermilion on each side of the cleft
- Restore muscular continuity such that normal lip movement results
- Create a labial sulcus of normal depth
- Create a normal nasal floor, nasal sill, and alar base
- Centralize the columella and elevate the columella base

Bilateral cleft lip repair:

- Maintain (or establish) symmetry
- Prepare the projecting premaxilla
- Anticipate future changes that will occur with growth (Particularly in the design of the size and shape of the philtral flap)
- Construct a full central lip using lateral labial elements and discard prolabial vermilion
- Deepen the gingivolabial sulcus using premaxillary mucosa
- Establish muscular continuity primarily
- Address the nasal deformity synchronously

8. b) Flexor Tendon Injuries of the Hand

Flexor tendons

• Verdan described five zones of flexor tendon injury:
◦ Zone 1: distal to FDS insertion.
◦ Zone 2: between proximal flexor sheath and FDS insertion.
◦ Zone 3: between distal flexor retinaculum and proximal flexor sheath.
◦ Zone 4: under the flexor retinaculum.
◦ Zone 5: proximal to the flexor retinaculum.
– Zone 2 repair is complicated by having two tendons in a tight sheath.
• Thumb zones:
◦ Zone T1: distal to IPJ.
◦ Zone T2: from A1 pulley to IPJ.
◦ Zone T3: in the thenar eminence.
◦ Zones T4 and T5 are the same as for the fingers.
• FDP can be avulsed from its bony attachment.
◦ Caused by a hyperextension force on an actively flexed DIPJ.
◦ Known as 'rugger jersey finger' – a tackler grabs the opponent's rugby shirt.
◦ The ring finger is most commonly injured because it is the 'longest' flexed finger.
• Leddy and Packer classify FDP avulsions:
◦ Type I: tendon retracts into the palm; rupture of both vincula.
◦ Type II: tendon retracts to the PIPJ; long vinculum intact.
◦ Type III: a large bony fragment avulsed with the tendon prevents retraction beyond the A4 pulley.

INJURY PATTERN:

-Injury patterns are differentiated into open or closed, sharp or blunt, traumatic or degenerative lesions, as well as injury to the dorsal or palmar part.

-Further subdivisions are osseous tendon lesions, complex lesions with concomitant trauma or injury of the tendon sheath and pulley system.
-Closed tendon injuries are quite common.
FLEXOR TENDON HEALING:
2forms-
-Intrinsic healing: occurs without direct blood flow to the tendon
-Extrinsic healing: occurs by proliferation of fibroblast from the peripheral epitendon, adhesion occurs because of extrinsic healing of the tendon and limit tendon gliding within fibrous synovial sheath
PHASE OF INTRINSIC HEALING:
1.Inflamatory (0-5 days): strain of the repair is reliant on the strength of the suture itself.
2.Fibroblastic(5-28 days): or so called collagen producing phase.
3.Remodelling(>28days).
SIGN & SYMPTOMS:

- Unable to bend one & more finger joints
- Pain when bending finger/s
- Open injury to hand
- Mild swelling over joint closet to finger tip
- Tenderness along effect finger/s on palm side of hand
- Complain of numbness proceeded by excessive bleed- consider neurovascular insults

EXAMINATION:
Inspection:
-There is a normal arcade to hand with index finger showing lest and little finger showing maximum flexon
-If affected finger shows more extension than others digits, chance of tendon injury are high.
-If distal IP joint can be actively flexed while proximal IP joint is stabilized, profundus tendon has not been served.
-If proximal IP joint can be actively flexed while adjacent fingers are held completely extended, Sublimis tendon has not been severed.
-FPL: stabilised the MCP joint, ask the patients to flex IP joint.
DIAGNOSIS OF FLEXOR TENDON INJURIES
History
Clinical examination
Use of bedside USG in ER (more sensitive & specific than physical examination)
Wound exploration technique or MRI
3-view x-ray to rule out foreign body or bony injury or dislocation
FLEXOR TENDON REPAIR TYPE:
Primary repair: First 24hours of injury
Delayed primary: 1 to 10days
Secondary repair: 2 to 4 weeks
Late secondary repair: after 4weeks
Primary repair:
Emergency repair needed if altered digital perfusion present
Clean wound caused by sharp object
Secondary repair:
Indicated if associated with

- Extensive crushing with bony communication
- Severe neurovascular injury
- Severe joint injury and skin loss requiring a coverage procedure
- Primary repair gives better functional outcome than secondary repair.

No repair if less than 25% laceration
Only epitedon repair in 25-50% laceration
Core suture plus epitenon repair when >50% laceration
Dorsal blocking splint for 6-8 weeks as conservative measure.

SUTURUEE TECHNIQUE
Flexor tendon repair
Skin incision
• An extensive exposure is planned.
• Popular approaches include the Brunner and midlateral.
The exor tendon sheath
• A synovial-lined fibro-osseous tunnel in the fingers and thumb.
• Runs between the metacarpal neck and DIPJ.
• Synovial portion contributes to tendon glide and nutrition.
• Retinacular portion contributes mechanical effciency.
• Retinacular part consists of five annular (A) and three cruciform (C) pulleys:
◦ A1, A3 and A5 originate from the volar plates of MCPJ, PIPJ and DIPJ, respectively.
◦ A2 and A4 originate from proximal and middle phalanx, respectively.
◦ Cruciform pulleys are collapsible; they 'concertina' to allow flexion.
• Pulleys are ordered from proximal to distal as follows: ◦ A1 – A2 – C1 – A3 – C2 – A4 – C3 – A5.
• The thumb has two annular pulleys overlying the MCPJ (A1) and IPJ (A2).
• An oblique pulley runs between the two: from ulnar on the proximal phalanx to radial on the distal phalanx.
• The sheath usually needs to be opened for access to the tendon ends.
◦ As much sheath as possible should be preserved to maintain function.
◦ Function is usually adequate if either A2 or A4 is preserved.
• Closure of the sheath is controversial, particularly if it limits glide.
◦ An alternative to venting zone II pulleys is excising a slip of FDS
The tendon repair
• Results are better when repair is done within the first few days of injury.
• The following principles apply to most techniques:
◦ Handle tendon ends as little as possible.
◦ Repair should be strong enough to allow early mobilisation.
◦ Strength of repair is dependent on:
– Gauge of suture – 3/0 is stronger than 4/0.
– Number of strands crossing the repair – four are stronger than two.
– Configuration of the peripheral suture.
– Tendon-suture interaction – grasping sutures pull through easily; locking sutures 'lock' a bundle of tendon fibres, minimising suture pullout.
◦ Excessive suture bulk can increase resistance to tendon glide.
◦ No gapping of the tendon ends on mobilisation.
– A 2mm gap increases gliding resistance significantly.
– A 3mm gap is unlikely to pass under the A2 pulley without rupture.
◦ Avoid shortening FDP >1cm – quadriga may ensue.
– The quadriga phenomenon was described by Verdan.
– Occurs whenFDPexcursion in an unaffected finger is reduced as aresult of decreased FDP excursion in another finger due to stiffness, injury or adhesion.
• Decreases global grip strength because all FDPs share a common muscle belly.
• Most repairs use core and peripheral sutures.
• No evidence that using 'cutting' needles gives a higher rupture rate.

• Examples of core sutures include:
◦ 2-strand repair
– Kessler, with two knots on the outside of the tendon.
– Modified Kessler, with a single knot within the repair site.
◦ 4-strand repair
– Cruciate
– Adelaide (modified Savage)
◦ 6-strand repair
– Savage.
• Peripheral sutures do the following:
◦ Align tendon ends prior to core suture (back wall first).
◦ Tidy up tendon ends following core suture.
◦ Contribute significant strength to the repair.
• Examples of peripheral sutures include:
◦ Strickland simple continuous suture
◦ Halsted continuous horizontal mattress.

Partial injury

• Lacerations up to and beyond 75% of the cross sectional tendon area maintain adequate strength at
physiological loads.
• Partial lacerations may cause triggering – the triggering part should be trimmed.
• Placing epitendinous sutures into partial lacerations doubles the gliding resistance.
◦ This is unnecessary; may require sheath incisions for access.

Rehabilitation following repair of flexor tendons

• Tendons were historically immobilised in the belief that adhesions were necessary for healing.
• Discovery of intrinsic healing allowed early mobilisation to improve glide.
• Most regimes require a dorsal blocking splint to protect the repair.
• The splint is maintained for up to 6 weeks.
• Heavy use is avoided for 12 weeks total.
• Common regimes are variations on the following:

Immobilisation

• Mainly for children or adults unsuitable for early mobilisation.

Early passive mobilisation

• No active movement is permitted.

Early active extension with passive flexion

• Advocated by Kleinert et al.
• Finger flexion is maintained by rubber-band traction.
• Active extension is done against the recoil of the bands.
• Passive flexion occurs by elastic recoil of the bands.
• Critics state that PIPJ extension lag is a problem due to prolonged PIPJ flexion.
• It is also regarded as a poor mobiliser of the DIPJ.

Early active mobilisation

• Strength of repair is increased by early active flexion.
• The 'Belfast' regime is widely used in the United Kingdom in modified forms.
• Active mobilisation is started 48 hours after the operation.
• Exercises are repeated two-hourly throughout the day:
• Two passive movements, then two active movements of the finger(s).
• The aim is full passive flexion in the splint within the first week.
• Range of active motion is gradually increased.

Outcomes

• Rupture and adhesion affect 5% of flexor tendon repairs
• No consensus on ideal outcome measures.
    - Most measure range of motion.
- The commonly used systems have never been validated.

9. Indications of cardiopulmonary bypass and treatment options in Patent Ductus Arteriosus. 5+5 = 10

Answer. Surgical procedures in which cardiopulmonary bypass is used:

- Coronary artery bypass surgery
- Cardiac valve repair and/or replacement (aortic valve, mitral valve, tricuspid valve, pulmonic valve)
- Repair of large septal defects (atrial septal defect, ventricular septal defect, atrioventricular septal defect)
- Repair and/or palliation of congenital heart defects (Tetralogy of Fallot, transposition of the great vessels)
- Transplantation (heart transplantation, lung transplantation, heart–lung transplantation, liver transplantation)
- Repair of some large aneurysms (aortic aneurysms, cerebral aneurysms)
- Pulmonary thromboendarterectomy
- Pulmonary thrombectomy
- Isolated Limb perfusion

- Cardiopulmonary bypass with balloon occlusion provides a safe operation for adult patients with complicated patent ductus arteriosus. The majority of patent ductus arteriosus (PDA) patients undergo a surgical correction in childhood.
- However, some situations retard the operation until adulthood.
- Complications of untreated patent ductus arteriosus (PDA) include bacterial endocarditis, late congestive heart failure (CHF), and the development of pulmonary vascular obstructive disease. Patent ductus arteriosus (PDA) can complicate other circulatory or ventilatory abnormalities, such as the following:
    - Aortic rupture
    - Eisenmenger physiology
    - Left heart failure
    - Myocardial ischemia
    - Necrotizing enterocolitis
    - Pulmonary hypertension
    - Right heart hypertrophy and failure

Treatment options for PDA:

- Watchful waiting. In a premature baby, a PDA often closes on its own. ...
- Medications. In a premature baby, nonsteroidal anti-inflammatory drugs (NSAIDs) — such as ibuprofen (Advil, Infant's Motrin, others) or indomethacin (Indocin) — might be used to help close a PDA.

- Surgical closure:
  - Surgical ligation or surgical ligation and division remain the standard treatment of large patent ductus arteriosus (PDA) that require treatment in infancy (see the following image). This is a particularly successful, low-risk procedure in the hands of an experienced pediatric cardiovascular surgeon. This is true even in the smallest premature babies.
  - Ligation (with or without division of the patent ductus arteriosus [PDA]) without cardiopulmonary bypass can be performed through a left posterolateral thoracotomy. Video-assisted thoracoscopic surgery (VATS) ligation of patent ductus arteriosus (PDA) is less invasive than the posterolateral thoracotomy and has been shown to be safe and effective.
- Catheter procedures:

  Cardiac Catheterization
  The use of the percutaneous route to close the patent ductus arteriosus (PDA) is becoming more common. Transcatheter occlusion is an effective alternative to surgical intervention and is becoming the treatment of choice for most cases of patent ductus arteriosus (PDA) in children and adults.
  Most patients with an isolated patent ductus arteriosus (PDA) can have successful treatment by catheterization after the first few months of life.
  After the first birthday, the most common treatment for a patent ductus arteriosus (PDA) is occlusion at cardiac catheterization. In fact, as catheterization techniques advance, the ability to close defects in smaller infants has also been reported with high levels of success.

10. Outline the principles of microsurgery. Discuss briefly pectoralis major flap. 5+5 = 10

Answer. Principles of microsurgery:

- Microsurgery is a surgical discipline that combines magnification with advanced diploscopes, specialized precision tools and various operating techniques. These techniques are primarily used to anastomose small blood vessels (arteries and veins) and to coapt nerves.
- Microsurgical reconstruction is used for complex reconstructive surgery problems when other options (eg, primary closure, healing by secondary intention, skin grafting, and local or regional flap transfer) are not adequate.
- Microsurgery may not be the best solution for all reconstructive dilemmas and usually is not the first choice in the reconstructive ladder. However, it can offer the reconstructive surgeon an important tool for achieving complex reconstruction by proceeding with free tissue transfer from distant sites.Free tissue transfer includes flaps such as the following:

  - Isolated transfers
  - Composite tissue transfers
  - Functioning free muscle transfers
  - Vascularized bone grafts
  - Toe transplantation

  In addition, specific tissue transfers such as neural grafts or vein grafts are also considered free tissue transfer. In specific cases, such as large defects of the face after tumor resection, free tissue transfer may be the best option for closure of the defect.
  Reconstructive microsurgery has entered a stage where, because of continued developments in technology and a better understanding of the anatomy, anastomosis of very small vessels (0.3 mm) is possible. These highly challenging procedures are referred to in the literature as

supermicrosurgery. They allow anastomosis of perforator flaps such as the medial plantar flap to perforator recipient vessels. Additional applications include complex digit reimplantation and lymphatic anastomosis.

Although microsurgery continues to develop, the basic principles of microsurgery remain the same:

- Select patients carefully
- Develop a careful preoperative plan and a back-up plan
- Use a well-defined workhorse flap
- Obtain full patient consent
- Pay attention to intraoperative details
- Employ meticulous microsurgical technique
- Remain vigilant during postoperative care

Indications:

Indications for tissue transfer utilizing microsurgical techniques include the following:

- Need to cover exposed vital structures, such as joint surfaces, tendons, vessels, and bone denuded of periosteum
- Need to restore shape, as in the breast after mastectomy
- Need to restore function, as in the muscles of the face

❖ Technical Considerations:

- Vessel injury and regeneration:

Vessel injury and regeneration occur through the following steps:

- Formation of a platelet plug
- Pseudointima formation
- Endothelial regeneration

❖ Classification of flaps: Mathes and Nahai classified flaps as either random or axial on the basis of blood supply. A random flap is perfused by random small blood vessels without a proper name (eg, local bilobed flap). An axial flap is based on a known, named blood vessel or set of blood vessels. Mathes and Nahai classified these flaps as follows:

- One vascular pedicle (eg, tensor fasciae latae [TFL])
- Dominant pedicle(s) and minor pedicle(s) (eg, gracilis)
- Two dominant pedicles (eg, gluteus maximus)
- Segmental vascular pedicles (eg, sartorius)
- One dominant pedicle and secondary segmental pedicles (eg, latissimus dorsi)

Pectoralis major flap:

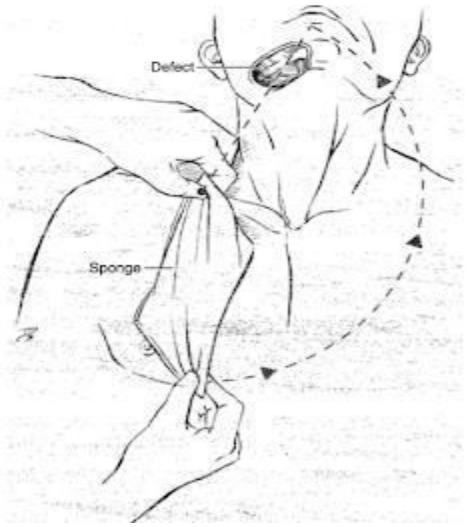
Anatomy of the Pectoralis Major:

- Origin
    - Clavicle

        - Sternum (2-7 costal cartilages)
        - Abdominal rectus sheath
    - Insertion
        - Greater tubercle of humerus
    - Arterial supply
        - Pectoral branches of the thoracoacromial artery. from the axillary a. from the subclavian artery
    - Innervation
        - Medial and lateral pectoral nerves
    - Mohrenheim's fossa
        - Fossa between the pectoralis major, deltoid, and clavicle
        - Importance: cephalic vein passes here
- Indications
    - Pectoralis major myofascial flap: a valuable tool in contemporary head and neck reconstruction
    - Pectoralis major musculocutaneous flap in oropharyngeal reconstruction
    - Pectoralis myofascial flap during salvage laryngectomy prevents pharyngocutaneous fistula
- Strengths
    - Robust and highly reliable
    - Ease of harvest
    - Excellent color-texture match to neck and facial skin
- Limitations
    - Bulky
    - Restricted reach

Preparation

- Mark the thoracoacromial artery
    - Draw a line from the acromial end of the clavicle to the xiphisternum
    - Draw a 2nd line vertically from the midpoint of the clavicle to intersect the 1st line
- Design the skin incision and skin paddle
    - Consider any potential future or concurrent need for a deltopectoral flap
    - For men
        - Plan a vertically oriented skin paddle, adjacent to but sparing the nipple
    - For women
        - Plan a horizontally oriented inframammary skin paddle
    - Consider the secondary defect closure
        - Generally, chest skin defects of ~ 9 cm or less may be closed primarily
    - Use a sponge or towel to plan the skin paddle to make sure that it will reach the defect



- Place the sponge on the clavicle and arc around
- Ioban over the chest (Dr. Fong)
  - Dr. Fong designs the incision as a curvilinear line from lateral to just medial to the nipple in a man

Procedure

- Incise through skin to the fascia of the pectoralis major muscle .
- Expose the pec major muscle by elevating skin flaps in the *suprafascial* plane
- Transect the pec major muscle
  - Transect the pectoralis major m. laterally and bluntly elevate from the pectoralis minor muscle.
  - Continue to transect the pectoralis major muscle inferiorly to accomodate the skin paddle
  - Transect the pectoralis major muscle medially to separate from the sternal attachments
  - Continue to transect the pectoralis major muscle up to the clavicle
    - Identify and cauterize the intercostal vessels well since they will retract back into the chest
- Elevate the pec major m. from the pec minor in the avascular plane
- Identify the thoracoacromial artery and cephalic vein on the deep surface of the pectoralis major muscle.
- Transect the pectoralis major muscle lateral attachment to the humerus
  - Protect the pedicle with your fingers
- *Optional*: Identify and denervate the flap by clipping and dividing the medial and lateral pectoral nerves
- Bluntly dissect the subplatysmal plane tunnel superficial to the clavicle superiorly into the neck
  - Generally, about 4 fingerbreadths of space are needed to prevent ischemia of the pedicle
- Pass the flap into the neck
  - Avoid shearing the skin paddle
  - Check the pedicle for twisting
- Close the secondary defect

- If needed, undermine adjacent skin to facilitate primary closure
- If needed, harvest a STSG for closure
- 2 suction drains in the chest, exiting infero-laterally, secured with 2-0 Silk
- 3-0 Polysorb interrupted buried deep dermal
- 5-0 Fast or 5-0 Prolene simple running vs staples to approximate the epidermis

The west bengal university of health sciences

MS (general surgery) examination, 2018

Paper - III

1. **Discuss the pathophysiology and management of flail chest and tension pneumothorax. 5+5**
2. **Classify anorectal malformations. Outline the management schedule for different types of ARM. 4+6.**
3. **Discuss the aetiology, clinical features and management of different types of synergistic gangrene. What is necrotizing fasciitis? 2+3+3+2**
4. **What are the types of phonation problems encountered after thyroid surgery? How are they prevented or treated? 4+6**
5. **Discuss the role of conservative surgery for RCC. 10**
6. **Compare the surgical treatment options for procidentia of rectum. 10**
7. **Give a brief account of oncoplastic breast surgery. 10**
8. **Discuss the principles of different modalities of surgery for chronic venous stasis of inferior extremities. 10**
9. **Discuss the surgical management of morbid obesity. 10**
10. **Discuss the perioperative management of a patient on thromboprophylaxis (post cabg status) requiring emergency exploratory laparotomy. 10**

The west bengal university of health sciences

MS (general surgery) examination, 2018

Paper - III

1. Discuss the pathophysiology and management of flail chest and tension pneumothorax.

5+5

Answer.

	Pathophysiology	Management
Flail chest	Flail chest results from deceleration injury and can be associated with life-threatening aortic disruption, tracheobronchial disruption, and sternal fracture. The anatomical basis of the flail chest is the presence of multiple rib fractures. When a series of adjacent ribs is fractured in two places (anteriorly and posteriorly) because of a blunt trauma that segment of the chest wall (the flail) may lose its mechanical continuity with the rest of the thorax. The flail section of the chest wall becomes unstable and moves inward during inspiration. A flail segment of the chest wall can lead to inefficient ventilation, pulmonary contusion, and atelectasis resulting in derangement of ventilation function and gas exchange. The excessive mobility of the flail segment not only causes significant pain but also leads to inefficient ventilation, inability to cough leading to accumulation of tracheobronchial secretions with its sequel. The associated pulmonary contusion can produce arteriovenous shunting and alters the alveolar ventilation-perfusion ratio resulting in hypoxemia and respiratory distress.	Patients with flail chest and multiple injuries present with shock will require control of the airway preferably by endotracheal intubation. Traditional management focuses on treatment of the flail segment to ameliorate the flail respiration or on treating the underlying pulmonary contusion to improve gas exchange. Treatment of the flail chest depends on the severity of the ventilation dysfunction and physiologic impairment (attributable to the flail segment). Methods available for stabilizing a flail chest include surgical stabilization, treatment in a respirator (physiologic stabilization), or a combination of both. Surgical fixation may decrease morbidity, but conservative treatment with positive pressure ventilation is recommended when there are multiple injuries to other intrathoracic organs

Tension Pneumothorax	Intrapleural pressure is normally negative (less than atmospheric pressure) because of inward lung and outward chest wall recoil. In pneumothorax, air enters the pleural space from outside the chest or from the lung itself via mediastinal tissue planes or direct pleural perforation. Intrapleural pressure increases, and lung volume decreases. tension pneumothorax is a pneumothorax causing a progressive rise in intrapleural pressure to levels that become positive throughout the respiratory cycle and collapses the lung, shifts the mediastinum, and impairs venous return to the heart. Air continues to get into the pleural space but cannot exit. Without appropriate treatment, the impaired venous return can cause systemic hypotension and respiratory and cardiac arrest (pulseless electrical activity) within minutes. Tension pneumothorax most commonly occurs in patients receiving positive-pressure ventilation (with mechanical ventilation or particularly during resuscitation). Rarely, it is a complication of traumatic pneumothorax, when a chest wound acts as a one-way valve that traps increasing volumes of air in the pleural space during inspiration.	• Immediate needle decompression for tension pneumothoraces • Observation and follow-up x-ray for small, asymptomatic, primary spontaneous pneumothoraces • Catheter aspiration for large or symptomatic primary spontaneous pneumothoraces • Tube thoracostomy for secondary and traumatic pneumothoraces Patients should receive supplemental oxygen until chest x-ray results are available because oxygen accelerates pleural reabsorption of air. Treatment then depends on the type, size, and effects of the pneumothorax. Primary spontaneous pneumothorax that is < 20% and that does not cause respiratory or cardiac symptoms can be safely observed without treatment if follow-up chest x-rays done at about 6 and 48 h show no progression. Larger or symptomatic primary spontaneous pneumothoraces should be evacuated by catheter aspiration. Tube thoracostomy is an alternative.

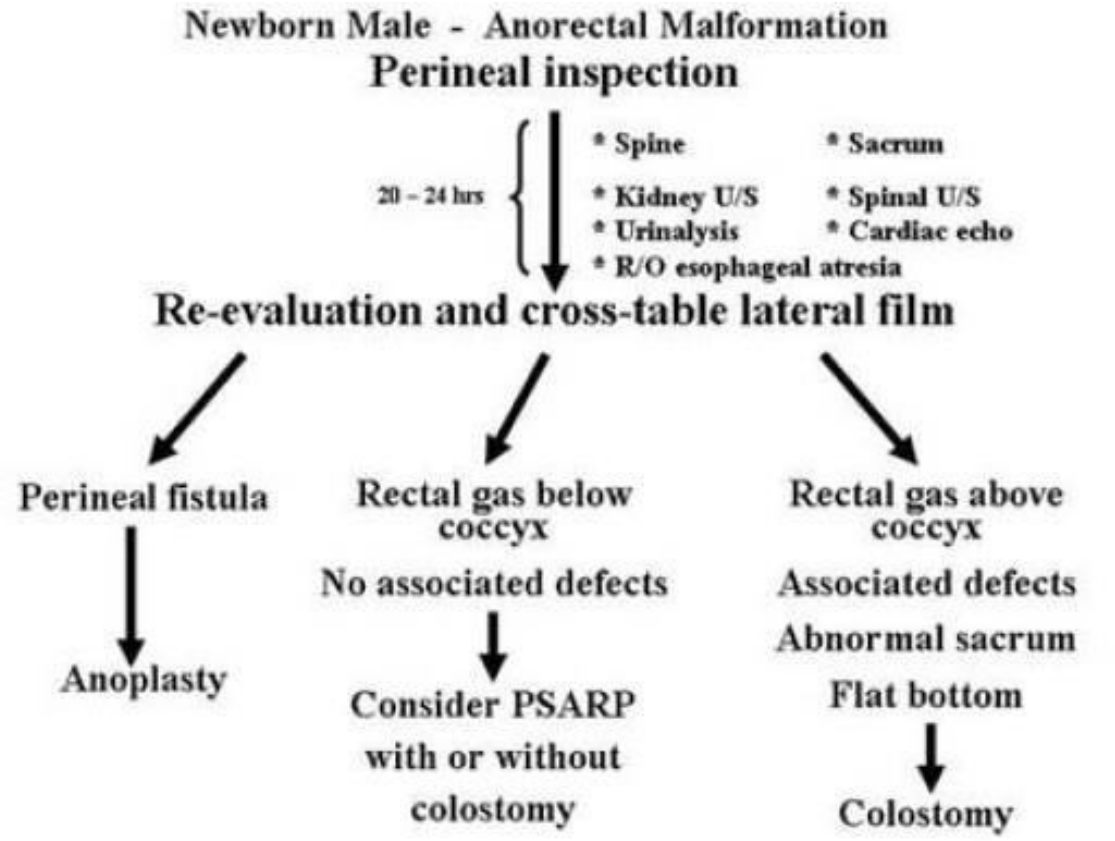
2. Classify anorectal malformations. Outline the management schedule for different types of ARM. 4+6.

Answer. Wingspread anatomical classification of Anorectal malformations (1984)

FEMALE	MALE
High Anorectal agenesis With rectovaginal fistula Without fistula Rectal atresia	**High** Anorectal agenesis With rectoprostatic urethral fistula Without fistula Rectal atresia
Intermediate Rectovestibular fistula Rectovaginal fistula Anal agenesis without fistula	**Intermediate** Rectobulbar urethral fistula Anal agenesis without fistula
Low Anovestibular fistula Anocutaneous fistula Anal stenosis	**Low** Anocutaneous fistula Anal stenosis
Cloacal malformations	
Rare malformations	Rare malformations

(Therapeutic and Prognostic)
Males
Cutaneous (perineal) fistula Rectourethral fistula Bulbar Prostatic Recto-bladder neck fistula Imperforate anus without fistula Rectal atresia
Females
Cutaneous (perineal fistula) Vestibular fistula Imperforate anus without fistula Rectal atresia Cloaca Complex malformations

Algorithm for management of ARM in newborn male

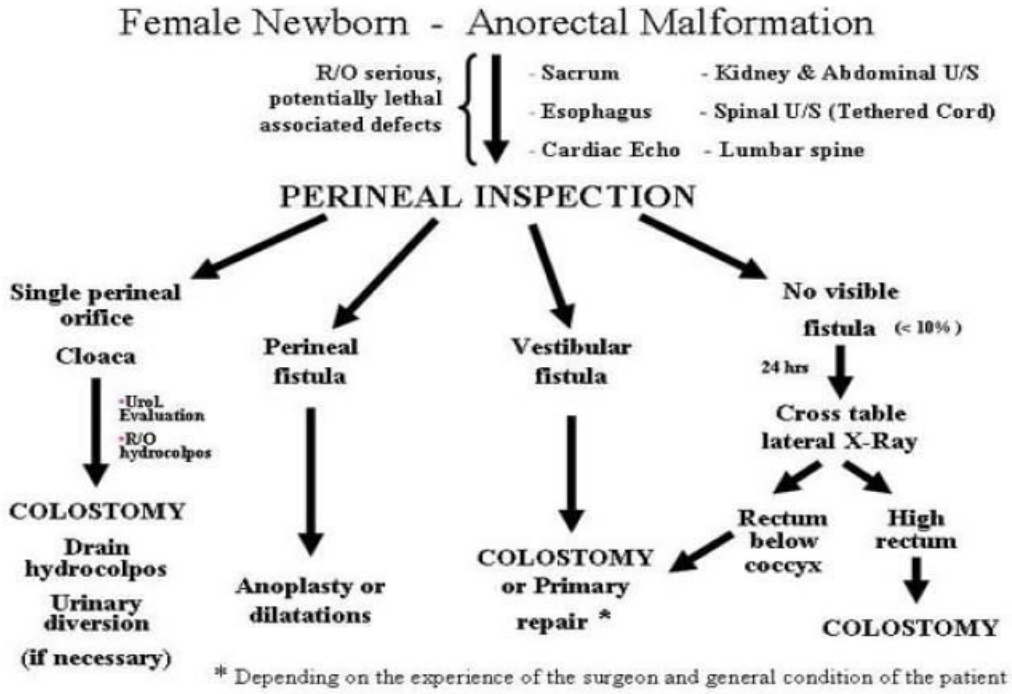


Posterior Sagittal Ano-RectoPlasty – PSARP.

PSARP involves:

- **Stimulation of muscles to demonstrate the midline and sphincter**
- **Posterior sagittal incision - length depends on severity of abnormality and required extent of dissection**
- **Rectum identified. Abdominal approach may be required in addition in 10% of males and 40% of cloacae**
  Rectum dissected.
- **Separation from genitourinary tract - often the most difficult part**
- **Repositioning the neoanus within the sphincteric mechanism**

Algorithm for management of ARM in newborn female



3. **Discuss the aetiology, clinical features and management of different types of synergistic gangrene. What is necrotizing fasciitis? 2+3+3+2**

Answer.

Type	Aetiology	Clinical presentation	Management
Fournier gangrene is necrotising fasciitis of the perineum. It is a true urological emergency due to the high mortality rate but fortunately, the condition is rare.	Fournier gangrene is typically seen in diabetic men aged 50-70 years, rarely in women. Other predisposing factors include: • Diabetes mellitus • Immunosuppression • Alcoholism • Debility	• Perineal/scrotal pain, swelling, redness. • Crepitus from soft tissue gas (up to 65%). • Systemically unwell • Fever and leucocytosis	Management options include: • Immediate radical surgical debridement of necrotic tissue • Intravenous antibiotics • Hyperbaric oxygen therapy • Testes replaced into the remaining scrotum or covered by skin graft (once infection settled)
Meleney's gangrene is a rare, rapidly spreading destructive subcutaneous tissue infection	• Most commonly occurs at post-surgical sites Caused by staphylococcus aureus and streptococcus organisms • Most patients with post-operative synergistic Gangrene have pre-existing	• Initial signs are not specific. • One of the identifying symptoms is the presence of extremely painful lesions, which usually form in the second week after surgery or minor	• With introduction of newer antimicrobials zinc oxide was replaced with modern day antibiotics as the choice of treatment. • Surgical debridement is most important. Serial debridements are usually necessary to completely remove the dead devitalised

	immunosuppressive Conditions such as chronic renal failure,HIV, Diabetes mellitus or are elderly.	trauma. • The ulcers that form at the center of the lesion are usually covered by a black eschar and encircled by a gangrenous margin.	tissue. • Additional treatment measures such as hyperbaric oxygen therapy can be used as an adjunct to this.
Synergistic gangrene of breast	History of trauma Diabetes mellitus	Cellulitis of breast Growing necrotic ulceration	• Resuscitation and supportive treatment. • Broad spectrum antibiotics. • Surgical debridement.

Necrotising fasciitis (rare plural: necrotising fasciitides) refers to a rapidly progressive and often fatal necrotising soft tissue infection primarily involving and spreading along the fascia.
The most common risk factor is diabetes mellitus, especially in combination with peripheral arterial disease. Other predisposing factors include immunocompromise due to hiv infection, cancer, alcoholism, and organ transplants. However, infections can occur in otherwise healthy individuals following surgery, penetrating trauma, minor wounds such as insect bites or abrasions, or even blunt trauma with no clear portal of entry.
Microbiologically, there are two major recognised forms:

- Polymicrobial (type i): most common; involves both anaerobic and aerobic organisms, such as *clostridium*, *bacteroides*, and *peptostreptococcus* in the former group, and *enterobacteriaceae* family members and *staphylococcus aureus* in the latter group.
- Monomicrobial (type ii): less common (10-15%); most commonly involves group a streptococci, the "flesh-eating bacteria" and may be complicated by toxic shock syndrome. Less commonly due to *staphylococcus aureus*

4. What are the types of phonation problems encountered after thyroid surgery? How are they prevented or treated? 4+6

Answer. The voice problems after thyroid surgeryinclude breathiness with loss of air during vocalization, change in pitch, inability to project the voice, and early vocal fatigue, any and all of which can impair communication.

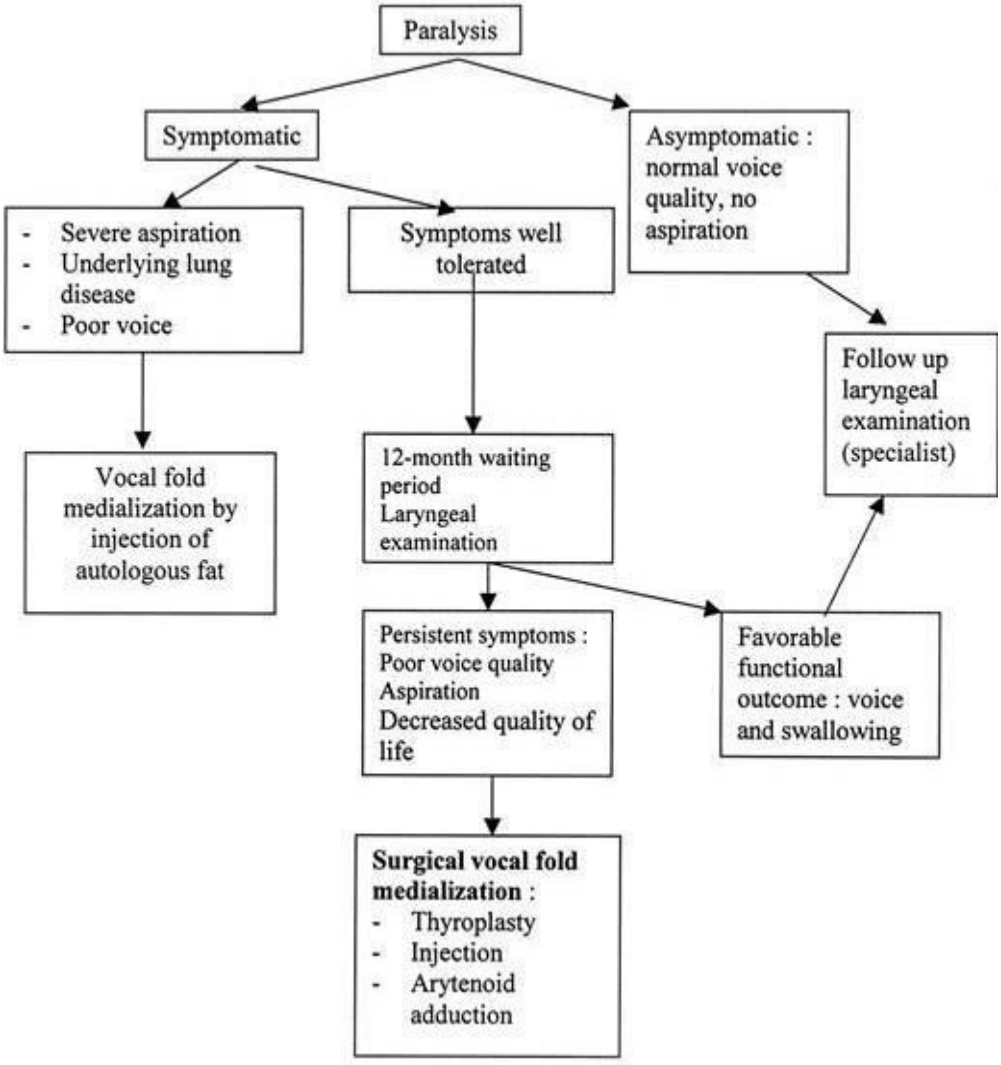
- Voice change — is a known complication after thyroid surgery. There are two sets of nerves near the thyroid gland that help control the voice. These are the recurrent laryngeal nerve and the external branch of the superior laryngeal nerve. Damage to a recurrent laryngeal nerve can cause patient "to losehis/her voice". The chance that one of the recurrent laryngeal nerves will be permanently damaged is about 1%. A more subtle change in vocal function may be noticeable if the patient is a professional voice singer or public speaker.
- Temporary voice changes, such as mild hoarseness, voice tiring, and weakness are more common and can happen in 5 to 10% of patients. The temporary problem usually occurs because one or more of the nerves are irritated either by moving them out of the way during the operation or because of the inflammation that happens after the surgery. Although the voice usually improves in the first few weeks after surgery, it can last up to 6 months.

- If both recurrent laryngeal nerves are damaged, the vocal cords may close and not allow air to pass from the mouth and nose into the lungs. In this case, a tracheostomy tube may need to be placed to allow passage of air into the lungs. This is extremely rare.
- If the external branch of the superior laryngeal nerve is injured and not functioning properly, the vocal cord may move normally. However, it may cause a problem in making high-pitched noises or yelling. These changes are slightly more common, but may be so subtle that they are difficult to notice.
- If any of these voice changes last for more than 6 months after the operation, they are likely to be permanent. An otolaryngologist/Ear, Nose, & Throat (ENT) doctor or vocal specialist can be very helpful in determining the specific problem and can perform different procedures to reposition the vocal cord to improve voice quality (vocal cord medialization).

Algorithm for management of URLNP after thyroid surgery.

Signs and symptoms of vocal cord paralysis may include:

- A breathy quality to the voice.
- Hoarseness.
- Noisy breathing.
- Loss of vocal pitch.
- Choking or coughing while swallowing food, drink or saliva.
- The need to take frequent breaths while speaking.
- Inability to speak loudly.
- Loss of your gag reflex.



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- Loss of vocal pitch.
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- The need to take frequent breaths while speaking.
- Inability to speak loudly.
- Loss of gag reflex.

5. Discuss the role of conservative surgery for RCC. 10

Answer. Indications for nephron-sparing surgery (nss):

- Synchronous bilateral tumors,
- tumors in a solitary kidney, and
- presence of a poorly functional contralateral renal unit are generally absolute indications for nephron-sparing surgery (nss).
- Nss is also indicated for rcc in patients with a normal contralateral renal unit, especially in younger patients with an incidental, localized, single, small (< 4 cm) rcc.
- Recently, the indications for nss have expanded to include all t1 lesions (up to 7 cm), even in the setting of a normal contralateral kidney.
- Other indications for nss include hereditary papillary rcc and rcc associated with von hippel-lindau (vhl) syndrome.
- In addition to size, the location of the lesion in the kidney is an important criterion when considering nss. Centrally located tumors near the hilum and adjacent to the collecting system are technically more difficult to remove than exophytic peripheral lesions. A recent

study revealed that treatment with nss or radical nephrectomy is equally effective, regardless of tumor location.

6. Compare the surgical treatment options for procidentia of rectum. 10

Answer. Abdominal Surgical Procedures

As noted, abdominal repairs are typically performed in younger, healthier patients, whose life expectancy is longer. For these patients, procedures with lower recurrence rates but higher morbidities are most appropriate. The choice of abdominal procedure is often dictated by the extent of the associated constipation and by the surgeon's preference.

Laparoscopic surgical rectopexy procedures have been developed that have outcomes as good as those of open abdominal procedures but are associated with shorter hospital stays and greater patient comfort.

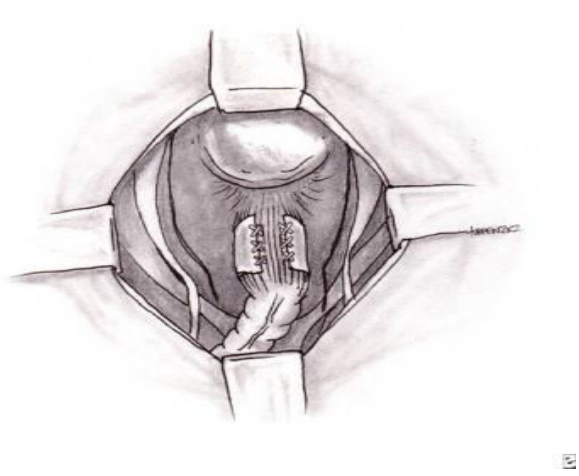
- **Anterior resection:**

- Patients with rectal prolapse and constipation often have a redundant colon, and some surgeons believe that resection of this alleviates constipation and decreases recurrence of rectal prolapse.
- In an anterior resection for rectal prolapse, the rectum is mobilized to the level of the lateral ligaments, and the redundant colon (sigmoid) is resected. The left colon is then anastomosed to the top of the rectum.
- This anastomosis is performed without laxity in the colon so that the rectum is held in place and can no longer prolapse.
- It is not thought to address anatomic abnormalities such as poor rectal fixation.

- **Marlex rectopexy**

- In a Marlex rectopexy (Ripstein procedure), the entire rectum is mobilized down to the coccyx posteriorly, the lateral ligaments laterally, and the anterior cul-de-sac anteriorly (see the image below).
- A nonabsorbable material (eg, Marlex mesh or an Ivalon sponge) is fixed to the presacral fascia. The rectum is placed on tension, and the material is partially wrapped around the rectum to keep it in position. To prevent a circumferential obstruction, the anterior rectal wall is not covered with the sponge or mesh.
- The peritoneal reflections are then closed to cover the foreign body. The Marlex mesh or sponge causes an intense inflammatory reaction that scars and fixes the rectum into place. This procedure should not be performed on patients who have a large component of constipation or a very redundant sigmoid colon, because the symptoms are likely to worsen. If the rectum is inadvertently entered during mobilization, the foreign material should not be implanted, because of the risk of infection.
- Although the rate of Marlex erosion into the rectum is low, management is extremely difficult, and for this reason, many surgeons prefer resection with suture rectopexy to Marlex fixation.

Marlex rectopexy for rectal prolapse



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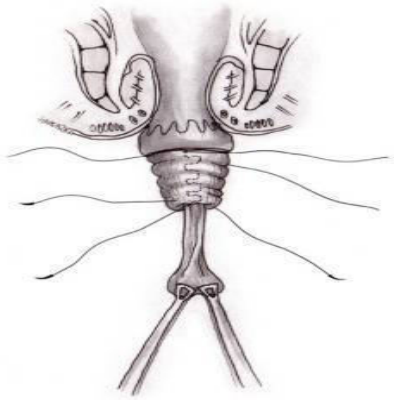
- **Suture rectopexy**
  - A suture rectopexy is essentially the same as a Marlex rectopexy, except that the rectum is fixed to the presacral fascia with suture material rather than mesh or an Ivalon sponge.
- Resection rectopexy
  - A resection with rectopexy (Frykman-Goldberg procedure) is a combination of an anterior resection and a Marlex rectopexy; it is a good option for patients with a significant component of constipation. The rectum is completely mobilized to the coccyx posteriorly, to the lateral ligaments laterally (some surgeons divide the lateral ligaments), and to the cul-de-sac anteriorly.
  - The redundant sigmoid colon is then resected, and the remaining colon is anastomosed to the top of the rectum. The lateral ligaments (or the rectal fascia) are then sutured to the presacral fascia with the rectum on tension, which keeps the rectum in place and prevents further rectal prolapse.
  - The rectopexy is accomplished with suture instead of nonabsorbable mesh because the bowel is opened for the anastomosis and the mesh may become contaminated.

Perineal Surgical Procedures:
Perineal procedures have higher recurrence rates but lower morbidities and are often performed in elderly persons or in patients for whom general anesthesia is contraindicated.

- **Anal encirclement**
  - With anal encirclement (Thiersch wire), a nonabsorbable band is placed subcutaneously around the anus. The purpose of this procedure is to keep the rectum from prolapsing by restricting the size of the anal lumen.
  - Anal encirclement is effective in mechanically preventing the rectum from prolapsing, but it does not treat the underlying disorder.
  - Complications from this procedure include obstruction with fecal impaction and erosion of the wire with infection.
  - Anal encirclement is no longer commonly performed; it is usually reserved for only the most debilitated patients and for patients with the highest surgical risks, in whom palliation is the goal. Anal encirclement carries a very high risk of fecal impaction.

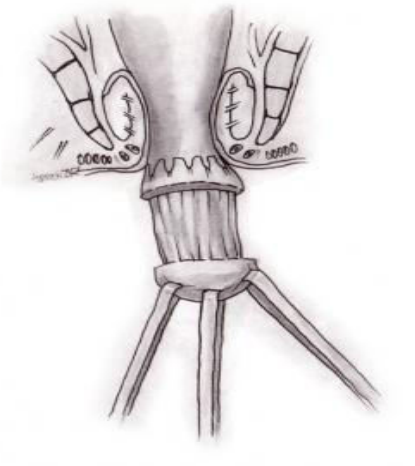
- **Delorme mucosal sleeve resection:**
    - In a Delorme mucosal sleeve resection, a circumferential incision is made through the mucosa of the prolapsed rectum near the dentate line; with the electrocautery, the mucosa is stripped from the rectum to the apex of the prolapse and excised.
    - The denuded prolapsed muscle is then pleated with a suture and reefed up like an accordion, and the transected edges of the mucosa are sutured together.
    - This procedure is often used for small prolapses but may also be used for large ones.



Delorme mucosal sleeve resection for rectal prolapse.

- **Altemeier perineal rectosigmoidectomy**

- In an Altemeier perineal rectosigmoidectomy, a full-thickness circumferential incision is made in the prolapsed rectum about 1-2 cm from the dentate line.
- The hernia sac is entered, and the prolapse is delivered. The mesentery of the prolapsed bowel is serially ligated until no further redundant bowel can be pulled down.
- The bowel is transected and either hand-sewn to the distal anal canal or stapled with a circular stapler.
- Before anastomosis, some surgeons plicate the levator ani muscles anteriorly, which may help improve continence.



Altemeier perineal rectosigmoidectomy for rectal prolapse.

- **Hemorrhoidectomy**
  - Mucosal prolapse is treated with a hemorrhoidectomy.
- **Perineal stapled prolapse resection:**
  - Although the procedure is fast and safe, the long-term functional outcome was poor, and the recurrence rate was 44%.

7. Give a brief account of oncoplastic breast surgery. 10

Answer. Patient selection:

- Opinions about which patients should undergo breast reconstruction are as varied as the surgeons who perform the procedures. In general, young healthy patients with early-stage disease are the best candidates for reconstruction, and consequently, older patients with advanced disease are poorer candidates. However, because of the multitude of different reconstructive options available, all women at least need to be presented with the options before being excluded.
- With the increasing popularity of autogenous breast reconstruction, more stringent guidelines may be needed for the selection of potential reconstructive candidates. With regard to mastectomy alone, the greater surgical trauma, increased operative time, increased blood loss, and prolonged recovery mandate that all patients, regardless of their desire for reconstruction, be thoroughly evaluated both physically and psychologically.

Options for Breast Reconstruction:

Options for Breast Reconstruction

• Autogenous
  ○ Abdominal-based flaps
  ▪ TRAM
  ▪ Single pedicle
  ▪ Double pedicle
  ▪ Free flap
  ▪ Deep inferior epigastric perforator flap
  ○ Upper abdominal horizontal flap
  ○ Vertical abdominal flap
  ○ Tubed abdominal flap
  ○ Latissimus dorsi musculocutaneous flap
  ○ Gluteal flap
  ▪ Superiorly based
  ▪ Inferiorly based
  ○ Rubens flap

- Thoracoepigastric flap
- Lateral thigh flap
- Breast-splitting procedure

- Alloplastic
  - Silicone gel implant
  - Silicone implant with saline fill
    - Smooth wall
    - Textured wall
    - Round shaped
    - Anatomic shaped
  - Silicone injection

- Combination procedures
  - Latissimus dorsi flap with implant
  - TRAM flap with implant

TRAM, transverse rectus abdominis myocutaneous.

- The primary part of the procedure can often be carried out immediately following the mastectomy. As with many other surgeries, patients with significant medical comorbidities (high blood pressure, obesity, diabetes) and smokers are higher-risk candidates.
- The infection rate may be higher with primary reconstruction (done at the same time as mastectomy), but there are psychologic and financial benefits to having a single primary reconstruction.
- Patients expected to receive radiation therapy as part of their adjuvant treatment are also commonly considered for delayed autologous reconstruction due to significantly higher complication rates with tissue expander-implant techniques in those patients. Waiting for six months to a year following may decrease the risk of complications, but this risk will always be higher in patients who have received radiation therapy.
- Delayed breast reconstruction is considered more challenging than immediate reconstruction. Frequently not just breast volume, but also skin surface area needs to be restored. Many patients undergoing delayed breast reconstruction have been previously treated with radiation or have had a reconstruction failure with immediate breast reconstruction. In nearly all cases of delayed breast reconstruction tissue must be borrowed from another part of the body to make the new breast.
- Breast reconstruction is a large undertaking that usually takes multiple operations. Sometimes these follow-up surgeries are spread out over weeks or months. If an implant is used, the individual runs the same risks and complications as those who use them for breast augmentation but has higher rates of capsular contracture (tightening or hardening of the scar tissue around the implant) and revisional surgeries.

Operative Risk Factors for Breast Reconstruction With the TRAM Flap

Moderate: <25% above ideal body weight
Severe: >25% over ideal body weight
Light to moderate smoking (1+ pack/day for 2-10 yr)
Chronic heavy smoking (10-20 pack-years)
Chronic heavy smoking (20-30 pack-years)
Autoimmune disease (e.g., scleroderma, Raynaud's)
Diabetes mellitus: non–insulin dependent
Diabetes mellitus: insulin dependent
Unstable emotional state (life crisis)
Personality disorder
Substance abuse
If “planned out” of flap design
Disruption of vascular perforators: transection of superior epigastric vessels (e.g., chevron incision, abdominoplasty)
Patient unwilling or unable to invest the time required for healing or objects to an abdominal scar
<10 TRAM flaps
Chronic lung disease
Severe cardiovascular disease

Management of the contralateral breast

The challenge of breast reconstruction requires not only creating a natural-appearing breast but also achieving breast symmetry. Accordingly, on occasion, breast reconstruction requires an additional procedure on the contralateral breast. Occasionally, the mastectomy affords the patient the opportunity to obtain the breast size or shape modification that she had long desired previously.

In reconstructing postmastectomy breasts, matching preexisting ptosis and larger contralateral breast size is a difficult task. In the absence of medical contraindications, a reduction mammoplasty, mastopexy, or insertion of an implant may be required to optimize the breast reconstruction to achieve optimal symmetry.

Although the risk for development of cancer in the contralateral breast is low (~4%), in reconstructing the contralateral breast, results are best if done with the same reconstructive option. *BRCA*-positive patients require additional counseling to discuss their ultimate risk for a metachronous cancer in the contralateral breast, and such women may opt for simultaneous, bilateral mastectomy with reconstruction.

8. Discuss the principles of different modalities of surgery for chronic venous stasis of inferior extremities. 10

Answer.

Venoablation:

Venoablation is reserved for those with discomfort or ulcers refractory to medical management. The primary goal of surgical and endovenous approaches is to correct venous insufficiency by removing the major reflux pathways.

Techniques for venoablation include the following:

- Ligation with stripping
- Simple ligation and division
- Sclerotherapy (with or without ligation)
- Stab evulsion (with or without ligation)
- Radiofrequency ablation (RFA)
- Endovenous laser therapy (EVLT)

All methods of venoablation are effective (although there is some disagreement between the medical and the surgical literature as to the prevalence and timing of varicose recurrences). Once the overall volume of venous reflux is reduced below a critical threshold by any mechanism, venous ulcerations heal, and patient symptoms are resolved.

In general, vein ligation is reserved for cases of chronic venous insufficiency (CVI) involving reflux in the saphenous system that causes severe symptoms.

Thus, a diagnosis of reflux must be established preoperatively, usually with photoplethysmography or duplex imaging.

In patients with symptomatic varicosities of the great saphenous vein (GSV), deep occlusion must be ruled out; it is an absolute contraindication to vein ligation. Venography of the deep venous system before superficial vein ligation is imperative.

Sclerotherapy is performed by injecting or infusing a sclerosing substance into the refluxing vessel to produce endothelial destruction and fibrosis of the treated vessel. Injection of a sclerosing agent directly into veins usually is reserved for telangiectatic lesions rather than CVI. Phlebotonics have not been proven to be beneficial for CVI.

EVLT is performed by passing a laser fiber from the knee to the groin and then delivering laser energy along the entire course of the vein. Destruction of the vascular wall is followed by fibrosis of the treated vessel. It has been shown to yield excellent long-term (>5 years) results and a low rate of complications, which vary with the laser wavelength used.

RFA is performed by passing a special radiofrequency (RF) catheter from the knee to the groin and then carrying out controlled and preset heating of the targeted vessel until thermal injury causes shrinkage. The process is repeated every 7 cm along the course of the vein. Initial thermal injury is followed by fibrosis of the treated vessel. RFA has been shown to be effective, with a low rate of complications. It has produced excellent results that have been confirmed with up to 10 years of follow-up.

Subfascial endoscopic perforator surgery (SEPS) has also been employed to treat CVI. Endoscopic techniques are used to find and ligate perforating veins. Preliminary reports showed that after SEPS, the average healing time for ulcers was 42 days, with a recurrence rate of 3%, and that ulcers treated with SEPS healed 4 times faster than ulcers treated conventionally. In addition, the morbidity of SEPS was significantly lower than that of traditional operations.

9. Discuss the surgical management of morbid obesity.

Answer. Eligibility criteria for bariatric surgery

▪ bmi > 40; or bmi > 35, with obesity-related comorbidity
▪ failed previous attempts at nonsurgical weight reduction
▪ no active history of alcohol or substance abuse
▪ realistic expectations of outcomes and commitment to long-term follow-up
▪ acceptable medical risk for surgery

Bariatric operations: mechanism of action
Restrictive
Vertical banded gastroplasty (vbg) (historic purposes only)
Laparoscopic adjustable gastric banding (lagb)
Largely restrictive/mildly malabsorptive
Roux-en-y gastric bypass (rygb)
Largely malabsorptive/mildly restrictive
Biliopancreatic diversion (bpd)
Duodenal switch (ds)

Vertical banded gastroplasty

This procedure has now largely been abandoned.

Causes are:

- Poor long-term weight loss,
- A high rate of late stenosis of the gastric outlet, and
- A tendency for patients to adopt a high-calorie liquid diet, thereby leading to regain of weight.

- Weight regain several years after surgery is typically due to a breakdown of the vertical staple line and patients report new dietary freedom. Revisional surgery and conversion to a gastric bypass usually result in durable weight loss but can be associated with a higher rate of perioperative complications.

adjustable gastric banding

- The agb procedure may be performed with any of three types of adjustable bands.
- They all work on the principle of restriction of oral intake by limiting the volume of the proximal part of the stomach.
- Their advantage over the traditional vertical banded gastroplasty is adjustability.
- Gastric banding is a least-invasive operation with 50-60% excess weight loss over 5 years but long term results are unknown and the complication rate may be cumulative.

Roux-en-y gastric bypass

Essential components of roux-en-y gastric bypass
Small proximal gastric pouch
Gastric pouch constructed from the cardia of the stomach to prevent dilation and minimize acid production
Gastric pouch divided from the distal part of the stomach
Roux limb at least 75 cm in length
Enteroenterostomy constructed to avoid stenosis or obstruction
Closure of all potential spaces for internal hernias

Results of roux-en-y gastric bypass

- Rygb has an established track record longer than that of any other operation.
  Its recovery after rygb is improved after a laparoscopic approach.
- This improvement is largely related to the decrease in postoperative pain experienced by patients after laparoscopic rygb versus open rygb.
- Weight loss with both approaches was comparable (68% loss of excess weight for laparoscopic rygb versus 62% loss of excess weight for open rygb).
- Another important advantage of the laparoscopic approach for rygb is a decrease in the incidence of wound complications and incisional hernia seen after rygb.
- There is no difference in the rate resolution of comorbid conditions or weight loss between the two procedures. After rygb.
- Resolution of comorbid conditions after open and laparoscopic rygb has generally been excellent.

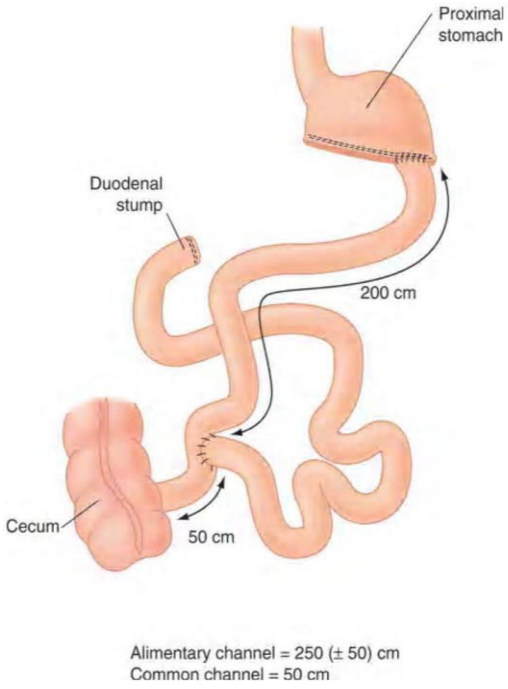
- Rate of resolution and improvement of diabetes, hypertension and obstructive sllep apnoea is significant.
- Metabolic syndrome is cured or ameliorated with gastric bypass.
- Hyperlipidemia, hypercholesterolemia, and hypertriglyceridemia has been improved significantly in patients undergoing rygb.
- Rygb has also been shown to resolve the symptoms of pseudotumor cerebri, as well as cure the difficult problem of venous stasis ulcers.
- Immediate resolution of symptoms of gerd occurs in more than 90% of cases.

biliopancreatic diversion

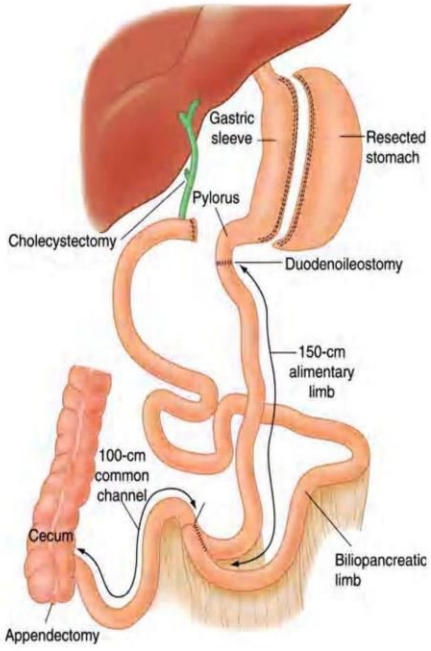
- Bpd produces weight loss based primarily on malabsorption, but it does have a mild restrictive component.
- The intestinal tract is reconstructed to allow only a short so-called common channel of the distal 50-cm of terminal ileum for absorption of fat and protein.
- The alimentary tract beyond the proximal part of the stomach is rearranged to include only the distal 200 cm of ileum, including the common channel.
- The proximal end of this ileum is anastomosed to the proximal end of the stomach after performing a distal hemigastrectomy.
- The ileum proximal to the end that is anastomosed to the stomach is in turn anastomosed to the terminal ileum within the 50- to 100-cm distance from the ileocecal valve, depending on the surgeon's preference and the patient's size.

Duodenal switch

- This modification was developed to help lessen the high incidence of marginal ulcers after bpd.
- The mechanism of weight loss is similar to that of bpd.
- An appendectomy is followed by measurement of the terminal ileum. Notably in the ds procedure, the common channel is 100 cm and the entire alimentary tract is 250 cm.
- However, the major difference between ds and bpd is the gastrectomy and the proximal anatomy. Instead of a distal hemigastrectomy, a sleeve gastrectomy of the greater curvature of the stomach is performed. This procedure is done as the initial part of the operation because if the patient exhibits any intraoperative instability, the operation can be discontinued after the sleeve gastrectomy alone.
- A two-stage ds has been used in patients who have an extremely high bmi and are high operative risks.
- The goal is to produce a lesser curvature gastric sleeve with a volume of 150 to 200 ml.
- After sleeve gastrectomy, or preceding it in smaller patients, the duodenum is divided with the stapler approximately 2 cm beyond the pylorus.
- The distal connections are performed as for bpd. The distal anastomosis is created at the 100-cm point proximal to the ileocecal valve.
- The proximal anastomosis is created between the proximal end of the 250 cm of terminal ileum and the first portion of the duodenum. The duodenoileostomy is an antecolic end-to-side duodenoenterostomy.



Scematic diagram of biliopancreatic diversion



Scematic diagram of duodenal switch

Results of biliopancreatic diversion/duodenal switch

- Excess weight loss (ewl)after bpd/ds is the highest of all the bariatric operations
- In a recent study comparing morbidly obese patients with a bmi greater than 50 kg/m^2, there was significantly more ewl at 12, 18, and 24 months postoperatively after ds than after rygb.
- Thus, some surgeons argue that super-obese patients fare better and maintain weight loss better in the long term after undergoing ds than after other bariatric operations.
- Bpd/ds has also been highly effective in treating comorbid conditions, including hypertension, diabetes, lipid disorders, and obstructive sleep apnea.
- Lipid disorders and type 2 diabetes are almost uniformly resolved after bpd/ds.
- Hypertension is cured in 83.4% and obstructive sleep apnea resolves in 91.9% of patients.
- After bpd, patients typically have between two and four bowel movements per day. Excessive flatulence and foul-smelling stools are the rule.
- Relatively selective malabsorption of starch and fat provides the major mechanism of weight loss, although the partial gastric resection does contribute a restrictive component to the operation.
- When protein malnutrition does occur, the common channel may need to be lengthened with a reoperation.
- Major considerations for achieving excellent results in patients offered bpd/ds include the ability to reliably monitor these patients, as well as confirm that they are being compliant with the recommendations to take appropriate vitamin supplements.
- Supplements include multivitamins, as well as at least 2 g of oral calcium per day. Supplemental fat-soluble vitamins, including d, k, and a, are indicated monthly as well.

- Because of a high incidence of morbidity and mortality in patients with a bmi greater than 60 kg/m^2 undergoing laparoscopic ds, surgeons developed the two-stage ds, with sleeve gastrectomy alone performed as the first stage to decrease morbidity in this super-obese patient population.

Other procedures:

- Endoluminal sleeve
- Jejunoileal bypass

Comments:

- Cultural factors, surgeon and patient preference drive choice of operation which should be based on the balance of risk and benefit.
- Bariatric surgery pays for itself within 3-4 years after surgery.
- Bariatric surgery patients have better long-term survival than obese controls.
- A number of procedures have been investigated for weight loss surgery but have not been totally accepted by the surgical community. Several surgeons have proposed a two-stage procedure for a super-obese patient, who often has a large liver that precludes safe retraction for gastric bypass, because of the recognition that the ds procedure has been associated with much higher mortality and morbidity rates in the super-obese (bmi >60 kg/m^2).
- Now, reports of vertical sleeve gastrectomy (vsg) alone suggest that weight loss is sufficient to preclude conversion to gastric bypass or ds.
- Gastric pacing has been performed in several trials but has not gained widespread acceptance. The concept is to stimulate gastric smooth muscle by implanting a pacemaker in

the body of the stomach to induce early satiety, which reduces caloric intake and therefore results in weight loss.

- Increasingly, surgeons are observing effects of bariatric operations not just on the physical reduction of caloric intake or malabsorption. Alteration in comorbid conditions caused by metabolic processes may prove equally as important. For example, bariatric operations may have important metabolic components that alter the hormonal/cytokine/metabolic rate of patients.

10. Discuss the perioperative management of a patient on thromboprophylaxis (post cabg status) requiring emergency exploratory laparotomy. 10

Answer. Perioperative management of anticoagulant therapy is constantly evolving, with the primary aim being a balance between reducing the risk of systemic arterial and venous embolism and reducing perioperative bleeding risk. The traditional strategy to 'bridge' interrupted warfarin therapy for atrial fibrillation with the administration of low-molecular-weight heparin is under review, following the results of large and influential studies such as the BRIDGE trial.1 The use of novel oral anticoagulants (NOACs) is also increasing and so it is crucial to understand both the pharmacokinetics of these drugs and their use in the perioperative period. This article aims to give a concise update of perioperative anticoagulation and to guide readers on the perioperative management of patients on NOAC.

Recommendations related to drugs used to modify coagulation:

Drug	Time to peak effect	Elimination half-life	Acceptable time after drug for block performance	Administration of drug while spinal or epidural catheter in place	Acceptable time after block performance or catheter removal for next drug dose
Warfarin	3–5 days	4–5 days	INR 1.4 or below	Not recommended	After catheter removal
Rivaroxaban prophylaxis (creatinine clearance > 30 mL min^{-1})	3 hours	7–9 hours	18 hours	Not recommended	6 hours
Rivaroxaban treatment (creatinine clearance > 30 mL min^{-1})	3 hours	7–11 hours	48 hours	Not recommended	6 hours
Apixaban prophylaxis	3–4 hours	12 hours	24–48 hours	Not recommended	6 hours
Dabigatran prophylaxis or treatment					
Creatinine clearance > 80 mL min^{-1}	0.5–2 hours	12–17 hours	48 hours	Not recommended	6 hours
Creatinine clearance 50–80 mL min^{-1}	0.5–2 hours	15 hours	72 hours	Not recommended	6 hours
Creatinine clearance 30–50 mL min^{-1}	0.5–2 hours	18 hours	96 hours	Not recommended	6 hours

Management of patients undergoing emergency surgery while taking dabigatran.

Dabigatran <30 ng/ml APTT<1.2	Operate
Dabigatran >30 ng/ml<200 ng/ml APTT>1.2<1.5	Wait 12 hours and obtain new test If emergent, operate and antagonize anticoagulant effect as needed
Dabigatran >200 ng/ml APTT>1.5	Wait 12 hours and obtain new test Delay surgery as much as possible Discuss Haemodialysis, especially if Creatinine clearance less than 50 ml/min If emergent, operate and antagonize anticoagulant effect as needed
Dabigatran >400 ng/ml	Major haemorrhagic risk Haemodialysis

APTT: Activated Partial Thromboplastin Time

Management of patients undergoing emergency surgery while taking rivaroxaban.

Rivaroxaban <30 ng/ml APTT<1.2 and PT<1.2	Operate
Rivaroxaban >30 ng/ml<200 ng/ml APTT>1.2<1.5 and PT>1.2	Wait 12 hours and obtain new test If emergent, operate and antagonize anticoagulant effect as needed
Rivaroxaban >200 ng/ml APTT>1.5	Wait 12 hours and obtain new test Delay surgery as much as possible If emergent, operate and antagonize anticoagulant effect as needed
Rivaroxaban >400 ng/ml	Major haemorrhagic risk

APTT: Activated Partial Thromboplastin Time; PT: Prothrombin Time

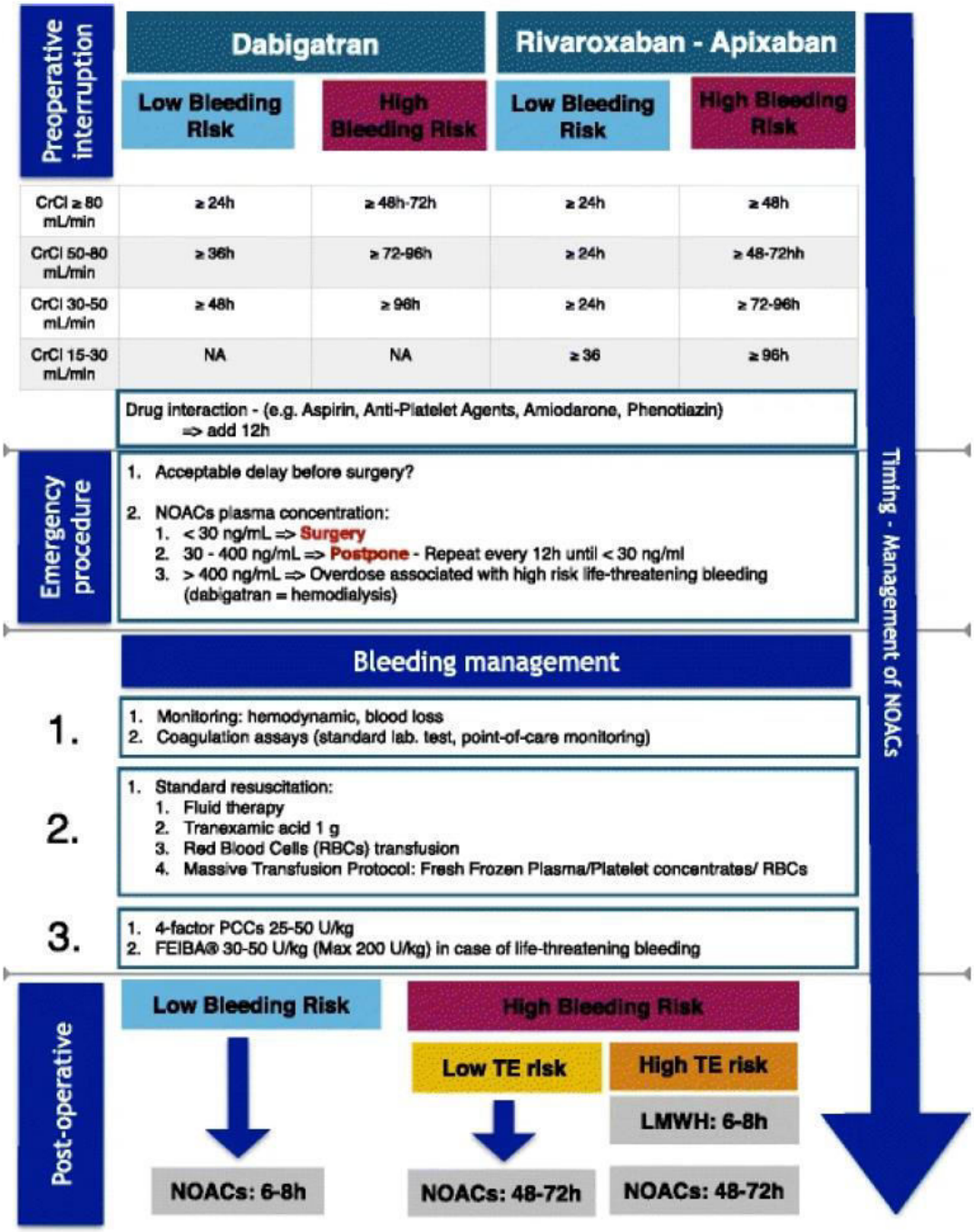
If no specific reversal agent is available, non-specific haemostatic agents can be used for reversal of excessive bleeding.

- Recombinant factor 7a initiates thrombin generation by activating factor 10.
- Four-factor prothrombin complex concentrates contain large amounts of non-activated vitamin K-dependent factors 2, 7, 9 and 10.
- Three-factor prothrombin complexes contain small amounts of non-active factor 7 relating to 2, 9 and 10.
- Activated prothrombin complex concentrate contains activated factor 7 and factors 2, 9 and 10.

One of the speci□c characteristics of emergency surgery is its limitation in patient preparation. □e elimination of certain patient-related factors to lower the operative risk is di□cult and o□en impossible [1]. □e e□ects of some drugs being used by patients in the emergency setting, such as anticoagulant drugs, may therefore raise important issues [2,3]. □e introduction of anticoagulant drugs represented a major breakthrough in the treatment and prophylaxis of some cardiovascular diseases. Similarly, the possibility of safe oral administration allowed the patients to treat themselves
in the comfort of their homes. □erefore, the introduction of oral anticoagulant drugs to the pharmacopoeia was welcomed by both patients and clinicians. I

The reversal agent used for warfarin is a synthetic preparation of phytomenadione (vitamin K_1). The presence of vitamin K is essential for formation of prothrombin, factor 7, factor 9 and factor 10.

- Major bleeding – stop warfarin sodium; give 5 mg phytomenadione (vitamin K_1) by intravenous injection; give four-factor prothrombin complex (factors 2, 7, 9 and 10); if prothrombin complex unavailable, fresh-frozen plasma can be given but is less effective.
- INR > 8.0, minor bleeding – stop warfarin sodium; give 1–3 mg phytomenadione (vitamin K_1) by slow IV injection; repeat dose of phytomenadione if INR still too high after 24 hours; restart warfarin sodium when INR < 5.0.
- INR > 8.0, no bleeding – stop warfarin sodium; give 2.5 mg phytomenadione (vitamin K_1) by mouth using the IV preparation orally; repeat dose of phytomenadione if INR still too high after 24 hours; restart warfarin when INR < 5.0.
- INR 5.0–8.0, minor bleeding – stop warfarin sodium; give 1–3 mg phytomenadione (vitamin K_1) by IV injection; restart warfarin sodium when INR < 5.0.
- INR 5.0–8.0, no bleeding – withhold one or two doses of warfarin sodium and reduce subsequent maintenance dose.
- Unexpected bleeding at therapeutic levels – always investigate possibility of underlying cause, e.g. unsuspected renal or gastrointestinal tract pathology.



Proposed algorithm for peri-operative management of non-vitamin K antagonist oral anticoagulants. CrCl, creatinine clearance; LMWH, low molecular weight heparin; NA, not applicable; NOAC, non-vitamin K antagonist oral anticoagulant; PCC, prothrombin complex concentrate; TE, thromboembolism.

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES
MS (General Surgery) Examination, 2017
PAPER III

Time Allowed: 3 Hours **Full Marks: 100**

1. Classify Flexor Tendon injury of hand and briefly mention its management. 10.

Answer.

1. Flexor tendon injury of hand:
Anatomy:

- Muscles
  - flexor digitorum profundus (FDP)
    - functions as a flexor of the DIP joint
    - assists with PIP and MCP flexion
    - shares a common muscle belly in the forearm
  - flexor digitorum superficialis (FDS)
    - functions as a flexor of the PIP joint
    - assists with MCP flexion
    - individual muscle bellies exist in the forearm
      - FDS to the small finger is absent in 25% of people
  - flexor pollicis longus (FPL)
    - located within the carpal tunnel as the most radial structure
  - flexor carpi radialis (FCR)
    - primary wrist flexor
    - inserts on the base of the second metacarpal
    - closest flexor tendon to the median nerve
  - flexor carpi ulnaris (FCU)
    - primary wrist flexor
    - inserts on the pisiform, hook of hamate, and the base of the 5th metacarpal
- Blood supply
  - 2 sources exist
    - diffusion through synovial sheaths
      - occurs when flexor tendons are located within a sheath
      - it is the more important source distal to the MCP joint
    - direct vascular supply
      - nourishes flexor tendons located outside of synovial sheaths
- Campers chiasm
  - located at the level of the proximal phalanx where FDP splits FDS
- Pulley system
  - digits 1-4 contain
    - 5 annular pulleys (A1 to A5)
    - 3 cruciate pulleys (C1 to C3)
      - A2 and A4 are the most important pulleys to prevent flexor tendon bowstringing
  - thumb contains
    - 2 annular pulley
    - interposed oblique pulley (most important)

Classification

Zone	Definition	Introduction	Treatment
I	Distal to FDS insertion	Jersey finger	
II	FDS insertion to distal palmar crease	Zone is unique in that FDP and FDS in same tendon sheath (both injured within the flexor retinaculum)	Direct repair of both tendons followed by early ROM (Duran, Kleinert). Be sure to preserve A2 and A4 pulley. This zone historically had very poor results but results have improved due to advances in postoperative motion protocols
III	Palm	Often associated with neurovascular injury which carries a worse prognosis	Direct tendon repair. Good results from direct repair can be expected due to absence of retinacular structures (if no neurovascular injury)
IV	Carpal tunnel	Often complicated by postoperative adhesions due to close quarters and synovial sheath of the carpal tunnel	Direct tendon repair. Transverse carpal ligament should be repaired in a lengthened fashion
V	Wrist to forearm	Often associated with neurovascular injury which carries a worse prognosis	Direct tendon repair
Thumb	TI, TII, TIII	Outcomes different than fingers. Early motion protocols do not improve long-term results and there is a higher re-rupture rate than flexor tendon repair in fingers	Direct end-to-end repair of FPL is advocated. Try to avoid Zone III to avoid injury to the recurrent motor branch of the median nerve. Oblique pulley is more important than the A1 pulley; however both may be incised if necessary. Attempt to leave one pulley intact to prevent bowstringing

2. Merits and demerits of various surgical procedures in treatment of morbid obesity. 10

Answer. Surgeries for weight loss can be classified as follows:

- Restrictive procedures that limit the amount of food intake by reducing the size of the stomach
- Malabsorptive procedures that interfere with absorption of food from the digestive tract
- Combined restrictive and malabsorptive procedures

The 2 most commonly performed operations for weight loss in the United States are the Roux-en-Y gastric bypass (RYGB) and the adjustable gastric band (AGB). Both procedures could be done laparoscopically with smaller incisions than those required for traditional open approach (laparotomy). Small incisions result in less pain, early ambulation, and rapid postoperative recovery and less chance for wound complications (wound infection, fluid collection, and hernia).

Gastric bypass: Roux-en-Y gastric bypass is the most commonly performed weight loss procedure in the United States. This operation both restricts food intake and limits absorption of food. A part of the stomach is closed off, creating a small pouch. This restricts the amount of food that you can eat at one time. The small pouch of the stomach is connected directly to the small bowel. As the name implies, food bypasses the stomach and the first portion of the small intestine. Because a part

of the small bowel is bypassed, less food is absorbed. Most people find they can eat less than 1 cup of food at a time after the operation. Food must be chewed very well. Overeating or not chewing food finely will result in cramping, nausea, and vomiting.

Laparoscopic adjustable gastric binding: This is a purely restrictive procedure. It involves placing an inflatable silastic band around the uppermost part of the stomach. This results in a smaller upper stomach pouch and a narrow opening between the upper and lower parts of the stomach. This induces and early feeling of fullness and thereby decreases food intake. It is adjustable by changing the volume of saline in a surgically placed subcutaneous reservoir, thereby tightening or loosening the band.

Biliopancreatic diversion: Biliopancreatic diversion (BPD) is a malabsorptive procedure with some restrictive component. A part of the stomach is removed and the remaining part is attached directly to the small intestine near its end. BPD is used much less often than Roux-en-Y because it has a greater risk of complications.

Vertical banded gastroplasty Vertical banded gastroplasty (VBG, stomach stapling) is a restrictive procedure that traditionally was done by applying bands or staples to the stomach. This procedure is rarely performed today due to the high failure rate. More information about these procedures can be obtained by visiting the American Society for Bariatric Surgery or the Bariatric Multidisciplinary Institute.

Benefits and Risks of Weight-Loss Surgery

Like all surgical procedures, weight-loss operations have benefits and risks. No one should decide to have surgery without being completely informed of both the pros and cons. This is a decision that you make with your family members, your health care provider, and your surgeon.

Benefits of weight-loss surgery

- Weight loss: Most patients begin to lose weight right away. Some gain some of the weight back, but most are able to keep the weight off for long periods.
  - In general, combined restrictive and malabsorptive procedures (like gastric bypass) are more successful than restrictive procedures (like adjustable gastric banding) at promoting weight loss.
    - Gastric bypass is the most successful procedure. In the first 2 years after gastric bypass, average weight loss is 65% of excess weight. On the other hand, average weight loss with AGB is 35% of excess weight.
    - With gastric bypass, no band is introduced into the body. Also, it is a good operation for a sweet eater because eating sugar makes the patient feel ill (referred to as "dumping").
    - The lap-band system has the advantages of being less invasive, providing a faster recovery, and avoiding alteration of anatomy of the gastrointestinal tract. It is adjustable and reversible with normal stomach restoration. No opening of the stomach or intestines occurs that could cause a leak.
  - People who undergo one of these procedures are much more likely to reach their goal and keep weight off if they also adopt a plan of healthy eating and regular exercise.
- Improved health: Most obesity-related medical conditions improve drastically after surgery, especially diabetes, sleep apnea, and hypertension.

- After surgery mortality rate is reduced and improvements are seen in many of the health risks associated with obesity.
- Overall, quality of life, self image, and mobility are reported to be better.

Risks of weight-loss surgery

All surgical procedures have complications. Talk to your surgeons about this and make sure that your surgeons are specialists in bariatric surgery.

- Disadvantages of gastric bypass - A patient who has gastric bypass may develop the following complications:
  - "Dumping syndrome" - Patients experience nausea, abdominal cramping, and diarrhea after eating sugar. Other symptoms include weakness or faintness.
  - Narrowing or ulcer formation or leak at the stomach to intestine connection - These may require reoperation.
  - Incisional hernia - This is more common in open bariatric surgery.
  - Blood clot in the leg - This may migrate to the lung.
  - In addition to surgical complications, long-term consequences of the malabsorption arise if patients with gastric bypass do not take supplemental vitamins, iron, and calcium. These nutritional deficiencies include the following:
    - Vitamin deficiencies (A, B-12, D, E, and K) - Deficiencies of vitamin B-12, folate, and iron can cause anemia.
    - Mineral deficiencies (calcium, iron, and folic acid) - Calcium deficiency is a concern because it may lead to osteoporosis and other bone disorders.
- Disadvantages of adjustable gastric band
  - The lap-band system is not the operation of choice in sweet eaters or patients with severe gastroesophageal reflux disease (GERD).
  - There is a low possibility of port leak or infection, as well as slippage, erosion, or migration of the band. This may require re-operation. High conversion rates of band to gastric bypass have been reported in American studies and may reflect patient selection.

In experienced hands, the benefits of surgery are typically viewed to outweigh the risks. The immediate operative mortality rate for both adjustable gastric band and Roux-en-Y gastric bypass is about 1%.

Weight regain after bariatric surgery

Some patients may regain weight after bariatric surgery. This may be due to many factors, among them the following:

- Noncompliance with postoperative diet
- Noncompliance with postoperative exercise
- Stretching of the stomach pouch
- Communication between the pouch and the rest of the stomach
- Band problems

3. Methods for increasing resectibility for pancreatic cancer. 10

Answer.

- ❖ Locally advanced pancreatic cancer is described as Tumor invaded locally adjacent structures such as major blood vessels, lymph nodes, bowel or the bile duct, without evidence of distant metastatic disease.
- ❖ Involvement of para-aortic LN considered as metastasis and sugically contrindicated.
- ❖ Locally advanced pancreatic cancer may or may not be resectable and would include T3 and T4, whereas T1 and T2 are considered resectable tumours.

BORDERLINE RESECTABLE PANCREATIC CANCER:

It is defined by two groups

- ❖ MD Anderson Cancer Center (MDACC).
- ❖ American HepatoPancreatoBiliary Association (AHPBA)/ Society of Surgical Oncology (SSO)/Society for Surgery of the Alimentary Tract (SSAT).

- MDACC group describes any venous involvement as resectable disease and only occlusion of the SMV or PV (with the possibility of reconstruction) as borderline.

Comparison of definitions of borderline resectable pancreatic cancer.

	AHBPA/SSAT/SSO	MD Anderson	NCCN 2012
SMV-PV	Abutment, encasement, or occlusion	Occlusion	Abutment with impingement and narrowing
SMA	Abutment	Abutment	Abutment
CHA	Abutment or short-segment encasement	Abutment or short-segment encasement	Abutment or short-segment encasement
Celiac trunk	No abutment or encasement	Abutment	No abutment or encasement

SMV-PV: superior mesenteric vein-portal vein; SMA: superior mesenteric artery.
CHA: common hepatic artery.

National Comprehensive Cancer Network (NCCN) Guidelines for pancreatic cancer treatment:

- Pancreatic cancers classified in to

  - Resectable
  - Borderline resectable and
  - Unresectable.

Resectable:

- Arterial: Clear fat planes around the coeliac axis (CA), SMA and HA.
- Venous: The SMV or PV abutment but no distortion of the vessels.

Borderline Resectable:

Arterial :

Pancreatic head /uncinate process:

- Solid tumor contact with CHA without extension to celiac axis or hepatic artery bifurcation.
- Solid tumor contact with the SMA of ≤180°
- Presence of variant arterial anatomy (ex: accessory right hepatic artery, replaced right hepatic artery, replaced CHA) and the presence and degree of tumor contact should be noted if present as it may affect surgical planning.

Pancreatic body/tail:

- Solid tumor contact with the CA of ≤180°.
- Solid tumor contact with the CA of >180° without involvement of the aorta and with intact and uninvolved gastroduodenal artery.

Venous: Venous involvement of the SMV or PV with distortion or narrowing of the vein or occlusion of the vein with suitable vessel proximal and distal, allowing for safe resection and replacement.

Unresectable:

Arterial:

- Arterial (Head of Pancreas): Greater than 180° encasement of the circumference of the SMA or any CA abutment.
- Arterial (Body/Tail of Pancreas): SMA or CA encasement >180°.
- Arterial (Any Part of the Pancreas): Aortic invasion or encasement.

Venous: Unreconstructable SMV and/or PV.

Nodal Status: Metastases to lymph nodes beyond the field of resection should be considered unresectable.

Grading system proposed by Lu et al. for predicting vascular invasion by tumor based on the degree of tumor contiguity with a vessel:

GRADE	DESCRIPTION	COMMENT
Grade 0	No contiguity of tumor with a vessel	Vascular invasion in 0% of cases
Grade I	Tumor is encasing <25% of the circumference of a vessel	0%
Grade 2	25–50% of the circumference of a vessel	57%
Grade 3	50–75% of the circumference of a vessel	88%
Grade 4	>75% of the circumference of a vessel or any vessel constriction	All cases

Grading system proposed by Lover et al. for predicting vascular invasion by tumor

GRADE	DESCRIPTION	COMMENT
Type A	Fat plane separates the tumor and the normal pancreatic parenchyma from adjacent vessels	Overall resection rate: 100%.
Type B	Normal parenchyma separates the tumor from adjacent vessels	Overall resection rate: 100%.
Type C	Tumor is inseparable from adjacent vessels, and the points of contact form a convexity against the vessels	Overall resection rate: 89%.
Type D	The points of contact form a concavity against the vessels or partially encircle the vessels	Overall resection rate: 47%.
Type E	Tumor encircles adjacent vessels, and no fat plane is identified between the tumor and the vessels	Overall resection rate: 0%.
Type F	Tumor occludes the vessels	Overall resection rate: 0%.

The increased resectability and improve in long-term survival for patients with pancreatic cancer, extensive surgical procedures have been developed, mainly involving **vascular reconstruction techniques.**

- Birkmeyer et al. first reported aggressive surgery for borderline resectable pancreatic cancer with the first SMV resection and reconstruction in 1951.
- In 1973, Fortner first described the regional pancreatectomy. This involved a total pancreatectomy, radical lymph node clearance, combined PV resection (type 1) and/or combined arterial resection and reconstruction (type 2).

Venous Resection

- Venous involvement is not considered a contraindication to surgical resection.
- Pancreatic resection requiring venous reconstruction is technically challenging and may be associated with a higher morbidity.

❖ **Lygidakis et al. compared en bloc splenopancreatic and venous resection versus palliative gastrobiliary bypass and reported two-year survival rates of 81.8% and 0%, respectively.**

❖ **Randomised controlled trial by Doi et al. in 2008 was closed early when interim analysis showed a clear survival benefit for PDVR with chemoradiotherapy compared with chemoradiotherapy with or without a surgical bypass**

Arterial Resection

❖ In 2007, Hirano et al. reported their long-term follow-up for patients undergoing distal pancreatectomy with en bloc CA resection (DP-CAR)

- They reported 1yr and 5yr survival rates of 71% and 42%, respectively, and concluded that DP-CAR offers a high resectability rate and may potentially achieve complete local control in selected patients.
- Bachellier et al., in 2011, matched a group of patients undergoing **pancreatectomy with arterial resection to conventional pancreatectomy and** demonstrated similar three-year survival rates**.**
- Bockhorn et al. reported one of the largest series on **pancreatectomy with simultaneous arterial resection (*n* = 29) and**
- concluded that there was **no overall difference in disease-specific survival** for patients who underwent arterial reconstruction versus those patients who underwent pancreatectomy alone.

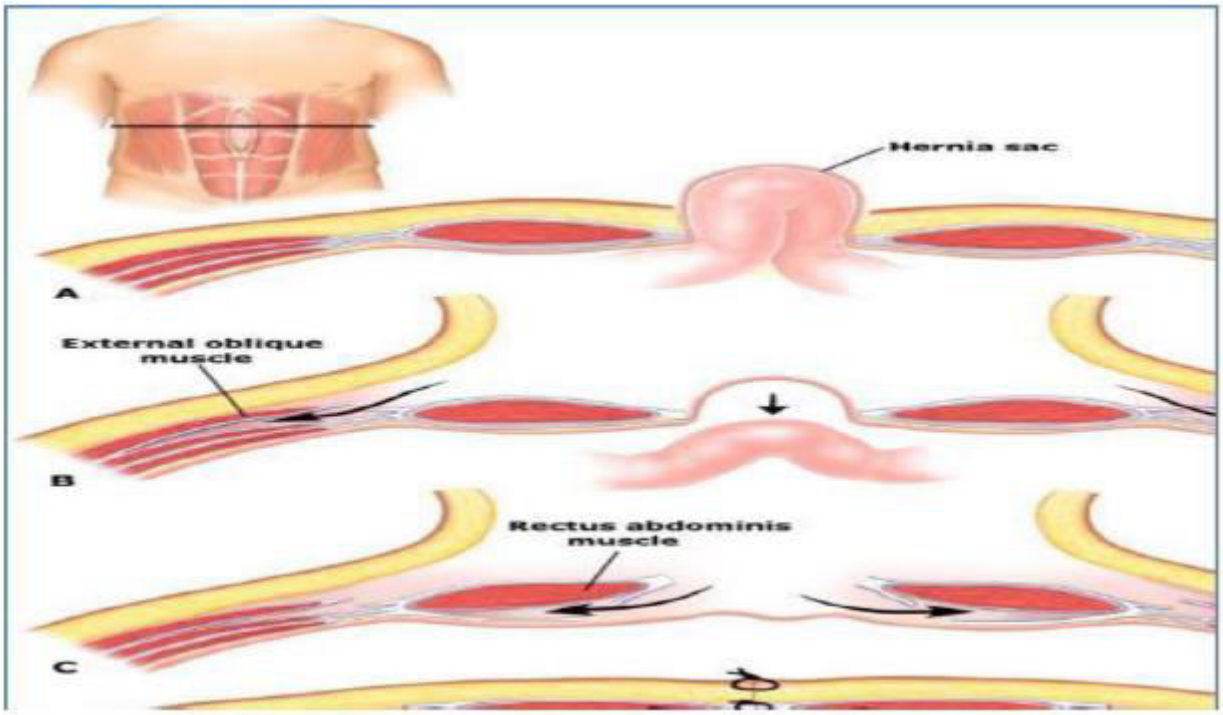
4. Component separation in Hernia Repair. 10

Answer. COMPONENTS SEPARATION TECHNIQUE (CST)

Principle of CST:Unilateral or bilateral release of one of the three muscles of the abdominal wall through a long relaxing incision. This leads to weakening of traction on the remaining wall thereby firstly helps to slide & advance the remaining vascularized, innervated musculofacial layers of abdomen medially facilitating midline closure and secondly increases the total abdominal capacity thereby compensate for the domain loss in very large ventral hernias.

Midline Closure of Defect: Is the ESSENCE of CST:Because intact midline provides anchorage for the lateral abdominal wall. Large midline defects can be closed with "physiological" tension" to create a new linea alba without use of prosthetic materials.

Advantages: Neo linea alba helps restore anatomy and dynamic integrity resulting in improved abdominal wall function and improved contour due to reduced "pseudo-recurrences" and better quality of life (QOL). Reduced seroma formation rate helps reduce morbidity and reduced recurrence rate. Other benefits may include improved respiratory function, need for a smaller sized mesh helping to cut down costs and facilitate concurrent additional surgery e.g. bariatric surgery.



Types of CST based on approach:

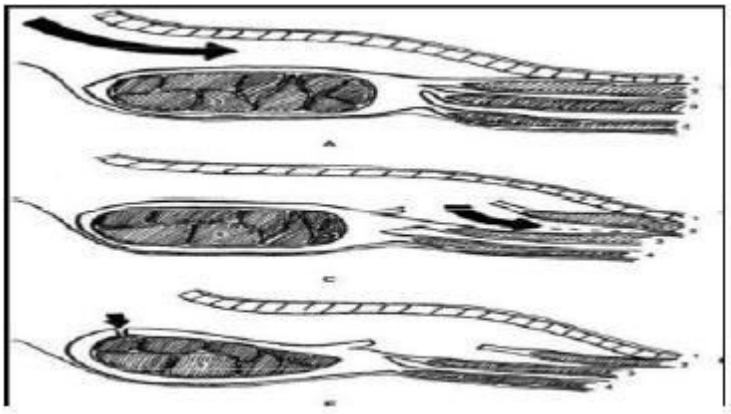
1.	Open approach: a) Anterior CST:	Release of external oblique aponeurosis
b) Posterior CST:		Release of transverse abdominis aponeurosis (TAR)
2.	Endoscopically assisted Ant. CST:	Release of external oblique aponeurosis
3.	Hybrid (combination of open & lap)	Release of external oblique aponeurosis
After CST further procedure:		May include augmentation with Meshplasty

INDICATIONS FOR CST

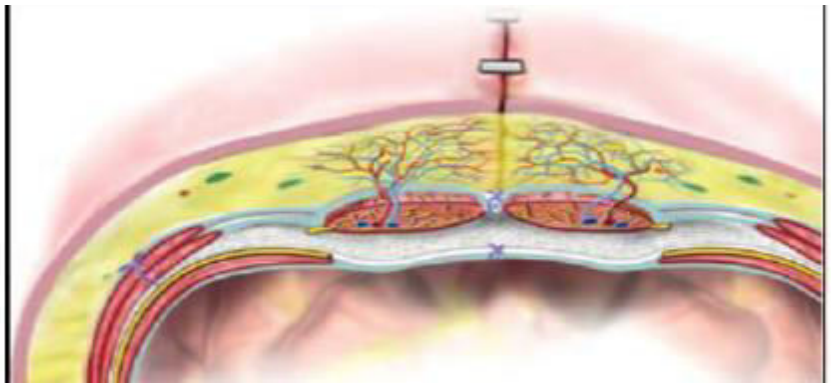
ENDOSCOPIC CST WITH IPOM VERSUS OPEN CST WITH ONLAY OR SUBLAY MESH: Endoscopy: Advantages of lap: Eliminates large surgical incisions, reduced wound complications, lower risk of mesh contamination, less post-op pain, rapid recovery, early discharge, reduction in overall costs, possibility in recurrent hernias & ostomies through rectus.
Endoscopy: Advantages of CST: Better able to assess entire abdominal wall, ensure proper mesh overlap, morbidly obese, preserves blood supply to skin, decreases operative time, less blood loss and in the elderly.
Endoscopy: Disadvantages:Steeper learning curve, medialization only 85% of open CST, disfigured scars needing excision, multiple abdominal surgeries- “frozen abdomen”, difficult when incisions extend lateral to linea semilunaris and development of lateral hernias.
OPEN COMPONENT SEPARATION TECHNIQUES

Ramirez’s Classical Anterior CST (1990):

Dissection of overlying skin & subcutaneous tissue from anterior rectus sheath & EOM. Cutting EO aponeurosis from costal margin to inguinal ligament. Separation of EOM from IOM laterally to allow sliding and translation. Advancement of musculoaponeurotic bundle medially and approximating it to the opposite side to create “neo line alba” in the midline. Upto 20 cm defect could be closed. Incision of posterior rectus sheath and freeing of the rectus muscle can add a few more cms to this. However, associated with high morbidity including hematoma, seroma, infection & skin necrosis.



Saulis & Dumanian -Periumbilical rectus abdominis perforator preservation (2002):



Proposed that preserving the periumbilical rectus abdominis perforators to the abdominal skin flaps will decrease the prevalence of postoperative superficial wound complications. Noted a reduction in wound ischemia and skin necrosis. No reduction in hematoma & seroma.

Rives-Stoppa-Wantz- Posterior CST (Retro-Rectus Repair) (1989):
Opening of the anterior rectus sheath bilaterally to redevelop the posterior facial wall.

Reconstruction of the facial wall and insertion of the prosthetics behind the rectus muscle plane in partial contact with the subcutaneous tissue.

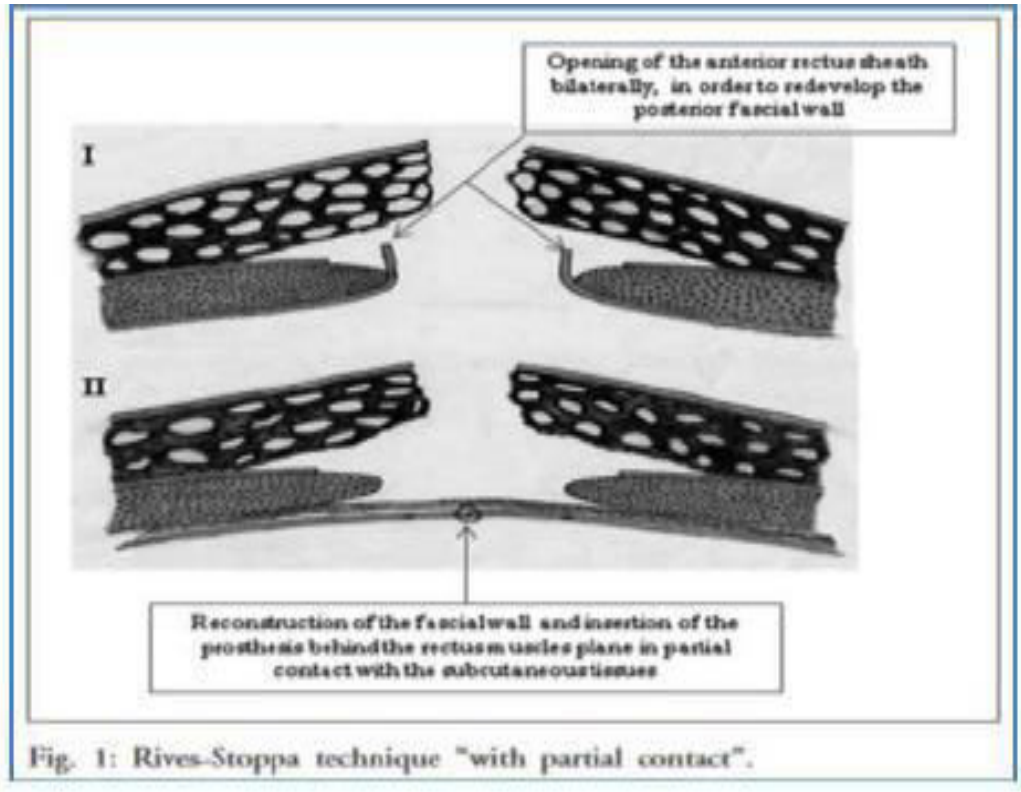
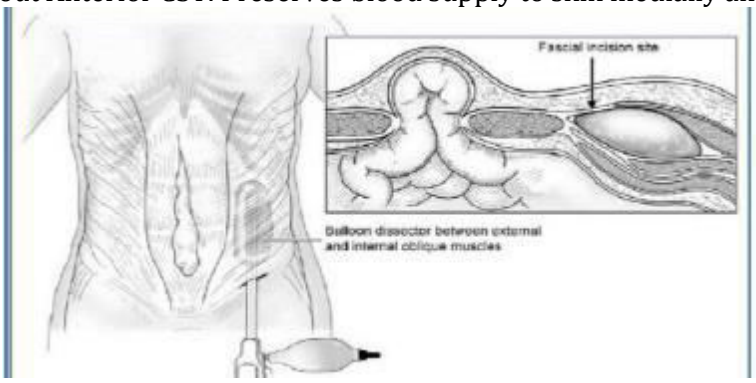


Fig. 1: Rives-Stoppa technique "with partial contact".

2012: Novitsky- Open posterior CST –Transverse abdominis release (TAR) (2 012):

This novel technique of trans versus abdominis muscle release (TAR) for posterior component separation during major abdom inal wall reconstructions is a modification of the classic retromuscular Stoppa technique to facilitate d issection beyond the lateral border of the rectus s heath. Briefly, the retromuscular space is developed laterally to the edge of the rectus sheath. Th e posterior rectus sheath is incised 0.5-1 cm unde rlying medial to the linea semilunaris to expose the medial edge of the transversus abdominis muscle. The muscle then is divided, allowing entrance to th e space anterior to the transversalis fascia. The posterior rectus fascia then is advanced medially. The mesh is placed as a sublay and the linea alba is r estored ventral to the mesh. It was associated with a low perioperative morbidity and a low recurrence rate.

ENDOSCOPIC ASSISTED CST
Lowe et. al. – Endoscopic CST (2000) & Maas et. al.- Endoscopic CST (2002):
Introduction of endoscope (laparoscope) in the anterior axillary line and creation of a space between the subcutaneous tissue and EOM (Lowe) or between the EOM and IOM (Maas), lateral to linea semilunaris with the help of hernia balloon spacemaker.
Cut the EO aponeurosis from above costal margin to inguinal ligament through this space to carry out Anterior CST. Preserves blood supply to skin medially and prevents ischemia.



Rosen et.al.- Combined Endoscopic CST wit laparoscopic IPOM mesh re pair (2007):

Is a minimally invasive bila teral laparoscopic component separation. A 10-m m incision is made lateral to the rectus abdom inus muscle. The external oblique fascia is incised , and a dissecting balloon is inflated between the internal and external oblique muscles. Two additional ports are placed in the intermuscular space. The external oblique is incised from the costal margin to the inguinal ligament. The max imal abdominal wall advancement achieved is an average of 86% of the myofascial advancement compared with a formal open release. The laparoscopic approach does not require extensive subcutaneous dissection and might theoretically result in a decreased incidence or decreased complexity of postoperative wound infections or skin-flap necrosis.

Conclusion:

- Large complex midline ventral hernias are a surgical challenge.
- Components separation with or without a prosthetic reinforcement is an excellent option in these large midline ventral hernias
- It facilitates midline closure and creation of a neo linea alba.
- Helps to improve dynamic function of the abdominal wall and also has better cosmetic outcome.

Endoscopic CST is associated with a significant reduction in the post operative morbidity an overall improvement in the quality of life.

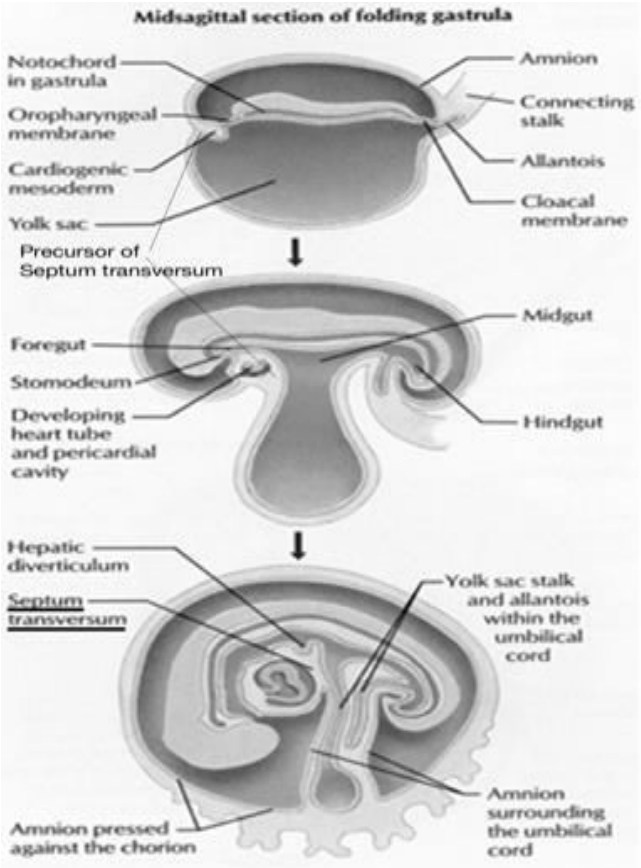
5. Development of diaphragm and management of diaphragmatic hernia 4+6

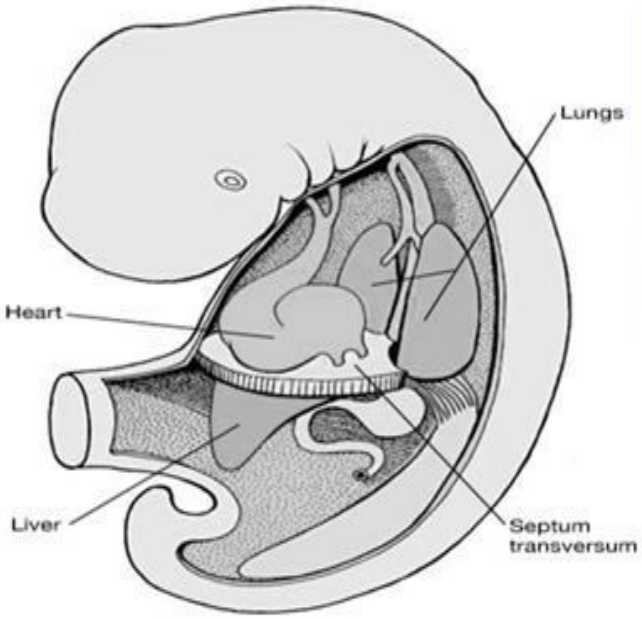
Answer. The diaphragm is a curved musculo fibrous sheet that separates the thoracic from the abdominal cavity.

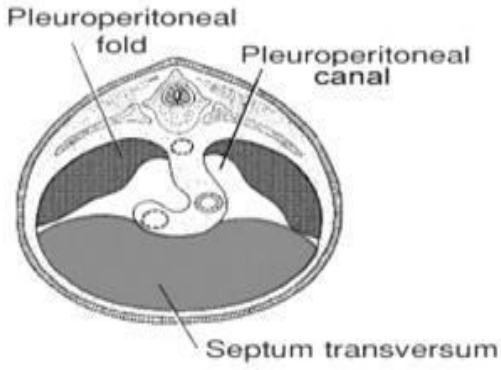
- Pierced by structures that pass between these two regions of the body.
- Primary muscle of respiration.
- Dome shaped and consists of a peripheral muscular part and central tendinous part.
- Muscular part arises from the margins of the thoracic opening and gets inserted into the central tendon.
- Attachments to the thoracic wall are low posteriorly and laterally, but high anteriorly.
- Orgin in vertebral , costal and spinal attachments from which muscular fibers curve upwards and inwards from periphery to be inserted into the fibrous sheet called central tendon.

Develops from 4 sources

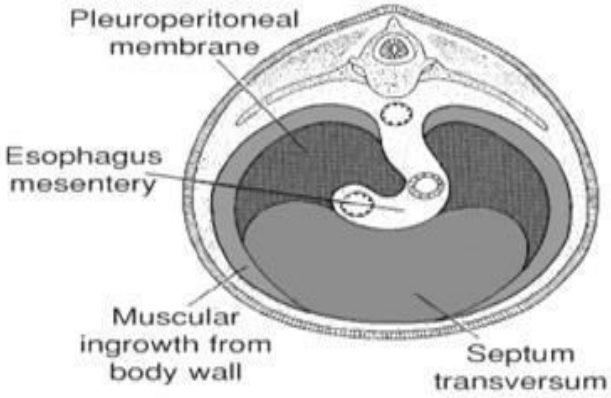
- Septum transversum
- Pleuroperitoneal membrane
- Medial dorsal portion of primary oesophageal mesentry
- Marginal ingrowths of the body wall



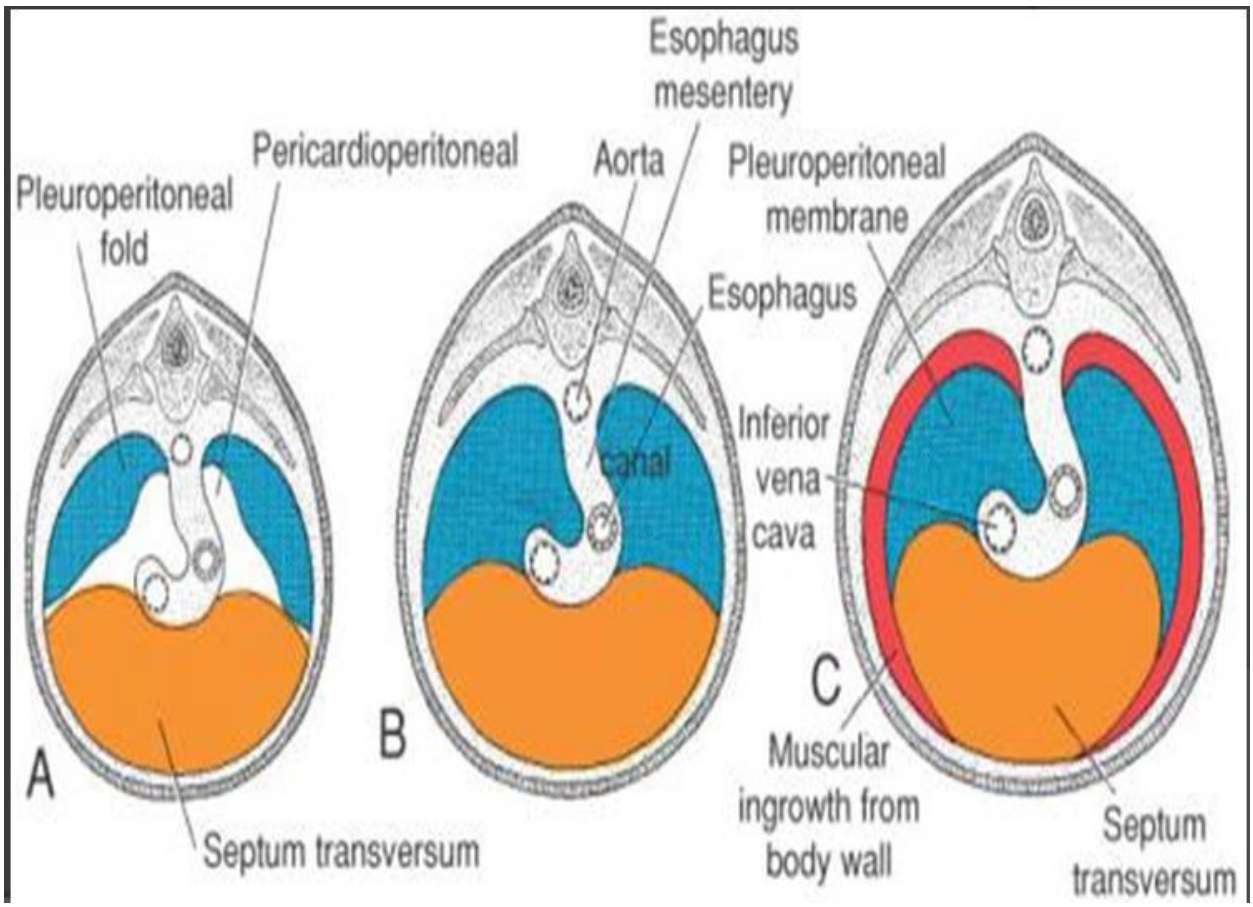




Diaphragm at 5 weeks



Diaphragm at 4 months



Septum transversum:

- Third week of development.
- Mass of mesoderm situated cranially to the pericardial cavity
- Contributes to the ventral portion like the sternal and costal parts

Pleuroperitoneal membrane:

- Is a paired dorsolateral portion
- Fuses with dorsal mesentry of oesophagus and dorsal portion of the septum transversum to complete the partition between thorax & abdomen.
- Forms the primitive diaphragm at 7th wk of development.

Medial portion of the diaphragm:

- From the medial dorsal portion of primary oesophageal mesentry.
- Fuses with septum transversum & pleuroperitoneal membrane.
- Curves of diaphragm – develop from growth of muscle fibres into the dorsal mesentry of the oesophagus.

At 9-12th week , the source is contributed by – the marginal outgrowth of the body wall.

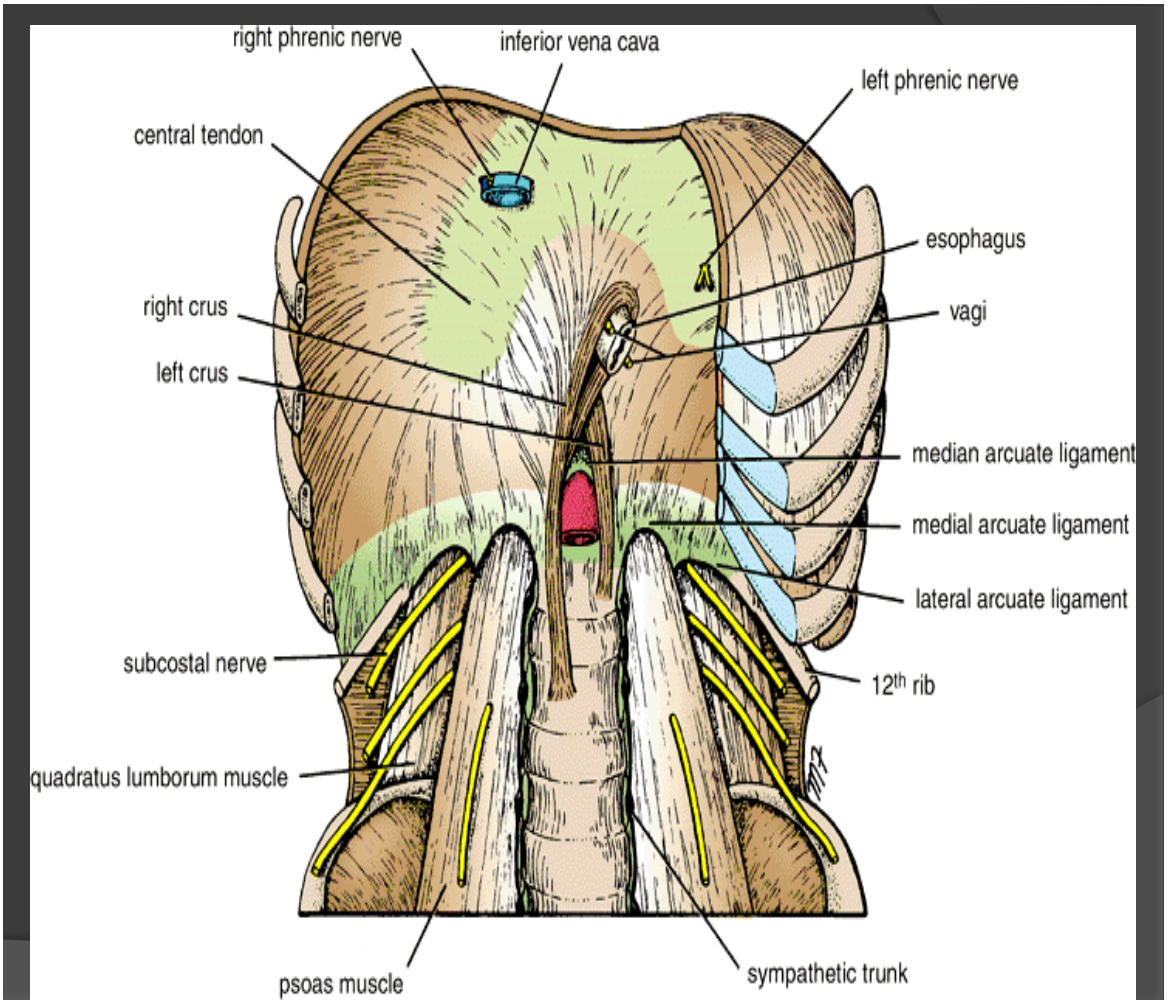
These contibutions from thoracic myotome contain nerve fibers of lower six or seven intercostal nerves - distribute the sensory fibers to periphery of diaphragm.

At the 5 th week , nerve fibers from the 3rd, 4th & 5th cervical segments of spinal cord grow into septum transversum, via the pleuropericardial membrane to form the PHRENIC NERVE.

At the 8th week – diaphragm attached to dorsal body of 1st lumbar vertebrae, giving rise to the domed contour character of the diaphragm.

Origin of the diaphragm:

- Sternal part- arising from the posterior surface of the xiphoid process.
- Costal part arising from the deep surfaces of the lower six ribs and their costal cartilages & forms the right & left domes.
- Vertebral/lumbar part arising from upper three lumbar vertebrae; forms the right & left crura & the arcuate ligaments.
- **Crura:**the right crura is from the bodies of first three lumbar vertebrae. The left crus, from the bodies of first two lumbar vertebrae.



6. Discuss clinical features, staging and management of Non-Hodgkin's Lymphoma. 2+3+5

Answer. Clinical features:

- The clinical manifestations of non-Hodgkin lymphoma (NHL) vary with such factors as the location of the lymphomatous process, the rate of tumor growth, and the function of the organ being compromised or displaced by the malignant process.
- The Working Formulation classification groups the subtypes of NHL by clinical behavior—that is, low-grade, intermediate-grade, and high-grade. Because the Working Formulation is limited to classification based upon morphology, it cannot encompass the complex spectrum of NHL disease, excluding important subtypes such as mantle cell lymphoma or T cell/natural killer cell lymphomas. However, it continues to serve as a basis for understanding the clinical behavior of groups of NHLs.

Low-grade lymphomas:

- Peripheral adenopathy that is painless and slowly progressive is the most common clinical presentation in these patients. Spontaneous regression of enlarged lymph nodes can occur in low-grade lymphoma, potentially causing confusion with an infectious condition.
- Primary extranodal involvement and B symptoms (ie, temperature >38°C, night sweats, weight loss >10% from baseline within 6 mo) are not common at presentation, but they are common in patients with advanced, malignant transformation (ie, evolution from a low-grade to an intermediate- or high-grade lymphoma) or end-stage disease.
- Bone marrow is frequently involved and may be associated with cytopenia or cytopenias. Fatigue and weakness are more common in patients with advanced-stage disease.

Intermediate- and high-grade lymphomas:

- These types of lymphomas cause a more varied clinical presentation. Most patients present with adenopathy. More than one third of patients present with extranodal involvement; the most common sites are the gastrointestinal (GI) tract (including the Waldeyer ring), skin, bone marrow, sinuses, genitourinary (GU) tract, thyroid, and central nervous system (CNS). B-symptoms are more common, occurring in approximately 30-40% of patients.
- Lymphoblastic lymphoma, a high-grade lymphoma, often manifests with an anterior superior mediastinal mass, superior vena cava (SVC) syndrome, and leptomeningeal disease with cranial nerve palsies.
- Patients with Burkitt lymphoma (occurring in the United States) often present with a large abdominal mass and symptoms of bowel obstruction. Obstructive hydronephrosis secondary to bulky retroperitoneal lymphadenopathy obstructing the ureters can also be observed in these patients.
- Primary CNS lymphomas are high-grade neoplasms of B-cell origin. Most lymphomas originating in the CNS are large cell lymphomas or immunoblastomas, and they account for 1% of all intracranial neoplasms. These lymphomas are more commonly observed in patients who are immunodeficient because of conditions such as Wiskott-Aldrich syndrome, transplantation, or AIDS.

- Cotswolds-modified Ann Arbor classification

    - **Stage I:** one nodal group or lymphoid organ (e.g. Spleen or thymus)

    - **Stage IE:** one extranodal site
- **Stage II:** two or more nodal groups, same side of diaphragm
    - **Stage IIE:** localised extranodal site with stage II criteria, both on the same side of the diaphragm
- **Stage III:** nodal groups on both sides of the diaphragm
    - **Stage IIIS(1):** with splenic involvement
    - **Stage IIIE(2):** with localised extranodal site
    - **Stage IIISE**: both
- **Stage IV:** disseminated involvement of one or more extralymphatic organ (e.g. Lung, bone) +/- any nodal involvement

Additional staging variables:

- **A:** asymptomatic
- **B:** presence of B symptoms (fever, night sweats and weight loss)
- **X:** bulky nodal disease: nodal mass >1/3 of intrathoracic diameter or 10 cm in dimension

Treatment:

The treatment of non-Hodgkin lymphoma (NHL) varies greatly, depending on the following factors:

- Tumor stage
- Phenotype (B-cell, T-cell or natural killer [NK] cell/null-cell)
- Histology (ie, low-, intermediate-, or high-grade)
- Symptoms
- Performance status
- Patient age
- Comorbidities

- Most of the chemotherapy for NHL, whether combination or single-drug, can be administered in an outpatient setting, at an infusion clinic. In the infusion clinic, specially trained oncology nurses, who are supervised by oncologists, administer the chemotherapy. Growth factor support (eg, granulocyte-colony stimulating factor [GCSF], granulocyte macrophage–colony stimulating factor [GM-CSF], erythropoietin) is also administered in an outpatient treatment setting.
- Infusional chemotherapy (eg, infusional cyclophosphamide, doxorubicin, and etoposide [CDE], which should be administered continuously for 4 days) should be administered as inpatient treatment. High-dose chemotherapy and bone marrow and/or stem cell transplantation are administered in an inpatient setting of a tertiary hospital with an approved transplant center.
- For the initial treatment of patients with intermediate- or high-grade lymphoma and patients with bulky disease, an inpatient setting is recommended in order to monitor for tumor lysis syndrome and to manage appropriately.
- Admit patients with NHL for complications of disease progression (eg, pain control for intractable pain) or adverse effects from chemotherapy (eg, dehydration secondary to diarrhea, vomiting requiring IV hydration, severe mucositis). Patients with fever during neutropenia should be admitted for broad-spectrum antibiotic therapy.

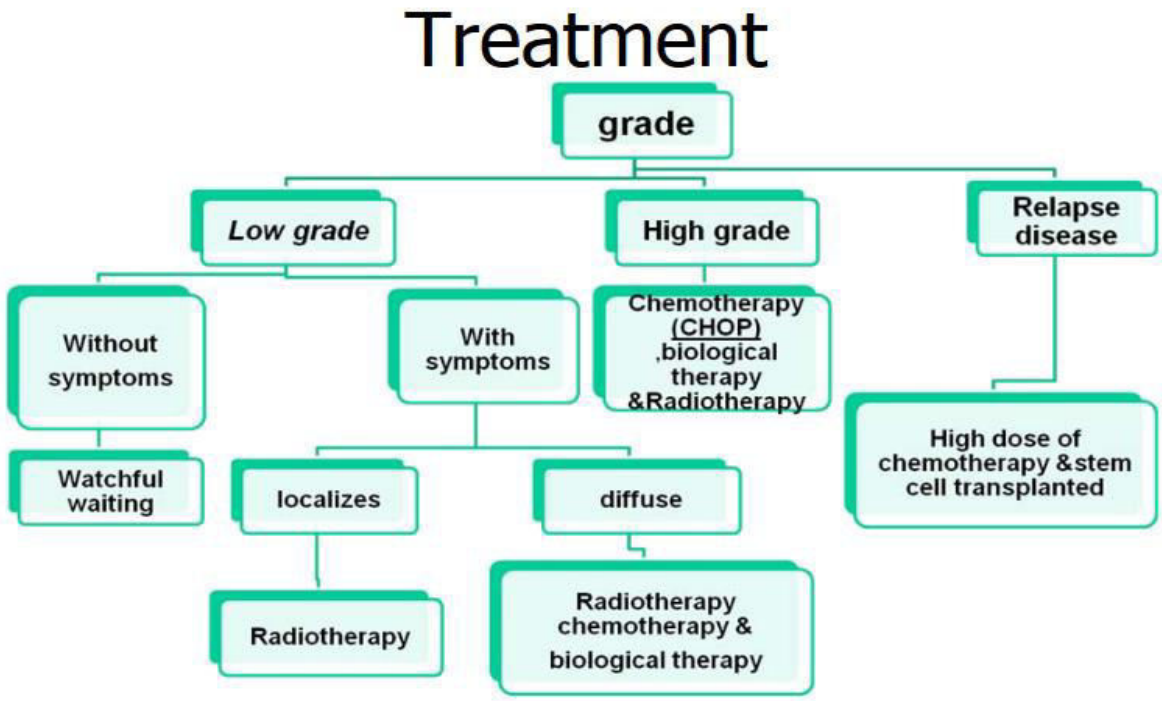
Treatment Options

Many effective treatment options exist for NHL patients, including:

- Active surveillance (also known as watchful waiting)
- Chemotherapy
- Radiation therapy
- Stem cell transplantation
- Novel targeted agents
- Newer versions of established agents

The form of treatment chosen depends on the type of lymphoma and the stage of disease, as well as other factors including age, prior therapies received and the patient's overall health.

Some patients may relapse (disease returns after treatment) or become refractory (disease does not respond to treatment). However, numerous treatment options exist for patients with relapsed or refractory NHL, which are often referred to as secondary therapies. Many of the novel therapeutic agents that have been approved by the United States Food and Drug Administration, as well as those being investigated in clinical trials, focus specifically on those with relapsed or refractory disease.



7. Write a note on chylous ascites. 10

Answer. True chylous ascites is defined as the presence of ascitic fluid with high fat (triglyceride) content, usually higher than 110 mg/dL.

Pathophysiology: Chylous ascites is an uncommon clinical condition that occurs as a result of disruption of the abdominal lymphatics. Multiple causes have been described, including the following:

- Abdominal surgery
- Blunt abdominal trauma
- Malignant neoplasms - Hepatoma, small bowel lymphoma, small bowel angiosarcoma, and retroperitoneal lymphoma
- Spontaneous bacterial peritonitis
- Cirrhosis - Up to 0.5% of patients with ascites from cirrhosis may have chylous ascites.
- Pelvic irradiation
- Peritoneal dialysis
- Abdominal tuberculosis
- Carcinoid syndrome
- Congenital defects of lacteal formation

Milky ascites is subdivided into 3 groups as follows:

- True chylous ascites - Fluid with high triglyceride content
- Chyliform ascites - Fluid with a lecithin-globulin complex due to fatty degeneration of cells
- Pseudochylous ascites - Fluid that is milky in appearance due to the presence of pus

Clinical disease associations:

- In adults, chylous ascites is associated most frequently with malignant conditions. These conditions particularly include lymphomas and disseminated carcinomas from primaries in the pancreas, breast, colon, prostate, ovary, testes, and kidney. Infectious diseases, such as tuberculosis and filariasis, can cause chylous ascites.
- In children, the most common causes are congenital abnormalities, such as lymphangiectasia, mesenteric cyst, and idiopathic "leaky lymphatics." Other congenital causes include the primary lymphatic hypoplasia associated with Turner syndrome and yellow nail syndrome and the lymphatic malformations associated with Klippel-Trenaunay syndrome.
- Neoplasia is an uncommon cause of pediatric chylous ascites. Recently, chylous ascites has been reported in adults in association with hepatoma, small bowel angiosarcoma, retroperitoneal lymphoma, jejunal carcinoid,] and sclerosing mesenteritis.
- The incidence of spontaneous chylous ascites in patients with chronic liver diseases is estimated to be 0.5%. An increase in portal pressure can lead to increased flow of fluid into both the space of Disse and the liver's lymphatic system. Indeed, patients with cirrhosis have increased thoracic duct lymph flow. Lymphatics may spontaneously rupture in patients with cirrhosis as a result of higher than typical flow, with formation of chylous ascites. Chylous ascites has been reported in patients with polycythemia vera and resulting hepatic vein thrombosis.
- Abdominal surgery is a common cause of chylous ascites. The surgical procedures most frequently associated with chylous ascites are resection of abdominal aortic aneurysm and retroperitoneal lymph node dissection. Chylous ascites is also described after peritoneal dialysis catheter insertion , after pancreatic resection, after splenorenal shunt surgery, after cadaveric and living donor liver transplantation, after laparoscopic donor nephrectomy, and after laparoscopic Nissen fundoplication.

Clinical features: Abdominal distension is the most common symptom in patients with chylous ascites. Other clinical features include abdominal pain, anorexia, weight loss, edema, weakness, nausea, dyspnea, weight gain, lymphadenopathy, early satiety, fever, and night sweats. Fever, night sweats, and lymphadenopathy usually are observed in patients with lymphoma. Often, features of the primary illness, such as cirrhosis or of an associated malignancy, dominate the clinical picture. Rarely, it can present as acute peritonitis.

Complications: Sepsis is the most common complication, and sudden death has been reported in patients with chylous ascites. The prognosis in adult patients with chylous ascites is poor due to its association with malignancy and severe liver disease. However, pediatric patients and adult patients with postsurgical and posttraumatic chylous ascites have a favorable prognosis.

Laboratory Studies:

- Routine laboratory tests may show hypoalbuminemia, lymphocytopenia, anemia, hyperuricemia, elevated alkaline phosphatase and liver enzymes, and hyponatremia. Usually, serum cholesterol and triglyceride levels are normal.
- Abnormal liver enzymes are more common in patients with disseminated carcinoma than in patients with lymphoma or nonmalignant disorders. Anemia is common in patients with neoplasia.
- The diagnosis of chylous ascites is made by peritoneocentesis and analysis of the ascitic fluid.

Ascitic fluid study

- Color usually is white or milky. Gross milkiness of the ascitic fluid corresponds poorly with absolute triglyceride levels because turbidity also reflects the size of the chylomicrons.
- The ascites triglyceride level is elevated in all patients. Typically, chylous ascites is diagnosed when the ascites triglyceride level is greater than 110 mg/dL. Levels as high as 8100 mg/dL have been described. Other authors have identified an elevated ascites:plasma triglyceride ratio (between 2:1 and 8:1) as being indicative of chylous ascites.

Other ascites tests include the following:

- Specific gravity is 1.010-1.054.
- Total fat content is 4-40 g/L.
- Glucose and amylase levels usually are normal.
- Cholesterol level usually is low.
- Leukocyte count generally is high, from 232-2560 cells/mm ^{3}, usually with a marked lymphocytic predominance.
- Total protein content varies from 1.4-6.4 g/dL, with a mean of 3.7 g/dL. This variation reflects changes in serum proteins and dietary habits.
- Microbiologic cultures usually are negative

Other diagnostic tests

- CT scan
- Lymph node biopsy
- Laparascopy
- Laparotomy

- Lymphangiography
- Bone marrow examination
- Intravenous pyelography

Treatment :

- Because chylous ascites is a manifestation rather than a disease by itself, the prognosis depends on the treatment of the underlying disease or cause.
- Supportive measures can relieve the symptoms. These measures include repeated paracentesis, diuretic therapy, salt and water restriction, elevation of legs with use of supportive stockings, and dietary measures.
- Lymphatic flow increases after the ingestion of a fatty meal. The fatty acids derived from short-chain and medium-chain triglycerides diffuse directly across enterocytes into the portal venous system. Their absorption does not affect lymphatic flow. However, the fatty acids derived from long-chain triglycerides are re-esterified into triglycerides in the enterocyte. They are then incorporated into chylomicrons which subsequently enter the lymphatic system.
- A low-fat diet with medium-chain triglyceride supplementation can reduce the flow of chyle into the lymphatics. Typically, medium-chain triglyceride oil is administered orally at a dose of 15 mL 3 times per day at meals. However, this approach is frequently not successful.
- If chylous ascites persists despite dietary management, the next step may involve bowel rest and the institution of total parenteral nutrition. Bowel rest and total parenteral nutrition are postulated to be beneficial in patients with posttraumatic or postsurgical chylous ascites.
- Paracentesis can result in immediate symptom relief; however, reaccumulation of fluid usually follows, and patients may require repeated paracentesis. Some authorities have advocated large-volume paracentesis. Morbidity from a single tap is usually low, but complications, such as peritonitis and hemorrhage, can occur. Transfusion of albumin and/or RBCs during paracentesis may help prevent hypovolemia in patients with hypoalbuminemia or anemia.
- Multiple case reports describe the use of octreotide, a somatostatin analog, in the management of chylous ascites, typically at a dose of 100 mcg administered subcutaneously 3 times per day.
- A combination of total parenteral nutrition and subcutaneous octreotide has been used to successfully treat congenital chylous ascites in a newborn. Octreotide is most likely effective in chylous ascites on account of its ability to inhibit lymphatic flow.
- Postsurgical chylous ascites usually resolves with supportive therapy. Early reoperation is indicated when the site of leakage is apparent and if the patient is a good operative candidate.
- Fibrin glue applied to absorbable mesh was useful in patients with large areas of diffuse lymphatic leakage.
- Treatment of chylous ascites after laparoscopic Nissen fundoplication with percutaneous injection of tissue glue (ie, N -butyl-cyanoacrylate mixed with ethiodol) into the thoracic duct may be helpful.

8. Discuss overall management of a case of traumatic Quadriplagia. 10

Answer. Active Physiological Conservative Management:
Active simultaneous, non surgical management, from the early hours of injury,

- Of the injured spine,
- The multisystem neurogenic effects of spinal cord injury on respiratory, cardiovascular, urinary, gastrointestinal, dermatological, sexual, reproductive functions,
- The associated psychological, effects,
- Rehabilitation and
- Environmental modifications

SCI terminology and classification:

- The International Standards for Neurological and Functional Classification of Spinal Cord Injury (ISNCSCI) is a widely accepted system describing the level and extent of injury based on a systematic motor and sensory examination of neurologic function.

o The following terminology has developed around the classification of spinal cord injuries:
  - ➢ Tetraplegia (replaces the term quadriplegia): Injury to the spinal cord in the cervical region, with associated loss of muscle strength in all 4 extremities.
  - ➢ Paraplegia: Injury in the spinal cord in the thoracic, lumbar, or sacral segments, including the cauda equina and conus medullaris.

❖ The percentage of spinal cord injuries as classified by the American Spinal Injury Association (ASIA) is as follows:
  - ✓ Incomplete tetraplegia: 29.5%
  - ✓ Complete paraplegia: 27.9%
  - ✓ Incomplete paraplegia: 21.3%
  - ✓ Complete tetraplegia: 18.5% The most common neurologic level of injury is C5. In paraplegia, T12 and L1 are the most common level.

Quadriplegia

C1-4 Quadriplegia

— **C1 & C2** - may have functional phrenic nerves.
— C3 — impaired breathing, ventilator dependent
— C4 — may be free from advanced respiratory support but require functional equipment need as C3

C1-4 Quadriplegics require assistance for all personal care, turning, and transfer functions.

- **C-5 Quadriplegia**
  - — Have functional deltoid and/or biceps musculature.
  - — can feed themselves, perform oral facial hygienic and upper body dressing activities.
  - — Require assistance to perform bathing , bowel and bladder care, and for transfers.

- **C-6 Quadriplegia**
  - — have musculature that permits most shoulder motion, elbow bending, but not straightening and active wrist extension.
  - — can perform upper & lower body dressing without assistance.
  - — can perform some transfers independently with a transfer board.

- **C7-8 Quadriplegia**
  - have functional triceps, they can bend and straighten their elbows
  - may also have enhanced finger extension and wrist flexion.
  - They can turn and perform most transfers independently.

- An early and accurate diagnosis of lesions of the spine and cervical spinal cord in tetraplegic patients is important. To find out which part of the spine is damaged they could use imagining studies such as computed tomography (CT) and magnetic resonance imaging. Sometimes they use CT or MRI scan with contrast for a more accurate diagnosis. In case of diseases of the spinal cord they do a blood test and/or spinal tap to investigated the blood and/or spinal fluid.
- The initial assessment of individuals with acute spinal cord injury should include a complete history, physical, and neurologic examination to determine the level of injury as accurately as possible. Physical assessment should include an evaluation of breathing pattern and effectiveness of cough. The most common abnormal breathing pattern is an isolated diaphragmatic breathing with chest wall retraction during inspiration.
- The neurologic examination, more specific the motor and sensory examinations, of tetraplegia includes:
  - The International Standards for Neurological Classification of Spinal Cord Injury (ISCSCI)
  - Electrophysiological measures: stimulated muscle testing, strength-duration (SD) testing, evoked-potential testing, nerve conduction velocity (NCV) testing, and needle and dynamic electromyography (EMG) testing.
- These motor and sensory examinations could be used for the assessment of muscles strength and sensation.
- For the assessment of upper limb in tetraplegia the Sollerman hand function test, Capabilities of the Upper Extremity instrument (CUE), the Motor Capacity Scale and the Tetraplegia Hand Activity Questionnaire are useful instruments. At least one or a battery of several of these tools should be used for the assessment of the hand function and to collect evidence for interventions.

- The medical management of tetraplegia could be the treatment of the cause, an invasive technique might be used to release pressure or attempts can be made to repair damage. Most of these techniques are still in an experimental stage (eg. use of stem cells).
-

Medications

- Methylprednisolone (Medrol) is a treatment option for an acute spinal cord injury.
- If given within eight hours of injury, some people experience mild improvement.
- reducing damage to nerve cells and decreasing inflammation near the site of injury.
- not a cure for a spinal cord injury.

- More often the treatment is aimed on the functional recovery. The ability to use the upper limb(s) has an important influence on the independency of the patient (use of a wheelchair, pressure relief manoeuvres, independent transfers, etc. Therefore procedures such as: the transfer of the teres minor motor branch for triceps reinnervation and biceps-to-triceps transfer for elbow extension could give the patient an improvement in function.
- Patients that lost their ability to breathe autonomously are ventilated through a tracheotomy and are more likely to get a respiratory infection and/or decease. A better technique is the use of a diaphragm pacing system which electrically stimulates the phrenic nerve to pace the diaphragm. This technique has promising results but more trials are necessary to evaluate the impact on the patients.

Physical Therapy Management:

- The ability to use the upper limbs is considered crucial to regain independence. A review of several studies showed that different training techniques may improve arm and hand functioning after cervical spinal cord injury, with tetraplegia as a consequence.
- There is some evidence that suggests that task-specific training (with functional electrical stimulation if the grasp function is to weak) is ideal to improve the hand function. Almost all studies showed an improvement in arm and hand function and/or activity level. Therefore a physical therapist should set individual goals for each patient and use a specific (suitable) training program to gain success.
- If the surgeon and physician decide to use a procedure as mentioned above, the physiotherapist's task will be to reinforce the muscle and learn the patient to control his muscle individually.
- Furthermore the lack of physical activity which is often paired with chronic spinal cord injury should be one of the key points a physical therapist should address. Innovative techniques such as: the use of functional electrical stimulation lower extremities cycling , treadmill gait and electrical stimulation during gait are used to regain/maintain muscle mass in the legs, strengthen the bones and to gain many other benefits from physical activity (cardiovascular).
- Hypotension and orthostatic hypotension is often seen is these patients, a patient should be instructed to get up (form a lying or seated position) gradually and slowly. Circulatory exercises before standing up might be helpful to stimulate the blood flow. Furthermore medication, a special diet (with enough water and salt) and regular exercise therapy should be given to prevent hypotension.
- For the respiratory problems that can come with tetraplegia secretion removal techniques, use of expiratory flow devices are recommended and the improvement of various components of cough (Vital capacity, flow rate, maximum respiratory pressures) are recommended.

❖ Intermittent positive pressure breathing (IPPB) can be used as a treatment for or to prevent atelectasis. The efficacy for quadriplegics has not been proven but it is suggested that this will help the respiration as it does for COPD patients.

- Surgery
  - remove fragments of bones, foreign objects, herniated disks or fractured vertebrae.
  - needed to stabilize the spine to prevent future pain or deformity.

- Immobilization
  - traction to stabilize spine and correct alignment
  - traction is accomplished by securing metal braces, or a body harness.
  - In some cases, a rigid neck collar may needed to keep head from moving.
  - A special bed also may help immobilize body.

FES

- Functional Electric Stimulation has been applied to various nerves in the LL to facilitate a more normal gait.
- Theory is that FES applies the appropriate sensory input necessary to normalize reflex output of the spinal cord.
- Therefore the disruption caused by the SCI is removed.

Clinical bottom line:

❖ Patients with tetraplegia have different clinical presentations, depending on the level of the injury. An injury of the cervical spinal cord can result in a partial or total sensory and motor loss of the four limbs and torso. An early and accurate diagnosis of lesions of the spine and cervical spinal cord in tetraplegic patients is important.

❖ The initial assessment of individuals with acute spinal cord injury should include a complete history, physical, and neurologic examination (CT-scan) to determine the level of injury as accurately as possible.

❖ Physical assessment should include an evaluation of breathing pattern and effectiveness of cough.
A physical therapist should set individual goals for each patient and use a specific (suitable) training program to gain success.

❖ The lack of physical activity which is often paired with chronic spinal cord injury should be one of the key points a physical therapist should address. In case of respiratory problems the proper treatment should be applied.

9. Discuss the role of LASER in surgery. 10

Answer.

- Laser surgery is a type of surgery that uses a laser (in contrast to using a scalpel) to cut tissue.
- Examples include the use of a laser scalpel in otherwise conventional surgery, and soft-tissue laser surgery, in which the laser beam vaporizes soft tissue with high water content.
- Laser surgery is commonly used on the eye. Techniques used include LASIK, which is used to correct near and far-sightedness in vision, and photorefractive keratectomy, a procedure which permanently reshapes the cornea using an excimer laser to remove a small amount of the human tissue.
- Types of surgical lasers include carbon dioxide, argon, Nd:YAG laser, and potassium titanyl phosphate, from among others.

Effects:

- Photochemical effect: clinically referred to as photodynamic therapy. Photosensitizer (photophrin II) is administered which is taken up by the tumor tissue and later irradiated by laser light resulting in highly toxic substances with resultant necrosis of the tumor. Photodynamic therapy is used in palliation of oesophagial and bronchial carcinoma and ablation of mucosal cancers of Gastrointestinal tract and urinary bladder.
- Photoablative effect: Used in eye surgeries like band keratoplast, and endartectomy of peripheral blood vessels.
- Photothermal effect: this property is used for endoscopic control of bleeding e.g. Bleeding peptic ulcers, oesophagial varices
- Photomechanical effect: used in intraluminal lithotripsy

Equipments:

- A 40 watt CO_2 laser used for soft-tissue laser surgery
- Surgical laser systems, sometimes called "laser scalpels", are differentiated not only by the wavelength, but also by the light delivery system: flexible fiber or articulated arm, as well as by other factors.
- CO_2 lasers were the dominant soft-tissue surgical lasers .

Applications:

- Soft tissue: Soft-tissue laser surgery is used in a variety of applications in human (general surgery, neurosurgery, ENT, dentistry, orthodontics, and oral and maxillofacial surgery)

- Dermatology and plastic surgery:
  A range of lasers such as erbium, dye, Q switch lasers and CO_2 are used to treat various skin conditions including scars, vascular and pigmented lesions, and for photorejuvenation. The laser surgery for dermatology often bypass the skin surface. The principle of laser surgery for dermatologic problem is based on SPTL(selective photothermolysis). The laser beam penetrates the skin until it encounters chromophore which absorbs the laser beam. After absorption of the laser beam, heat is generated to induce coagulation, necrosis of the targeted tissue, this results in removal of unwanted tissue by laser surgery.

- Lasers are also used for laser-assisted lipectomy.

- Eye surgery: Various types of laser surgery are used to treat refractive error:
- LASIK, in which a knife is used to cut a flap in the cornea, and a laser is used to reshape the layers underneath, to treat refractive error

    - IntraLASIK, a variant in which the flap is also cut with a laser

- Photorefractive keratectomy (PRK, LASEK), in which the cornea is reshaped without first cutting a flap
- Laser thermal keratoplasty, in which a ring of concentric burns is made in the cornea, which cause its surface to steepen, allowing better near vision

Lasers are also used to treat non-refractive conditions, such as:

- Phototherapeutic keratectomy (PTK), in which opacities and surface irregularities are removed from the cornea
- Laser coagulation, in which a laser is used to cauterize blood vessels in the eye, to treat various conditions
- Lasers can be used to repair tears in the retina.

- Endovascular surgery: Laser endarterectomy is a technique in which an entire atheromatous plaque in the artery is excised. Laser recanalization of blocked arteries. other applications include laser assisted angioplasties and laser assisted vascular anastomosis.
- Foot and ankle surgery: Lasers are used to treat several disorders in foot and ankle surgery. They are used to remove benign and malignant tumors,[12] treat bunions,[13] debride ulcers and burns, excise epidermal nevi, blue rubber bleb nevi, and keloids, and the removal of hypertrophic scars and tattoos.[14]
- A carbon dioxide laser (CO_2) is used in surgery to treat onychocryptosis (ingrown nails), onychauxis (club nails), onychogryposis (rams horn nail), and onychomycosis (fungus nail).
- Gastro-intestinal tract:

- Peritoneum-Laser is used for adhesiolysis.
- Peptic ulcer disease and oesophageal varices - Laser photoablation is done.
- Coagulation of vascular malformations of stomach, duodenum and colon.
- Lasers can be effectively used to treat early gastric cancers provided they are less than 4 cm and without lymph node involvement. Lasers are also used in treating oral submucous fibrosis.

- Palliative laser therapy is given in advanced oesophageal cancers with obstruction of lumen. Recanalisation of the lumen is done which allows the patient to resume soft diet and maintain hydration.
- Ablative laser therapy is used in advanced colorectal cancers to relieve obstruction and to control bleeding.
- Laser surgery used in hemorrhoidectomy, and is a relatively popular and non-invasive method of hemorrhoid removal.
- Laser-assisted liver resections have been done using carbon dioxide and Nd:YAG lasers.
- Ablation of liver tumors can be achieved by selective photovaporization of the tumor.
- Endoscopic laser lithotripsy is a safer modality compared to electrohydraulic lithotripsy.

- Oral and dental surgery: The CO_2 laser is used in oral and dental surgery for virtually all soft-tissue procedures, such as gingivecomies, vestibuloplasties, frenectomies and operculectomies.

The CO_2 10,600 nm wavelength is safe around implants as it is reflected by titanium, and thus has been gaining popularity in the field of periodontology. The laser may also be effective in treating peri-implantitis.

- Spine surgery: Laser spine surgery first began seeing clinical use in the 1980s and was primarily used within discectomy to treat lumbar disc disease under the notion that heating a bulging disc vaporized enough tissue to relieve pressure on the nerves and help alleviate pain.
- Other surgery:The CO_2 laser is also used in gynecology, genitourinary, general and thoracic surgery, otorhinolaryngology, orthopedic, and neurosurgery.
- Hard tissues:Lasers are used to cut or ablate bones and teeth in dentistry.

10. Describe symptomatology and management of congenital Megacolon. 3+7

Answer. Symptomatology/Clinical features:

- Failure to pass meconium or stool in first 24 hours post-partum;
- abdominal distention; vomiting; constipation at birth.
- Peristalsis is absent in aganglionic segment, causing proximal pseudo-obstruction and gross dilatation, enterocolitis and perforation.
- In older children, Hirschsprung disease is characterised by chronic constipation, abdominal distention and stunted growth.

Radiographic features

Radiograph

- Findings are primarily those of a bowel obstruction. The affected bowel is of smaller calibre and thus depending on the length of segment affected variable amounts of colonic distension are present.'
- In protracted cases marked dilatation can develop, and even progress to enterocolitis and perforation.

Fluoroscopy

- A carefully performed contrast enema is indispensable in both the diagnosis of Hirschsprung disease but also in assessing the length of involvement. It should be noted however that the depicted transition zone on the contrast enema is not accurate at determining the transition between absent and present ganglion cells.
- The affected segment is of small calibre with proximal dilatation. Fasciculation/saw-tooth irregularity of the aganglionic segment is frequently seen.

Views of particular importance include:

- Early filling views that include rectum and sigmoid colon allowing for rectosigmoid ratio to be determined.
- Transition zone

Antenatal ultrasound: In particular cases there may be evidence of fetal colonic dilatation

A definitive diagnosis requires a full thickness rectal biopsy.

Treatment: Treatment of Hirschsprung's disease consists of surgical removal (resection) of the abnormal section of the colon, followed by reanastomosis.

Colostomy: The first stage of treatment used to be a reversible colostomy. In this approach, the healthy end of the large intestine is cut and attached to an opening created on the front of the abdomen. The contents of the bowel are discharged through the hole in the abdomen and into a bag. Later, when the patient's weight, age, and condition are right, the "new" functional end of the bowel is connected with the anus.

Swenson, Soave, Duhamel, and Boley procedures

- The pull-through procedure repairs the colon by connecting the functioning portion of the bowel to the anus. The pull-through procedure is the typical method for treating Hirschsprung's in younger patients. Swenson devised the original procedure, and the pull-through surgery has been modified many times.
- Currently, several different surgical approaches are used, which include the Swenson, Soave, Duhamel, and Boley procedures. The Swenson procedure leaves a small portion of the diseased bowel. The Soave procedure, leaves the outer wall of the colon unaltered. The Boley procedure, is a small modification of the Soave procedure, so the term "Soave-Boley" procedure is sometimes used. The Duhamel procedure, uses a surgical stapler to connect the good and bad bowel.
- For the 15% of children who do not obtain full bowel control, other treatments are available. Constipation may be remedied by laxatives or a high-fiber diet. In those patients, serious dehydration can play a major factor in their lifestyles. A lack of bowel control may be addressed by a stoma, similar to a colostomy. The Malone antegrade colonic enema (ACE) is also an option.
- If the affected portion of the lower intestine is restricted to the lower portion of the rectum, other surgical procedures may be performed, such as a posterior rectal myectomy.

The prognosis is good in 70% of cases. Chronic postoperative constipation is present in 7 to 8% of the operated cases. Postoperative enterocolitis, a severe manifestation, is present in the 10–20% of operated patients.

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2016

PAPER - III

Time Allowed: 3 Hours **Full Marks: 100**

Attempt all questions (ten marks for each question)

1. **Describe the recent trends in diagnosis and management of carcinoma of prostate.**
2. **Investigations and surgical management of portal hypertension.**
3. **Discuss common flaps used in general practice.**
4. **Classify anorectal malformations. Discuss investigations and management of various anorectal malformations.**
5. **What are the commonly created types of pouches after total colectomy? Discuss the merits and demerits of pouch creation.**
6. **Management of meningomyelocele and hydrocephalus.**
7. **Mention clinical features of median nerve injury at various levels and its management.**
8. **Describe the steps of axillary clearance for breast carcinoma with particular reference to anatomical guides for identification and protection of vital structures.**
9. **Describe the development and descent of testis.Discuss the medical and surgical management of undescended testis.**
10. **Current concept in the management of different types of thyroid carcinoma.**

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2016

PAPER - III

Time Allowed: 3 Hours **Full Marks: 100**

Attempt all questions (ten marks for each question)

1. Describe the recent trends in diagnosis and management of carcinoma of prostate.

Answer. The most common diagnostic modality for prostate cancer is currently transrectal ultrasonography (TRUS) with guided biopsies. TRUS provides imaging of the prostate and seminal vesicles using a 7.5m Hz biplane intra-rectal probe measuring approximately 1.5cm in diameter. Most patients find the procedure uncomfortable, some painful. It takes 5min and is undertaken on an outpatient basis with or without some form of anaesthetic. Various anaesthetic techniques are available, including the ultrasound-guided peri-prostatic injection of local anaesthetic, peri-anal GTN paste, or inhalation of nitrous oxide/air (Entonox). A DRE precedes insertion of the probe. If biopsies are planned, an antiseptic rectal wall cleansing is also undertaken. Broad-spectrum antimicrobials are given before and after the procedure.

Indications for transrectal ultrasonography alone

- Accurate measurement of prostate volume.
- Male infertility with azospermia, to look for seminal vesicle and ejaculatory duct obstruction due to calculus or MÃ¼llerian cyst.
- Suspected prostatic abscess (can be drained by needle aspiration).
- Investigation of chronic pelvic pain, looking for prostatic cyst or calculi.

Indications for transrectal ultrasonography with biopsies

- An abnormal DRE and/or an elevated PSA (exceptions include very elderly men with massively elevated PSA and abnormal DRE, or those in whom a TURP is indicated for BOO with severe LUTS/retention where histology will be obtained). Previous biopsies showing isolated PIN or ASAP.
- Previous biopsies normal, but PSA rising or DRE abnormal.
- To confirm viable prostate cancer following treatment if further treatment is being considered.

Radiographic features

Ultrasound

- Transrectal ultrasonography (TRUS) is often initially performed to detect abnormalities and to guide biopsy, usually following an abnormal PSA level or DRE.
- Ultrasound is used to direct biopsy of suspicious, hypoechoic regions, usually in the peripheral zone. Because of the high incidence of multifocality, systematic sextant biopsies are recommended.

- On ultrasound, prostate cancer is usually seen as a hypoechoic lesion (60-70%) in the peripheral zone of the gland, but can be hyperechoic or isoechoic (30-40% of lesions).
- Transrectal ultrasound is also the modality of choice for directing brachytherapy seeds into the prostate gland.

MRI: The primary indication for MRI of the prostate is in the evaluation of prostate cancer, after an ultrasound guided prostate biopsy has confirmed cancer in order to determine if there is extracapsular extension. Increasingly MRI is also being used to detect and localise cancer when the PSA is persistently elevated, but routine TRUS biopsy is negative. Both the American College of Radiology (ACR) and European Society of Uroradiology (ESUR) advocate the use of multiparametric.

MRI-guided prostate biopsy is also being used, particularly in those cases where TRUS biopsy is negative but clinical and PSA suspicion remains high. Following radical prostatectomy, patients with elevated PSA should also be examined using MRI.

Often a PI-RADS score is given to assess the probability of the lesion being malignant.

Signal characteristics

- **T1:** useful for detection of prostate contour, neurovascular bundle encasement, and post-biopsy haemorrhage
- **T2**
  - using an endorectal coil, on T2-weighted images prostate cancer usually appears as a region of low signal within a normally high signal peripheral zone
  - most significant cancers occur along the posterior portion of the gland abutting the rectum
- **DWI/ADC:** often shows restricted diffusion
- **dynamic contrast enhancement (DCE):** (dynamic contrast enhancement in prostate cancer)
  - shows enhancement but it can be difficult to distinguish from prostatitis or benign prostatic hyperplasia (especially in the central zone lesions)
  - more specific than T2 signal
  - involves post-processing time
- **MR spectroscopy**: (MR-spectroscopy in prostate cancer)
  - increased choline:citrate or choline+creatine:citrate ratios is seen in prostate cancer (see below for more details)

Routine use of body 3T magnets now means that endorectal coils have become unnecessary for prostate imaging due to the improved signal to noise and spatial resolution associated with higher field strength.MRI parameters routinely assessed include the presence of a mass with a low T2 signal, restricted diffusion with reduced ADC and increased tissue capillary permeability using

dynamic gadolinium contrast enhanced imaging and calculation of the so-called Ktrans (a calculated time constant for permeability). These so-called multi-parametric techniques are increasingly being used in the assessment of prostate malignancy with MRI.

Extracapsular extension carries a poor prognosis. Assess for:

- Asymmetry/extension into the neurovascular bundles
- Obliteration of the rectoprostatic angle
- Involvement of the urethra
- Extension into the seminal vesicles (normal seminal vesicles have high signal on T2)

Lymphadenopathy is best appreciated on T1-weighted images.

MR spectroscopy: The addition of MR spectroscopy with fast T2-weighted imaging is an area of research that holds promise for the detection of disease. The normal prostate produces a large of amount of citrate from the peripheral zone, which tumours do not. In normal prostate tissue citrate and polyamine levels are high and choline levels low. The reverse is the case in a tumour.

CT:

- Not accurate at detecting *in situ* prostate cancer. Scans of the abdomen and pelvis are commonly obtained before the onset of radiation therapy to identify bony landmarks for planning.
- In advanced disease, CT scan is the test of choice to detect enlarged pelvic and retroperitoneal lymph nodes, hydronephrosis and osteoblastic metastases.

Nuclear medicine: Tc^{99} MDP bone scans are usually used to detect metastases.

Prostate specific antigen (PSA) is currently used as a tumour marker for prostate adenocarcinoma. Its normal physiologic role is as a liquifying agent for seminal fluid and the normal amount in human serum is usually very low. Elevated serum levels of PSA have been associated with prostate carcinoma.

PSA can exist in the serum in two forms:

- bound/complexed (to serum protein): elevated levels are associated with prostate cancer
- free PSA (fPSA): elevated levels are associated with benign prostatic hyperplasia (BPH)

PSA levels: Although an increased PSA level is associated with prostate cancer, a low level cannot exclude prostate cancer. Although exact cut-off values are continually in flux, subject to the most recent data:

- 2-4 ng/ml: 15-25% change in a man >50 years old of having prostate cancer
- 4-10 ng/ml: imaging screening/biopsy indicated

The absolute level may also be misleading if there is a trend in the data upward (or downward) over time. Men with enlarged glands from BPH may also have elevated PSA levels. False-positive levels have been associated with

- Benign prostatic hyperplasia
- Prostate infection / prostatitis

- urinary tract infection
- Manipulation (e.g. Digital rectal exam or transrectal ultrasound)
- Recent ejaculation

An upward trend in a patient's PSA value may also be concerning after a prostatectomy, and it may indicate recurrent or metastatic disease.

Prostate cancer staging can be thought of in terms of physical location or grading histologically. The TNM classification is used to determine spread, and the Gleason score is used to determine the histological type. Another staging system is the Jewett-Whitmore staging system.

Additionally, there is some overlap with pre-biopsy imaging assessment using Prostate imaging-reporting and data system (PIRADS).

TNM staging

Primary tumour staging (T)

- **T1:** not palpable via DRE or seen using TRUS
    - **T1a:** cancer found incidentally during TURP, less than 5% of the gland
    - **T1b:** cancer found incidentally but over 5% of the gland is involved
    - **T1c:** found by needle biopsy for a raised PSA
- **T2:** palpable on DRE, but confined to the prostate
    - **T2a:** less than half of one lobe
    - **T2b:** more than half of one lobe
    - **T2c:** cancer in both lobes of the prostate
- **T3:** spread outside the prostate
    - **T3a:** extracapsular extension (one or both sides)
    - **T3b:** tumour invades the seminal vesicles
- **T4:** spread into the adjacent tissues (other than seminal vesicles)
    - e.g. bladder sphincter, rectum, levator ani, or pelvic side wall

Nodal status (N)

On CT a 1 cm short axis diameter cut off is used if its purely on size grounds [1].

- **N0:** no spread to lymph nodes
- **N1:** one or more nearby lymph nodes involved

Metastases (M)

- **M0:** no spread beyond regional lymph nodes
- **M1:** spread beyond local nodes
    - **M1a:** distant lymph nodes outside the pelvis

    - **M1b:** bony metastasis
    - **M1c:** other organ involvement independent of bone involvement
        - e.g. lungs, liver, brain

Histopathologic grading: Gleason scores can be then grouped into a variety of grades:

- **Gx:** grade cannot be assessed
- **G1:** well-differentiated (slight anaplasia) (Gleason score of 2-4)
- **G2:** moderately differentiated (moderate anaplasia) (Gleason score of 5-6)
- **G3-4:** poorly differentiated or undifferentiated (marked anaplasia) (Gleason score of 7-10)

Stage groupings

- **stage I**
    - T1a, N0, M0, G1
- **stage II**
    - T1a, N0, M0, G2-4
    - T1b, N0, M0, any G
    - T1c, N0, M0, any G
    - T1, N0, M0, any G
    - T2, N0, M0, any G
- **stage III**
    - T3, N0, M0, any G
- **stage IV**
    - T4, N0, M0, any G
    - any T, N1, M0, any G
    - any T, any N, M1, any G

Selection of patients for watchful waiting
Watchful waiting is the best option for patients with localized prostate cancer and:

- Gleason score 2-4 disease (in which the results of the more aggressive treatments described below are no better); any age
- Gleason score 5 and 6 disease; >75 years old
- Significant comorbidity; life expectancy considered to be <10 years
- Stage T1a disease with normal PSA (only 17% T1a will progress, compared to 68% with T1b)

However, WW should be considered and discussed with all who have Gleason score <7, when small-volume disease is predicted by DRE and the biopsy report.

Management of localized prostate cancer: radical prostatectomy:
Radical (total) prostatectomy (RP) is excision of the entire prostate, including the prostatic urethra, with the seminal vesicles. It may be performed by open retropubic, perineal, or laparoscopic approaches. The

perineal approach does not allow a simultaneous pelvic lymph node dissection. Following excision of the prostate, reconstruction of the bladder neck and vesico-urethral anastomosis completes the procedure.
RP is indicated for the treatment of fit men with localized prostate cancer whose life expectancy exceeds 10 years, with curative intent. It is not considered to be an appropriate treatment for locally advanced disease. Patients with Gleason score 2â€“4 disease appear to do as well with WW as with any other treatment. The patient should consider all available treatment options and the complications of RP prior to proceeding. The surgeon should take part in multidisciplinary team discussion of each case; there may be local guidelines on age and upper PSA cut-off for offering RP, perhaps 70 years and 20ng/ml respectively.

Management of localized prostate cancer: radical external beam radiotherapy (EBRT):

EBRT is administered with curative intent, often accompanied by 3 months of neoadjuvant hormone therapy in high-risk cases.

Management of localized prostate cancer: brachytherapy (BT)

This is ultrasound-guided transperineal implantation of radioactive seeds, usually I^{125}, into the prostate. The treatment is expensive due to the cost of the consumables.

Management of localized and radio-recurrent prostate cancer: cryotherapy and HIFU

- **Management of locally advanced non-metastatic prostate cancer: ERBT, Hormone therapy.**
- **Management of advanced prostate cancer: hormone therapy**

Mechanisms of androgen deprivation:

- Surgical castration: bilateral orchidectomy
- Medical castration: luteinizing hormone-releasing hormone (LH-RH) agonists, oestrogens; also termed androgen ablation or androgen deprivation
- Anti-androgens (steroidal or non-steroidal): androgen receptor blockade at target cell
- Maximal androgen blockade (MAB): medical or surgical castration plus anti-androgen
- 5-alpha reductase inhibition (5ARI) with finasteride or dutasteride

2. Investigations and surgical management of portal hypertension.

Evaluation:

- Assessment of the liver function.
- Assessment of the portal circulation.
- Upper GI endoscopy.

Investigations:

Assessment of liver function:

- Hypoalbuminaemia.
- ALT & AST are moderately raised.
- Prothrombin time and INR are disturbed.

Blood picture → anaemia, leucopenia, thrombocytopenia or pancytopenia.

Assessment of portal circulation: Duplex scan or Doppler ultrasound:

- To assess the hepatic artery, hepatic vein and portal vein.
- Patency of portal vein.

Upper GI Endoscopy or EGD:

- To detect gatroesophageal varices .
- Gold standard for diagnosing variceal bleeding

Diagnosis of the aetiology of liver disease is performed by:

(a) Immunological tests for hepatitis markers.

Other specific serological markers are alpha foeto protein, ceruloplasmin,alpha 1 antitrypsin, antimitochondrial antibodies,and iron studies.

(b) Liver biopsy.

CT/MR Angiography – to map the hepatic vasculature.

MELD Score:

- **Score = 0.957 × log*e creatinine (mg/dL) + 0.378 × loge* bilirubin (mg/dL) + 1.120 log*e INR***

Child Pugh classification

	Points		
	1	2	3
Bilirubin (mg/dL)	< 2	2 – 3	> 3
Albumin (g/dL)	> 3.5	2.8 – 3.5	< 2.8
Prothrombin time (seconds)	1 – 3	4 – 6	> 6
Ascites	None	Slight	Moderate
Encephalopathy	None	Minimal	Advanced

Grade A, 5-6 points; Grade B, 7-9 points; Grade C, 10-15 points

Resuscitation and medical measures:

- Admit patient in ICU
- Fluids and blood products judiciously administered
- Somatostatin or its analogues octreotide or terlipressin administered and continued for 3-5 days

- Non-selective beta blockers like propanol or nadolol

Current recommendation is to administer an antibiotic prophylaxis upto 7days, specifically a fluoroquinolones.

Surgery for portal hypertension:

Decompressive shunts:

- **Transjugular intrahepatic portosystemic shunt** or (**TIPS**) is a procedure that involves the creation of an artificial anastomosis between the hepatic and portal veins under fluoroscopic guidance with the use of a covered stent, shunting away blood from the hepatic sinusoids and relieving portal pressure.

Indications for TIPSS:

- Refractory bleeding
- Prior to transplant
- Child C
- Refractory ascites

Types of surgical procedure:

- Porta – systemic shunts.
- Non Shunt surgery – Devascularisation.
- Liver transplantation.

<u>Porto-systemic shunts:</u> Classification:

Non-selective shunts:

Total shunts:

- Portacaval
- Mesocaval
- Proximal spleno-renal

- Partial shunts:

- Small diameter porta-caval (Sarfeh)

Selective shunts: Distal spleno renal shunt

Porta-caval shunt:

- Portal blood is completely redirected into IVC below the liver.
- Two types: end to side and side to side.

Side to side shunt is useful in preventing portal hypertension in Budd – Chiari syndrome .

Meso-caval shunt:

- Anastomosis of the side of the SMV to the proximal end of the divided IVC, for control of portal hypertension;
- The incidence of thrombosis is high.

Proximal spleno-renal shunt:

Indication:

- EHPVO.

Advantage:

- The incidence of encephalopathy is less than after porta caval shunt.

Disadvantage:

- Less effective In rebleeding.
- If the splenic vein is less than 1 cm the anastomosis is liable to thrombosis.

Partial porto systemic shunts (Sarfeh)

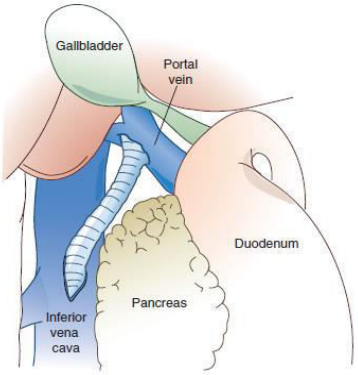
A small diameter interposition (8-10 mm) porta – caval shunt.

Advantage:

- **Partially decompress the portal venous system.**
- **Hepatic portal flow is preserved.**

Draw back:

- **Increasaed incidence of thrombosis.**
- **Recurrence of bleeding.**



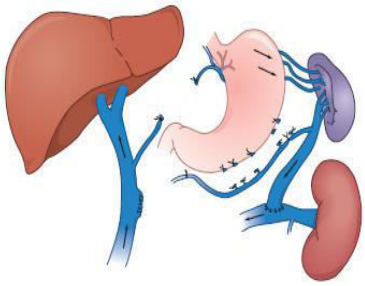
Selective shunts:

<u>Types</u> :

- **The distal splenorenal shunt (Dean Warren shunt)**
- **Inokuchi splenocaval shunt (IMV to IVC)**
- **Interposition shunts with the left gastric vein to IVC**

Distal splenorenal shunt

- An anastomosis of the splenic vein and the left renal vein, created to lower portal hypertension



Merits:
- The incidence of encephalopathy is low
- Liver functions remain normal.

Non-shunt surgery:

Devascularisation:

<u>Aim</u>: Direct disconnection between the portal and azygos vein done by disconnecting the varices from their bleeding vessels.

<u>Components:</u>

- **Splenectomy**
- **Gastric and oesophageal devascularisation**
- **Oesophageal transection**

<u>Ultimately liver transplantation is the option.</u>

Prevention of rebleeding:

Good-risk patients—Child's A patients or MELD less than 10.

- Pharmacotherapy +/- Banding
- If they rebleed or have failure to obliterate their varices banding, they may be a candidate for decompression with TIPS or DSRS.

Indeterminate patients—Child's B or MELD 10–16.

- Majority of patients
- Initial treatment is with endoscopic banding and a beta-blocker.
- Subsequent treatment depends on the course of their liver disease.

End-stage liver disease—Child's C or MELD greater than16.

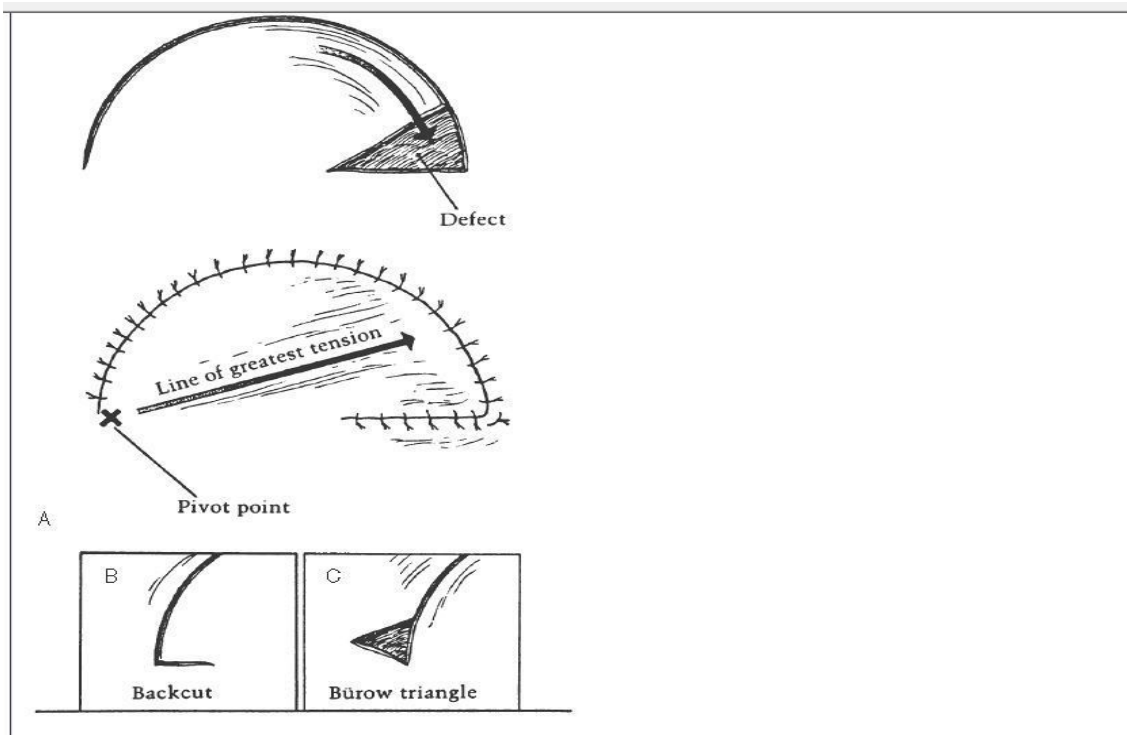
- Liver transplantation

Patients with any of the above scenarios, who also have advanced liver disease, are candidates for liver transplantation, possibly using TIPS as a bridge.

3. Discuss common flaps used in general practice.

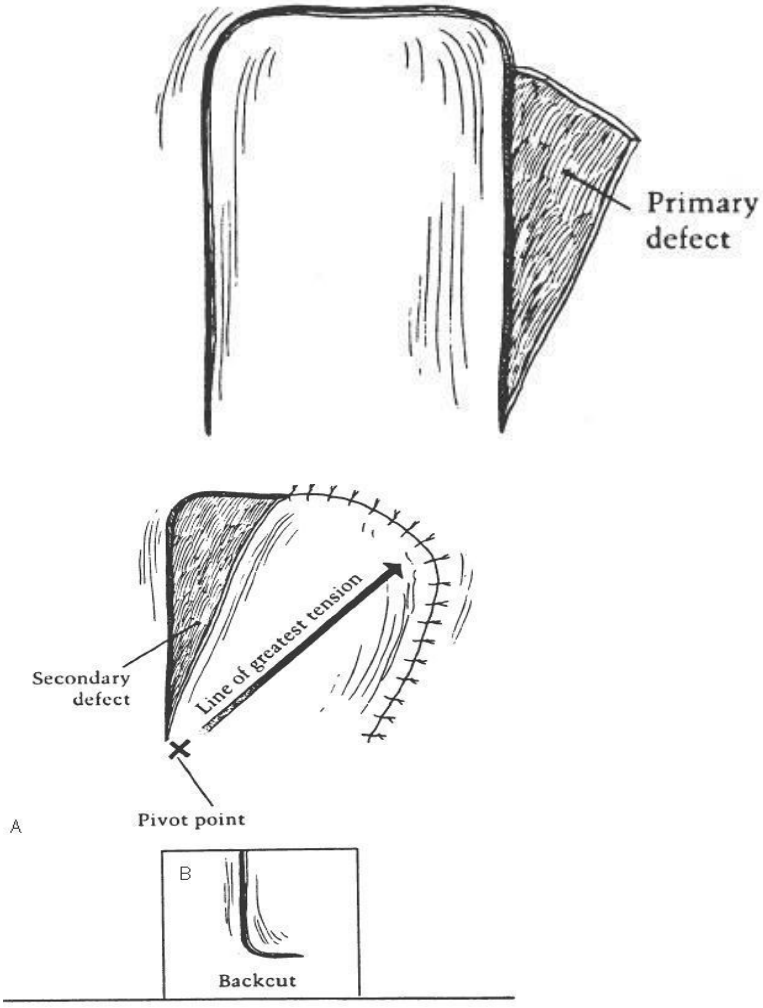
Answer. A flap is any tissue that is transferred to another site with an intact blood supply.
Classification based on blood supply

- Random cutaneous flaps have a blood supply from the dermal and subdermal plexus without a single dominant artery. They generally have a limited length-to-width ratio (usually 3:1), although this varies by anatomic region (e.g., the face has a ratio of up to 5:1). These flaps are usually used locally to cover adjacent tissue defects but can be transferred to a distant site by use of a staged procedure.
- Depending on the size of the defect to be covered, moving a local tissue flap can create a donor defect, which may require skin grafting. All local flaps are comparatively easier to use with the loose skin of the elderly.



Rotation flap. A: The edge of the flap is four to five times the length of the base of the defect triangle. B, C: A backcut or Burow triangle can be useful if the flap is under tension.

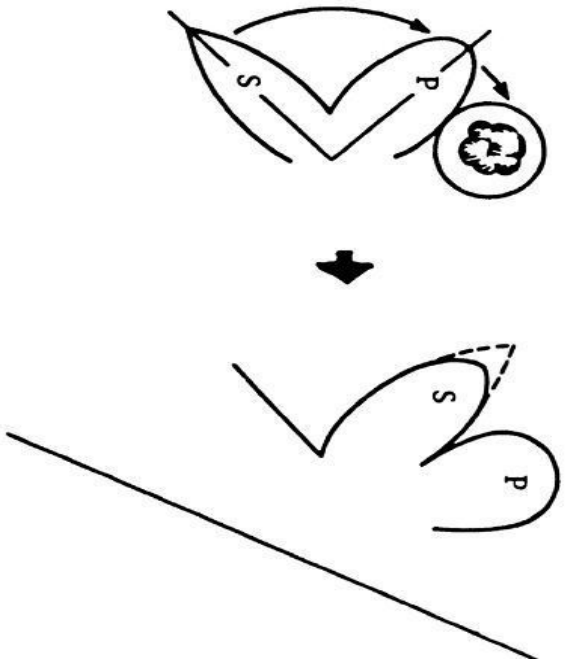
    - Flaps that rotate around a pivot point include rotation flaps and transposition flaps. Planning for shortening of the effective length through the arc of rotation is important when designing these flaps. More complex rotation flaps include bilobed flaps and rhomboid flaps.
    - Advancement of skin directly into a defect without rotation can be accomplished with a simple advancement, a V-Y advancement (Fig. 29-5), or a bipedicle advancement flap.
- Axial cutaneous flaps contain a single dominant arteriovenous system. This results in a potentially greater length-to-width ratio.
    - Peninsular flaps are those in which the skin and vessels are moved together as a unit.
    - Island flaps are those in which the skin is divided from all surrounding tissue but maintained on an isolated, intact vascular pedicle.
    - Free flaps are those in which the vascular pedicle is isolated and divided. The flap and its pedicle are then moved to a new location and microsurgically anastomosed to vessels at the recipient site, allowing for long-distance transfer of tissue.

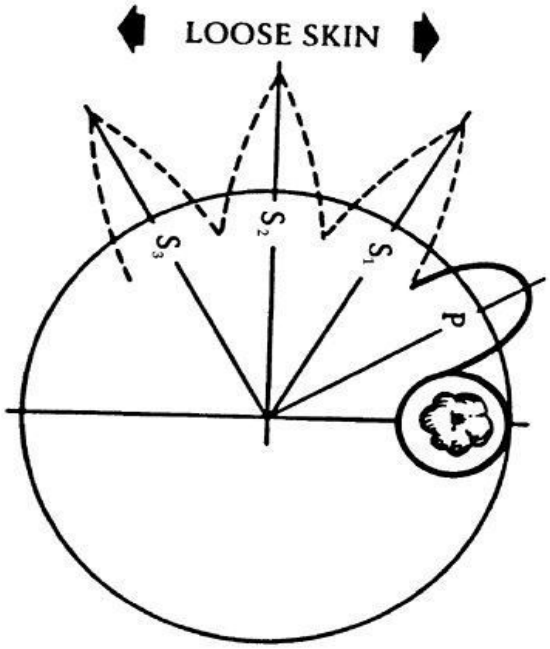


A: Transposition flap. The secondary defect is typically covered with a skin graft. B: A backcut may be added to reduce tension at the pivot point.

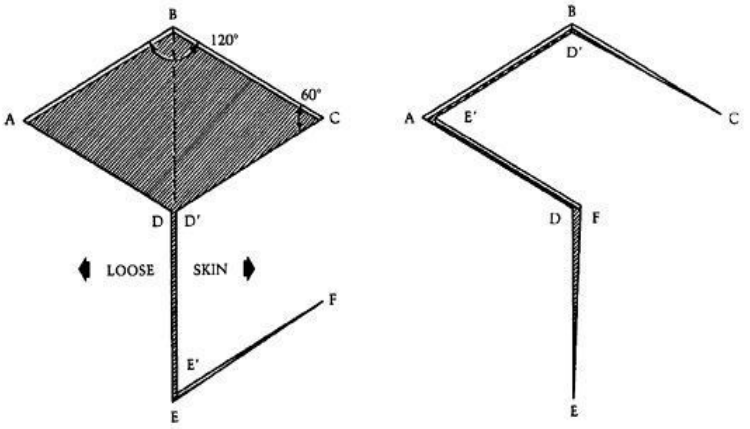
B. Classification based on tissue type

- Cutaneous flaps include the skin and subcutaneous fat. These are generally random flaps because the axial blood supply is deep to the fat.
- Fasciocutaneous flaps are axial flaps with a single dominant blood supply contained in the deep fascia along with the overlying fat and skin. A wide variety of fasciocutaneous flaps have been described, but those commonly used include radial forearm, parascapular, lateral arm, and groin flaps. These flaps are often utilized for coverage of mobile structures such as tendons.
- Muscle flaps use the specific axial blood supply of a muscle to provide well-vascularized soft-tissue bulk. These flaps can often be transferred with the overlying skin as a myocutaneous flap. Alternatively, they may be transferred without the overlying skin to fill a cavity or may be covered with a skin graft.





Bilobed flap. After the lesion is excised, the primary flap (P) is transposed into the initial defect, and the secondary flap (S) is moved to the site vacated by the primary flap. The bed of the secondary flap is then closed primarily. The primary flap is slightly narrower than the initial defect, whereas the secondary flap is half the width of the primary flap. To be effective, this must be planned in an area where loose skin surrounds the secondary flap site. Three choices for the secondary flap are shown (S_1, S_2, S_3).



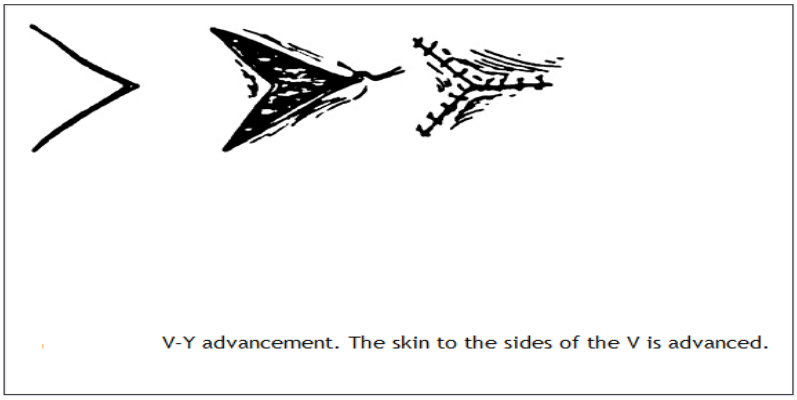
Rhomboid or Limberg flap. The rhomboid defect must have 60- and 120-degree angles so that the length of the short diagonal is the same as the length of the sides. The short diagonal is extended by its own length to point *E*. The line *EF* is parallel to *CD*, and they are equal in length. There are four possible Limberg flaps for any rhomboid defect; the flap should be planned in an area where loose skin is available to close the donor defect primarily.

- Considerations in the transfer of vascularized muscle include the pattern of circulation, arc of rotation, donor-site contour, and donor-site functional defects. Commonly used muscle flaps include the latissimus dorsi, pectoralis major, rectus abdominis, gastrocnemius, soleus, gracilis, tensor fascia lata, trapezius, and gluteus maximus, but any muscle can potentially be transferred as a flap.
- A musculocutaneous flap involves transfer of a muscle with the overlying skin and subcutaneous tissue. The skin is vascularized via myocutaneous or septocutaneous perforating vessels.

C. Specialized flaps

- Fascial flaps are used when thin, well-vascularized coverage is needed (e.g., for coverage of ear cartilage or the dorsum of the hand or foot). The temporoparietal fascia flap is a classic example, but other fasciocutaneous flaps (see Basic Techniques and Principles, Section III.B.2) can be transferred without the overlying skin.
- Vascularized bone flaps are designed to meet specific reconstructive needs, as dictated by loss of bony structure. Because they must be transferred to a specific location, they are generally transferred as free flaps. They may or may not include muscle and/or overlying skin. Commonly used bone flaps include free fibula, scapular spine, iliac (with overlying internal oblique muscle), and rib (with pectoralis major or intercostal muscle).
- Functional muscle may be transferred with its accompanying dominant nerve. Common functional muscle transfers include transfer of gracilis for restoration of facial movement or latissimus for replacement of biceps function.
- Segmental muscle flaps can be used when multiple sources provide blood supply to the muscle. A portion of the muscle is used as a flap, leaving behind a vascularized, innervated, functional muscle.

This technique minimizes donor-site functional loss. Portions of the serratus anterior and gluteus maximus can be transferred as segmental flaps.



V-Y advancement. The skin to the sides of the V is advanced.

4. Classify anorectal malformations. Discuss investigations and management of various anorectal malformations.

Answer. Classification of Anorectal malformations:

FEMALE	MALE
High Anorectal agenesis With rectovaginal fistula Without fistula Rectal atresia	**High** Anorectal agenesis With rectoprostatic urethral fistula Without fistula Rectal atresia
Intermediate Rectovestibular fistula Rectovaginal fistula Anal agenesis without fistula	**Intermediate** Rectobulbar urethral fistula Anal agenesis without fistula
Low Anovestibular fistula Anocutaneous fistula Anal stenosis	**Low** Anocutaneous fistula Anal stenosis
Cloacal malformations	
Rare malformations	Rare malformations

(Therapeutic and Prognostic)
Males
Cutaneous (perineal) fistula
Rectourethral fistula
Bulbar
Prostatic
Recto-bladder neck fistula
Imperforate anus without fistula
Rectal atresia
Females
Cutaneous (perineal fistula)
Vestibular fistula
Imperforate anus without fistula
Rectal atresia
Cloaca
Complex malformations

Associated Anomalies:

- **Sacrum and Spine:** Sacral deformities appear to be the most frequently associated defect.
- **Genitourinary Defects:** The frequency of associated genitourinary defects varies from 20% to 54%.
- Anal atresia may occur as a part of the VACTERL group of anomalies
  V-Vertebral body segmentation defect
  A-Anal atresia
  C-Cardiovascular (PDA, VSD)
  TE-Tracheoesophagial fistula
  R - unilateral **R**enal agenesis
  L-Limb anomaly (radial ray hypoplasia)
- **CVS**: Tetrology of Fallot or VSD
- **GI**: Tracheo-esophageal abnormality , Duodenal atresia , Hirschsprung's disease.

Investigations for associated anomalies:

Investigation	Purpose
Plain X Ray abdomen Erect	To rule out Pouch colon
X-Ray Lumbosacral spine	To rule out Spinal (sacral) anomalies
2-D Echo	Cardiac anomaly
USG Abdomen & Pelvis	Urogenital anomalies
Micturating cystourethrogram (optional at birth, can be done later if needed)	Vesico-ureteric reflux

Investigations for boys with anorectal anomalies

Clinical features	Investigation	Timing	Purpose	Details
Absent anus + Bulge in perineum/anal site especially on crying	-			
Anus present - Perineal fistula/anal stenosis	-			
Absent anus + No bulge in anal site on crying ± meconium stained urine ± meconium at the urethral meatus	Invertogram (not preferred now) Cross table prone lateral (CTPL) X ray (1) (Fig. 1)	18-24 hours after birth	1. Delineate the level of gas filled rectum which gives information of level of atresia. 2. Decisive for type of surgery.	Invertogram Baby held upside down for 3-5 minutes and then lateral X-ray is taken centered at the greater trochanter. CTPL Prone position with hips and knees flexed at 45°, lateral xray centered at greater trochanter INTERPRETATION (Fig. 2)

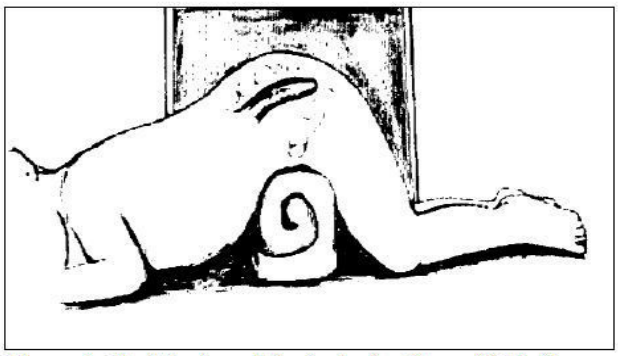


Figure 1: Positioning of the baby for Cross Table Prone Lateral X-Ray.

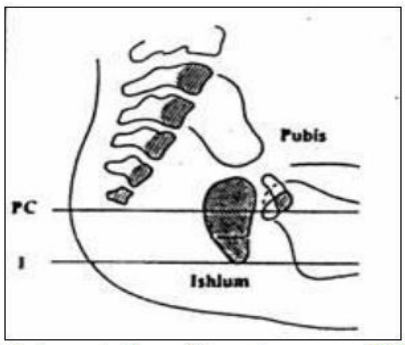
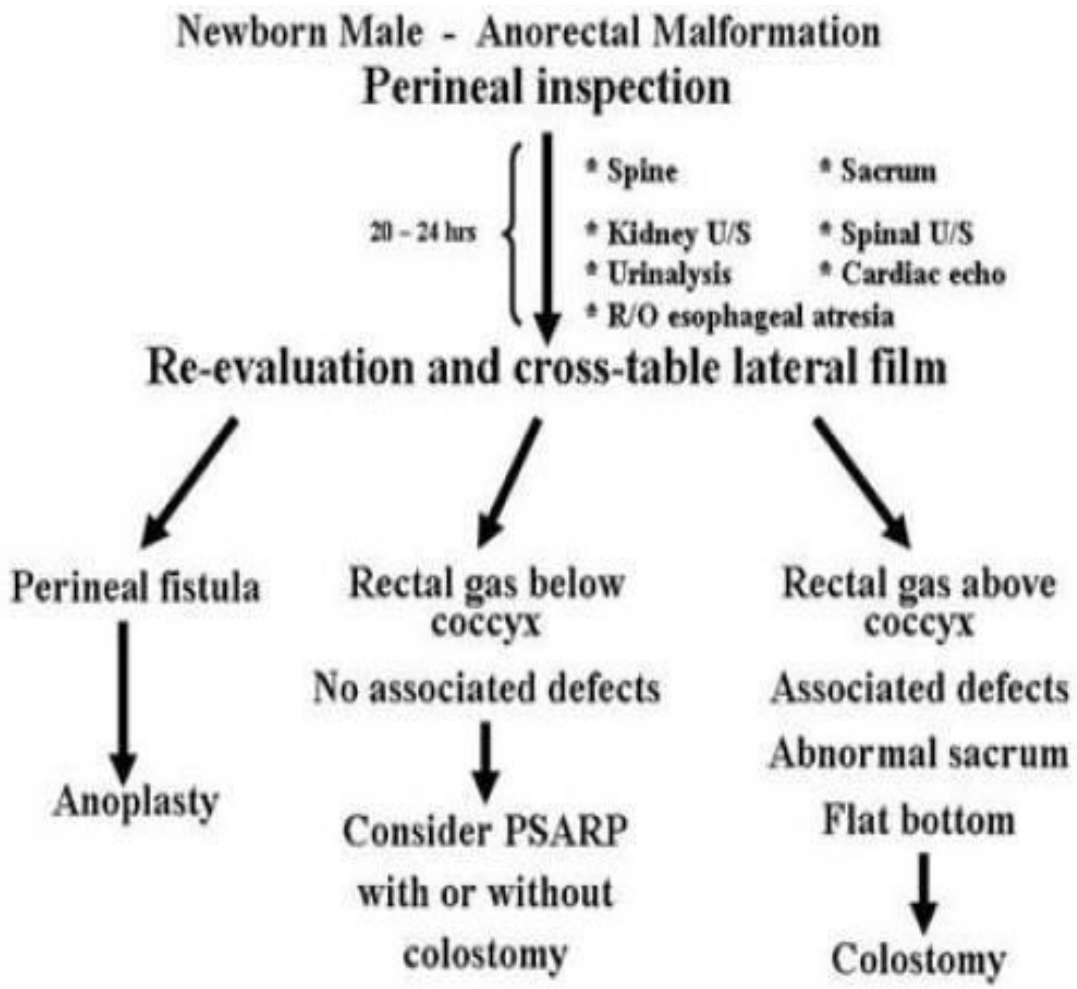


Figure 2: Interpretation of Invert gram or CTPL X-ray.

Algorithm for management of ARM in newborn male



Posterior Sagittal Ano-RectoPlasty – PSARP.

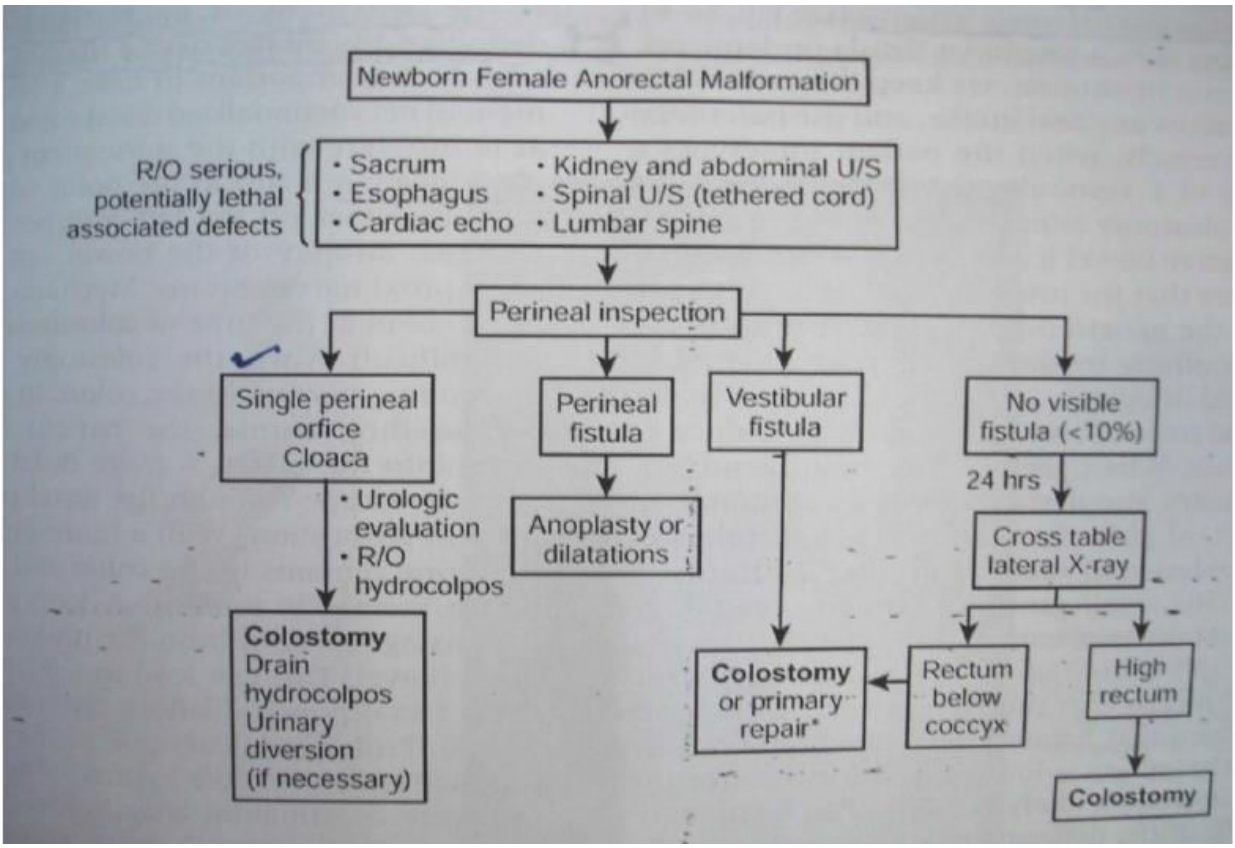
PSARP involves:

- Stimulation of muscles to demonstrate the midline and sphincter
- Posterior sagittal incision - length depends on severity of abnormality and required extent of dissection
- Rectum identified. Abdominal approach may be required in addition in 10% of males and 40% of cloacae
  Rectum dissected.
- Separation from genitourinary tract - often the most difficult part
- Repositioning the neoanus within the sphincteric mechanism

Investigations for boys with anorectal anomalies

Clinical Features	Investigation	Timing	Purpose
Absent anus + 3 openings in vestibule	-	-	-
Absent anus + 2 openings in vestibule (high anomaly rectovaginal fistula most common)	-	-	-
Absent anus + single opening in vestibule (cloaca)	Cloacogram + Cystovaginoscopy	At birth	To plan for type of surgical intervention, either a. Primary repair b. Colostomy
Anteposed anus	-	-	-

Algorithm for management of ARM in newborn female



5. What are the commonly created types of pouches after total colectomy? Discuss the merits

and demerits of pouch creation.

Answer. The **ileal pouch-anal anastomosis** (**IPAA**), also known as an **ileo-anal pouch**, **restorative proctocolectomy**, **ileal-anal pullthrough**, or sometimes referred to as a **j-pouch**, **s-pouch**, **w-pouch** or an **internal pouch** (or **Kock pouch**), is a surgically constructed internal reservoir; usually situated near where the rectum would normally be. It is formed by folding loops of small intestine (the ileum) back on themselves and stitching or stapling them together. The internal walls are then removed thus forming a reservoir. The reservoir is then stitched or stapled into the perineum where the rectum was. The procedure retains or restores functionality of the anus with stools passed under voluntary control of the patient.

In this surgical procedure the ileum is attached to the anus after the rectum has been removed.

- In a *J-pouch anastomosis*, a 12-inch section of the small intestine is formed into a J-shaped pouch in order to replace the function of the rectum and store stool until it can be eliminated. This procedure is similar to the side-to-end coloanal anastomosis but a larger pouch is formed.
- In a *Side-to-end coloanal anastomosis* a side of the colon is attached to the anus after the rectum has been removed. A section of the colon about 2 inches long is formed into a mini-pouch in order to replace the function of the rectum and store stool until it can be eliminated. This procedure is similar to the J-pouch coloanal anastomosis but a much smaller pouch is formed.

The entire procedure can be performed in one operation, but is usually split into two or three. When done as a two-step, the first operation (step one) involves a proctocolectomy (removal of the large intestine and rectum), and fashioning of the pouch. The patient is given a temporary defunctioning ileostomy (also known as a "loop ileostomy"). After a period of usually 6–12 weeks the second step (sometimes called the "takedown") is performed, in which the ileostomy is reversed. The reason for the temporary ileostomy is to allow the newly constructed pouch to fully heal without waste passing through it, thus avoiding infection.

Some surgeons prefer to perform a *subtotal colectomy* (removing all the colon except the rectum), since removal of the rectum can lead to complications with the anal sphincters. When a colectomy is performed as an emergency (which can arise from toxic megacolon and other complications), or when the patient is extremely ill, the colectomy and pouch construction are performed in separate stages, resulting in a three-part surgery.

Immediately after surgery, patients are encouraged to eat low fiber, high protein/carbohydrate meals, but after the pouch function has settled, most are able to reintroduce a fully varied diet. There are some foods that are known to irritate the pouch, however, and though they may be introduced carefully, are best avoided immediately following surgery.

- **Increased stool output** can be caused by fibrous foods (such as pulses, green leaves, raw vegetables etc.) and also by spicy foods, alcohol and caffeine.
- **Anal irritation** can be caused by nuts, seeds, citric acid, raw fruit and spicy food.
- **Increased gas** can be caused by fizzy drinks, milk, beer, broccoli, cauliflower, sprouts, cabbage etc.
- **Increased odor** can be caused by foods such as fish, onions, garlic and eggs.

Diseases/Disorders of the ileal anal pouch

- **Surgery related/mechanical complications** (examples: fistulas, strictures)
- **Inflammatory or infections disorders** (examples: pouchitis, cuffitis)
- **Functional disorders** (examples: irritable pouch syndrome, pelvic floor dysfunction)
- **Dysplasia or neoplasia** (examples: adenomas , cancers).
- **Systemic or metabolic disorders** (examples: malnutrition, anemia)

- **Pouchitis:** Pouchitis is an inflammation of the ileo-anal pouch, which occurs particularly in cases where the pouch has been created to manage colitis. The symptoms are normally somewhat similar but less acute than those of colitis, and include (sometimes bloody) diarrhea, urgency or difficulty in passing stools, and, in few cases, pain. The standard treatment for pouchitis is a 7- to 10-day course of a combination ciprofloxacin and metronidazole.

Complication	*Functional manifestation*	*Other manifestations*	*Investigation*
Pouchitis	Liquid stool, blood,urgency	Abdominal pain, fever	Pouchoscopy and biopsy
Chronic intestinal obstruction	Liquid stool	Abdominal pain and distension	Plain or contrast radiology, CT
Evacuation disorders			
Ileoanal stenosis	Frequent, small volume stool		Digital examination, pouchogram
Long distal segment	Frequent, small volume stool. May need to intubate		Pouchogram
'Functional'			
Low capacitance reservoir	Frequent, small volume stool. Urgency		Pouchogram
'Functional' frequency	Phasic frequency		Ambulant pressure monitoring

Merits:

- **Acts as a reservoir.**
- **Overcomes the difficulty of hand-sewn anastomosis.**
- **Keeps the functional volume of intestine.**
- **Overcomes the post-operative hazards of stoma.**

6. Management of meningomyelocele and hydrocephalus.

Answer. Management of newborns with myelomeningocele

Newborns should be placed on intravenous ceftriaxone (or cefotaxime) and gentamicin immediately and the spina bifida defect covered with sterile saline – soaked gauze, which should be changed as needed to keep it moist and clean.
Regardless of whether there is CSF leak, the infant should be scheduled for urgent surgery to close the defect (ideally within 24 hours of admission), if it is medically stable.
The infant should remain on the same empiric intravenous antibiotic coverage for a total of one week. This would require modification in the event of meningitis or ventriculitis.
Anterior fontanel tension and head circumference should be monitored to assess for development of hydrocephalus.
If hydrocephalus is already present at birth, the spina bifida defect should be closed first (rather than treating the hydrocephalus) in order to avoid ventriculitis. The only reason to treat hydrocephalus urgently is if the infant is symptomatic (poor feeding, vomiting, lethargy) or is manifesting symptoms of the Chiari malformation in the face of untreated hydrocephalus (stridor, frequent apnea spells, nasal regurgitation). In such cases, urgent management can be achieved with percutaneous ventricular puncture for drainage of CSF. Repeated taps are not advised, and should only be performed as needed until a shunt or tapping reservoir can be placed.
If the child develops hydrocephalus following spina bifida closure, it is ill-advised to place a VP shunt within 2 weeks of closure because of the increased risk of shunt infection. In the presence of CSF infection or the need for hydrocephalus management soon after spina bifida closure, a ventricular catheter attached to a subcutaneous tapping reservoir (or a blind-ended shunt valve tied off at its distal end) should be placed for temporary management until shunt placement is safe. External ventricular drains are more dangerous to manage on the hospital ward. In the event of CSF infection, the CSF should be sterile (as demonstrated byserial cultures) for one week prior to shunt placement.
If no hydrocephalus has developed prior to discharge from the hospital, the child needs to be monitored monthly as an outpatient at 1, 2, 3, 6 and 12 months post-operatively. Hydrocephalus can become manifest late, but typically not after 6 months. Other aspects of hydrocephalus management will be considered below.

Late presentation of myelomeningocele

Infants may present for management of myelomeningocele relatively late (weeks or even months after birth). These may present with: 1) gross infection of the sac and neural elements; 2) CSF leak or poorly epithelialized sac with no clinically apparent infection; 3) CSF leak or poorly epithelialized sac with evidence of meningitis/ventriculitis; 4) complete epithelialization of the sac with no evidence of infection or CSF leak. Except for the latter, these should all be placed on ceftriaxone (orcefotaxime) and gentamicin and scheduled for urgent surgery.
In the case of gross purulent infection of the sac and neural elements, thorough debridement of pus and inflammatory material should be performed. If the child is septic, surgery should be delayed until the condition is stabilized with medical management. If the child is paraplegic, sections of grossly infected placode or lower nerve roots hopelessly encased in pus may be resected. A culture swab should be obtained at the time of surgery prior to irrigation with antibiotic solution. After debridement, the wound and the canal proximal to the spina bifida defect should be copiously irrigated with antibiotic irrigation.
The arachnoid and dura are often thick with inflammation, but primary dural closure can virtually always be achieved, and skin closure can proceed as usual. The child should continue antibiotic therapy for 14 days. The antibiotics used may require adjustment according to culture and sensitivity results.

Children presenting with CSF leak (with or without clinical infection) or a poorly epithelialized sac should be managed as described above for the newborn. In cases of meningitis and sepsis, surgery should be delayed until the child has had time to respond sufficiently to medical management and is stable for surgery. If meningitis/ventriculitis is being treated, antibiotics should be continued for 14 days. The antibiotics used may require adjustment according to culture and sensitivity results.
Children (usually weeks or months of age) with well-epithelialized sacs can undergo elective repair, and do not require a course of antibiotics, except for a single perioperative dose for staph coverage (e.g. Cloxacillin) at the time of anesthesia induction. This should not be undertaken by a surgeon with little experience, since the situation is not urgent and there is a risk of creating new neurologic deficits if any lower extremity function is present. The reasons to pursue elective repair of these lesions are: 1) untethering of the spinal cord; and, 2) removal of the sac and reconstruction of the tissues.

Symptomatic Chiari malformation

In around 5% of infants with myelomeningocele, the Chiari malformation may cause vocal cord weakness (secondary to lower cranial nerve dysfunction) leading to life-threatening airway obstruction. Early warningsigns of this condition include nasal regurgitation of milk and stridor with crying. If airway obstruction becomes significant, the child may require intubation to maintain the airway until surgical management can be undertaken.
Untreated hydrocephalus should be addressed first. Decompression of hydrocephalus may relieve the problem. However, if stridor persists in the absence of untreated hydrocephalus, upper cervicallaminectomies to decompress the brainstem may be necessary. Further discussion is beyond the scope of this protocol.

Management of hydrocephalous:

Management of hydrocephalus in developing countries is more difficult for many reasons. The cost of shunts may be prohibitive. The incidence of shunt infection in developed countries is around 10%, and higher for newborns. Shunt malfunction requiring surgery occurred in around 40% of patients within 2 years of initial placement in a recent prospective multicenter trial in North America. In a developing country, it can be difficult for patients to access qualified care in the case of shunt complications. Thus, shunts dependence is more dangerous in this context.
It has been shown that endoscopic third ventriculostomy (ETV) is effective in treating hydrocephalus without the need for a shunt in most children over the age of 1 year, and in the majority of children under one year with post-infectious aqueductal obstruction (as determined by the clinical history and a small 4th ventricle on the ultrasound or CT scan). It has subsequently been demonstrated that the addition of choroids plexus cauterization to the ETV procedure significantly increases them of treatment in infants less than 1 year of age that shunt dependency can be avoided in most children with hydrocephalus. Unfortunately, this technique is not available in most centers in the developing world, and shunts are the only recourse. If ETV is available in the region, the child should be referred to that center for evaluation because of the desirability of avoiding life-long shunt dependency.

7. Clinical features of median nerve injury at various levels and its management.

Answer.

Anatomy

- Mixed nerve (contain motor & sensory fibers). • Root value: C 5,6,7,8 & T1 • Runs in the median plane of the forearm , so its called median nerve.
- Arises in the axilla by joining: 1) Lat Cord of the brachial plexus 2) Med Cord of the brachial plexus.
- Axilla • After being from Lateral Cord Medial Cord of brachial plexus Runs on the lateral aspect of Axillary artery .
- Arm • Continues to run lateral to the brachial artery till the mid-arm • Crosses the artery anteriorly and passes anterior to the elbow joint into forearm .
- Forearm • Enters to the forearm b/w two heads of pronator teres . • Runs deep to the fibrous arch of FDS , in proximal 1/3rd • Mid forearm it descends b/w FDS and FDP • About 5 cm above wrist , it comes to lie on the lateral side of the FDS , becomes superficial just above wrist.
- Hand • Passes deep to the flexor retinaculum and enters the Hand • Muscular braches supply muscles of Thenar eminence: - abductor pollicis brevis - opponens pollicis - flexor pollicis brevis .
- Hand • Divides into 4 to 5 palmar digital branches supplying lateral three and half digit and their nail beds • Motor braches to the first and second lumbrical muscles

Other branches • Articular branches: supply the proximal radio- ulnar joint • Palmar cutaneous branch: supplies skin over thenar eminence

Injuries: **High and low**

- High Median Nerve injuries • Injury proximal to the elbow • Due to forearm fractures or elbow dislocation • Stab injuries and GSW's • Paralysis of all the muscles supplied by the median nerve in the forearm and hand .
- Low Median Nerve Injuries • Injury in the distal third of the forearm • Sparing of the forearm muscles • Muscles of the hand paralysed • Anaesthesia over the median nerve distribution in the hand • Thenar eminence is wasted and thumb abduction and opposition are weak • Sensation lost over the radial three and half digits and trophic changes may seen

- Examination • Flexor pollicis longus : Tested by holding thumb at its base and patient asked to flex the terminal phalanx
- • Flexor digitorum superficialis & profundus (Oscher's clasping test) - Patient is asked to clasp the hands , the index finger of affected side fails to flex
- • Flexor Carpi radialis : Hand deviates to the ulnar side when flexed against resistance
- • Muscles of Thenar eminance: - abductor pollicis brevis (Pen test) - hand laid flat on the table - pen held above the palm and the patient is asked to touch the pen with his thumb
- • opponens pollicis : brings the tip of the thumb towards the tips of other fingers Opponens polices
  Benedict Sign
  Klien Nioh/ OK Sign
  Ape Thumb

Principles of Surgical Management:

1. Direct Injury: Nerve repair 2. Compression neuropathies: Decompression 3. Long standing cases: Tendon transfers a) Low Median Nerve: - Re-routing of ring/ middle finger superficial flexor around FCU to APB to aid thumb opposition b) High Median Nerve: - Suturing of profundus tendons to ring and small finger tendons for restoration of IP jt movts - ECU re-routing and attachment to dorsal radius/ Transfer of biceps insertion from medial to lat radius for weak forearm pronation

Median nerve Compression Syndromes • Carpal Tunnel • Pronator • Interosseous

Carpal Tunnel Syndrome • Compressive neuropathy as the nerve passes through the Carpal Tunnel • Causes: - Idiopathic : Most common - Inflammatory : Rheumatoid Arthritis : Wrist osteoarthritis - Post traumatic : Bone thickening - Endocrine : Myxoedema : Acromegaly - Pregnancy - Gout - Repetitive wrist movts: Typists & Computer users

Carpal Tunnel : Symptoms • Hand and wrist Pain • Paraesthesia • Hypoaesthsia • Sparing of Palmar cutaneous branch supply • Patient wakes at night with burning or aching pain and shakes the hand to obtain relief and restore sensation • Aggravated by elevation of hand • Thenar atrophy and weakness of thumb opposition and abduction may develop late

Diagnosis • History • Clinical examination: - Thenar wasting - Phalen's sign - Tinel's sign - Carpal compression test • Electro Diagnostic Studies: - Very reliable for evaluation - Atypical cases may be present.

- Thenar atrophy
- Tinel's Sign
- Carpal Compression test/ Durkan's test

- Management • Splinting – prevents wrist flexion • Corticosteroid/anesthetic injection • Surgical decompression:Division of the transverse carpal ligament - Open - Endoscopic
- Complications • Injury to palmar cutaneous/recurrent motor branch of the median nerve • Hypertrophic scarring • Hematoma/Arterial injury • Pillar pain
- Pronator teres syndrome • High Compression neuropathy • It is rare compared to CTS and AIS Proximal forearm median nerve◊• Misnomer compression

Symptoms & signs • Symptoms are similar to those of carpal tunnel syndrome • Sensory disturbances - Thumb & Index > Middle finger • Night pain is unusual and forearm pain is more common • Hand numbness on gripping • Phalen's test negative • Double crush phenomena • Symptoms provoked by resisted elbow flexion with forearm supinated (tightening of bicipital aponeurosis) • By resisted forearm pronation with the elbow extended (pronator tension)

Management • No relief with steroids • Surgical decompression

Anterior Interosseous Syndrome • Damage to the Anterior Interosseous Nerve • Pain in the forearm • Weakness of the gripping movement of the thumb and index finger(unable to make ok sign) • Causes: - Injury to elbow - Injury during open/closed reduction

Management • Corticosteroids • Surgery: - Resection/detachment of deep head of PT

8. Describe the steps of axillary clearance for breast carcinoma with particular reference to anatomical guides for identification and protection of vital structures.

Answer. The axilla is a quadrangular space that lies between the following:

- The lower border of the axillary vein superiorly
- The chest wall medially
- The axillary skin laterally
- Pectoralis major and minor anteriorly
- Latissimus dorsi, teres major, and subscapularis posteriorly

Axillary dissection removes all the nodes and fat from this space. Although the nodes are in a continuum, the clearance can be anatomically divided into three levels based on the relationship of the tissue to the pectoralis minor muscle.

Technique:
The extent of ALND within the above boundaries is defined as level I (lateral to the pectoralis minor), level I-II (extending behind the minor), or level I-III (extending to the apex of the axilla, "Halsted's ligament"), and should be based on tumor characteristics, patient anatomy, and intraoperative findings. ALND should be sufficient to remove all gross evidence of disease and should in general contain at least 10 nodes. Palpably suspicious Rotter's (interpectoral) nodes should be removed if present.
The pectoralis minor may be divided or excised to facilitate exposure and removal of gross disease at levels II and III. The long thoracic, thoracodorsal and medial pectoral nerves should be identified and, unless grossly involved by tumor, preserved. If anatomically suitable, the T2 (intercostobrachial) and T3 sensory nerves may be preserved at the discretion of the surgeon. Unresectable residual disease should be clipped to facilitate RT treatment planning.

Surgical Procedure:

- Axillary dissection can be carried out through the incision for a mastectomy. Patients having lumpectomy usually require a separate incision in the axilla. Often, the preference is for a skin crease incision just below the axillary hairline extending from the posterior edge of the pectoral fold to the posterior axillary line. Flaps are raised off the skin and subcutaneous tissue.
- Dissection is carried past the edge of pectoralis major muscle. Retraction of the pectoralis major medially exposes the pectoralis minor and the clavipectoral fascia. The lateral pectoral nerve bundle is identified and preserved. Incision into the clavipectoral fascia allows entry into the axillary fat and the contained nodes. These are removed en bloc through the surgery.
- Dissection is carried superiorly along the edge of the pectoralis minor to reach the inferior edge of the axillary vein. Once the axillary vein is identified, this is followed medially to reach the axillary apex, where the axillary vein crosses the lateral border of the first rib.

- The axillary contents are then separated from the lateral thoracic wall, which is the medial boundary of the axilla. This exposes the long thoracic nerve, which supplies the serratus anterior muscle (injury to which would lead to winging of the scapula). During this dissection, branches of the intercostobrachial nerve will be identified as they cross the axilla after emerging from the intercostal spaces. The larger trunks should be preserved if possible.
- Ligation and division of the smaller tributaries of the axillary vein as they enter the axilla allows visualization and identification of the subscapular vessels and thoracodorsal nerve as they reach the subscapular and latissimus dorsi muscles posteriorly.
- The axillary fat and nodal tissue between the long thoracic nerve and the subscapular vascular bundle is carefully dissected. Often, this is performed en bloc with the specimen, although it sometimes can occur separately if there is extensive nodal involvement.
- The dissection then proceeds towards the apex to include the nodes medial to the pectoralis minor (Berg level III). This is facilitated by flexion of the free draped arm at the shoulder.
- The axillary fat and nodes are finally separated from the axillary tail of the breast to allow the specimen to be excised.
- Careful pathological examination for an axillary dissection will often reveal in excess of 20 lymph nodes.
- The wound is closed in layers over a suction drain.
- The dissection then proceeds towards the apex to include the nodes medial to the pectoralis minor (Berg level III). This is facilitated by flexion of the free draped arm at the shoulder.
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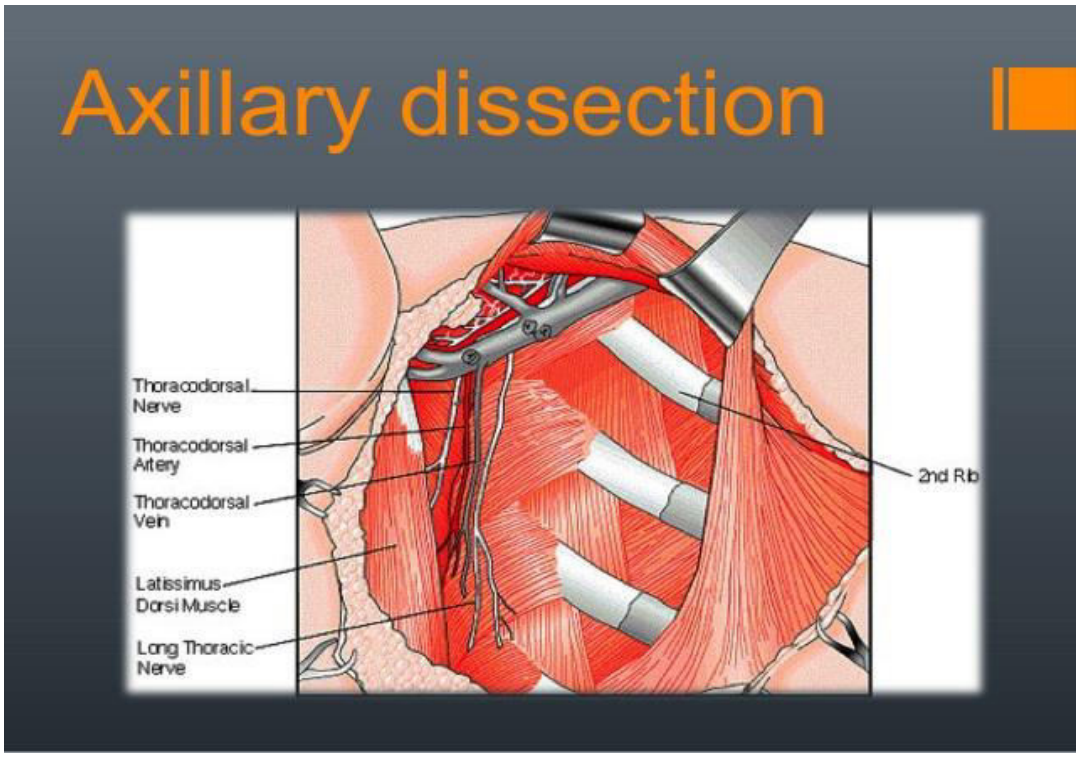


9. Describe the development and descent of testis.Discuss the medical and surgical management of undescended testis.

Answer. Testicular differentiation: The male gonad develops into the testis toward week 7 of development. Until then, it is undifferentiated. The differentiation is determined by the XY genetic constitution and proceeds as follows:

THE PRIMARY SEX CORDS, proliferating from the coelomic epithelium, condense and extend into the medulla of the gonad.

- In the medulla, the cords branch, their deep ends anastomose, and they form the *rete testis*
- The prominent sex cords become the *seminiferous or testicular cords* which soon lose their connections with the germinal epithelium because of the development of a thick fibrous capsule, the *tunica albuginea*
  I. The tunica albuginea is a layer of connective tissue which is interposed early, between the coelomic epithelium (parietal peritoneum) and the rest of the glan It produces partitions which compartmentalize the gland, closing off the seminiferous ducts, about day 50, into testes cords
  II. Development of the tunica albuginea is a characteristic and diagnostic feature of testicular development
- The seminiferous or testicular cords develop into the *seminiferous tubules*, whose deep portions narrow to form the *tubuli recti*, which converge on the rete testis
- The seminiferous tubules become separated by mesenchyme which gives rise to the *interstitial cells of Leydig*

I. It is here that the androgenic hormones are secreted which help in the differentiation of the genital tract and the external genital organs
II. The interstitial cells of Leydig reach their maximum development between 3 1/2 and 4 months

- The walls of the seminiferous tubules, as a result of their cellular duality of origin, are composed of 2 types of cells: *supporting or sustentacular cells of Sertoli*, derived from the germinal epithelium, and the *spermatogonia*, derived from the primordial germ cells (unlimited in number, in contrast to the oogonia)

I. The cells of Sertoli make up most of the seminiferous epithelium in the fetal testis

- Gradually, the enlarging testis separates from the regressing mesonephros and is suspended by its own mesentery, the *mesorchium*.

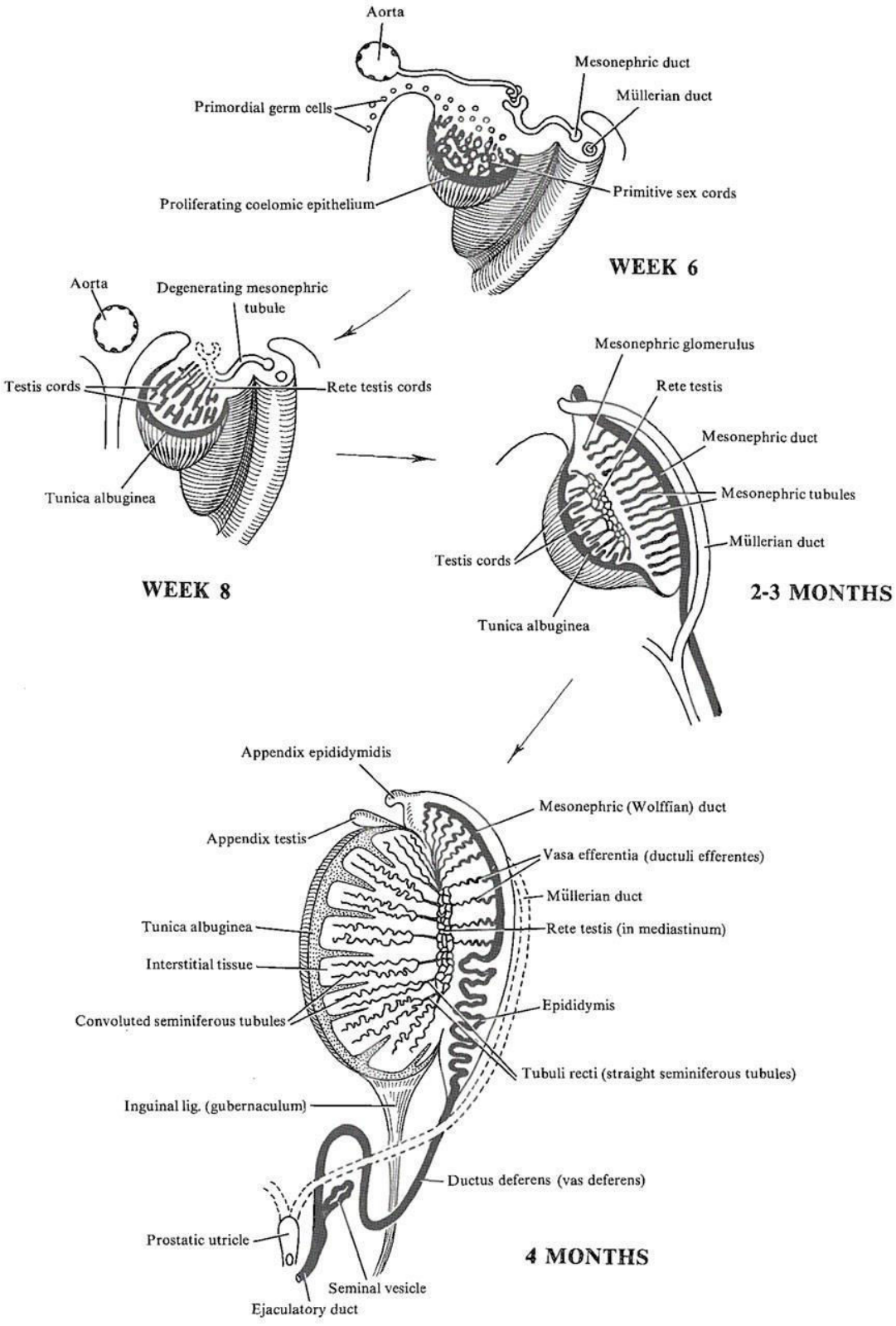
2. IN LATER DEVELOPMENT, THE GERMINAL EPITHELIUM flattens to form the mesothelium on the surface of the testis and the rete testis becomes continuous with the 15 to 20 adjacent persistent mesonephric tubules

- The persistent mesonephric tubules, after regression of the mesonephric (wolffian) body, participate in the formation of the excretory tracts of the testis, forming the *vasa efferentia or efferent ductules*
- The efferent ductules open into the adjacent mesonephric duct which becomes the *ductus epididymidis* (*epididymis*)
- Thus, the vasa efferentia and the epididymis are of mesonephric origin

Testicular Descent

The primitive gonad, destined to be a testis ,starts getting condensation of mesenchyme at its caudal end (gubernaculums) at 8th week. The gubernaculum attaches caudal epididymis through the inguinal canal to the scrotum. Gubernaculum gets hollowed out by the development of out pouching of the peritoneum, the processusvaginalis.

The initial migration of the future gonad from its lumbar position to internal inguinal ring 12th week is through to result from rapid growth of lumbar somatic segments (Trans abdominal migration). For 3-7 fetal months, testis remains in this position. A sudden swelling of gubernaculums and elongation of processusvaginalis heralds the trans-inguinal migration of testis. Gubernaculums migration precedes testicular descent which is complete by 35 week. With rapid elongation and descent of epididymis and degeneration of gubernaculums (probably due to enzymatic digestion), testis finally rests in the scrotum. The degeneration of gubernaculums is under the control of androgens.


Aorta
Mesonephric duct
Müllerian duct
Primordial germ cells
Primitive sex cords
Proliferating coelomic epithelium
WEEK 6
Aorta
Degenerating mesonephric tubule
Testis cords
Rete testis cords
Tunica albuginea
WEEK 8
Mesonephric glomerulus
Rete testis
Mesonephric duct
Mesonephric tubules
Müllerian duct
Testis cords
Tunica albuginea
2-3 MONTHS
Appendix epididymidis
Mesonephric (Wolffian) duct
Appendix testis
Vasa efferentia (ductuli efferentes)
Müllerian duct
Tunica albuginea
Rete testis (in mediastinum)
Interstitial tissue
Epididymis
Convoluted seminiferous tubules
Tubuli recti (straight seminiferous tubules)
Inguinal lig. (gubernaculum)
Ductus deferens (vas deferens)
Prostatic utricle
4 MONTHS
Seminal vesicle
Ejaculatory duct

Various theories have been propounded for explaining the phenomenon of testicular descent:

1. Traction by gubernaculums and/or cremaster muscle
2. Force of abdominal pressure
3. Hormonal theory

a. Role of Androgens by action on gubernaculum
b. Estrogens may hinder testicular descent
c. Mullerian inhibiting substance (MIS) –facilitate testicular descent by causing regression of mullerian structures
d. Calcitonin gene related peptide

4. Role of nerves e.g. genitofemoral nerve.

TREATMENT

The aim of the treatment is to fix the result in scrotum. This is done to take care of the potential complications of UDT that are, testicular torsion, risk of trauma and testicular tumors. It is hoped that endocrine and germ cell functions of such a testis will show improvement, especially is orchidopexy is done early.

Treatment options

a) Hormonal treatment
b) Surgical treatment.

Hormonal Treatment

- The basis of hormonal therapy is that the deficiency of hormones of hypothalamic – pituitary-testicular axis prevents testicular descent and is responsible for malfunction of such testes
- Direct androgen therapy was associated with many side effects (precocious puberty, stunted growth) and is replaced by HCG and LH-RH (LH releasing hormone) therapy
- It is now realized that these hormonal therapies are hardly useful in promoting descent of truly undescended testis; while acquired variants of undescended testis (retractile testis, ascending testis) respond fairly well to this treatment. Overall success rate ranges between 10-50%. Success of hormonal therapy is directly related to age and inversely related to position of the testis. Hormone therapy seems to be more effective in olderchildren (aged >5 years), in boys with bilateral pathology, and in those with retractile testes
- It is hypothesized that hormone therapy improves fertility by enhancing germ-cell maturation and increasing germ-cell number. Hormone therapy might, therefore, be indicated preoperatively, but only in the case of bilateral non palpable testes
- Hormonal therapy should not be used for the patients with inguinal hernia, ectopic testis, those with an obstructive cause of testicular maldescent or those with previous surgery.
- There can be a subsequent retraction of testis descended with hormonal therapy in upto 20% patients.

HCG therapy dosages *International health Foundation, 1974* (Job,1982)	250 IU / dose - young infants 500 IU/ dose - up till 6years 1000 IU/ dose -older children. HCG is administered in 2 doses per week for 5 weeks 1500 IU/m2 as nine injections
LHRH (intranasal)therapy	100 mg intranasally in each nostril 6 times a day for 3-4 weeks
Combined therapy	400 ug of LHRH as nasal spray three times daily for 4 weeks followed by HCG 1500U/week for 3 weeks

The side effects of hormonal treatment include increased scrotal rugosities and pigmentation, premature epiphyseal closure. Growth retardation, penile/ pubic hair growth and higher doses can make testis refractory to hormonal stimulation.

Surgical treatment

Standard orchidopexy is generally done for unilateral UDT and requires standard inguinal incision, with lateral extension if necessary. Indirect hernia sac is present in most patients with UDT and requires to be separated from the cord structures in order to achieve their mobilization. Extensive retroperitoneal dissection requires to be performed in some patients, including division of retroperitoneal bands (Browne's bands) and reaching upto the kidneys, in an endeavour to get testis to scrotum. The testis is then routed through the external ring and fixed in the scrotum. Whereas some surgeons would like to take a fixing suture from tunicavaginalis to the lowermost scrotal dartos, there are others who like to accomodate the testis in the extradartos pouch (Lattimer) technique. If the testis is not found within the inguinal canal, the internal inguinal ring is immediately opened. Many a times, a ' peeping testis' can be made more prominent by applying abdominal pressure superior to the incion. If the testis is in a high abdominal position or near the bladder, the inguinal approach may not provide a sufficiently ample view of the abdominal cavity to correctly localize the testis and one needs to enter peritoneal cavity for a better surety. This approach is mandatory when on inguinal exploration, testis is not found but a patent processes vaginalis is present.

The testicular blood supply should be preserved whenever possible. Though main blood supply of testis from testicular vessel, a direct branch of aorta, additional supply is derived from multiple anastomoses between vasal artery (branch of inferior vesical artery) and cremasteric artery (branch of inferior epigastric artery); most of which are present within 3- 4 cm from testicular poles. Therefore, despite the extensive mobilization of cord structures, the testis manages toi survive. At about 4 cm above the superior pole of testis the testiculararteryd divides into two main branches and these anatomic consideration are important while contemplating staged orchidopexy involving testicular vessel division.

If the testicular vessels are too short, a two-stage orchidopexy without sectioning the vessels, is recommended and involves mobilizing the abdominal testis and fixing it as low as

possible (e.g. at the pubic tubercle or inguinal ligament). In such patients, few surgeons prefer to wrap testis in an inert bag in order to prevent multiple adhesions with surrounding tissues and prevent possible injury to the reproductive tract at the second stage. The second stage is done 6–12 months later. In a few patients, straightening the course of the cord may achieve successful scrotal position of testis (by making new internal inguinal ring medial to inferior epigastric vessels).

Orchidopexy involving division of testicular vessels (Fowler–Stephens procedure): Fowler–Stephens orchidopexy is used in boys with intra-abdominal testis in whom the testicular artery and veins are too short to allow the testis to reach the scrotum with a standard orchidopexy. Generally, these are the patients where the testis is located more than 3 cm from the ipsilateral internal inguinal ring. The Fowler–Stephens technique involves clipping and transecting the testicular vessels and can be done as one stage or two staged open or laparoscopic procedure. As has been stated earlier, the collateral arterial flow through the deferential (vasal) artery to allow the testis to survive. When this technique is performed as a single-stage procedure, the spermatic vessels are isolated, ligated (or clipped) and sectioned at least 3–4 cm away from the testis, allowing the testis to be placed in the scrotum without tension. The main disadvantage of this single-stage procedure is that the deferential artery might be so small that, if it goes into vasospasm, testis atrophy is very probable. One prerequisite for this procedure is that the vas should be long enough to allow reposition of testis in the scrotum. Another essential point is that decision for Fowler Stephens procedure in open orchidopexy has to be taken fairly early so as to minimally disturb the collateral supply to the testis. This entails minimal or no dissection within the spermatic cord structures and even preserving the peritoneal tongue. Therefore, most pediatric surgeons prefer staging this procedure. During the first step, the spermatic vessels are clipped 3–4 cm proximally to the testis. The second step of the Fowler–Stephens procedure is done 3–6 months later. This interval is necessary for the improvement of the collateral circulation derived from deferential vessels. Both steps can be done as a laparoscopic procedure. During the second step, spermatic vessels are divided between the clips and the testis is brought down into the scrotum.

Bianchi technique: This technique employs surgical treatment of palpable and ascending or low lying testis in young children. Transverse incision is made at scrotal neck, tunica vaginalis is exposed and delivered through wound (under tension). Attachments spermatic cord are divided and residual fibrous strand of obliterated processusvaginalis is identified and divided to release vas and vessels so that adequate length is achieved to get testis to scrotal base. In young children the hernia sac can be tackled through the same incision as inguinal canal in them is very short. The cosmesis is excellent.

Laparoscopic-assisted orchidopexy: Laparoscopic-assisted orchidopexy preserves the spermatic vessels and the technique consists essentially of dividing the gubernacular attachment and mobilizing the testicular vessels and the vas deferens from the posterior peritoneum by a distance so that the testis can be brought down into the scrotum. One simple test to dictate the success of laparoscopic orchidopexy is that the mobilized testis with its pedicle can easily reach the internal inguinal ring of the opposite side. At occasion, a neoinguinal ring is created medially to the inferior epigastric vessels and the obliterated

umbilical artery, especially when there is a short cord (Prentiss maneuver).
Microvascularorchidopexy: Silber and Kelly's introduced microsurgical testicular autotransplantation technique in which microscopic vascular anastomosis of the testicular artery and vein to the inferior epigastric vessels is done whenever testicular vessels and the vas is too short for successful orchidopexy. However, the popularity of this technique was limited due to the long duration of the operation and the need for microsurgical skill and special instrumentation. In experienced hands, microvascularorchiopexy has a success rate of about 80%
Orchiectomy: If the surgeon finds a hypotrophic or atrophic intra-abdominal testis during inguinal or laparoscopic exploration, the best therapeutic choice is to perform a laparoscopic orchiectomy; specially when there is a normal contralateral descended testis. This is to obviate the need for continued surveillance of testicular remnants that can undergo malignant change over the time. Laparoscopic orchidectomy involves separation of the spermatic from the posterior peritoneum, and then cauterization /ligation followed by their division.
For the cosmetic reason the empty scrotal sac can be given testicular implants, appropriate for the age, in the subsequent surgery.
Surgical management of bilateral intra-abdominal testis: The principle of surgical management generally remains the same, except that pre-operative karyotyping and hormonal work-up is necessary to confirm the presence or absence of testicular tissue and rule out intersex disorder. Bilateral orchidopexy is generally preferred in the same sitting though few may like to stage the procedure. When no testicular structures are evident on laparoscopy, the patient should be referred to a pediatric endocrinologist for hormone replacement therapy.

10. Current concept in the management of different types of thyroid carcinoma.

Answer. Investigations:
TSH and FT3, FT4.
High Resolution Ultrasound: Halo sign, commet tail sign, and type 3 intranodular vascularity of malignancy are helpful. Involvement of trachea, vessels, strap muscles can be made out.
Fine Needle Aspiration Cytology: Cellular diagnosis of DTC is now feasible; ultrastructural study and histo/histocytochemistry are a great help.
Trucut Biopsy: Selected indication is in inoperable cases to plan out management. Also to differentiate lymphoma from anaplastic carcinoma.
Monoclonal antibodies for lymphoma: This can differentiate anaplastic carcinoma from lymphoma.
Imprint smear: Better interpretation than FNAC/ Frozen section.
CT/MRI: Specific indication is to know extent of tumour spread and local tissue plane infiltration.
Scintiscan: Presently limited use. Cold nodule classically in malignancy. Still helpful in solitary nodule thyroid.
Tumor markers: Very significant is TGB which if done before and after management helps in follow up and can indicate recurrence/ mets. CEA, CD-34, MVD, p 53 protein have also correlation.
X-ray Chest and X-ray of bone met site: Demonstrates local secondary deposit.
Ultrasound Liver: Done to detect liver metastases wherever suspected.

Skeletal survey: Done by radionuclide scan (Gamma camera) wherever indicated can alter the clinical staging of the disease.

MACIS score:

MACIS: Score = 3.1 (if age <40 years) or 0.08 × age (if age ≥40 yrs)
+ 0.3 × tumor size (cm maximum diameter)
+ 1 (if incompletely resected)
+ 1 (if locally invasive)
+ 3 (if distant spread)

Survival by MACIS score (20-yr):
<6 = 99%
6-6.99 = 89%
7-7.99 = 56%
≥8 = 24%

AGES: Prognostic score = 0.05 × age (if age ≥40)
+ 1 (if grade 2)
+ 3 (if grade 3 or 4)
+ 1 (if extrathyroid)
+ 3 (if distant spread)
+ 0.2 × tumor size (cm maximum diameter)

Survival by AGES score (20-yr):
≤3.99 = 99%
4-4.99 = 80%
5-5.99 = 67%
≥6 = 13%

AMES

Low risk: Younger patients (men ≤40, women ≤50) with no metastases

Older patients (intrathyroid papillary, minor capsular invasion for follicular lesions)

Primary cancers <5 cm

No distant metastases

High risk: All patients with distant metastases

Extrathyroid papillary, major capsular invasion follicular

Primary cancers ≥5 cm in older patients (men >40, women >50)

Survival by AMES risk-groups (20-yr):

Low risk = 99%

High risk = 61%

Treatment: Low-Versus High-Risk Criteria in Papillary Thyroid Cancer

Low risk	High risk
1. Women < 50 years 2. Men < 40 years 3. Well-or moderately differentiated tumors 4. Tumor< 4 cm in diameter 5. Tumor confined to the thyroid gland 6. No distant metastases	1. Women ≥ 50 yr 2. Men ≥ 40 yr 3. Poorly differentiated tumors, tall-cell, columnar cell, or oxyphilic variants. 4. Tumor ≥ 4 cm in diameter 5. Local invasion 6. Distant metastases

Surgical treatment:

- A lobectomy and isthmusectomy is satisfactory for papillary cancers less than 1.0 cm in size without lymphatic or systemic metastases.
- Lobectomy with isthmusectomy - for patients with papillary cancers that are greater than 1.0 cm when patients are categorized as low risk for recurrence or mortality.
- Total thyroidectomy is uniformly accepted for treatment of high-risk papillary carcinoma.
- In addition, patients with a history of head and neck irradiation should undergo total thyroidectomy due to the high incidence of carcinoma at sites other than the nodule and their increased lifetime risk of developing thyroid cancer in the remaining thyroid gland.

Role of post operative remnant ablation:

Indications:

• Stage III and IV disease

• All patients with stage II disease younger than age 45 years

• Most patients with stage II disease 45 years or older

• Selected patients with stage I disease - especially those with multifocal disease, nodal metastases, extra-thyroidal or vascular invasion, and/or more aggressive histologies.

Protocol of thyroid hormone withdrawal for remnant ablation

Aim: Achieve TSH of more than 30 mU/L

- Single-dose exogenous rTSH results in TSH levels between 51–82 mU/L
- Endogenous TSH elevation can be achieved by
  - Stopping levothyroxine (LT4) and switching to levo-triiodothyronine (LT3) for 2–4 weeks followed by withdrawal of triiodothyronine (T3) for 2 weeks
  - Discontinuation of LT4 for 3 weeks without use of T3
  - rTSH stimulation can be used for remnant ablation.

Role of post operative diagnostic RAIU scan:

• Indication:
– When the extent of thyroid remnant cannot be assessed from the surgical report/ USG
– If the result is likely to alter the subsequent management
– If the result is likely to alter the dose of RAI treatment
• If used, low dose I 131 (1-3mCi)/ I123 scan recommended
– Low iodine diet (50microgram/day for 1-2 weeks) is recommended prior to scan
• Post therapy scan:
  - Detects additional foci in 10-26% cases, alters the stage in 10%
  - Done 1 week post radio-iodine therapy.

Role of TSH suppression therapy:

Mechanism of action:
  - Decreases the expression of thyroid specific proteins
  - Decreases the rate of cell growth
- High risk pts:
  - Keep TSH < 0.1mIU/L
  - After remission continue suppressive therapy x 3-5 yrs
- Low risk patients
  - TSH= 0.1-0.5 mIU/L
  - After remission keep it between 0.5-1mIU/mL

There is no role for routine adjunctive chemotherapy.

Surgery for Follicular Carcinoma:

- From clinicopathological stand point these carcinomas are divided into low risk and high risk.
- Three important risk factors viz vascular invasion, metastases and age greater than 45 years.
- The result of cytological and frozen section histology in this tumour is high in accuracy of both in interpretation.

- In low risk patient with intrathyroidal (non invasive) lesion less than 2.5 cm in size (determined on scan) a hemithyroidectomy with isthumusectomy suffices.
- Completion thyroidectomy is indicated if histology reveals a more invasive form of carcinoma postoperatively.
- In all other follicular carcinoma, a total or near total thyroidectomy is indicated.
  This is recommended in presence of even metastases (the incidence of which is fairly high with this carcinoma) as it facilitates adjuvant treatment with I -131.
- If nodes are involved, ipsilateral functional block dissection with central compartment clearance is to be undertaken.

Hürthle Cell Tumors:

- Hürthle cell, though modified follicular cell is now considered a separate tumor altogether, contrary to earlier belief, majority HCN are benign.
- Capsular and vascular invasion on histology and metastases clinically characterize malignant HCN.
- There is an indeterminate form also. The potential incidence of indeterminate forms creates controversy regarding extent of surgery.
- The undisputed benign forms are best treated by hemithyroidectomy.
- For ―aggressive‖ benign type, indeterminate type and frankly malignant HCN, a total or near thyroidectomy is the standard.
- If malignancy is found on post operative histology in a pre operative diagnosed benign lesion, a completion thyroidectomy is then indicated.
- The approach to lymph nodes is same as in follicular carcinoma; if nodes are involved, ipsilateral functional block dissection with central compartment clearance is to be undertaken.

Medullary carcinoma thyroid:

- All patients should receive total thyroidectomy, a complete central neck dissection (removal of all lymph nodes and fatty tissues in the central area of the neck), and removal of all lymph nodes and surrounding fatty tissues within the side of the neck which harbored the tumor.
- Radioactive iodine therapy is not useful.
- Prophylactic thyroidectomy recommended before the age of 5 years in Patients with familial medullary carcinoma , MENIIa, and IIB.

Anaplastic carcinoma thyroid:

Patients tend to present late. Compressive symptoms of neighouring structures can be common.

- CT - Useful for assessment of tumour invasion as well as metastatic burden. Lymph node +/- metastatic involvement is generally common at time of CT assessment . Typically seen as a highly infiltrative lesion about the thyroid gland
- Nuclear imaging - radioiodine: usually has no uptake

External irradiation or chemotherapy may provide limited palliation.

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2020

March, 2020

PAPER IV

Time Allowed: 3 Hours **Full Marks: 100**

Attempt all questions

1. **Define "metabolic surgery". What are the types of metabolic surgery? Discuss the risk associated with "metabolic surgery" procedure. 3+4+3**
2. **Describe colorectal Liver Metastasis management protocol. 10**
3. **Briefly describe management of Bile duct injury. 10**
4. **What are recent guidelines for management of thyroid nodule. 10**
5. **What is VATS? Briefly point out the indications and complications of VATS. 2+4+4**
6. **a) Discuss the role of intraperitoneal therapy and molecular therapy in the adjuvant treatment of resectable gastric cancer. 3+3+4**
   b) What is the role of neoadjuvant Tyrosine kinase Receptor Inhibitor therapy of GIST?
7. **Describe present day approach for creation and care of intestinal stoma. 10**
8. **Mention the controversies regarding the management of Primary lesion in presence of distant metastasis in breast cancer. 10**
9. **Discuss the energy devices in operation theatre. Mention the principles of safe use of electrosurgery. 3+2+5**
10. **Mention the endovascular approaches of Arteriovenous fistula. 10**

Answers.

1. **Metabolic surgery refers to variety of surgical procedures that are performed to control metabolic disorders like diabetes and obesity.**

Bariatric surgery is specifically aimed at people with a body mass index of more than 40.

Types of Metabolic Surgery
Restrictive
Vertical banded gastroplasty (VBG) (historic purposes only)
Laparoscopic adjustable gastric banding (LAGB)
Largely Restrictive/Mildly Malabsorptive
Roux-en-Y gastric bypass (RYGB)
Largely Malabsorptive/Mildly Restrictive
Biliopancreatic diversion (BPD)

Duodenal switch (DS) **Other procedures:** **Endoluminal sleeve** **Jejunoileal bypass**

Risk associated with metabolic surgery:

- **Dumping syndrome**
- **Low blood sugar**
- **Malnutrition**
- **Vomiting**
- **Ulcers**
- **Bowel obstruction**
- **Hernias**

Preoperative assessment before metabolic surgery:

Gastro-Intestinal Evaluation:	**Birth control counseling**	**Cardiac Risk assessment**	**Pulmonary Evaluation**	**Endocrine Evaluation**
○ **Endoscopy.** ○ **Ulcers (Helicobacter pylori).** ○ **Esophageal Disorders.** ○ **Irritable Bowel Syndrome.** ○ **Crohn's Disease.**	○ **Absence of pregnancy.** ○ **Birth control.** ○ **Risky pregnancy in the early post-op. period (1-2 years).** ○ **Weight loss may improve fertility.**	○ **Stress Testing** ○ **Echocardiogram** ○ **Medication adjustment** ○ **Cardiac Clearance**	○ **Obstructive Sleep Apnea (testing and treatment).** ○ **Asthma.** ○ **Smokers.**	○ **Diabetes Management.** ○ **Diabetes Education.** ○ **Thyroid disease.**

2. **Introduction : The most common malignant tumors of the liver are metastatic lesions. The liver is a common site of metastases from gastrointestinal tumors presumably because of dissemination through the portal venous system. The most relevant metastatic tumor of the liver to the surgeon is colorectal cancer because of the well-documented potential for long-term survival after complete resection.**

Guidelines:

- **General:**
  - **Patients under consideration of treatment of hepatic metastases should be discussed at a multidisciplinary meeting which has experience in the management of liver metastases.**
  - **A hepatobiliary multidisciplinary team (MDT) which carries out liver resection should be based in a cancer centre serving a population of at least two million. When two or three networks cooperate to**

create a single joint team, there should be explicit arrangements for referral between networks. (Category of evidence II ; strength of recommendation B)

- **Consideration of patients for resection of liver metastases should be carried out at a single high volume centre. (Category of evidence II; strength of recommendation B)**

- **At time of presentation of primary colorectal cancer:**

  - **Patients with primary colorectal cancer should have a computed tomography (CT) scan of the abdomen and pelvis performed with intravenous contrast and ideally a maximum collimation of 5 mm. This should be performed preoperatively or, in the case of an emergency, as soon as practical thereafter. (Category of evidence II; strength of recommendation B)**
  - **A chest CT is ideal to assess the presence of pulmonary metastases but a chest xray is considered satisfactory. (Category of evidence III; strength of recommendation C)**
  - **The whole of the colon should be visualised to ensure a "clean colon". (Category of evidence II; strength of recommendation B)**
  - **A baseline measurement of carcinoembryonic antigen (CEA) should be performed. (Category of evidence III; strength of recommendation C)**

- **Following curative resection of primary colorectal cancer:**

- **Following treatment of the primary disease, some patients will prove to be unfit or unwilling to have further treatment and in such cases follow up is inappropriate.**
- **Other patients will prove to have metastatic disease at presentation. Some of these will have isolated liver metastases and should be managed as described in these guidelines.**
- **Patients undergoing R0 colorectal resection may be candidates for adjuvant chemotherapy and a further abdominal contrast enhanced CT (or magnetic resonance imaging (MRI)) should be performed following completion of chemotherapy. (Category of evidence III; Strength of recommendation C)**
- **Where possible patients over the age of 50 years should be considered for randomisation to the FACS trial, the UK NCRN trial of follow up strategies.**
- **If the patient is ineligible for trial inclusion, does not wish to participate in the randomised trial, or if the unit is not recruiting to the trial, the following follow up schedule is appropriate:**
  - **i. CT scan of the abdomen and pelvis should be undertaken as a minimum in the two years following completion of treatment of the primary disease. (Category of evidence III; strength of recommendation C)**
  - **ii. Colonoscopy repeated after five years.**
  - **iii. The case for routine serial CEA measurements is unproven. (Category of evidence III; strength of recommendation C)**

- **Further staging investigation to detect extrahepatic involvement in patients with colorectal liver metastases:**

- **For a patient discovered to have isolated liver metastases, CT of the chest, abdomen, and pelvis should be performed by the liver surgery unit or using protocols agreed with that unit. The liver surgery centre will also often perform liver specific imaging by local protocol.**
- **Biopsy of hepatic lesions should not be performed without discussion with the regional hepatobiliary unit. (Category of evidence III; strength of recommendation C)**
- **Patients with "high risk" primary disease (T4 (perforated); C2 (apical node)) should have careful preoperative investigations that might include positron emission tomography (PET) and laparoscopy. (Category of evidence III; strength of recommendation C).**

Management of colorectal liver metastasis:

- **The liver is the most common site of metastases for tumor sites that drain initially via the portal circulation. Metastatic liver disease is found in 10% to 25% of patients having surgery for primary colorectal cancer. If hepatic interrogation is specifically pursued with computed tomography (CT) and intraoperative ultrasonography, the incidence appears to be close to 35% in patients with otherwise curable primary disease.**
- **It is important to acknowledge that not all hepatic lesions in a patient with a history of colorectal cancer are metastatic disease, although a majority are. Many other mass lesions are known to occur with some frequency, and it is important to rule these out.**
- **The ability to distinguish between these disorders and colorectal metastases relies on an adequate history of the patient, laboratory studies, and imaging studies. This combination allows accurate preoperative diagnosis in most patients. Preoperative biopsy is rarely necessary in patients with resectable disease.**
- **As the chemotherapeutic regimens in the adjuvant and metastatic settings currently differ, patients who are not candidates for resection usually require a tissue diagnosis or definitive imaging before beginning chemotherapy.**
- **In this setting, percutaneous biopsy may be appropriate. The presence of a new mass lesion, increasing levels of carcinoembryonic antigen (CEA), and a history of colorectal cancer should provide enough evidence of disease to justify treatment. Biopsy carries risk for tumor dissemination (which should be enough to discourage unwarranted biopsies) as well as minor risks for bleeding and pneumothorax.**
- **Goals for management of metastatic colorectal cancer are to provide the patient with an optimum quality of live for the longest duration possible. Resection of hepatic metastases is now associated with long-term survival and low mortality such that patients who would have been denied surgical treatment in previous eras are now routinely offered locally aggressive treatment options.**

Presentation and diagnosis:

- **Presentation of liver metastases may be either synchronous or metachronous. Synchronous disease, commonly defined as liver metastasis occurring within 12 months of the colon or rectal primary, represents 13% to 25% of newly diagnosed colorectal liver metastases.**
- **Disease is found primarily on preoperative imaging or intraoperative exploration. In these patients, the original presentation is often related to the primary neoplasm, whereas liver metastases are incidental findings.**
- **Common presenting symptoms generally include fever, fatigue, weight loss, and anorexia. Patients may also describe a sense of abdominal fullness or even upper abdominal and right flank pain.**
- **Physical examination may reveal a palpable liver mass or hepatomegaly, jaundice, and ascites. More commonly, the physical examination is unremarkable.**
- **The optimal timing for synchronous liver metastases is controversial. Although a staged approach with initial resection of the primary lesion followed by hepatic resection 3 months later has been practiced, an increasing number of hepatic surgeons are utilizing a simultaneous, collaborative approach with the colorectal surgeon during the initial operation.**
  - **Metachronous disease develops in 20% to 25% of patients.**
  - **The presentation of metachronous hepatic metastases varies according to the method by which they are detected. In unscreened populations, hepatic metastases can be detected only if the patient is having symptoms referable to the metastatic process.**
  - **Other more commonly used methods of early detection in patients who previously had curative treatment for primary colorectal cancer include serial serum CEA determination and serial surveillance with cross-sectional imaging and/or ultrasonography.**
  - **Presently, most metachronous presentations are not amenable to resection because of the late presentation or detection. Thus, dedicated, systematic follow-up for patients with a resected colorectal primary would lead to identification of patients who would benefit from hepatic resection.**

- **Diagnostic tests for hepatic colorectal metastases include serum CEA levels, CT, magnetic resonance imaging (MRI), positron emission tomography (PET), ultrasonography, and laparoscopy.**
- **CEA level has a sensitivity of ~75% and a specificity of 90% to 95% in detecting hepatic recurrence. CEA levels also have prognostic significance in patients undergoing evaluation for hepatic metastasectomy.**
- **Patients with a preoperative CEA level less than 200 ng/mL had a median survival of 38 months, and those with a level greater than 200 ng/mL had a median survival of 24 months.**
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- **Patients with a preoperative CEA level less than 200 ng/mL had a median survival of 38 months, and those with a level greater than 200 ng/mL had a median survival of 24 months.**
- **PET is an appropriate second test in patients with increasing levels of CEA and no clear abnormalities on CT of the chest, abdomen, or pelvis. Combined CT-PET devices have also been developed that provide both physiologic and anatomical detail in the same setting.**
- **The most important use of ultrasonography is during surgery. Intraoperative ultrasonography can detect occult colorectal metastases not seen on CT or transabdominal ultrasonography and has an overall sensitivity of 96%.**
- **Intraoperative ultrasonography is also useful in demonstrating segmental hepatic anatomy. This is particularly important when the tumor is in proximity to the inflow or outflow vessels. The value of intraoperative ultrasonography is operator dependent but in well-trained hands has been shown to alter the preoperative surgical plan in nearly 20% of patients.**
- **Diagnostic laparoscopy is useful prior to planned hepatic resection for colorectal metastases. It can aid in identifying lesions that may have been missed on preoperative cross-sectional imaging studies. Performance of laparoscopy does add time, expense, and its unique morbidities and has, therefore, not been universally practiced. A clinical risk score (CRS) has been described to clarify the role of pre-resectional laparoscopy yield.**

Treatment:

- **Systemic chemotherapy:**
  - **With ~80% of patients with colorectal hepatic metastases presenting with nonresectable disease, systemic chemotherapy represents the main if not the only form of therapy for many patients. Chemotherapy may also play a role in transforming a portion of patients with unresectable disease into resection candidates.**
  - **Systemic agents have been introduced that may elicit a better response than standard 5-fluorouracil (FU)-leucovorin (LV)–based treatment for advanced disease. Irinotecan (IR) and oxaliplatin (OX) combined with FU-LV appear to have a higher response rate than FU-LV alone.**
  - **IR has also been shown to facilitate resectability in patients initially deemed unresectable.**
  - **Addition of the monoclonal antibody against vascular endothelial growth factor, bevacizumab, to the combination chemotherapy has been shown to improve survival significantly.**
  - **The success of the modern chemotherapeutic agents for metastatic colorectal cancer is creating new opportunities for long-term survival in nonresectable patients. The application of neoadjuvant therapy for resectable disease also warrants investigation in clinical trials.**
- **Operative management:**
  - **Hepatic resection is currently the most effective form of therapy for colorectal metastases confined to the liver. It is important to have a definition of resectability to maintain a standard for evaluation. Resectability is defined as complete gross resection while retaining a sufficient liver remnant with intact biliary drainage and vasculature.**

- **With nearly 80% of hepatic parenchyma being safe to remove, hepatic resection should be considered in many patients. It is equally important to identify patients who have conditions and/or factors that would preclude a resectional strategy.**
- **Accepted contraindications to metastasectomy include poor overall health, inadequate liver reserve, inability to achieve margin-negative resection, and the presence of extrahepatic disease.**
- **Anatomic or segmental resections are currently favored over large wedge resections, although there are currently scant data on this subject. The oncologic principle of getting an adequate negative margin should be applied. Anatomic resections offer the best chance for achieving negative margins while maintaining maximum liver parenchyma.**
- **The resection margin is also critical in trying to achieve a cure. A positive histologic margin has been shown to be associated with poor long-term survival. The optimal surgical margin width, however, remains debatable. There have been no definitive studies showing that 1 cm or greater is favorable to a grossly negative margin. Thus, the importance of achieving a negative margin favors anatomic resections over wedge resections. It is likely, however, that a wedge resection is oncologically equivalent in the event that a negative margin can be reliably obtained.**
- **The success of resection of hepatic colorectal metastases has resulted in looking for ways to extend resectability. One technique is through preoperative portal vein embolization. The procedure is based on the physiologic phenomenon of liver atrophy of the embolized lobe and liver hypertrophy of the contralateral lobe. This augments the volume of the remaining liver and allows safe large-volume resectional strategies. The portal vein is usually reached through a percutaneous transhepatic route under ultrasound and fluoroscopic guidance.**

- **Ablative options:**
  - **Ablative therapies are also available for patients with unresectable disease who do not have apparent extrahepatic metastases. Patients with inadequate hepatic reserve despite technically resectable lesions are also candidates. Local ablative techniques such as radiofrequency ablation (RFA) and cryoablation treat tumors in situ, effecting tumor killing by thermal mechanisms.**

    - **RFA can be employed through percutaneous, laparoscopic, thoracoscopic, and open procedures.**
    - **Size and location of the tumor dictate choice of treatment. Ultrasound guidance facilitates accurate and safe probe placement.**
    - **Small lesions (< 3 cm) located on the periphery are best suited for percutaneous approach.**
    - **The laparoscopic approach with intraoperative ultrasonography has higher accuracy for detecting hepatic lesions than transcutaneous ultrasonography and is safer for mobilizing and ablating tumors that are close to or in contact with surrounding organs.**
    - **A thoracoscopic approach is useful for tumors situated on the dome of the liver that are difficult to reach percutaneously or laparoscopically.**
    - **When a question of efficacy or safety arises, an open approach should be used.**
  - **Portal vein embolisation: Portal vein embolization (PVE) is another modality used preoperatively for patients where the extent of liver resection is expected to result in less than the optimal functional liver volume of 25% to 40%, necessary to prevent postoperative liver failure**
  - **Hepatic arterial infusion:**
    - **The use of hepatic arterial infusion pump (HAIP) placement and administration of chemotherapy is based on the observation that hepatic tumors derive their blood supply primarily from the hepatic artery, in contrast to normal hepatic parenchyma, which is principally supplied by the portal vein. Therefore, infusion of chemotherapeutic agents through the hepatic arterial circulation should lead to high concentrations of the agents within tumor cells while sparing the normal hepatic parenchyma.**
    - **In addition, several agents are efficiently extracted within the liver such that systemic concentrations and concomitant toxicities are further reduced. Fluorodeoxyuridine is the most**

common agent administered by the intra-arterial route, although FU-LV has also been delivered in this fashion.

3. **Most benign strictures follow iatrogenic bile duct injury, most commonly during laparoscopic cholecystectomy. Most injuries are recognized intraoperatively or during the early postoperative period, and with appropriate management, the long-term results are acceptable. Long-term sequelae of unrecognized or inappropriately managed biliary strictures may lead to recurrent cholangitis, secondary biliary cirrhosis, and portal hypertension.**

Pathogenesis: A number of factors may be involved in the occurrence of bile duct injuries during laparoscopic cholecystectomy.

These include:

- **Acute or chronic inflammation, obesity, anatomic variations, and bleeding.**
- **Surgical technique with inadequate exposure and failure to identify structures before ligating or dividing them are the most common cause of significant biliary injury.**
- **The bile duct injury rate is increased in patients with complications of gallstones, including acute cholecystitis, pancreatitis, cholangitis, and obstructive jaundice.**
- **Surgeon training and experience were recognized as factors in early reports of laparoscopic bile duct injuries. As surgeon experience increases beyond 20 cases, the bile duct injury rate decreases.**
- **Aberrant biliary anatomy is often cited as a factor in biliary injuries. The bile duct may be narrow and can be mistaken for the cystic duct. The cystic duct may travel parallel to the common bile duct before joining it, misleading the surgeon to the wrong place. Also, the cystic duct may enter the right hepatic duct, and the right hepatic duct may run aberrantly, coursing through the triangle of Calot and entering the common hepatic duct.**
- **A number of other technical factors have been implicated in biliary injuries. The classic injury occurs when excessive cephalad retraction of the gallbladder may align the cystic duct with the common bile duct, allowing the latter to be mistaken for the cystic duct. Careless use of electrocautery may lead to thermal injury. Dissection deep into the liver parenchyma may cause injury to intrahepatic ducts, and poor clip placement close to the hilar area or to structures not well visualized can result in a clip across the bile duct.**

Presentation: Patients with bile duct injuries can present intraoperatively, in the early postoperative period, or months or years after the initial injury. About 25% of major ductal injuries are recognized intraoperatively because of bile leakage, an abnormal cholangiogram, or late recognition of the anatomy. The most common presentation of a complete occlusion of the common hepatic or bile duct is jaundice with or without abdominal pain. Patients may also present months or years after prior surgery with cholangitis or cirrhosis secondary to a biliary tract injury.

Diagnosis and Management

- **The management of bile duct injury is dependent on the timing of diagnosis and extent and level of injury. Inappropriate management of biliary strictures may result in significant morbidity.**
- **Isolated, small, non–cautery-based partial lateral bile duct injury recognized at time of cholecystectomy can be managed with placement of a T tube. The T tube can be placed at the site of the injury if this is similar in size to a choledochotomy.**
- **However, if the biliary injury is more extensive, or if there is significant thermal damage owing to cautery-based trauma, or if the injury involves more than 50% of the circumference of the bile duct wall, an end-to-side choledochojejunostomy with a Roux-en-Y loop of jejunum should be performed.**

- **Similarly, major bile duct injuries, including transections of the common bile or common hepatic duct, can be repaired if recognized at the time of cholecystectomy.**
- **Isolated hepatic ducts smaller than 3 mm or those draining a single hepatic segment can be safely ligated.**
- **Ducts larger than 3 mm are more likely to drain several segments or an entire lobe and need to be reimplanted.**
- **If one is uncertain or underexperienced, and no colleague with sufficient expertise is immediately available, placing a drain followed by referral to an experienced center is the most appropriate course of action.**

Management of the Bile Duct Injury Recognized After Cholecystectomy : Most large series report the incidence of ductal injury after laparoscopic cholecystectomy to be 0.3% to 0.85%. In general, patients with a bile leak will present early, whereas patients with postoperative biliary strictures alone often present with jaundice or cholangitis months to years after the initial injury.

Diagnosis :

- **Abdominal imaging with ultrasonography or CT should be performed in patients with signs of abdominal pain or peritonitis, sepsis, or any other clinical suspicion of biloma.**
- **Such patients must be stabilized with immediate parenteral antibiotics and image-guided percutaneous drainage of any fluid collections.**
- **Patients with signs and symptoms of cholangitis should undergo urgent cholangiogram with bile duct drainage.**
- **Cholangiography should be performed to establish the presence of ductal stricture, identify the level of the stricture, and identify the nature of the injury when necessary ERCP may be easier to obtain in a patient with a biliary stricture and cholangitis who requires urgent cholangiography and biliary decompression. However, this is only useful in patients with bile duct continuity. Cystic duct leaks or small tangential injuries can be treated with endoscopic stenting. In situations in which the biliary stricture is too tight to pass with ERCP, PTC may be performed for proximal biliary decompression.**
- **CT arteriography should be considered in the preoperative evaluation of patients with benign biliary strictures. Unrecognized injury to the hepatic artery or a portal vein branch occurs with a frequency of 12% to 47% concomitant with a bile duct injury. Certainly, if significant bleeding required urgent control at the time of the original operation, a vascular injury should be considered. The presence of a right hepatic artery disruption should not affect the surgical repair of a bile duct injury. In patients presenting with late strictures with evidence of liver dysfunction, a CT arteriogram should be performed to evaluate for evidence of portal hypertension.**

Intraoperative Considerations: The management of postoperative biliary strictures following ductal injury depends on the degree of injury, the presence of stricture-induced complications, and the operative risk of the patient. After recognition of a bile duct injury or stricture, a multidisciplinary team consisting of experienced interventional radiologists, endoscopists, and surgeons, coordinated by an experienced hepatobiliary surgeon, should plan the following specific goals:

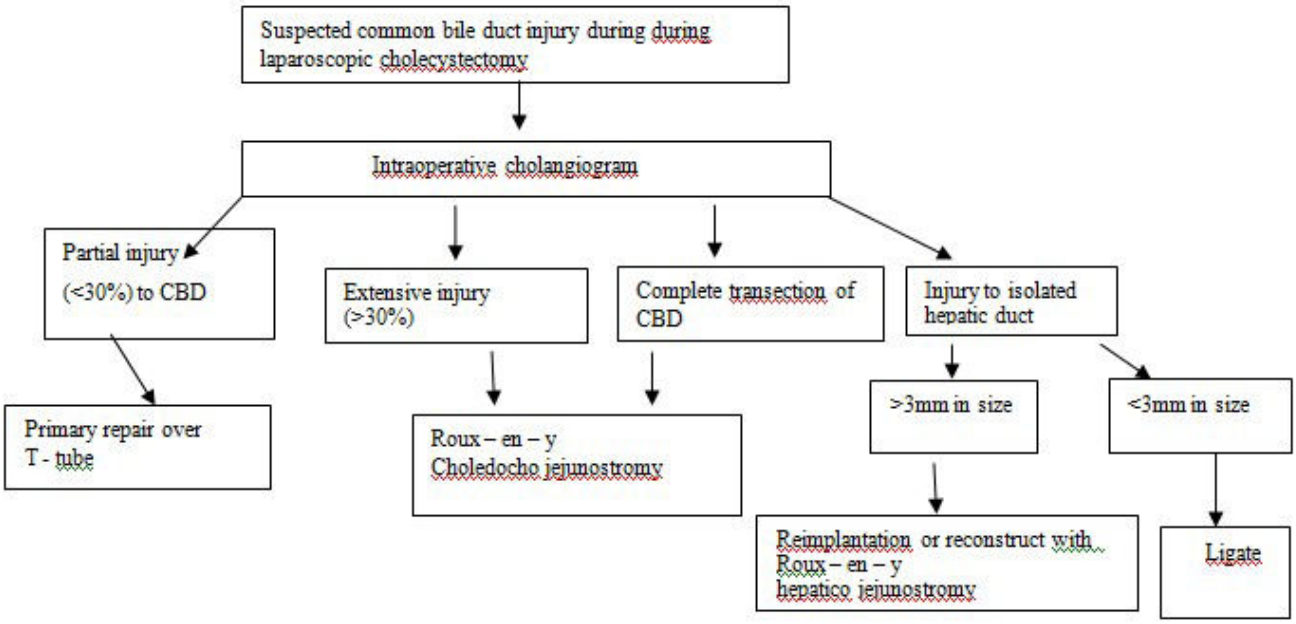
1. **Control the infection (abscess or cholangitis)**

2. **Drain the biloma**

3. **Complete the cholangiography**

4. Provide definitive therapy with controlled reconstruction or stenting

Suspected injury to the biliary tract during laparoscopic cholecystectomy and treatment.

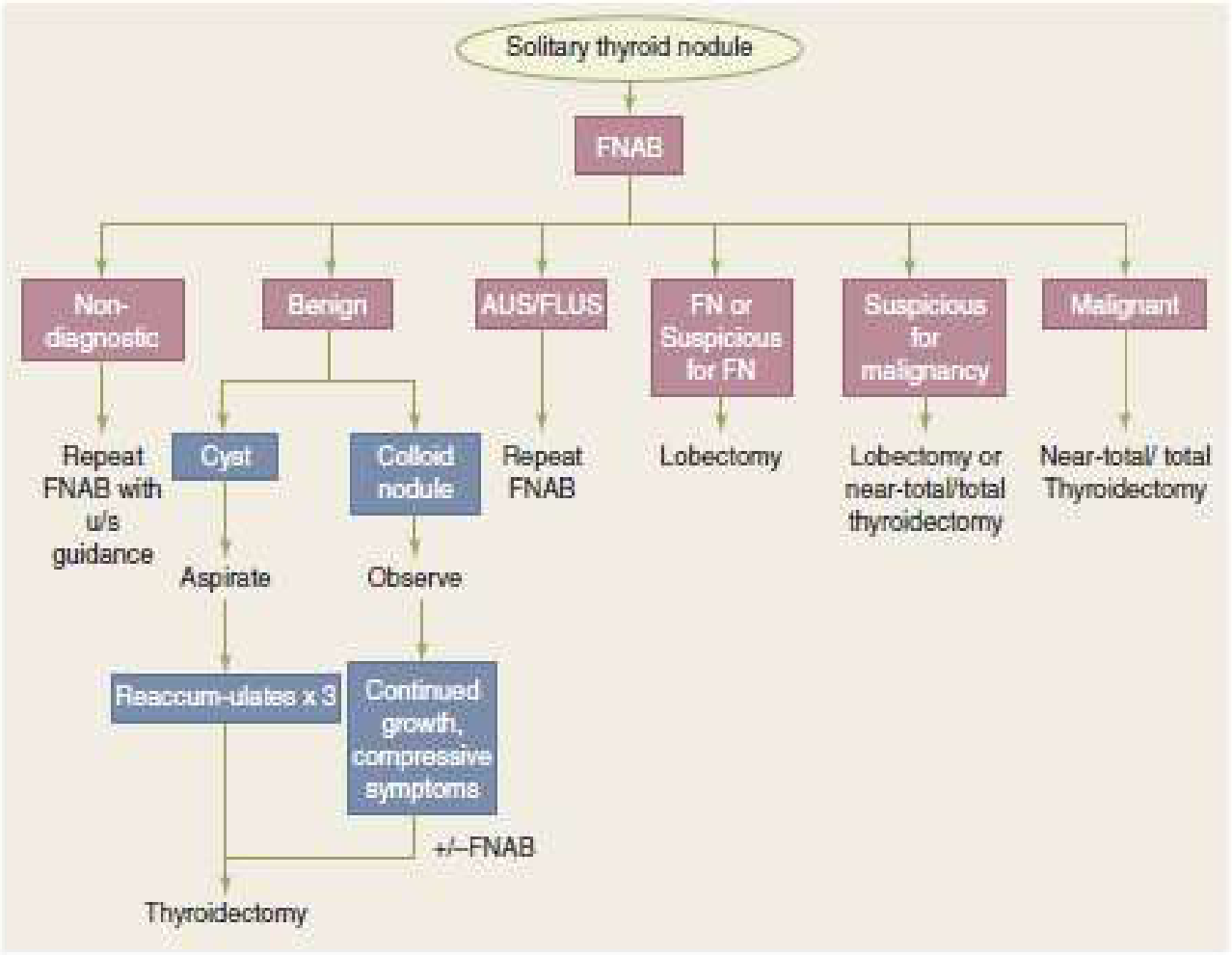


4. Recent guidelines for the management of thyroid nodule:

Modes of detection:

- **Incidentalomas on head/neck CTs and MRIs, carotid ultrasound, PET scans.**
- **Palpated by primary care physician**
- **Noticed by patient**
- **With symptoms of hypo/hyperthyroidism**

Solitary thyroid nodule:



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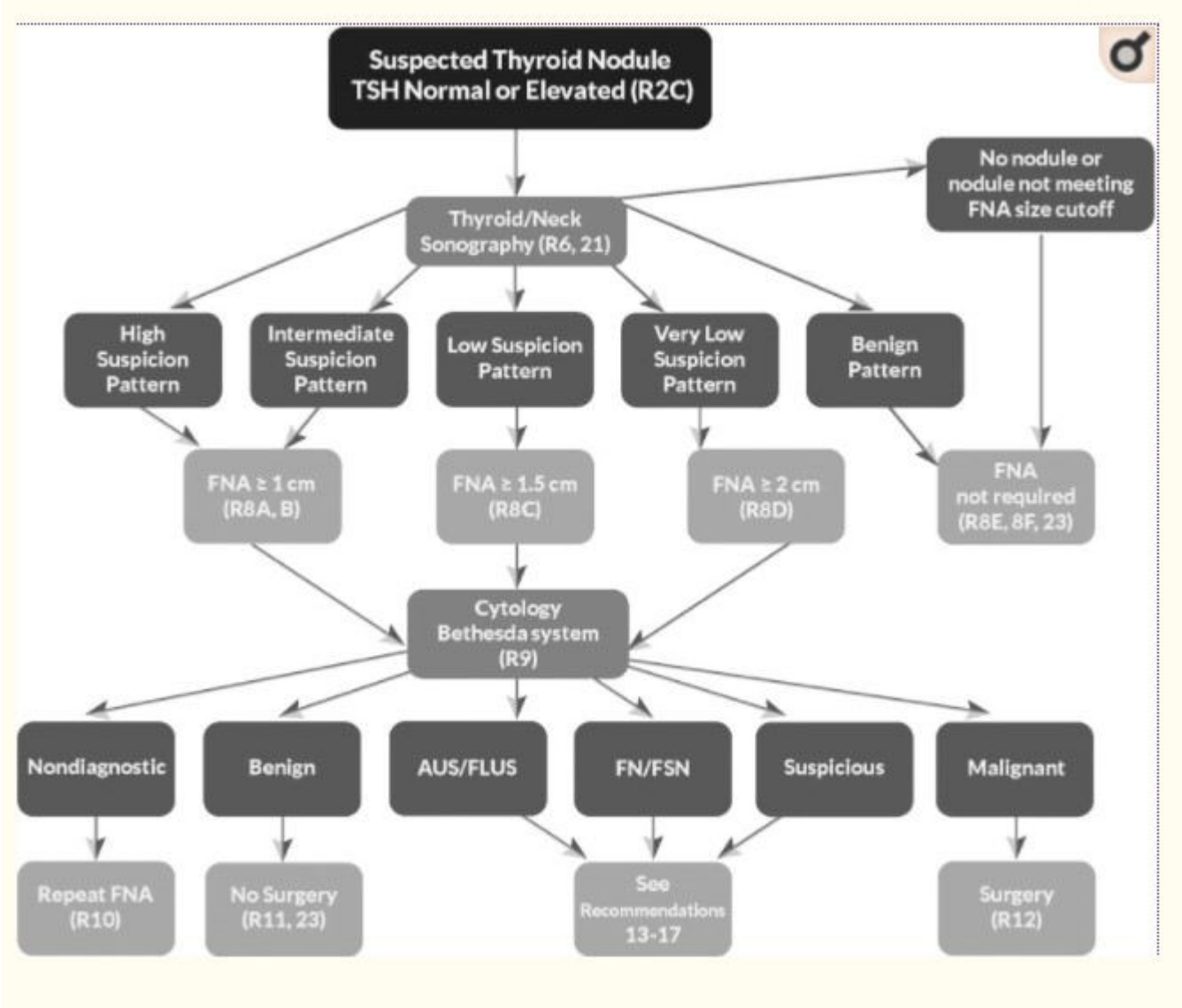


5. Video-assisted thoracoscopic surgery (VATS) is a minimally invasive surgical technique used to diagnose and treat problems in your chest. During this surgery, a tiny camera (thoracoscope) and surgical instruments are inserted in the chest through small incisions. The thoracoscope transmits images of the inside of your chest onto a video monitor, guiding the surgeon in performing the procedure. Video-assisted thoracoscopic surgery (VATS) can be used for many purposes, ranging from a biopsy to removal of tumors or entire lobes from the lung. Its advantages include:

- **Less pain and need for pain medication**
- **Smaller scar**
- **Shorter hospital stay**
- **Faster recovery time**

Uses for VATS surgery

Chest (thoracic) surgeons at Mayo Clinic use VATS to diagnose and treat a range of conditions, including:

- **Pleural diseases. The pleura is a two-layer membrane that lines the chest cavity and surrounds both lungs. VATS is used to remove air or fluid which can collect in the pleural cavity following a chest injury or disorder and lung surgery. Surgeons may also use VATS to perform pleurodesis, a procedure where medicine is injected into your chest to fuse the space between the lung and chest wall and prevent fluid from returning to the chest.**
- **Mesothelioma. A rare cancer of the membranes lining the chest, abdominal cavity or heart, mesothelioma can be diagnosed with a VATS biopsy.**
- **Lung cancer. VATS is used to remove pieces (wedge resection), lobes (lobectomy), fluid-filled lumps (nodules) and any suspicious spots on the lung along with a surrounding margin of healthy tissue. These tissue samples are then analyzed by an experienced pathologist to determine the stage of cancer.**
- **Interstitial lung disease. VATS is used to gather pieces of lung to make the proper diagnosis and guide treatment decisions.**
- **Empyemas. An empyema is a collection of pus and fluid that develops from a lung infection such as pneumonia. VATS is used to drain the excess fluid and allow the lung to re-expand.**
- **Granulomas: VATS can be used to diagnose and remove swollen (inflamed) tissue called a granuloma which can develop in the lungs.**
- **Lymphomas. Surgeons can remove tissue samples of abnormal lymph nodes from the chest cavity with a VATS biopsy to determine the type of lymphoma present.**
- **Hyperhidrosis (excessive sweating). Chest surgeons use VATS to remove or cut the nerves that cause sweating (sympathectomy or sympathotomy).**
- **Pericardial effusion. VATS can be used to drain fluid from the sac surrounding the heart (pericardium), caused by a range of diseases and conditions.**

Candidates

The best candidates for VATS procedures are:

- **Individuals who have never had chest surgery. Scar tissue from previous procedures can impede access to the chest cavity.**
- **People who are at high risk for complications if they undergo traditional, open chest surgery.**

Complications of VATS:

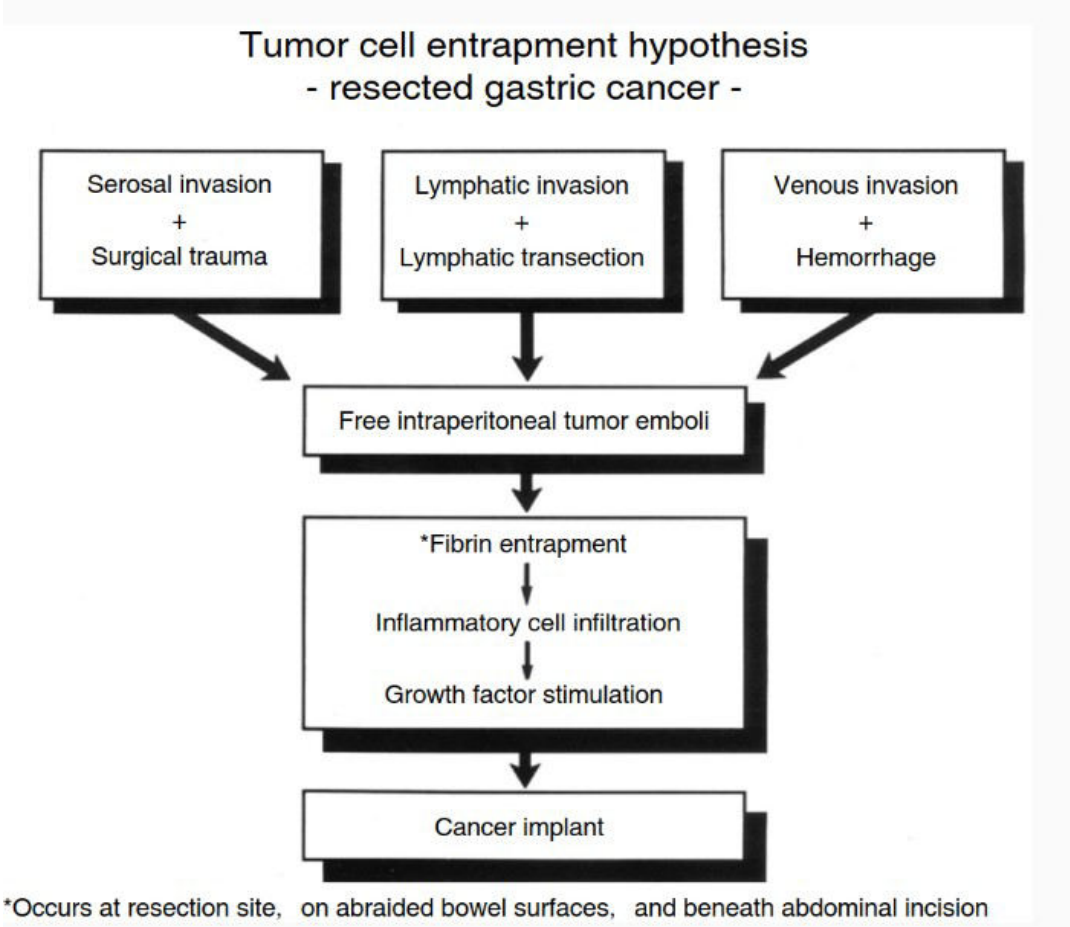
- **Air leak**
- **Partially collapsed lung (atelectasis)**
- **Abnormal heart rhythms**
- **Excess bleeding**
- **Pneumonia**
- **Empyema**
- **Wound infection**
- **Blood clot – this can lead to pulmonary embolism or stroke.**

6. Role of intra-peritoneal therapy in the treatment of adjuvant therapy of resectable gastric cancer:

- **Intraperitoneal chemotherapy is a promising and feasible option for gastric cancer with chance of peritoneal dissemination. There were several cases with long-term prognosis where conversion surgery was achieved.**
- **Numerous randomized clinical trials (RCTs) have compared surgery alone with adjuvant chemotherapy, but definitive evidence is lacking. There are different regimens, including monochemotherapy; combined**

chemotherapy with fluorouracil derivatives, mitomycin C, and other therapies but no anthracyclines; combined chemotherapy with fluorouracil derivatives, mitomycin C, and anthracyclines;

- **Possible treatments include neoadjuvant systemic chemotherapy (NAC), neoadjuvant intraperitoneal and systemic chemotherapy (NIPS), cytoreductive surgery (CRS) and perioperative chemotherapy which may include hyperthermic intraperitoneal chemotherapy (HIPEC) and/or early postoperative intraperitoneal chemotherapy (EPIC).**
- **Surgical treatment failure with resection site and intraabdominal tumors are the most common sites of first recurrence in gastric cancer after potentially curative resection**
- **Sources of recurrence after curative resection are (1) spontaneous spreading from the primary tumor; and (2) surgical trauma causing scattering of cancer cells during the surgical procedure. If serosal surface invasion has occurred within the primary tumor, then spontaneous dissemination is more common and patients are frequently found to have viable intraperitoneal cancer cells (positive cytology). Tumor cells can also seed the intraabdominal cavity during surgery according to the tumor cell entrapment hypothesis.**



- **Perioperative or intraoperative hemotherapy can eliminate progression of peritoneal implantation after curative surgery, however, it cannot treat residual disease within lymph nodes. Therefore, an adequate lymphadenectomy is essential. Intraperitoneal chemotherapy enters the peritoneal nodule by simple diffusion so it only penetrates to 1 or 2 mm. It is not effective in lymph nodes.**

- **Historical analyses of treatment failure after curative resection for gastric cancer showed that approximately 40 to 50% of patients had a first site of recurrence in their peritoneal cavity and the development of local-regional recurrence had a negative impact on overall survival.The potential role of adjuvant treatments for gastric cancer remains to be clarified. The survival results of the MRC**

adjuvant gastric infusion chemotherapy (MAGIC) trial suggested that patients with operable gastric cancer may benefit from perioperative regimen of epirubicin, cisplatin and infused fluorouracil (ECF).

- **The role of perioperative intraperitoneal chemotherapy may be regarded as complimentary to adjuvant systemic treatment. The fundamental goal of intraperitoneal chemotherapy administration is to maximize the total amount of drug delivered into the peritoneal surface, while minimizing that delivered to the systemic circulation.**
- **The rationales for adjuvant intraperitoneal chemotherapy are to eradicate residual disease by direct cytotoxic effects, generated by high drug concentrations in the peritoneal cavity and to reduce systemic toxicity. However, intraperitoneal chemotherapy has several foreseeable shortcomings in the management of gastric cancer. Firstly, the depth of drug concentration by simple diffusion was limited to 1 or 2 mm.Therefore, in patients with macroscopic peritoneal carcinomatosis, the efficacy of this intraperitoneal delivery is questionable. Several centers have utilized peritonectomy procedures to remove all macroscopic disease, followed by intraperitoneal chemotherapy.**
- **This approach is associated with relatively higher morbidity and cost, and therefore should be restricted to selected patients in experienced peritonectomy centers. Secondly, gastric cancer spreads not only by the transcoelomic route, but also via lymphatic and hematogenous dissemination. The containment of disease with targeted local-regional therapy alone, in high-risk patients, may not be adequate. Thirdly, relatively higher complication rates associated with intraperitoneal chemotherapy should be recognized.**

Role of molecular therapy in the treatment of adjuvant therapy of resectable gastric cancer:

- **In the recent few decades, the development of molecular targeted agents has advanced explosively. Based on the ToGA trial, trastuzumab, a monoclonal antibody against HER2, was used as one of the standard options for HER2-positive gastric and EGJ adenocarcinoma in the unresectable or metastatic condition..**
- **Thereafter, the efficacy of ramucirumab, a monoclonal antibody VEGFR-2 antagonist, for gastric and EGJ adenocarcinoma was demonstrated by the REGARD and RAINBOW trials.**
- **Recently, the ONO-4538-12/ATTRACTION-2 trial indicated that nivolumab, a monoclonal antibody inhibitor of PD-1, prolonged the OS of patients with unresectable advanced or recurrent gastric and EGJ adenocarcinoma.**
- **The ST03 trial was designed to assess the usefulness of the addition of bevacizumab, a monoclonal antibody against VEGF in the treatment for patients with resectable gastric and EGJ adenocarcinoma**
- **Pembrolizumab, a humanized antibody that binds to the PD-1 receptor was suggested to be effective for advanced gastric cancer.**

Scope of neoadjuvant Tyrosine Kinase Receptor Inhibitor therapy of GIST:

- **Imatinib, sunitinib and regorafenib are standards of care in advanced and metastatic GISTs.**
- **Imatinib: first-line treatment in advanced/metastatic GISTs**
- **Sunitinib: second-line treatment in patients with GIST after failure of or intolerance to imatinib**
- **Regorafenib: a recent standard of care for GISTs**
- **Based on the high rate of responses observed with imatinib in patients with metastatic GIST, preoperative use of imatinib aims to reduce tumor bulk to facilitate complete surgical resection or increase the likelihood of organ preservation of initially unresectable or borderline resectable disease.**
- **The initial dose of imatinib of 400 mg/day is considered to be reasonable as a standard dose.**
- **There is not enough evidence about the appropriate treatment period of neoadjuvant imatinib therapy for advanced GIST.**
- **The pharmacological effect of imatinib therapy is promptly expressed, but it takes time to decrease tumor size because imatinib works as a cytostatic agent. Therefore, imatinib needs to be administered for longer periods than the usual neoadjuvant chemotherapies for carcinoma.**

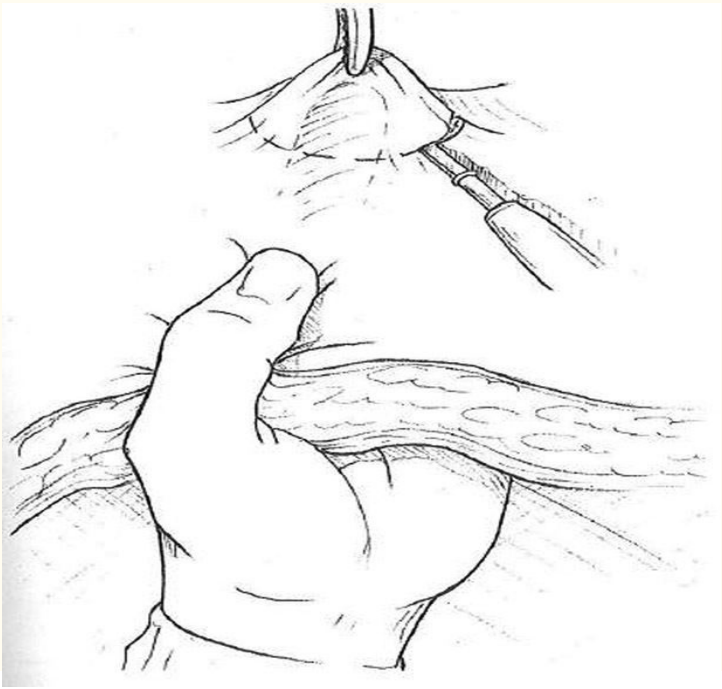
- **GIST develops in any part of the gastrointestinal tract from the esophagus to the rectum, but has a high incidence in the stomach (60%) and the small intestine (30%). Lymph node metastasis is rarely seen, so lymph node dissection and extensive excision of associated organs is unnecessary in contrast to the radical surgery for gastrointestinal carcinoma.**
- **However, GIST often shows expansive development, and is often diagnosed after experiencing an increase in size without defined subjective symptoms such as obstruction, bleeding and pain. Therefore, the range of organ resection may be enlarged or multiple organ involvement may be necessary for resection of large tumors. For this reason, preoperative treatment is also expected to be favored from the viewpoint of organ/function preservation by tumor shrinkage.**
- **The importance of neoadjuvant treatment lies in its feasibility and its survival outcome. The feasibility of neoadjuvant imatinib therapy seems to be well established from the results of clinical trials. However, proof of the survival effectiveness of neoadjuvant-setting imatinib therapy has not been sufficiently demonstrated.**
- **It is expected that the long-term results of phase II study for large gastric GIST in Japan and South Korea will prove the survival benefit of neoadjuvant imatinib therapy. Clinical questions still remain about the most appropriate period of pre- and post-operative imatinib administration in the neoadjuvant protocol.**
- **The benefits of neoadjuvant therapy with other tyrosine kinase inhibitors against imatinibresistant GIST are also controversial. Since GIST is a rare disease and cases are limited, neoadjuvant therapy should be registered in nationwide or worldwide clinical trials/ databases to compile meaningful bodies of evidence.**

7. An ostomy is named according to the part of intestine used to construct it. A colostomy is the creation of a stoma from part of the colon (large bowel), where the intestine is brought through the abdominal wall and attached to the skin, diverting normal intestinal fecal matter through the stoma instead of the anus.
An ileostomy is created from the ileum (small bowel), which is brought through the abdominal wall and used to create a stoma. A urostomy or ileal conduit is a stoma created using a piece of the intestine to divert urine to the outside of the body. The ureters are sewn to a piece of the intestine, brought through the abdominal wall, and sutured to create the stoma. These surgeries are performed on patients with diseases such as cancer of the bowel or bladder, inflammatory bowel diseases (such as colitis or Crohn's), or perforation of the colon. Emergencies that may require an ostomy include diverticulitis, trauma, necrotic bowel, or radiation complications. An ostomy may be permanent or temporary, depending on the reason for the surgery. Other types of ostomies are called jejunostomy, double-barrel ostomy, and loop ostomy.

Creation of stoma:

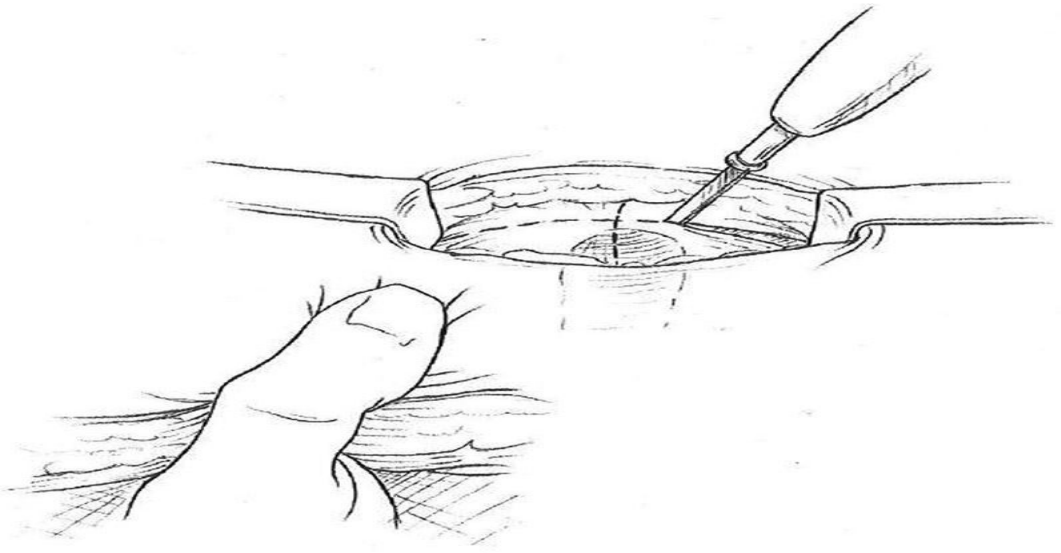
There are certain key aspects to creating an ideal end ileostomy or colostomy. Among the principles:

- **Excise a circular skin disc approximately 2.5 cm in diameter at the previously marked site .**



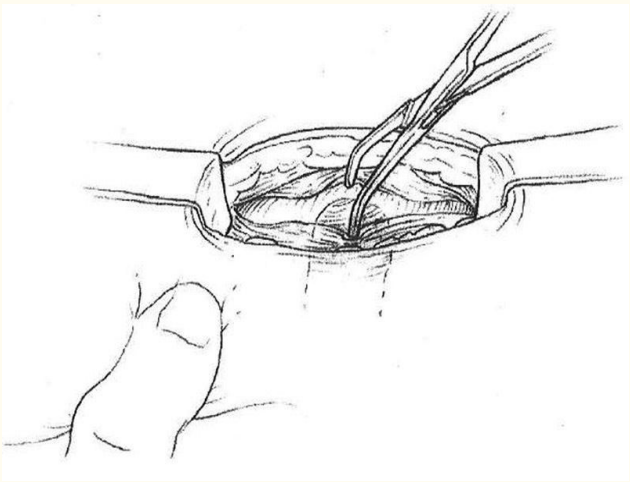
Excision of skin disc at stoma site.

- **Divide the subcutaneous tissue with small retractors until the anterior rectus sheath is exposed. Do not excise or "core-out" subcutaneous tissues.**
- **Make a vertical incision in the anterior rectus sheath approximately 3 cm in length. At the midpoint of the incision, make a perpendicular 1-cm incision laterally. The lateral counterincision keeps the stoma opening away from the midline incision.**



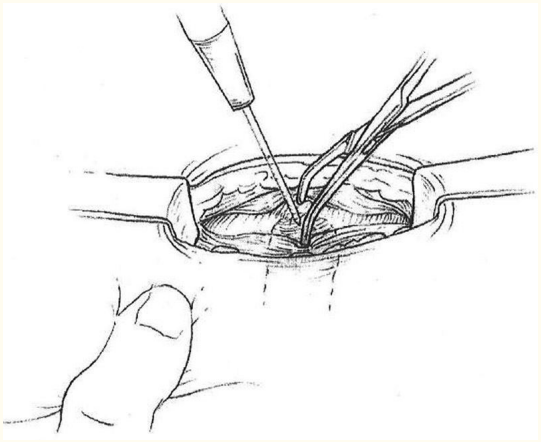
Cruciate incision in anterior fascia.

- **Split the rectus abdominis muscle in the direction of its fibers.**



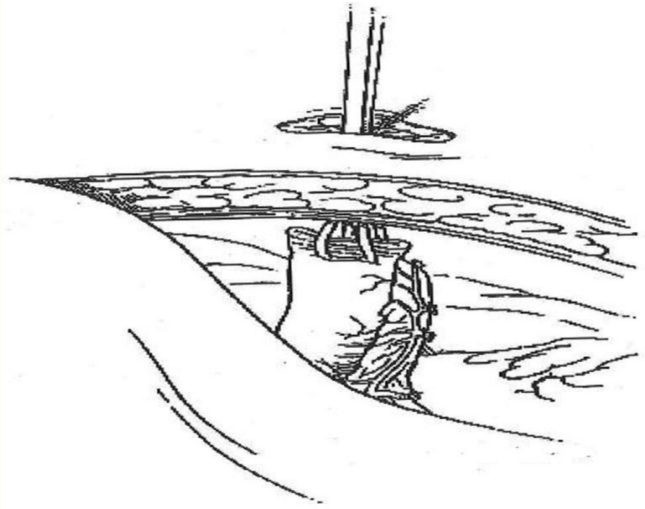
Splitting of rectus muscle in direction of fibers.

- **Create a vertical incision in the posterior rectus sheath.**



Incision of posterior rectus sheath.

- **Deliver the previously divided bowel through the abdominal wall without twisting it. "Pushing" from within the abdominal cavity is preferred to "pulling" when exteriorizing the bowel.**



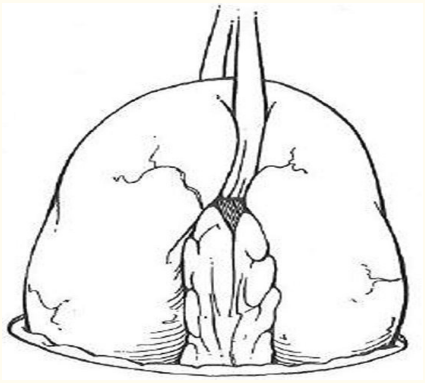
Delivery of bowel through stoma site.

- **Again confirm that the bowel is viable and not twisted.**
- **For a colostomy, the colon should extend 2 cm above the skin surface. For an ileostomy,5 cm of bowel should be pulled through. The matured colostomy should protrude 0.5 to 1 cm above the skin. The matured ileostomy should protrude 2 to 2.5 cm.**
- **Excise the staple line at end of the bowel cleanly with a no. 10 scalpel blade. Ileostomies must be everted. Eversion of a colostomy is optional and should ideally be dictated by the stomal therapist who will be working with the patient long term. The abdominal incision should be closed before this step. However, if there is concern that the stoma is under too much tension or has questionable viability, the abdomen can be closed after stoma maturation.**
- **Perform the enterocutaneous anastomosis with interrupted absorbable sutures that take full-thickness bites of the end of the colon and the dermal layer of the skin.**
- **Colostomies may be matured flush or can be everted similar to ileostomies. For flush creation, full-thickness bites of the terminal end of the bowel are followed by corresponding dermal bites on the stoma trephine. Sutures incorporating the epidermal skin layer may lead to "mucosal islands," or small growths of mucosa, in the skin surrounding the stoma, and therefore should be avoided.**
- **Ileostomies are everted by placing "triplicate" sutures. First, the suture is placed through the dermis, followed by a seromuscular bite 4 to 5 cm from the proximal to the distal end of the ileum. The final bite is passed full-thickness through the cut end of the bowel. Three everting sutures, away from the mesentery, will often evert the stoma effectively. Gaps can be closed with standard sutures between the triplicate sutures.**
- **Loop Ileostomy Creation**

When simple fecal diversion is required, a loop ileostomy is most often the procedure of choice. However, it is important to remember that a significant number of diverting stomas become permanent. Therefore, creating a well-functioning, easily reversible stoma is often the difference between reversal and life with a permanent ostomy. The purpose of a diverting stoma is most commonly to prevent fecal material from reaching a distal portion of the bowel, either because of fear of anastomotic leak or to treat a leak or injury. Diverting stomas do not decrease the incidence of anastomotic leak, per se, but instead decrease the related morbidity. When treating

pelvic infection from a colonic source or when planning diversion of a low pelvic anastomosis, the two options are transverse loop colostomy and loop ileostomy. While it is important to be aware of both the techniques, the loop ileostomy is clearly the superior procedure. [4] Loop ileostomies are created using the following technique:

- **Identify an appropriate loop terminal ileum that will protrude easily at the stoma site. A segment at least 20 cm from the ileocecal junction will facilitate subsequent stoma reversal. Any closer to the cecum may make a stapled anastomosis at the time of reversal more difficult. It is also important to confirm and mark the distal bowel with a suture or marker to ensure proper orientation.**
- **Make a circular skin incision that is slightly larger than that required for an end stoma at the previously marked site and excise the skin.**
- **Part the subcutaneous tissue with small retractors until the anterior rectus sheath is exposed. Do not excise this tissue.**
- **Make a vertical incision in the anterior rectus sheath approximately 2 cm in length. At the midpoint of the incision, make a perpendicular 1-cm incision laterally. This will keep the stoma opening away from the midline incision.**
- **Split the rectus abdominis muscle in the direction of its fibers.**
- **Make a vertical incision in the posterior rectus sheath.**
- **Deliver the bowel through the abdominal wall. This can be facilitated by placing a small Penrose drain through a defect created in the mesentery adjacent to the bowel wall. The Penrose drain can then be used as a handle to help deliver the bowel. If desired, the drain can later be exchanged for the stoma bridge. Be careful with friable bowel, as the drain (or some prefer to use an umbilical tape) can inadvertently "saw" through the bowel with excessive tension.**
- **Placement of a plastic self-retaining wound protector (e.g., Alexis Wound Protector [Applied Medical], Covidien SurgiSleeve [Covidien]) through the stoma trephine will facilitate passage of the bowel through the subcutaneous tissue, especially in obese individuals.**
- **Confirm that the bowel is viable and not twisted by using the previously placed suture or mark in the distal segment.**



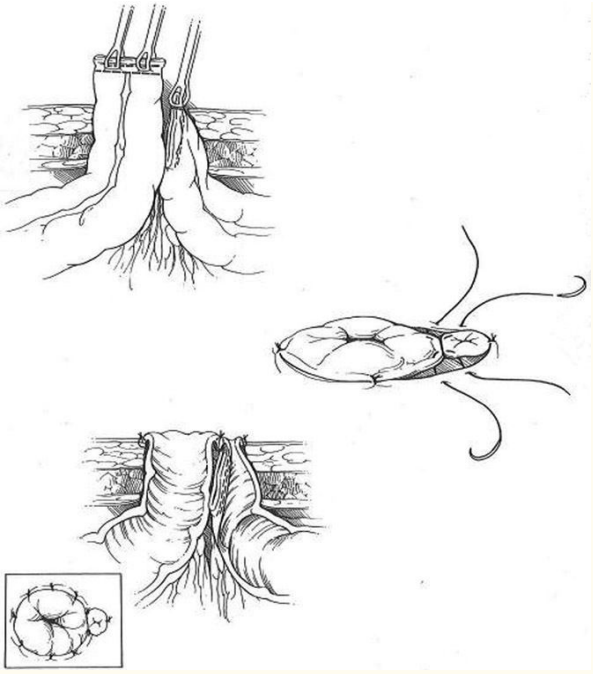
Loop ileostomy creation. Ileum is elevated through stoma site with a Penrose drain. Care is taken to avoid twisting.

- **Transect 80% of the circumference of the antimesenteric portion of the bowel wall just above where the distal end meets the skin between two Allis clamps .**
- **Peel back the edges of the bowel to reveal the two openings. Exchange the catheter for the stoma bridge, if desired. The proximal limb should still protrude approximately 2.5 cm, but the distal limb can be matured flush with the skin.**
- **Mature the stoma (proximal end of the bowel) by eversion with standard "triplicate" sutures on either side of the mesentery and the antimesenteric border with interrupted absorbable sutures. It is best to mature the distal end without eversion using as little of the skin circumference as is practical. Complete maturation with simple sutures including terminal bowel and dermis between every suture .**
- **If using a bridge or rod to support the stoma above skin level, remove it after 5 days. Of note, a bridge is rarely necessary, particularly if the loop stoma is externalized and created without tension.**

End-Loop Stomas

When creating a temporary stoma, it is always preferable, if possible, to bring the proximal and distal bowel loops through the same trephine in the abdominal wall. Among other advantages, this eases eventual stoma reversal by avoiding formal laparotomy. With standard loop stomas, this occurs by definition, but in other circumstances, it only occurs through proper technique and advanced planning. end-loop stomas can be created with remote intestinal segments following bowel resection. They consist of end-loop ileoileostomy, ileocolostomy, or colocolostomy. For example, it may be unsafe to perform a primary anastomosis after a right colectomy for trauma. An end-loop ileocolostomy (terminal ileum and transverse colon exiting through the same stoma site) is a viable alternative to an end ileostomy and long Hartmann's pouch, which would require a formal laparotomy for reversal in the future. Similar stomas can be performed following small bowel or left colon resections.

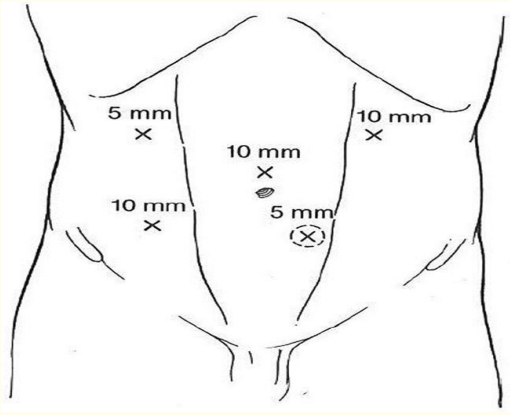
Whether using adjacent or remote intestinal segments, the technique for creating an end-loop stoma is similar. The stapled proximal end is passed through the preselected stoma site. Only the antimesenteric border of the stapled distal end is then advanced through the same trephine. The antimesenteric corner of the staple line is cut off and the small open segment of the distal bowel is matured flush to the skin using as little of the stoma circumference as possible. The proximal end is then matured in the standard fashion. A full thickness stitch between the proximal and distal ends completes the procedure . An end-loop sigmoid colostomy is an ideal stoma for distal fecal diversion for incontinence or in association with complex anorectal procedures. A stoma created with this technique will be easily reversible but will also function well should reversal be contraindicated.



End-loop colostomy creation.

Laparoscopic Stoma Creation

Fecal diversion for unresectable cancers, severe perineal disease, or trauma is a fairly common procedure. Laparoscopic colostomy or ileostomy creation is an attractive alternative to a formal laparotomy, especially when ostomy creation is the sole purpose of the operation. As with any laparoscopic procedure, preoperative planning and patient positioning are key to success. Use of Trendelenburg positioning and right or left patient rotation, depending on the ostomy to be performed, will help expose the bowel segment targeted for stoma creation. Port placement depends upon the type of stoma undergoing creation. Using the future stoma site as a trocar site may be advantageous. Laparoscopic technique for stoma creation is detailed as follows .



Potential port locations for laparoscopic ostomy creation.

- **Place the first trocar, which will accommodate the laparoscope, in the middle abdomen on the side opposite the future stoma.**
- **If the previously marked site appears acceptable once the laparoscope is inserted, place a 5-mm port through the future stoma site.**
- **Pass an atraumatic bowel clamp through this port, and grasp the needed segment of bowel and assess for mobility. If the desired bowel segment reaches without tension, enlarge the port site into a standard stoma trephine.**
- **Marking the distal bowel prior to exteriorization with the felt tip of a marker held in a laparoscopic grasper facilitates proper orientation of the bowel once the stoma is matured.**
- **If the bowel requires mobilization, which is common in sigmoid colostomy creation, place additional ports as necessary and mobilize along the white line of Toldt.**
- **Enlarge the fascial defect as needed and deliver the bowel through the stoma site without twisting. Prior to maturing the stoma, reestablish pneumoperitoneum and confirm proximal and distal orientation of the bowel.**
- **Mature the stoma in the standard fashion.**

Pouching Systems (Ostomy Appliances)

Individuals with colostomies, ileostomies, or urostomies have no control or sensation of frequency or output of the stoma. Patients with ostomies must wear a pouching system to collect the effluent from the stoma and protect the skin from irritation. The pouching system must be completely sealed to prevent leaking of the effluent and to protect the surrounding peristomal skin. The disposable pouching systems can be either a one-piece or a two-piece flexible system consisting of a plastic bag and a flange (skin barrier) that sit against the patient's skin. The flange may be flat or convex. The ostomy pouch and flange come together to form one integrated, leakproof unit. The pouch has an open end to allow effluent to be drained, and may be closed using a plastic clip or Velcro strip. There are many different types of pouching systems to meet different needs.

The flange is cut to fit around the stoma without impinging on it. Ostomy pouching systems vary and are based on type of stoma, stoma characteristics, stoma location, patient abilities, skin folds, and patient preference. Depending on the type of pouching system, the system can last from four to seven days. The pouch must be changed if it is leaking, odour is present, there is excessive skin exposure, or the patient complains of itching or burning under the skin barrier. Patients with pouches can swim and take showers with the pouching system on. All patients are expected to participate in all aspects of the care of their ostomy; if they cannot, a caregiver may be taught to care for the ostomy. Depending on the patient, a surgical procedure may be performed to create an internal pouch to collect feces or urine, which eliminates the need for an external pouch. The continent ileostomy is made from part of the ileum and is flushed a number of times each day to clean out the effluent. An ileoanal ostomy is a pouch created above the anal sphincter and is also created from a portion of the ileum. Two types of internal urinary diversions may be created from part of the intestine. The first is an orthotopic neobladder, where a bladder is created and placed in the body at a normal bladder position; over time, with continent training, the patient can learn to void normally. The second type is a continent urinary reservoir, where a pouch is created from part of the intestine, and a catheter is inserted a number of times during the day to remove the urine.

Physical and Emotional Assessment

Patients may have co-morbidities that affect their ability to manage their ostomy care. Conditions such as arthritis, vision changes, Parkinson's disease, or post-stroke complications may hinder a patient's coordination and function to manage the ostomy. In addition, the emotional burden of coping with an ostomy may be devastating for some patients and may affect their self-esteem, body image, quality of life, and ability to be intimate. It is common for ostomy patients to struggle with body image and an altered pattern of elimination. Ensure the patient has the appropriate referrals to the wound and ostomy nurse and social workers, as well as access to support groups or online support groups. As a health care provider, be very aware of non-verbal cues: take care not to show disgust at the ostomy or at odour that may be present when changing an appliance or pouching system.

Safety considerations:

- **Pouching system should be changed every 4 to 7 days, depending on the patient and type of pouch.**
- **Always consult a wound care specialist or equivalent if there is skin breakdown, if the pouch leaks, or if there are other concerns related to the pouching system.**
- **Patients should participate in the care of their ostomy, and health care providers should promote patient and family involvement.**
- **Encourage the patient to empty the pouch when it is one-quarter to one-half full of urine, gas, or feces.**
- **Ostomy product choices are based on the patient's needs and preference.**
- **Follow all post-operative assessments for new ostomies according to agency policy.**
- **Medications and diet may need adjusting for new ileostomies/ colostomies.**
- **An ostomy belt may be used to help hold the ostomy pouch in place.**
- **Factors that affect the pouching system include sweating, high heat, moist or oily skin, and physical exercise.**
- **Always treat minor skin irritations right away. Skin that is sore, wet, or red is difficult to seal with a flange for a proper leakproof fit.**

Caring for a Colostomy

  - **Use the right size pouch and skin barrier opening. ...**
  - **Change the pouching system regularly to avoid leaks and skin irritation. ...**
  - **Be careful when pulling the pouching system away from the skin and don't remove it more than once a day unless there's a problem.**
  - **Clean the skin around the stoma with water.**

8. Controversies regarding the management of Primary lesion in presence of distant metastasis in breast cancer;

Cure is not possible for these patients, because the cancer cells have spread throughout the body. The aim of treatment is to 'prolong survival and palliate symptoms'. Hormone therapy, chemotherapy and molecular targeted agents are administered, according to their predicted of efficacies, as systemic therapies. Recently, appropriate use of new drugs, becoming available annually, has allowed long-term control of symptoms due to metastases and has prolonged the lives of patients. In addition, there have been remarkable advances in diagnostic imaging examinations.

We can now detect extremely small metastases that could not previously be visualized by traditional imaging modalities .

Stage IV breast cancer with small metastases is referred to as 'minimal Stage IV disease and these patients may have a better prognosis than those with standard Stage IV breast cancer.

Moreover, the concept of 'oligometastasis' is currently being debated . According to this concept, even distant metastases, depending on their location and number, can potentially be cured with an aggressive treatment strategy that includes surgery.

Resection of a primary tumor is not actively recommended by guidelines due to lack of high-level evidence indicating prognostic benefit. While clinical experience indicates that resection can be useful for alleviating chest symptoms, such as bleeding and ulceration as well as pain due to invasion of the chest wall, no studies or prospective trials have determined whether or not earlier surgery achieves better local control and/or prolongs survival. Several recent retrospective studies have demonstrated that resection increases survival time.

The efficacy of and indications for surgery, as part of an optimal treatment strategy for Stage IV breast cancer tailored to individual situations, require evaluation. Defining the role of surgery for Stage IV breast cancer may substantially alter future treatment strategies.

Distant metastasis is a systemic disease. Cancer cells have already spread throughout the systemic circulation by the time distant metastases are detected. Thus, local therapies do not affect overall survival. Moreover, Fisher et al. raised the possibility that primary tumor resection may promote the progression of distant metastases.

This might be attributable to resection of the primary tumor triggering surgical dissemination with increased adhesion of circulating tumor cells to the vascular endothelium of target organs, surgery-induced immunosuppression, surgery-induced angiogenic switch or the inflammatory cascade.

However, there are several other theories possibly explaining the basic rationale for resection of the primary tumor increasing the survival time of patients with Stage IV breast cancer. A reduction in circulating tumor cells according to primary tumor resection reportedly correlates with prognosis. Moreover cancer stem cells, found mainly in the primary tumor, tend to be resistant to systemic drugs. Resection of the primary tumor can reduce the tumor volume, including that of cancer stem cells, thereby reactivating autoimmunity and increasing the efficacy of systemic therapies. In addition, the concept of 'cell seeding' highlights the important features of cancer cells comprising the primary tumor. This concept suggests that cancer cells released into the blood from the primary tumor return to be activated in the primary tumor. Both of these hypothetical mechanisms are based on the results of basic experiments. It is very important to demonstrate similar results clinically by conducting prospective studies.

At present, whether primary tumor resection for Stage IV breast cancer provides any clinical benefit is unclear. According to the results obtained in two trials, routine surgery for all Stage IV breast cancer patients is not warranted, though some do obtain benefits from surgery and it is necessary to establish reliable means of identifying such patients . However, as yet, robust and definitive evidence supporting the use of surgery is lacking. Breast cancer is not a single disease and there are subtypes which must be considered when devising individual treatment strategies. We can achieve disease control by appropriately using systemic chemotherapeutic agents, based on analyses of cancer biology. However, the costs of new drugs constitute a major challenge in cancer treatment. Our aim should be to devise the most effective treatment strategies for individual cancer patients, employing drugs, surgery and radiation, alone or in combination. The treatment goals for Stage IV breast cancer are to prolong the patient's survival time and to control symptoms. Detailed examinations of the results of ongoing clinical trials are anticipated to provide the high-level evidence necessary to optimize the treatments we can offer our patients. An effective strategy for treating Stage IV breast cancer must incorporate both symptom amelioration and survival prolongation, while remaining mindful of the significance of surgery.

Recent therapeutic developments, such as the introduction of new cytotoxic agents (taxanes, vinorelbine, capecitabine, gemcitabine, liposomal anthracyclines, etc), newer hormonal agents, (third-generation aromatase inhibitors and fulvestrant), and biological therapies (trastuzumab, lapatinib, and bevacizumab), have resulted in constant improvements in treatment efficacy and consequently in metastatic breast cancer outcome.

9. Most commonly used energy devices:

I. Monopolar electrocautery
II. Bipolar electrocautery:
- **Bipolar diathermy**
- **Ligasure**
- **En Seal**
- **Gyrus plasma kinetics**

III. Ultrasonic energy:
- **Harmonic scalpel**
- **CUSA: Cavitron Ultrasonic Surgical Aspirator**

IV. LASER energy:
- **Nd-YAG Laser**
- **Argon LASER**
- **CO_2 LASER**

V. Argon beam coagulator
VI. Radio frequency ablation
VII. Thunderbeat

Mechanism of Electrosurgery

In electrosurgery, heat is generated in the tissue by the flow of radio frequency (RF) electric current unlike electrocautery where the heat is transferred directly from the tool to the tissue. The use of RF current (voltage in the range of 300 to 500 KHz) eliminates neuromuscular stimulation, which ceases above 100 KHz. When the RF electrical energy is made to concentrate in a very small area in the tissue, typically by applying the energy through pointed or hooked tool tips, the resulting high concentration of current flow in a narrow area increases the cellular temperature which leads to various effects on the tissue including, coagulation, dessication or dehydration and carbonization.

The RF energy can be applied to tissue by using either monopolar or bipolar tools. In monopolar electrosurgery, the electrical circuit is completed by the passage of current from the active electrode at the surgical site to the dispersive electrode (or the return electrode) attached to the body of the patient. The active electrode can be of any form (usually a point, hook or a blade) with sharp edges and/or blunt edges. The sharp edges increase the current density (the amount of current per unit area) and used for cutting whereas the blunt edges are used for coagulation. The return electrode is usually a wide pad, attached to the skin of the patient, which disperses the heat and safely leads the current out of the body. In bipolar electrosurgery both active and return electrodes are located in the same tool and the electrical circuit is closed by the small area of tissues that are grasped or manipulated by the tool. Bipolar tools are, thus, usually designed as grippers or forceps. Since the current only has to travel short distances in bipolar surgery, the voltage required for the surgery is low. Lower voltage is better for uniform drying of the tissue which minimizes the chance of re-bleeding. Thus the bipolar devices are more suitable for coagulation rather than cutting.

The basic working principle of ultrasonic surgical instruments such as ultrasonically activated scalpel (UAS) is to use the low frequency mechanical vibrations (ultrasonic energy in the range of 20–60 kHz) of the tool tips or the blades for tissue cutting and coagulation.

The cutting using an Ultrasonic surgical instrument is achieved by two methods. For tissues and muscles with high protein densities, the mechanical stretching of the tissues beyond its elastic limit due to the longitudinal

motion of the sharp blades between 60 to 100 µm at 55.5 kHz is used for cutting. For tissues with low protein densities, such as liver, cavitation effect in which intercellular water is vaporized at lower temperatures due to mechanical vibrations, there by rupturing the cells is used for cutting. In general the cutting and coagulation in UAS depends on various factors such as grip pressure, the shape and area of the blades in contact with the tissues and the power settings.

Lasers generate heat by applying a concentrated beam of light. In a laser system, electromagnetic or light waves are amplified multiple fold in an optical resonator (which contains mirrors and a gain medium) and passed out in the form of high intensity light waves. The amount of amplification in the resonator determines the amount of energy transmitted by the light waves which are then absorbed by the tissue. This energy absorbed by the tissue then manifests itself into heat which cuts and coagulates the tissue.

In electrosurgery a radio frequency current is applied to tissue to cauterize and control bleeding. In ABC(Argon beam coagulation), a directed beam of argon gas from the electrode tip aids in conduction of the radio frequency current to the tissue by ionization. Like laser, this is a non-contact method where the argon gas - which is a good conductor of electricity - acts as a means of transportation of the current from the tool to the tissue. ABC performs faster than conventional coagulation systems and provides a more uniform and shallower coagulation region which results in faster dispersion thus minimizing tissue damage.

THUNDERBEAT, developed by Olympus Medical Systems, is now available in the US, Europe and some markets in Asia. THUNDERBEAT is the world's first integration of both bipolar and ultrasonic energies delivered simultaneously from a single instrument.

Principles of safe use of electrosurgery:

Basic principles of electrosurgery:

Energy in wattage (power) is the product of current and voltage. Power is the amount of current times the voltage level at a given point measured in wattage or watts (W). It corresponds to the rate of work being performed, $W=V\times I$.

Ohm's law, $I=V/R$, shows the relationship between the properties of electrosurgical energy.

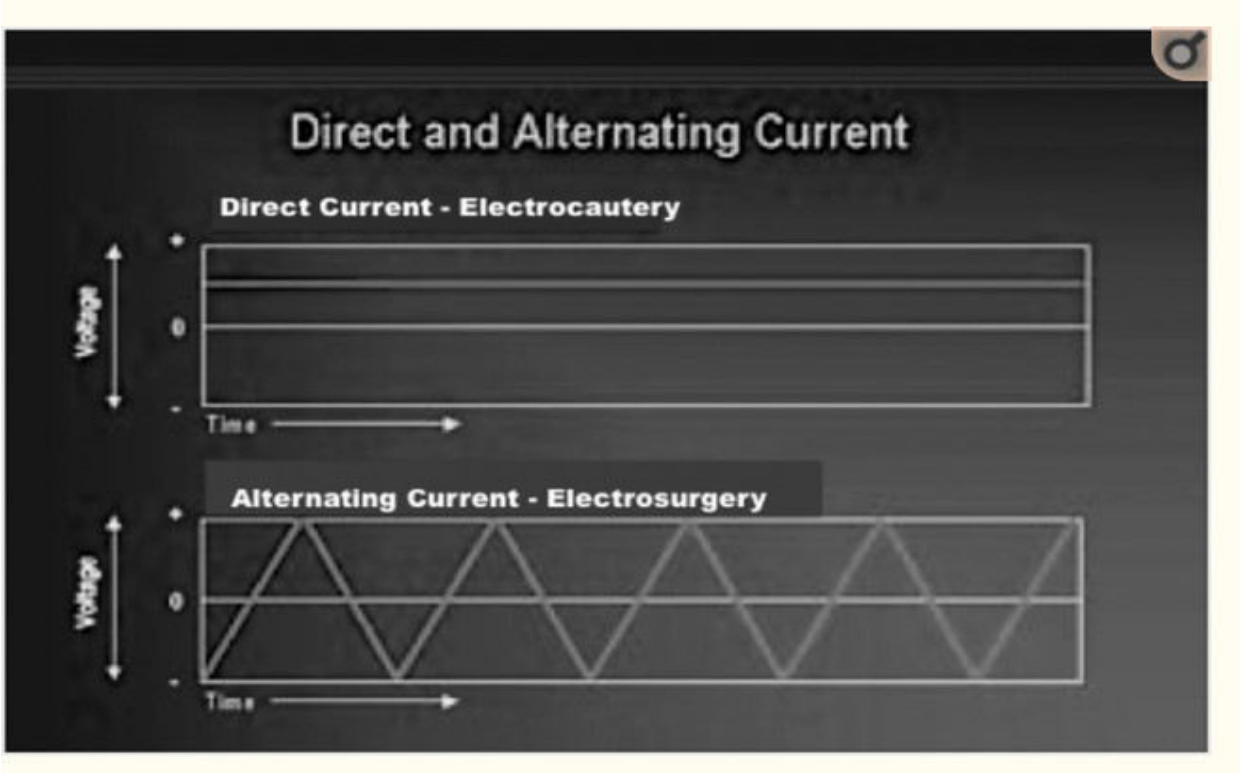
Current (I) is what flows on a wire or conductor like water flowing down a river. Current flows from negative to positive on the surface of a conductor. Current is measured in amperes (A) or amps.

Voltage (V) is the difference in electrical potential between 2 points in a circuit. It is the push or pressure behind current flow through a circuit and is measured in volts (V).

Resistance determines how much current will flow through a component. Resistors are used to control voltage and current levels. A very high resistance allows a small amount of current to flow. A very low resistance allows a large amount of current to flow. Resistance is measured in Ω ohms.

Principles of Electrosurgery

Often “electrocautery” is used to describe electrosurgery. This is incorrect. Electrocautery refers to direct current (electrons flowing in one direction), whereas electrosurgery uses alternating current. Modern day electrosurgery is the utilization of alternating current at radiofrequency levels. During electrocautery, current does not enter the patient's body. Only the heated wire comes in contact with tissue. In electrosurgery, the patient is included in the circuit and current enters the patient's body.



Electrical current flows when electrons from one atom move to an adjacent atom through a circuit. Heat is produced when electrons encounter resistance. For current to flow, a continuous circuit is needed. In the operating room, the circuit is composed of the patient, the electrosurgical generator, the active electrode and the return electrodes. The electrosurgical unit is the source of the voltage

Electrical energy is converted to heat in tissue as the tissue resists the flow of current from the electrode. Three tissue effects are possible with today's electrosurgical units—cutting, desiccation, and fulguration.[7] Achieving these effects depends on the following factors: current density, time, electrode size, tissue conductivity, and current waveform.

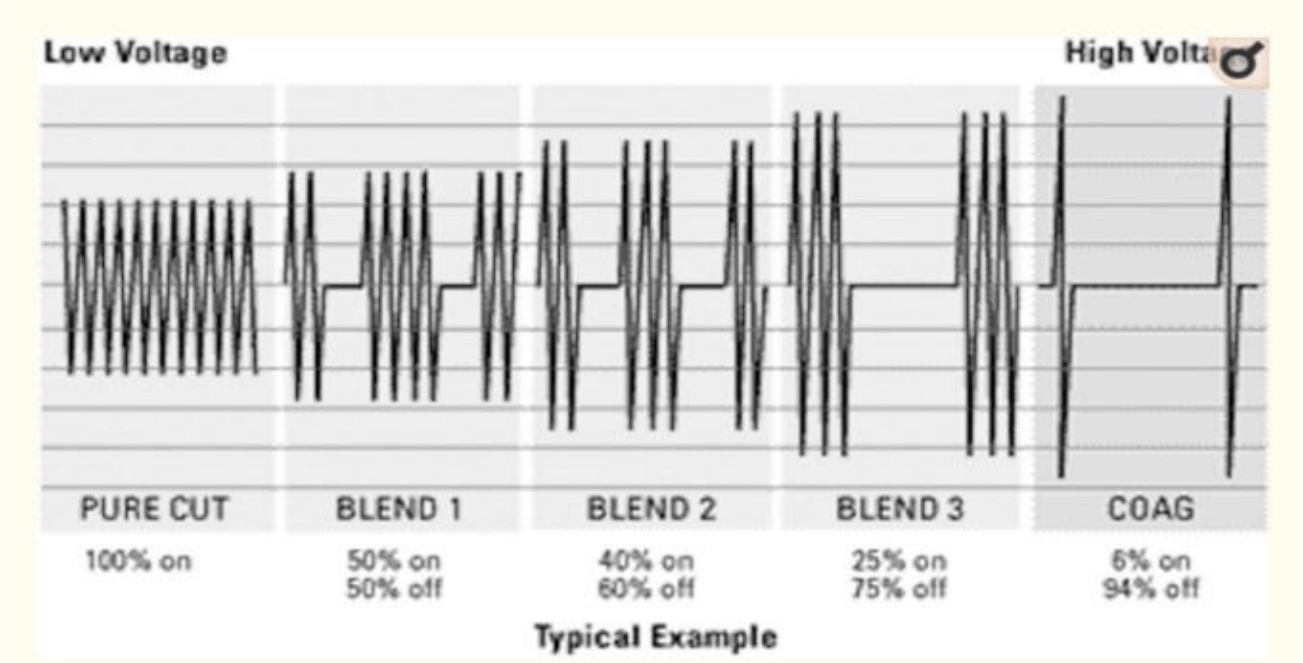
I. **Current density: As expected, the greater the current that passes through an area, the greater the effect will be on the tissue.**

II. **Time:The length of time a surgeon uses an active electrode determines the tissue effect. Too long an activation will produce wider and deeper tissue damage. Too short an activation will result in absence of the desired tissue effect.**

III. **Electrode Size: With respect to electrode size, smaller electrodes provide a higher current density and result in a concentrated heating effect at the site of tissue contact. Following the same principle, the patient return electrode used in monopolar electrosurgery is large in relation to the active electrode in order to disperse the current returning to the electrosurgical unit and minimize heat production at this return electrode site .**

IV. **Tissue Conductivity: Various tissue types have a different electrical resistance, which affects the rate of heating. Adipose tissue and bone have high resistance and are poor conductors of electricity, whereas muscle and skin are good conductors of electricity and have low resistance.**

V. **Current Waveforms: The final determinant of how tissue responds to electrosurgery is the current type. Electrosurgical units produce 3 different waveforms: cut, blend, and coagulation.**



A pure cutting (vaporization) waveform is continuous, unmodulated, and undamped. A coagulation waveform is interrupted, modulated, and damped current. A blend waveform is a modification of the cutting waveform and is used when hemostasis is needed while cutting.[5,6] This waveform type consists of a combination of both cutting and coagulation waveforms. Higher blend settings translate into more time between bursts of current and greater coagulation, as seen in the following examples: Blend 1 (80% cut, 20% coagulation); Blend 2 (60% cut, 40% coagulation); and Blend 3 (50% cut, 50% coagulation).

A cutting current power setting must be between 50W and 80W to be effective. Ideally, the electrode is held slightly away from the tissue to create a spark gap or steam envelope through which the current arcs to the tissue. This spark gap results from heating up the atmosphere between the electrode and the tissue.The coagulation current is effective with the power settings in the range of 30W and 50W.

Fulguration (Spray) is a noncontact coagulation that also utilizes spark gap to mediate tissue effects, which results in heating and necrosis as well as greater thermal spread. Desiccation (Deep) is another form of coagulation in which direct contact is made with the tissue, resulting in electrical energy being converted into heat within the tissue. The end result is deeper necrosis and greater thermal spread.

Comparison of Tissue Effects of 4 Energy Modalities

	Monopolar	Traditional Bipolar	Advanced Bipolar	Ultrasonic
Tissue Effect	Cutting, Coagulation	Coagulation	Cutting, coagulation	Cutting, coagulation
Power Setting	50–80 W	30–50W	DEFAULT	55,000 Hz frequency
Thermal Spread	Not well assessed	2–6mm	1–4mm	1–4mm
Maximum Temperature	>100°C	>100°C	Not well assessed	<80°C
Vessel Sealing Ability	Not applicable	Not applicable	Seals vessels ≤7mm	Seals vessels ≤5mm
Technique	Not applicable	Not applicable	Tension free application	Tension free application

Electrothermal injury may result from the following situations: direct application, direct coupling, insulation failure, capacitive coupling, and so forth.

To ensure safe use of electrosurgical devices:

- **Inspect insulation carefully.**
- **Use the lowest possible power setting.**
- **Use a low-voltage waveform (cut)**
- **Use brief intermittent activation.**
- **Do not activate in open circuit.**
- **Do not activate in close proximity or direct contact with another instrument.**

10. Endovascular approaches of Arteriovenous fistula:

An arteriovenous fistula (AVF) is an abnormal connection between an adjacent artery and vein. Unlike an arteriovenous malformation (AVM), these are frequently acquired lesions, rather than developmental abnormalities.

Locations

These can occur in multiple locations with the more common ones having separate articles as below

- **Cerebral Arteriovenous Fistula**
  - **Dural Arteriovenous Fistula**
  - **Pial Arteriovenous Fistula**
- **Scalp Arteriovenous Fistula (Also Called Cirsoid Aneurysm)**
- **Spinal Arteriovenous Fistula**

- **Spinal Dural Arteriovenous Fistula**

- **Coronary Arteriovenous Fistula**
- **Renal Arteriovenous Fistula**

  - **Endovascular treatment can be performed for size and grade reduction, presurgical devascularization, size reduction before radiosurgery, targeted embolization, and as stand-alone treatment for cure. Targeted embolization can address intranidal or flow-related aneurysms and high flow arteriovenous shunts.**
  - **Endovascular treatment of AVMs is most often performed with liquid embolic material such as Onyx or N-butyl cyanoacrylate (NBCA) to occlude the nidus while avoiding migration or extravasation into the draining veins.**
  - **Total endovascular treatment is achieved in approximately 20% of cases;**
  - **Embolization complication rates range from 9% to 30% and the natural history needs to be considered during decision making.**
  - **Traditional endovascular treatment uses embolic material via a transarterial route; however, recently transvenous and combined approaches have been described.**
  - **Endovascular embolization uses liquid embolics such as NBCA (N-BUTYL CYANOACRYLATE) and ethylene vinyl alcohol.**
  - **STEREOTACTIC RADIOSURGERY is used for the treatment of cerebral AVMs. The ideal AVM for treatment with SRS is small, less than 3 cm in diameter or less than 10 cm3, in noneloquent regions where the margin can receive a dose of 16–25 Gy. Larger AVMs should be staged and thoughtful consideration should be given to multimodal therapy.**
  - **Renal arteriovenous malformations (AVMs) are rare vascular malformations that cause hematuria. Treatment for renal AVMs has evolved from open nephrectomy to transcatheter arterial embolization (TAE).**
  - **Embolization of congenital renal arteriovenous malformations using ethanol and coil .**
  - **Most intracranial dural arteriovenous fistulae (DAVFs) involve the transverse-sigmoid sinus (TSS), and various types of endovascular treatment (EVT) have been involved in managing TSS DAVFs.**

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2019

PAPER IV

1. Define intestinal failure. Types of intestinal failure and recent advances in the management of type3 intestinal failure. 2+3+5
2. Gynacomastia – evaluation and management. 10
3. Indications of Bariatric Surgery and Compare mini gastric bypass with Roux – en –Y gastric bypass. 3+7
4. Management of symptomatic gall stone in pregnancy. 10
5. New approach to pancreatic necrosis. 10
6. Vacuum assisted wound management. 10
7. Diagnostic laparoscopy in staging of Gastro-intestinal malignancy. 10
8. Describe recent advances in management of nipple discharge. 10
9. Clinical features and recent concept of management of necrotizing fasciitis. 10
10. What are the current perspectives in surgical treatment of Ascites? 10

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES
MS (General Surgery) Examination, 2019
PAPER IV

1. Define intestinal failure. Types of intestinal failure and recent advances in the management of type3 intestinal failure. 2+3+5

Answer. Definition of intestinal failure- The term IF encompasses multiple d/o of inadequate GIT length/ function that prevent adequate nutrient absorption. SBS refers to loss of bowel length usually >75%.

It results from obstruction,dysmotility, sx resection, congenital defect, loss of absorption.

TYPES- HOPE HOSPITAL CLASSIFICATION

- TYPE I
- TYPE II
- TYPE III

TYPE I

- short term
- Common
- Causes
    - Acute intestinal inflammation- IBD, RT,CT
    - Ileus- post op (MC), trauma, sepsis, ac. Pancreatitis, MODS
    - Intestinal obstruction/ pseudoobstruction
- Self limiting
- Nutritional support <14 days

Type II

- Weeks – months (>28 days)
- After major bowel resection
- Associated with sepsis, nutritional, metabolic complications
- Require PN

TYPE III

- Long term >6 months
- MC cause- SBS
- Irreversible
- Home PN
- Candidate for autologous reconstruction or transplant

MX OF TYPE III IF

Aim – maintain adq. Nutrition, fluid electrolyte balance – PN

Mortality more with- >60 yr,

<50 cm bowel,

Jejunostomy

Type of SBS	Length of remnant bowel
1 (jejunostomy)	<100-150 cm
2 (jejunocolic)	<60 cm
3(jejunoileocolic)	<35 cm

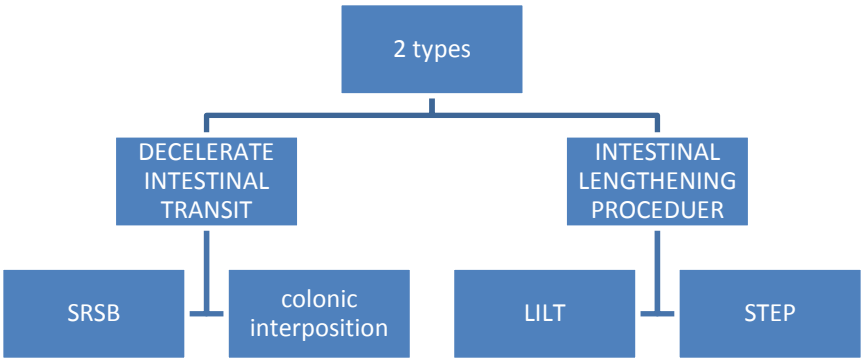
Medical options

GLP-2 analogues

TEDUGLUTIDE- improve intestinal adaptation and absorption
^crypt proliferation
^villous height
^ expression of glucose transporter

Surgical options

- AUTOLOGUS RECONSTRUCTION
  AUGIR (autologous GI reconstruction) aims- to optimize absorptive surface & function of residual bowel



- SRSB(segmental reversal of small bowel) a segment of 10-12 cm of jejunum is reversed and reanastomosed
- LILT(longitudinal intestinal lengthening & tailoring) – intestine devided longitudinally, 2 halves refashioned in tubes & anastomosed
- STEP(serial transverse enteroplasty) serial transverse division of intestine on alternate sides
- SMALL BOWEL TRANSPLANTATION- Radical Rx – last option

Indication –

- hepatic failure secondary to PN
- thrombosis > 2 central veins
- frequent severe dehydration despite IVF
- SINGLE episode of septic shock/ ARDS

GRAFT – cadaveric donors

Types-

- Isolated intestinal transplant
- Combined liver and intestinal transplant
- Multivisceral transplant (SI, stomach, spleen, liver)

- ❖ Modified Multivisceral transplant that exclude liver

Survival rate-

- 1yr – 80%
- 5 yr- 60%

- Intestinal tissue engineering
  - Acellular dermal matrix
  - SI submucosa

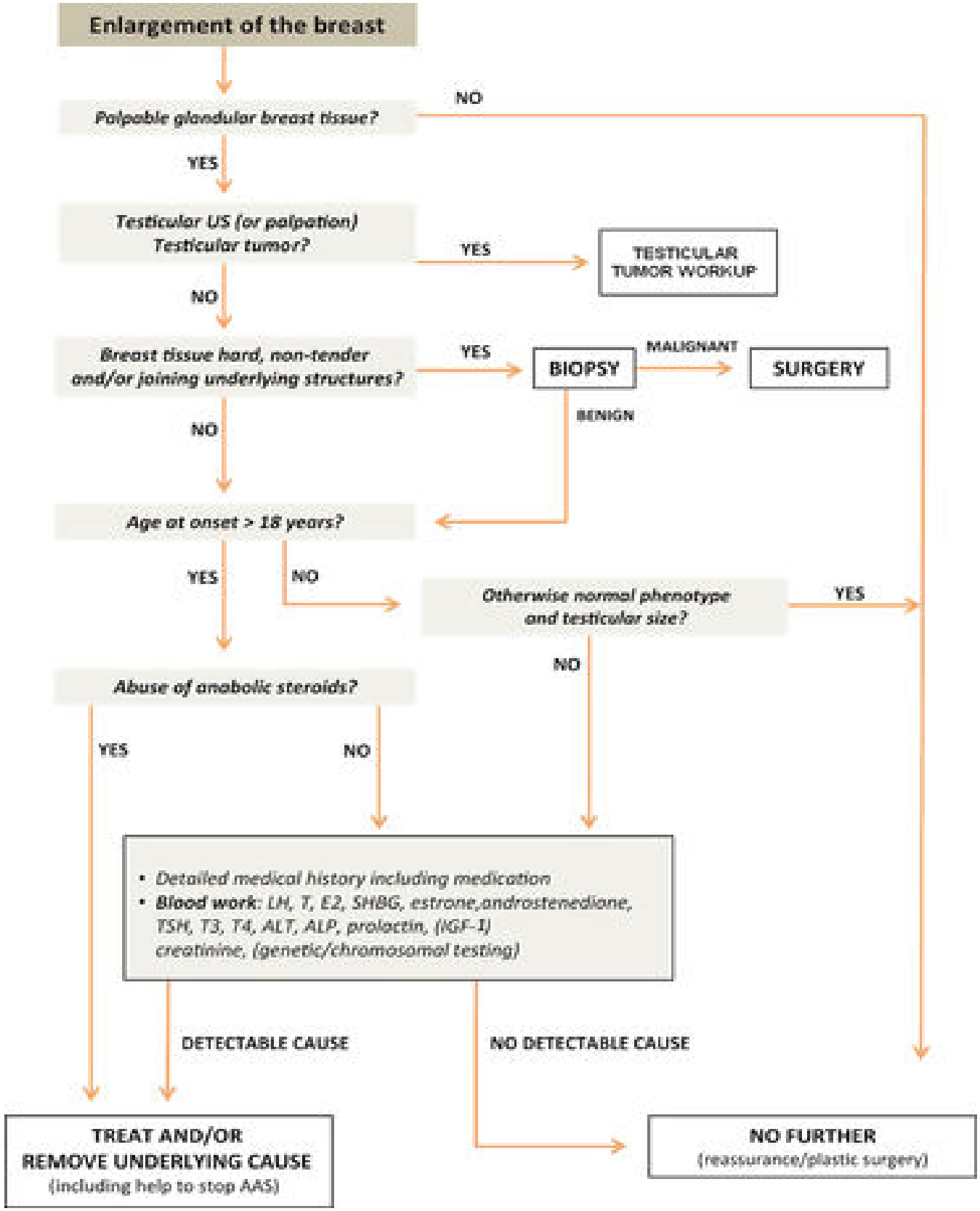
2. Gynacomastia – evaluation and management. 10

Answer. Diagnostic approach of men with gynecomastia:

- Medical history collection
  - Duration of gynecomastia, uni- or bilateral location, tenderness
  - Previous occurrences of gynecomastia
  - Previous or current cryptorchidism, fertility status
  - Symptoms of testosterone deficiency, hyperthyroidism, or systemic illnesses
  - Complete list of medication, use of recreational drugs and/or supplements
- Physical examination
  - Uni- or bilateral location, size, tenderness
  - Height, weight, and body mass index
  - Thyroid palpation
  - General (signs of systemic illnesses) and genital (testicular size, consistency) physical examination
- First-level laboratory blood tests and instrumental investigations
  - LH, FSH, T, E_2, SHBG
  - β-hCG
  - TSH
  - Prolactin
  - Liver function: SGOT, SGPT, albumin
  - Renal function: creatinine, urea
  - Testicular ultrasound scan
- Additional laboratory blood investigations

DHEA-S, AA
Karyotype
DNA for genetic analysis, such as PCR for androgen receptor

Gynaecomastia: Evaluation and management



3. Indications of Bariatric Surgery and Compare mini gastric bypass with Roux – en –Y gastric bypass. 3+7

Answer. Obesity is now a worldwide public health problem, an epidemic, with increasing incidence and prevalence, high costs and associated comorbidities. The term "metabolic syndrome" is generally used to indicate the cluster of central obesity, insulin resistance, hypertension and hyperlipidemia.

Bariatric surgery is the branch of surgery involving manipulation of the stomach and/or small bowel to aid weight loss. Bariatric term comes from the Greek word *baros:* weight/pressure, and –*iatric:* the medicine or surgery thereof. Bariatric surgery causes significant and sustained weight loss and can considerably reduce Insulin resistance, with dramatic clinical improvement or remission of insulin resistant states (i.e. dyslipidemia, hypertension, hyperuricemia, sleep apnea). Conventional bariatric procedures are now increasingly being proposed not only as mere surgical management of obesity but also as a valuable approach to intentionally treat T2DM – a new concept and practice referred to as "metabolic surgery".

WHO has classified obesity into following categories: [BMI (kg/m2): body weight in kg per (height in m)2]

- Class 1: BMI of 30 to <35
- Class 2: BMI of 35 to <40
- Class 3: BMI of ≥40. It is sometimes categorized as "extreme" or "severe" obesity
- Super Obese: BMI >50

For the Asian population, Obesity has been modified by the Western Asia Pacific WHO as follows:

- Class 1: BMI of 25 to 29.9
- Class 2: BMI of ≥30

Indications of Bariatric Surgery: Selection of patients for bariatric surgery is based on currently accepted National Institute of Health (NIH), USA and AHA/ACC/TOS guidelines which are as: Indications for Bariatric Surgery

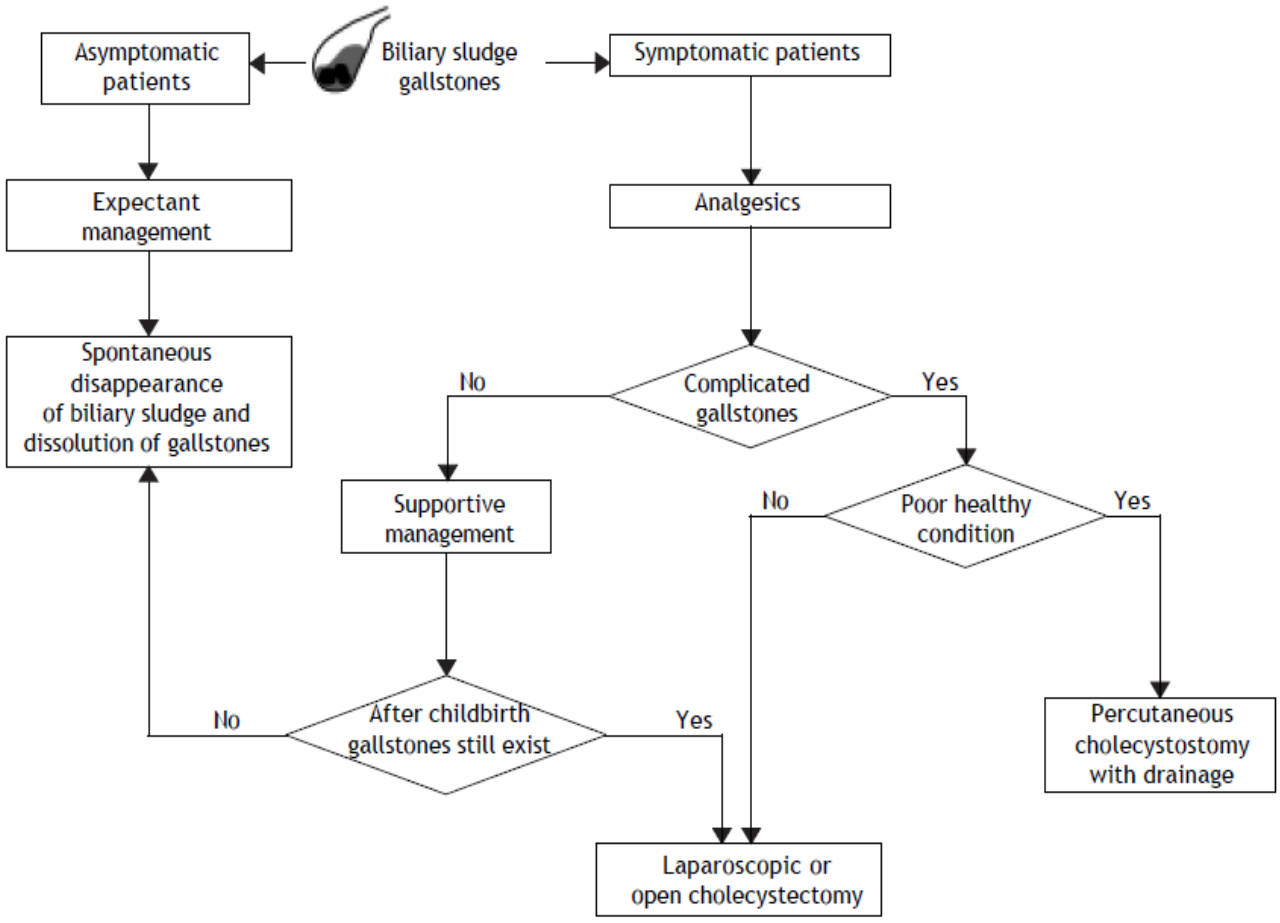
Patients must meet the following criteria for consideration for Bariatric Surgery. An inability to fulfill these criteria is a contraindication to bariatric surgery:

- BMI >40kg/m2 or BMI >35kg/m2 with an associated medical comorbidity worsened by obesity
- Failed dietary therapy
- Psychiatrically stable without alcohol dependence or illegal drug use
- Knowledgeable about the operation and its sequelae
- Motivated individual
- Medical problems not precluding probable survival from surgery

Common benefits of MGB & RYGB	Advantages of MGB over RYGB	Advantages of RYGB over MGB
In a prospective RCT from Taiwan comparing RYGB to MGB, it was concluded that both are effective for morbid obesity with similar results for resolution of metabolic syndrome and improvement of quality of life.	MGB is a simpler and safer procedure that has no disadvantage compared with RYGB at 2years of follow-up. It has only single anastomosis, thus less chance of leak.	The bilio-pancreatic content is bypassed to small intestine, thus there's no risk of biliary gastritis at GJ site, which is the case to some extent in case of MGB on long follow-up.

4. Management of symptomatic gall stone in pregnancy. 10

Answer.



Flow-chart depicting the standard therapy of biliary sludge and gallstones during pregnancy. For management purposes,
biliary sludge and gallstones should be considered similar in almost all respects. Surgery generally is reserved for pregnant women with recurrent or unrelenting biliary pain refractory to medical management or with complications related to gallstones, including obstructive jaundice, acute cholecystitis, gallstone pancreatitis, or suspected peritonitis. For its safety, laparoscopic or elective cholecystectomy is one of the most common treatments for gallbladder gallstones in pregnant women, but it is recommended after the second trimester in order to reduce the rate of spontaneous abortion and preterm labor. If cholecystectomy is required during pregnancy, laparoscopic surgery is first recommended because of its relative safety. Of special note is that the timing of surgery is important. The effect of laparoscopic surgery on a developing fetus in the first trimester is unknown and surgery is more difficult in the third trimester with uterine enlargement. The second trimester, therefore, is believed to be the optimal time for cholecystectomy. A supportive management is highly recommended if possible, delaying more definitive treatment until after childbirth.

5. New approach to pancreatic necrosis. 10

Answer. Diagnosis of pancreatic necrosis

Blood- amylase, lipase, CRP—diagnostic & prognostic

CECT W/A-

- After 72 hrs
- % of necrosis- CT severity score

MODIFIED CT SEVERITY INDEX

Pancreatic inflammation

0- N pancreas
2- Pancreatic changes with or without peripancreatic inflammation
4- Peripancreatic fluid collection/ Fat necrosis

Pancreatic necrosis:

0 – None
2 - 30% or less
4 - >30%

Extrapancreatic complication:

2-one or more of- pleural effusion, ascites, vascular or GI involvement

Total score

- 0-2 - MILD
- 4-6 - MODERATE
- 8-10 SEVERE

TREATMENT

GENERAL MEASURES:

High risk – shift to CCU/ HDU

Respiratory support – most O2/ ppv/ intubation

Hemodynamic stability-

- IVF- NS/ RL
- Aggressive fluid therapy - first 12-24 hrs- 250-500 ml/ hr (decrease BUN)

Antibiotics-

- Not recommended routinely as prophylasix

- Recommended-
  a. infected necrosis
  b. not improve after 7-10 days if conservative Rx
  c. extrapancreatic infection- cholangitis, pneumonia

IMIPENEM, IMIDAZOLE, QUINOLONE

Routine prophylactic ERCP – not improve outcome

Analgesic- narcotic

Nutrition-

1- Enteral – recommended
2- PN

SPECIFIC MEASURE

All necrosis need not to be drained

Infected necrosis-surgical necrosectomy

Air in necrosis -suspected

USG /CT guided FNAC +gram stain- proved

Surgical necrosectomy-- STEP UP treatment – recommended

Endoscopic RX- currently 1 st line Rx

- ENDOSCOPIC TRANSMURAL DRAINAGE with

a) Larger tract dilatation
b) Placement of multiple stents
c) Insertion of NCC (nasocystic catheter)
d) FCSEMS

- Direct debridement of solid necrotic tissue

Percuteneous drainage

Video assited retroperitoneal access

Open necrosectomy: When all fail

6. Vacuum assisted wound management. 10

Answer. Vacuum-assisted closure of a wound is a type of therapy to help wounds heal. It's also known as wound VAC. During the treatment, a device decreases air pressure on the wound. This can help the wound heal more quickly.

The gases in the air around us put pressure on the surface of our bodies. A wound vacuum device removes this pressure over the area of the wound. This can help a wound heal in several ways. It can gently pull fluid from the wound over time. This can reduce swelling, and may help clean the

wound and remove bacteria. A wound VAC also helps pull the edges of the wound together. And it may stimulate the growth of new tissue that helps the wound close.

A wound vacuum system has several parts. A foam or gauze dressing is put directly on the wound. An adhesive film covers and seals the dressing and wound. A drainage tube leads from under the adhesive film and connects to a portable vacuum pump. This pump removes air pressure over the wound. It may does this either constantly or it may do it in cycles.

The dressing is changed every 24 to 72 hours. During the therapy, patient will need to carry the portable pump everywhere you go.

The suction should not be off for longer than 2 hours daily. If the VAC suction is off for more than 2 hours, we must remove the VAC and cover the wound with a wet to dry gauze dressing.

- ❖ Need of a vacuum-assisted closure of a wound:
  - o for a recent traumatic wound
  - o for a chronic wound
  - o wounds linked to diabetes

Large wounds can take a longer time to heal.

A wound vacuum system may help your wound heal more quickly by:

- Draining excess fluid from the wound
- Reducing swelling
- Reducing bacteria in the wound
- Keeping the wound moist and warm
- Helping draw together wound edges
- Increasing blood flow to the wound
- Decreasing redness and swelling (inflammation)

Wound VAC offers some other advantages over other types of wound care. It may decrease your overall discomfort. The dressings usually need changing less often. And they may be easier to keep in place.

Indications and contraindications for the use of VAC

- ❖ The principal indications for the use of the mains powered VAC are:
  - Acute and traumatic wounds
  - Subacute wounds (i.e. dehisced incisions)
  - Pressure ulcers
  - Chronic open wounds (stasis ulcers and diabetic ulcers)
  - Meshed grafts
  - Flaps
- ❖ The small ambulant unit is recommended for:
  - Venous stasis ulcers
  - Lower extremity diabetic ulcers
  - Pressure ulcers
  - Lower extremity flaps

- Dehisced incisions
- Grafts

❖ Contraindications for both systems include:
- Fistulas to organs or body cavities
- Necrotic tissue in eschar
- Osteomyelitis (untreated)
- Malignancy in the wound

❖ Risks of vacuum-assisted closure of a wound:

- Bleeding (which may be severe)
- Wound infection
- An abnormal connection between the intestinal tract and the skin (enteric fistula)

Certain problems can increase the risk of complications, such as:

- Exposed organs or blood vessels
- High risk of bleeding from another health problem
- Wound infection
- Nearby bone infection
- Dead wound tissue
- Cancer tissue
- Fragile skin, such as from aging or longtime use of topical steroids
- Allergy to adhesive
- Very poor blood flow to your wound

Effectiveness: A 2007 Cochrane Review stated that the evidence comparing NPWT to alternative care was flawed and required more study, but the evidence did support improved healing and called for more, better quality research to be conducted. A 2010 systematic review found "consistent evidence of the benefit of NPWT" in the treatment of diabetic ulcers of the feet. Results for bedsores were conflicting and research on mixed wounds was of poor quality, but promising. The review did not find evidence of increased significant complications. The review concluded "There is now sufficient evidence to show that NPWT is safe, and will accelerate healing, to justify its use in the treatment of diabetes-associated chronic leg wounds. There is also evidence, though of poor quality, to suggest that healing of other wounds may also be accelerated.

7. Diagnostic laparoscopy in staging of Gastro-intestinal malignancy. 10

Answer. The staging of gastrointestinal malignancies aims to ensure that each patient receives the most appropriate treatment with minimal morbidity and in a cost-effective manner. Thus, the goal of staging is to distinguish patients who have a potentially resectable localized tumor from those with advanced disease and/or distant metastases. Accurate staging has become increasingly important in view of the increasing alternatives for neoadjuvant therapy and non-operative palliative procedures.

Inspection of the Peritoneal Cavity: The initial step in staging laparoscopy is meticulous inspection of the four quadrants of the peritoneal cavity, which, if done properly, can identify serosal implants as small as 1 mm. To facilitate visualization, any ascitic fluid should be aspirated and sent for

cytology prior to inspection. However, if laparoscopic ultrasonography is planned during the evaluation, it should be performed before aspiration, as the ascitic fluid is an excellent medium for the transduction of ultrasonic sound waves.

Peritoneal Washings: Peritoneal washings should be obtained, especially if the patient is being evaluated for pancreatic cancer, as the presence of malignant cells has been shown to influence resectability and prognosis.

Biopsy

When a parenchymal lesion, peritoneal implant, or suspicious lymph node is identified, laparoscopic biopsy can be done with great precision. Depending on the size and location, tissue may be obtained by a variety of techniques, including fine-needle, core-needle, forceps, and incisional or excisional biopsy.

Role of laparoscopic staging procedures in various regions of them gastrointestinal tract.

Hepatic Malignancies

Laparoscopic techniques are well-suited to confirm the diagnosis of hepatocellular carcinoma or metastatic liver lesions, in that they can be used to visualize a surface lesion and perform a biopsy.

Laparoscopy is a reliable method for detecting additional small lesions and peritoneal seeding, which are usually missed by other imaging methods.

Primary Liver Tumors

In a recent series of 50 consecutive patients diagnosed with potentially resectable liver tumors, laparoscopy alone demonstrated unresectability in 46%, and nontherapeutic laparotomy was avoided in these patients.

Numerous studies have shown that intraoperative ultrasound during open operations is more sensitive for the detection of liver lesions than preoperative imaging modalities, including ultrasound, CT, CT portography, and magnetic resonance imaging (MRI).

Based on the results of intraoperative ultrasonography, the operative plan was altered in one-third of the study group. Intraoperative ultrasonography also may be used to evaluate surrounding structures, including the portal vein and perihilar structures.

Laparoscopy and laparoscopic ultrasonography averted a nontherapeutic laparotomy.

Liver Metastases

Intraoperative ultrasound may also be used during primary resection of colorectal cancer to identify liver metastases that are not detected by preoperative ultrasound or CT.

Biliary Tract Malignancies

Malignancies of the biliary tree are relatively rare, and therefore comparisons of staging modalities are difficult to perform. Only a few studies have addressed the usefulness of laparoscopic staging in these diseases

If, during laparoscopic staging, a gallbladder carcinoma is suspected, conversion to an open surgical approach is recommended.

Pancreatic Cancer

Pancreatic cancer is notorious for its propensity to metastasize to the liver and peritoneum. Most patients exhibit local tumor invasion and metastatic spread by the time symptoms occur and therefore have disease that is unresectable for cure.

Unfortunately, current preoperative imaging methods frequently the disease, and, based on these tests, patients with unsuspected advanced disease undergo laparotomy unnecessarily.
Studies have demonstrated that over 40% of patients have peritoneal or liver metastasis despite negative preoperative imaging with ultrasound or CT.

Laparoscopy currently plays a dominant role in the management of pancreatic cancer since it not only has a sensitivity and specificity of 93% and 100%, respectively, for the detection of pancreatic tumors but also enables the biopsy of such lesions.[

Furthermore, peritoneal washings for cytologic examination should be obtained during laparoscopic staging of pancreatic malignancies.

Gastric Cancer

Accurate staging of gastric cancer is increasingly important since more patients are being offered neoadjuvant or palliative therapy without surgical confirmation of disease stage. Endoscopic ultrasonography combined with CT is currently the state-of-the-art in
staging gastric carcinoma.

However, as with other intraabdominal cancers, these imaging modalities can miss small metastatic deposits from gastric cancer, resulting in unnecessary laparotomies in patients who already have a poor prognosis. Moreover, endoscopic ultrasonography has been reported to overstage T-stage in 40% Of cases and may result in resectable patients being placed on palliative treatment protocols.

Several recent reports have addressed the value of laparoscopic staging in gastric cancer. A prospective comparative study in 103 patients showed that laparoscopy was more accurate in detecting metastases than ultrasound and CT.

Esophagogastric Cancer

Although the benefits of laparoscopic staging of pancreatic and liver malignancies are clear, the use of laparoscopy to stage cancer of the esophagus and gastric cardia remains controversial

Colon and Rectal Cancer

Currently, there are few absolute indications for staging laparoscopy in the evaluation of a primary colon or rectal malignancy.
It may be reasonable to perform diagnostic laparoscopy in a patient with an advanced rectal cancer if a suspicious liver lesion is noted on preoperative CT and the patient is being considered for neoadjuvant therapy. If the hepatic lesion is proven to be benign by laparoscopy and laparoscopic ultrasound, neoadjuvant therapy could then proceed. If malignant, such therapy could be canceled and an immediate palliative procedure performed .

Radioimmunoguided Surgery

Radioimmunoguided surgery (RIGS) using laparoscopic probes is also on the horizon. The RIGS system utilizes a monoclonal antibody CC49-radiolabeled with iodine-125 targeted against a mucin that is highly expressed in human adenocarcinomas, tumor-associated glycoprotein-72 (TAG-72). Although the accuracy of RIGS is still being evaluated in open operations, preliminary results of a phase III trial indicate that it accurately determines disease stage and, therefore may influence perioperative therapy and extent of resection.Perhaps laparoscopic RIGS will have its greatest impact on improving staging accuracy so that decisions about appropriate neoadjuvant therapy can be made prior to resection, if indicated.

Conclusions

Although the results of randomized trials comparing laparoscopic and conventional resections for abdominal malignancies will not be available for several years, it is clear that laparoscopic techniques are attaining a prominent role in the diagnosis and staging of many gastrointestinal malignancies. The recent addition of laparoscopic ultrasonography appears to have achieved an extremely high degree of sensitivity in the evaluation of solid organs without the need for a laparotomy.

8. Describe recent advances in management of nipple discharge. 10

Answer. Introduction: Nipple discharge is a common complaint among women. Evaluation and management of nipple discharge can be undertaken with minimal difficulty by performing a careful history and examination, and by logically linking the type of discharge with a suitable mode of treatment

- Nipple discharge disorders is a field in which there has been both increasing awareness on the part of patients and advances in management.
- Today secretion from nipples can be classified according to its color, cellularity and biology.
- To be significant a discharge should be true, spontaneous, persistent and non-lactational.
- Moreover there are methods to differentiate patients who require surgical intervention from those who do not.
- Surgically significant nipple discharges are watery, serous (yellow), serosanguineous and bloody.

Nipple discharge features based on its nature:

Nature of discharge	Etiology	Localization	Ducts involved
Milky	Postpartum Hyperprolactinemia Medications Chiari–Frommel syndrome*	Bilateral	Multiple
Serous/serosanguinous	Intraductal papilloma or papillomas (papillomatosis) Intraductal cancer	Unilateral	One
Bloody	Intraductal papilloma or papillomas (papillomatosis) Intraductal cancer Inflammation* Trauma*	Unilateral	One or two
Green	Fibrocystic disease	Bilateral	Multiple

**Relatively infrequent causes of nipple discharge.*

- Cytology smears of discharge material have helped to classify the cellular material, providing information about normality, atypia and malignancy and also about papillary formation of the exfoliated cells.

Masood cytologic classification.

Cellular arrangement	Cellular pleomorphism	Anisonucleosis	Nucleoli	Chromatin clumping	Myoepithelial cells	Score
Monolayer	Absent	Absent	Absent	Absent	Many	1
Nuclear overlapping	Mild	Mild	Micronucleoli	Rare	Moderate	2
Clustering	Moderate	Moderate	Micro and/or rare micronucleoli	Occasional	Few	3
Loss of cohesion	Conspicuous	Conspicuous	Predominantly macronucleoli	Frequent	Absent	4

Score 6–10: Nonproliferative breast disease. Score 11–14: Proliferative breast disease without atypia. Score 15–18: Proliferative breast disease with atypia. Score 19–24: Cancer.

- Tests such as Hemoccult help to discover occult blood in the secreted fluid. Modern immunological tests can be performed on cytology smears where occurrence of high levels of carcinoembryonic antigen could indicate a latent malignancy.
- Galactography investigation is today the state-of-the-art approach to investigate patients with nipple discharge disorders and this examination can demonstrate the size, location and extent of an intraductal abnormality.
- Modern high-resolution ultrasound techniques are helpful in visualizing intraductal disorders and are becoming a good complementary approach if not an alternative to traditional radiology techniques.

Ultrasonographical findings in common nipple discharge etiology.

Etiology	Findings
Intraductal papilloma	Ovoid hyperechoic mass (image)
Duct ectasia	Single or multiple tubular anechoic subareolar structures
Intraductal carcinoma	Calcifications, irregular shape and irregular margin contour*, hypoechogenicity and nonuniform internal echotexture†, posterior shadowing and loss of bilateral edge shadowing§

*In contrast: *To 2 or 3 gentle lobulations; †of the intense, uniform hyperechogenicity; and §of thin, echogenic capsule of benign conditions.*

- Recently even MR galactography has been shown to be of diagnostic value, but not as informative as regular galactography.
- The most sophisticated investigation method, which can also be used therapeutically, is fiber-ductoscopy of the concerned duct in a breast. This technique, although expensive and in its infancy, is a fascinating and promising approach for inspecting the intraductal lumina.

Surgical diagnosis:

- Biopsy–excision of the pathological duct(s) should be performed if nipple discharge persists or when it is bloody.
- Microdochectomy - The removal of the duct by a technique that leaves intact the surrounding tissues and the unaffected ducts. The procedure can also be carried out by transnipple pyramidectomy.

Future perspective:

- Endoscopic appearances of ductoscopy should be improved in order to achieve accurate diagnoses in more cases.
- Biopsy tools need further improvements.
- Further evaluation of the potential therapeutic role of guided intraductal biopsy, and of cytology assisted by ductoscopy as a screening tool, is required.
- The mammary pump could be prove to be an essential instrument in nipple discharge screening.

9. Clinical features and recent concept of management of necrotizing fasciitis. 10

Answer.

Intoduction: Necrotizing fasciitis (NF) is a severe life threatening, rapidly advancing soft tissue infection that progress along fascia and subcutaneous tissue, characterized by a fulminant course and a high mortality. It is commonly known as “flesh eating disease” or “synergistic gangrene”. It is commonly used as a general term to describe necrotizing soft tissue infections (NSTIs); referred by different names like necrotizing cellulitis, necrotizing erysipelas, necrotizing myositis, Phagedena, hemolytic streptococcal gangrene, Meleney’s synergistic gangrene, Fournier’s gangrene, etc.
Clinical featutres: Necrotizing fasciitis is difficult to diagnose in early stages and a high index of suspicion with low threshold to prompt surgical intervention should be the dictum. Patient may present with early features of localized evidence of skin inflammation (pain, erythema, oedema) or with later systemic symptoms of sepsis (pyrexia, tachycardia, hypotension, tachypnoea, altered mental state).

Clinical stages of Necrotizing fasciitis		
Stage 1	**Stage 2**	**Stage 3**
Tenderness	Blister and bullae formation	Tissue necrosis
Erythema		Hyposensitivity
Oedema		Anaesthesia
Warm skin		Tissue crepitation
Fever		Haemorrhagic bullae

Pathophysiology: NF is a deep seated infection with deep fascia as the primary site of pathology that results in progressive destruction of fascia and fat with sparing of the skin initially. The cutaneous manifeastations are secondary changes as a consequence of progressive ischaemia. Muscles usually are not affected. Organisms spread rapidly along superficial and deep fascial tissue planes facilitated by the production and release of bacterial enzymes (hyaluronidase), toxins and endogenous cytokines.
The major pathological events include:

- Extensive destructions of tissues and spread of bacteria along fascial planes;
- Thrombosis of blood vessels;
- Ischaemia and tissue necrosis;
- Damage to superficial nerves producing localized anaesthesia.

- Microbiology: NSTI can be classified into bacteriological classes, described by Giuliano et al. Some authors have described a fourth category, which is based on fungal infection: While it can affect any part of the body, 50% of cases involve the lower extremities. Other common areas include the upper extremities, the perineum (Fournier gangrene), and head and neck region. In neonates, the most common area involved is the trunk.

Type I (Polymicrobial)	Type II (Monomicrobial)	Type III (Salt Water NF)	Type IV (Fungal)
More common (80%) Synergism among bacteria lead to fulminant infection Gram positive cocci:*Staph aureus, Strept pyogenes, Enterococci* Gram negative rods: *E.coli, Psedomonas* Anaerobes: *Clostridium perfringes, C.septicum, C.sordellii*	Around 20% cases *Group A Streptococcus* (GAS) alone or with *Staph aureus* Can leads to Shock (Toxic Shock Syndrome) and Multi organ failure	Marine contamination of an open wound Gram negative marine organisms; *Vibrio species (V.Vulnificus)* High mortality (25%) despite aggressive therapy	Fungal infection following traumatic wounds or burns Rapidly progressive *Zygomycetes, Aspergillus* *Candida*

Investigations: Necrotizing fasciitis is a clinical diagnosis and a surgical emergency. The Laboratory Risk Indicators for Necrotizing Fasciitis (LRINEC) described by Wong et al, is an effective tool to help distinguish NF from other soft tissue infections or abscesses. LRINEC score of ≥6 is highly suspicious of NF and >8 is diagnostic; with positive predictive value of 92% and negative predictive value of 96%.

Variables	Value	Score
C-Reactive Protein (mg/dL)	<150	0
	>150	4
Total Leucocyte count (/mm^3)	<15k	0
	15-25k	1
	>25k	2
Hemoglobin (g/dL)	>13.5	0
	11.0-13.5	1
	<11.0	2
Serum Sodium Level (mmol/L)	>135	0
	<135	2
Serum Creatinine Level (µmol/L)	<141	0
	>141	2
Serum Glucose (mmol/L)	<10	0
	>10	1

Imaging: Plain film radiography can show gas within the soft tissues in presence of polymicrobial infection. This is a non-specific sign. Ultrasound can have a role in determining the presence or absence of an abscess and can reveal subcutaneous gas and oedema along the fascial planes. Magnetic Resonance Imaging (MRI) scan are highly sensitive, if no fascial thickening is found, NF can be excluded.

Surgical diagnosis: The gold standard for detection of NF is tissue biopsy. An incision over the site of maximal skin change is needed to assess the underlying tissue. Healthy subcutaneous fat and fascia indicates that further resection is not needed. If the exploration reveals the presence of dusky grey necrotic subcutaneous fat and fascia, lack of bleeding, thrombosed vessels, non-contracting muscle, dish water coloured fluid ("dish water pus") seeping from the wound and a positive finger test result; the diagnosis of NF is confirmed. A positive finger test is characterized by lack of resistance to finger dissection in tissue.

Treatment: NF is a surgical emergency needing a high index of suspicion, early diagnosis and aggressive surgical debridement. The treatment for NF follows the same principles for any kind of surgical infection:

- Source Control
- Antimicrobial therapy
- Support
- Monitoring

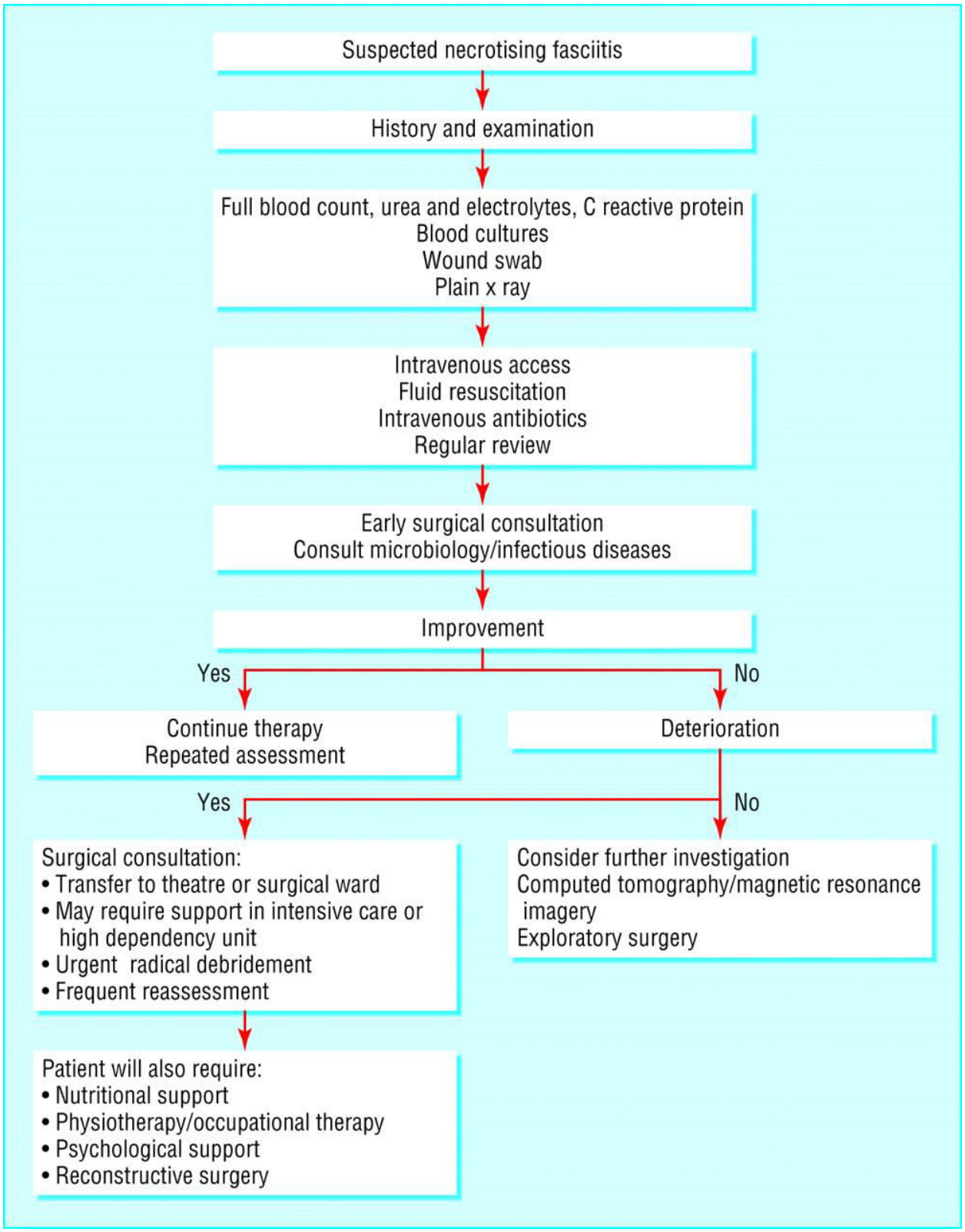
Resuscitation, Antibiotic and Critical Care: The degree of respiratory, hemodynamic, renal and metabolic compromise must be quickly assessed. Early resuscitation with intravenous fluids or colloids should be initiated and ionotrope should be added if required. All patients should be started with broad spectrum antibiotics to cover Staphylococcus, Streptococcus, Gram negative rods and anaerobes. Recommended regimens include single agents like Meropenem, Imipenem, Ertapenem, Piperacillin-Tazobactum, but may be changed acoording to sensitivity. The

commonly used multidrug regime includes a high dose of Penicillin, Clindamycin and a fluoroquinolone or an aminoglycoside for Gram Negative coverage.

Surgical treatment: NF is one of the excellent examples highlighting a very important role played by source control in management of Surgical Infection. Radical surgical debridement is the mainstay of treatment. Patients should be consented regarding the seriousness of the infection and informed that the risk of mortality is increased without wide surgical excision. A generous incision is made and the macroscopic features of the lesion are used to decide the extent of debridement; with excision of all non-viable tissue including the fascia, drainage of all abscesses and extensive fasciotomy. Healthy, viable, bleeding tissue at the edge of excision site should be the end point of debridement. To ensure that infectious process has not extended, a repeat surgical exploration 24-48hours later becomes essential.
After the initial debridement, patient should be preferably managed in an intensive care unit which allows to provide a good physiological support alongwith close monitoring of the patient.
Reconstructive surgery should be planned once the patient is stabilized and infection is fully eradicated. Sterile dressings with alginate or hydrogel are used for wound coverage during the interim. Skin cover can be provided either with secondary skin suturing, split skin grafting or tissue transfer.
Negative Pressure Wound Therapy (NPWT) is the vacuum assisted closure of wound. It improves healing and helps in reducing the size of larger defects that would have been difficult to manage with simply on their own.
Other forms of surgery which may be necessary include amputations for necrotizing infections of the extremities and a defunctioning colostomy for perineal wounds to prevent continuous faecal contamination.
Adjunct measures: Hyperbaric oxygen therapy has been used with controversial status in literature. It involves intermittent inhalation of 100% O2 under pressure exceeding the atmospheric pressure, which leads to enhanced oxygenation in blood and tissues. This prevents further necrosis and enhIntravenous Immunoglobulin (IVIG) is reasonable and desirable option to neutralize Streptococcal toxins.
Complications of NF:

- Septic Shock
- Cardiovascular collapse
- Renal Failure
- Scarring with cosmetic deformity
- Limb Loss
- Toxic Shock Syndrome

Prognosis and Outcome: NF is a life threatening condition with a high associated morbidity and mortality. Jones, who first described NF, reported a mortality rate of 46% and a recent pooled analysis estimated it to be around 34%. More recent studies have reported the mortality rates in the range of 16-24%.
The outcome of the disease also depends upon the region involved: with the involvement of limbs having a lower mortality (22%) as compared to the truncal (44%) and perineal (28%) involvement. The factors responsible for a higher mortality include: late or incomplete debridement, Age >60years, females, presence of hypotension, acidosis, bacteremia, renal failure, hyponatremia, PVD and an area involved >250cm2. ances healing.


Suspected necrotising fasciitis
History and examination
Full blood count, urea and electrolytes, C reactive protein
Blood cultures
Wound swab
Plain x ray
Intravenous access
Fluid resuscitation
Intravenous antibiotics
Regular review
Early surgical consultation
Consult microbiology/infectious diseases
Improvement
Yes
No
Continue therapy
Repeated assessment
Deterioration
Yes
No
Surgical consultation:
• Transfer to theatre or surgical ward
• May require support in intensive care or high dependency unit
• Urgent radical debridement
• Frequent reassessment
Consider further investigation
Computed tomography/magnetic resonance imagery
Exploratory surgery
Patient will also require:
• Nutritional support
• Physiotherapy/occupational therapy
• Psychological support
• Reconstructive surgery

10. What are the current perspectives in surgical treatment of Ascites? 10

Answer. Ascites is a pathological accumulation of fluid in the peritoneal cavity. Liver cirrhosis (75%) is the most common cause of ascites in adults in the Western World, followed by malignancy (10%), heart failure (3%), tuberculosis (2%) and pancreatitis (1%). An adequate diagnosis is necessary for successful treatment. Ascites can be classified as:

- Mild ascites: detectable only by ultrasound (grade 1)
- Moderate ascites : evident by moderate symmetrical distension of the abdomen (grade 2)
- Gross or large ascites : marked abdominal distension (grade 3).

Pathophysiological Mechanism	Causes of ascites
Increased portal venous pressure:	Pre-hepatic: Portal vein compression or thrombosis; Schistosomiasis Hepatic: Cirrhosis; Acute hepatic necrosis; Viral hepatitis Post-hepatic: Budd-Chiari syndrome; Myeloproliferqative disorders; constrictive pericarditis; Right heart failure; Hypercoagulable state
Hypoproteinemia	Renal disease – causing severe proteinuria Malnutrition and malabsorption Protein losing enteropathy Acute or chronic liver disease Severe acute or chronic illness
Chronic peritoneal inflammation and infection	Chronic infection: Tuberculosis; fungal infection Secondary malignant infiltration (carcinomatosis peritonei) Post-irradiation
Leakage of lymphatic fluid (chylous ascites)	Congenital Surgical trauma Primary or secondary lymphatic malignancy
Other fluids	Pancreatic ascites Bilious ascites Urinary ascites

Diagnostic work up:
History: Information about the medical history, medication use, lifestyle, risk factors for liver disease, and infectious disease risk (e.g. migration) are relevant to discover the underlying etiology.
Physical examination: A screening physical exam should be carried out in every patient with awareness of signs of liver disease (erythema palmare, spider naevi, splenomegaly), heart failure (peripheral oedema, jugular venous distension, third heart sound, pulmonary rales) and malignancy (lymphadenopathy). Flank dullness is found when approximately 1500ml of ascites is present. Shifting dullness is determined by a 3cm flank dullness shift when the patient changes from a supine to a lateral decubitus position. Detection of a fluid wave or puddle sign is less reliable.
Blood tests: Assessment of complete blood cell count, serum creatinine, urea, electrolytes, prothrombin time and liver function tests is recommended.
Abdominal Ultrasound: Abdominal ultrasound is the first-line imaging method to confirm the presence and quantity of ascites. It can also provide crucial information about the cause of ascites,

detect signs of portal hypertension (splenomegaly and portosystemic collaterals) and offer guidance during paracentesis.
Abdominal paracentesis and ascitic fluid analysis: It is the most important step in the diagnostic work-up.

a) Visual inspection: It can show a milky, cloudy, bloody, straw coloured or clear appearance. The first impression of the appearance of ascites can steer the direction of diagnosis.
b) Serum ascites albumin gradient: The serum ascites albumin gradient (SAAG) is the most sensitive marker to distinguish between ascites due to portal hypertension/hepatic congestion and other causes, with an accuracy of 97%. A value of ≥1.1g/dl indicates underlying portal hypertension/hepatic congestion; a value <1.1g/dl indicates aetiologies not due to portal hypertension, such as malignancy, pancreatitis or infection.
c) Amylase: The amylase concentration in ascetic fluid should be measured in particular when pancreatic disease is considered. An amylase ascetic fluid/blood serum concentration of 6.0 is indicative for pancreatic disease, considering that a ratio of 0.4 is normal in non-pancreatic ascites.
d) Triglycerides: A concentration of triglycerides in the ascitic fluid that exceeds the blood serum level (2.2mmol/l) indicates chylous ascites; seen mainly in previous abdominal surgery, pancreatitis, trauma and retro-peritoneal lymphoma.
e) Adenosine Deaminase activity: It is a reliable marker to differentiate tuberculous ascites from other aetiologies. An ADA cut-off value 36-40IU/l has a high sensitivity (100%) and specificity (97%) for diagnosing abdominal tuberculosis.
f) Glucose and Lactate dehydrogenase: A lower glucose concentration in ascitic fluid can indicate the presence of bacteria, White blood cells or cancer cells. A low level of LDH is associated with non-malignant ascites, high levels suggest a malignant aetiology.
g) Urea and Creatinine: A very uncommon cause of ascites is urinary leakage into the peritoneal cavity. The ascites/plasma creatinine ratio of five is reported in case of urinary ascites.
h) Polymorphonuclear leukocyte count: A count ≥250cells/mm3 confirms the diagnosis of SBP (spontaneous bacterial peritonitis) in the absence of an evident intra-abdominal source of infection. A repeat PMN count 48hours after antibiotic therapy is recommended to document the efficacy of antibiotic for SBP; with a decrease suggests SBP and a sustained increase secondary bacterial peritonitis.
i) Bacterial cultures: Ascitic fluid should be cultured if SBP is clinically suspected.
j) PCR: Bacterial DNA of Mycobacterium tuberculosis in ascitic fluid can be detected using polymerase chain reaction (PCR) and can be performed when tuberculous ascites is suspected.
k) Cytology: Ascitic fluid cytology should be performed in case of suspicion of malignant ascites or when underlying aetiology is in doubt. Positive cytology is highly indicative for peritoneal carcinomatosis. The sensitivity can be as high as 97% if three samples from separate paracenteses are analysed.
l) Diagnostic laparoscopy: Laparoscopy offers the advantages of visual inspection of the peritoneal cavity in combination with the ability to obtain targeted biopsies for histological and microbiological studies. The procedure may be particularly helpful to diagnose peritoneal carcinomatosis, tuberculous peritonitis and other peritoneal or omental diseases such as mesothelioma and sclerosing peritonitis.
Role of surgical therapy in intractable ascites: When large-volume paracentesis fails to relieve ascites, patients may be submitted to one of the three following surgical options:
1) Portosystemic shunting
2) Peritoneovenous shunting
3) Liver transplantation

Portosystemic shunting: Portosystemic shunting is efficient in clearing ascites, but it is associated with a high rate of encephalopathy or hepatorenal syndrome and liver failure. The indications for portosystemic shunting are therefore limited for intractable ascites due to portal hypertension and should be performed only in patient with good liver function in whom all other treatments failed. The techniques used are Transjugular intrahepatic portosystemic shunts (TIPS), Leinorenal shunt (Splenic and renal vein anastomosis) or Portocaval shunt (Portal vein and inferior venacava anastomosis).

Peritoneovenous shunting: This is a megalymphatic shunt that returns the ascitic fluid to the central venous system. Peritineovenous shunting is a good procedure and may provide definitive relief of ascites and long-term survival in >50% of the operated patients. Commonly used shunts are Denever shunt, LeVeen shunt, both have oneway valve situated in the middle. The PVS is placed entirely subcutaneously, with one end inserted into the peritoneal cavity and the other into the superior venacava (SVC) via jugular or subclavian vein. Beneficial effects of these shunts include increased cardiac output, renal blood flow, glomerular filtration rate, urinary volume and sodium excretion, and decreased plasma renin activity and plasma aldosterone concentration. The AASLD suggests considering peritoneovenous shunting for patients with refractory ascites who are not candidate for paracentesis, transplant or TIPS (class I, level A recommendation). Peritoneovenous shunting should not be done when there's history of severe liver failure, SBP or variceal bleeding. The post operative mortality of PVS is 10-20% reflecting the serious underlying disorder of patients requiring the procedure. Long-term complications include occlusion of the PVS (particularly with bloody or highly proteinacious or mucoid ascites), SVC thrombosis, bacteremia and shunt infection, which may lead to subacute bacterial endocarditits (SABE).
Liver Transplantation: The AASLD recommends that patient with cirrhosis and ascites be considered for Liver transplantation (class I, level B recommendation).

SPECIAL SITUATIONS:-
Malignant ascites: It is defined as an accumulation of excess fluid in the peritoneal cavity secondary to a disseminated malignancy. It is an ominous sign with an average survival of around 20weeks from its diagnosis. Ovarian malignancy is the most common cause (37%), followed by pancreatobiliary (21%) and gastric malignancy (18%). Around 20% patients have unknown primary malignancy.
Pathophysiology: It is multifactorial, originating from an imbalance between fluid secretion and absorption by peritoneum. This is secondary to increased fluid production by tumour cells lining peritoneal cavity in cases of peritoneal carcinomatosis (PC), alteration in vascular permeability, release of inflammatory cytokines and decreased lymphatic drainage due to tumour involvement and increased portal pressure due to tumour metastasis. Obstruction of lymphatics is believed to be the main pathogenic mechanism for malignant ascites. Role of matrix metalloproteinase-9 has also been implicated in the pathophysiology of malignant ascites.
Management: The aim of management is to provide symptomatic relief and specific treatment of the primary pathology. Diagnostic laparoscopy and tissue sampling may be utilized to confirm the diagnosis. Management options include the conventional methods discussed earlier and newer modalities.
Newer modalities: These includes Cytoreductive surgery (CRS); Hyperthermic Intraperitoneal Chemomtherapy (HIPEC); Intraperitoneal instillation of OK-432 (a preparation from Streptococcus pyogenes); Metalloproteinase inhibitors like Batimastat; Anti-VEGF therapies like Bevacizumab; etc. These newer modalities of treatment have ongoing trials, without definitive results.

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2018

PAPER IV

1. **Discuss the aetiology, presentation and management of recurrent pyogenic cholangitis. 2+3+5**
2. **Give an account on the procedures of Organ donation and organ procurement for transplantation. 5+5**
3. **Compare the role of Endoscopic versus open surgical treatment for chronic pancreatitis. Discuss the current recommendations for pain management of chronic pancreatitis. 6+4**
4. **Discuss the role of USG, CT, MRI and Radio pharmaceuticals in the management of Thyroid malignancies. 10**
5. **Discuss the role of intra-peritoneal therapy and molecular therapy in the adjuvant treatment of resectable Gastric cancers. What is the scope of neoadjuvant Tyrosine Kinase Receptor Inhibitor therapy of GIST? 3+3+4**
6. **Discuss the treatment options for primary and secondary hepatic malignancies. 5+5**
7. **Define bowel ischaemia. What are the sequalae of acute and chronic bowel ischaemia? Discuss the principle of management of such patients. 2+3+5**
8. **Discuss the role of chemotherapy/radiotherapy in management of anorectal malignancies. 10**
9. **Mention the merits and demerits of conservative and surgical treatment options for BPH. 10**
10. **Discuss the role of sentinel lymph node biopsy in different cancers. 10**

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES
MS (General Surgery) Examination, 2018
PAPER IV

1. Discuss the aetiology, presentation and management of recurrent pyogenic cholangitis. 2+3+5

Answer.

- The underlying mechanism of RPC is unclear.
- Most experts believe that RPC is initiated by helminthic infection of the bile ducts and/or sludge/stone formation from deficient glucuronidation as a consequence of profound malnutrition.
  - Hepatolithiasis is associated with Clonorchis sinensis and Ascaris lumbricoides infestation of the liver.
- The initial insult(s) to the bile ducts precipitates a cycle of biliary stone formation and infection that results in recurrent episodes of pyogenic cholangitis.

Patients may present with the following:

- An acute attack of cholangitis,
- A history of recurrent attacks of cholangitis typified by fevers and right upper quadrant (RUQ) abdominal pain, or
- Complications of pyogenic cholangitis.
- As the disease progresses, patients may develop cholangiocarcinoma and present with constitutional symptoms, including weight loss, easy fatigability, and jaundice.
- Presentation can be atypical with no pain or fever especially in the elderly population.

Diagnostic testing in the workup of recurrent pyogenic cholangitis includes the following:

- Complete blood count: A leukocytosis with a left shift is typical in patients with pyogenic cholangitis.
- Liver function tests: Aminotransferases, serum bilirubin, and alkaline phosphatase typically are elevated in patients with RPC.
- Prothrombin time: This may become prolonged if persistent cholestasis with consequent fat malabsorption and vitamin K deficiency is present. This is important to exclude because hypoprothrombinemia can impact the safety of invasive procedures and is easily correctible with parenteral vitamin K in this setting.
- Blood cultures: These are mandatory because many patients are bacteremic. The blood culture results often help guide antibiotic choice.
- Ova and parasites: Clonorchis infection frequently is associated with RPC and should be sought and treated when present.

- Imaging Studies:
- Noninvasive imaging studies: Noninvasive imaging studies include transabdominal ultrasonography, computed tomography (CT) scanning, and magnetic resonance cholangiopancreatography (MRCP).
- Ultrasonography is the preferred initial test during the primary workup. This imaging modality may demonstrate segmental biliary dilatation, hepatolithiasis, and liver abscesses, if present.

Ultrasonography findings often determines the choice of supplemental axial imaging techniques.

- CT scanning may demonstrate centrally dilated bile ducts with peripheral tapering. Cholangiohepatitis has a predilection for the left lobe of the liver, and predominantly left-sided findings should prompt consideration of this diagnosis in patients from endemic areas. Other potential findings on CT scans include bile duct stones and pyogenic liver abscesses.
- The role of MRCP in the investigation of biliary disease continues to evolve in spite of the poor availability of magnetic resonance imaging (MRI) facilities in many regions of the world where RPC is endemic. MRI produces axial images and can be performed to evaluate the portal and hepatic venous system.
    - MR cholangiography may quickly replace endoscopic retrograde cholangiopancreatography (ERCP) or percutaneous transhepatic cholangiography as the imaging modality of choice for delineating the biliary tree.
    - The choice of endoscopic (ie, ERCP) versus percutaneous cholangiography hinges on the patient's anatomy and general health status and on the availability of local expertise.
    - Very often, a combination of both techniques is necessary to achieve complete ductal clearance of stones and to ensure that drainage of the biliary tree has been optimized.

Treatment:

- Patients must be treated with a multidisciplinary approach by multiple subspecialists; therefore, referral to a tertiary center is prudent. Preferably, care should be rendered by individuals who are regional experts in interventional endoscopy, radiology, and hepatobiliary surgery.
- Medical care generally involves parenteral antibiotics, avoidance, and/or prompt recognition and treatment of complications. Patients who are malnourished require nutritional rehabilitation.
- A biliary drainage procedure is necessary to achieve resolution of the initial infection and to pursue the ultimate goal of preventing further attacks of recurrent cholangitis. The choice of biliary drainage procedure should hinge on patient presentation, comorbidities, cholangiographic findings, and local expertise. To prevent further attacks of cholangitis, these patients are best treated using a multidisciplinary approach of interventional gastroenterology, interventional radiology, and gastrointestinal surgery. Referral to an institution with considerable experience in the management of complex biliary disease is prudent.
- Initial biliary decompression is achieved at ERCP, which also allows for the delineation of the biliary tree, an essential step in the planning of the definitive decompressive procedure. Sphincterotomy, stricture dilatation, and placement of a biliary endoprosthesis (stent) often are necessary to achieve biliary decompression and, when appropriate, to alleviate stasis or luminal compromise in the biliary tree, thus preventing further episodes of pyogenic cholangitis. The results of endotherapy appear to be durable in well-selected patients.
- In some patients, initial medical management may fail and patients may require emergency surgery. These patients often have acute suppurative cholecystitis and require emergent cholecystectomy or percutaneous cholecystotomy (as a temporizing measure). Definitive surgery is directed toward optimizing biliary outflow and is determined by the anatomical extent of involvement.

Surgery is necessary in patients who have concomitant cholelithiasis or complex hepatolithiasis.

The surgical approach is based on the appearance at cholangiography and on axial imaging or MRCP.

- The usual surgical approach includes the following:
    - Cholecystectomy,
    - intraoperative stone clearance by ERCP,
    - Percutaneous cholangiography,
    - Lithotripsy (ie, mechanical, laser, electrohydraulic), and
    - A definitive biliary drainage procedure.

- Definitive drainage procedures include operative sphincteroplasty and appropriate biliodigestive bypass.
- Many surgeons favor performing a Roux-en-Y choledochojejunostomy. Access to the Roux limb for reintervention (if necessary) is achieved percutaneously or endoscopically.

2. Give an account on the procedures of Organ donation and organ procurement for transplantation. 5+5

Answer. Steps of organ donation:

- Registering a donor
- Medical care of potential donors
- Brain death testing
- Role of organ procurement organizations
- Authorizing donation
- The matching process
- Recovering and transporting organs
- Transplanting the organs

Organ Donation Step by Step

The organ recovery process involves a complex series of events coordinated by medical professionals in organ procurement organizations and hospitals. The National Organ Transplant Act of 1984 (NOTA) was enacted to help ensure the process is carried out in a fair and efficient way, leading to equitable distribution of donated organs. The act established the national Organ Procurement and Transplant Network (OPTN) for matching donor organs to waiting recipients. The OPTN is managed through the United Network for Organ Sharing (UNOS) located in Richmond, Virginia. UNOS works with 58 federally designated OPOs across the country to place organs locally, regionally and nationally.

Steps in the process are as follows:

- Identification of the Potential Donor by the Hospital: Medical professionals at a hospital identify a potential candidate for donation. The nature of the injury leads a physician to determine the patient is brain dead or a potential donation after circulatory death (DCD) candidate.

- Evaluation of Donor Eligibility: OneLegacy is called on all patient deaths and imminent patient deaths. Information is provided on the patient's medical status and the OneLegacy recovery coordinator evaluates the patient. The evaluation includes a medical and social history and physical examination of the patient. This determines whether or not the patient is a suitable candidate for donation.
- Authorization for Organ Recovery: If the patient is a candidate for organ and/or tissue donation, at an appropriate time the legal next-of-kin is approached with the opportunity of donation. If a donor designation or individual authorization by the decedent cannot be identified, the family must give their consent in order for the donation process to proceed. If the family consents, the legal next-of-kin signs a donor consent form.
- Medical Maintenance of the Patient: Once family consent or donor designation has been provided, the one legacy clinical coordinator, in concert with the hospital staff, maintains the patient medically. In some cases physician support is requested on a consultation basis.
- Matching Organs to Potential Recipients: Information on the organs available for donation, the donor's blood type and body size is provided to UNOS by the OneLegacy clinical coordinator. The UNOS computer then matches the donated organs to potential recipients. Recipient selection is based on blood type, body size, medical urgency and length of time on the waiting list. The heart, liver and lungs are matched by blood type and body size. In matching the pancreas and kidneys, genetic tissue type is also considered.
- Offering Organs Regionally, Then Nationally: A computerized list of waiting patients in the matching blood group is provided to the OneLegacy coordinator who seeks to match organs with recipients in the OneLegacy's donation service area. If a match cannot be made for a specific organ within this area, the organ is offered on a regional basis, then nationally, if necessary.
- Placing Organs and Coordinating Recovery: When a recipient match has been found, the OneLegacy coordinator calls the transplant center for the patient who matches the donated organ(s). The patient's transplant surgeon is responsible for making the decision whether to accept the organ. If the surgeon declines the organ for that patient, the OneLegacy coordinator contacts the transplant surgeon of the next patient on the list. This process continues for each organ until all of the organs have been appropriately matched with recipients. The OneLegacy coordinator then arranges for the operating room (for the recovery of the organs) and the arrival and departure times of the transplant surgery teams.
- Surgical Recovery of Organs:When the surgical team arrives, the donor is taken to the operating room where the organs and tissues are recovered through a dignified surgical procedure. In accordance with federal law, physicians recovering the organs do not participate in the donor's care prior to the determination of brain death.
- Preparing Recipients for Surgery: Once the recipients have been identified, they are called by their transplant surgeons for the final pre-operative preparations while the organ recovery process is occurring at the donor hospital. Upon the organs' arrival at the transplant hospital, the recipients are taken to surgery and the transplants are performed.
- Distribution of Organs: The one legacy coordinator takes a sample of the lymph node tissue to a laboratory for tissue typing and subsequent matching with recipients. Other organs are taken directly to the recipients by the surgical recovery teams.
- Funeral and Burial Plans: After the recovery process has occurred, the donor family can proceed with funeral or burial plans, which are not affected by organ donation. Organ and tissue donation is a dignified and respectful process.

- Follow-up with Family and Hospital: One legacy follows up each donation by sending letters to the donor family, hospital staff, physicians and nurses regarding the organs and tissues that have been recovered.

Organ procurement for transplantation:

Regulation:

Organ procurement is tightly regulated by United Network for Organ Sharing (UNOS). In the United States, there are a total of 58 Organ Procurement Organizations (OPOs) that are responsible for evaluating the candidacy of deceased donors for organ donation as well as coordinating the procurement of the organs. Each OPO is responsible for a particular geographic region and is under the regulation of the Organ Procurement and Transplantation Network.

The United States is divided into 11 geographic regions by the Organ Procurement and Transplantation Network. Between these regions, there are significant differences in wait time for patients on the organ transplant list. This is of particular concern for liver transplant patients because transplantation is the only cure to end-stage liver disease and without a transplant, these patients will die. One example that brought this disparity to light was in 2009, when Steve Jobs traveled from California, where wait times are known to be very long, to Tennessee, where wait times are much shorter, to increase his chances of getting a liver transplant. In 2009, when Jobs received his liver transplant, the average wait time for liver transplantation in the United States for a patient with a MELD score of 38 (a metric of severity of liver disease) was about 1 year. In some regions, the wait time was as short as 4 months, while in others, it was more than 3 years. This variation for a patient with the same illness severity has caused significant controversy over how organs are distributed.

Procedure:

If the organ donor is human, most countries require that the donor be legally dead for consideration of organ transplantation (e.g. cardiac or brain dead). For some organs, a living donor can be the source of the organ. For example, living donors can donate one kidney or part of their liver to a well-matched recipient.

Organs cannot be procured after the heart has stopped beating for a long time. Thus, donation after brain death is generally preferred because the organs are still receiving blood from the donor's heart until minutes before being removed from the body and placed on ice. In order to better standardize the evaluation of brain death, The American Academy of Neurology (AAN) published a new set of guidelines in 2010. These guidelines require that three clinical criteria be met in order to establish brain death: coma with a known cause, absence of brain stem reflexes, and apnea.

Donation after cardiac death (DCD) involves surgeons taking organs within minutes of the cessation of respirators and other forms of life support for patients who still have at least some brain activity. This occurs in situations where, based on the patient's advanced directive or the family's wishes, the patient is going to be withdrawn from life support. After this decision has been made, the family is contacted for consideration for organ donation. Once life support has been withdrawn, there is a 2-5 minute waiting period to ensure that the potential donor's heart does not start beating again spontaneously. After this waiting period, the organ procurement surgery beings as quickly as possible to minimize time that the organs are not being perfused with blood. DCD had been the norm for organ donors until 'brain death' became a legal definition in the United States in 1981. Since then, most donors have been brain-dead.

If consent is obtained from the potential donor or the potential donor's survivors, the next step is to perform a match between the source (donor) and the target (recipient) to reduce rejection of the organ by the recipient's immune system. In the United States, the match between human donors and recipients is coordinated by groups like United Network for Organ Sharing.

Co-ordination between teams working on different organs is often necessary in case of multiple-organ procurement. Multiple-organ procurement models are also developed from slaughtered pigs to reduce the use of laboratory animals.

The quality of the organ then is certified. If the heart stopped beating for too long then the organ becomes unusable and cannot be used for transplant.

Preservation and transport:

After organ procurement the organs are often rushed to the site of the recipient for transplantation or preserved for later study. The faster the organ is transplanted into the recipient, the better the outcome. While the organ is being transported, it is either stored in an icy cold solution to help preserve it or it is connected to a miniature organ perfusion system which pumps an icy solution (sometimes enriched with potassium) through the organ. This time during transport is called the "cold ischemia time". Heart and lungs should have less than 6 hours between organ procurement and transplantation. For liver transplants, the cold ischemia time can be up to 24 hours, although typically surgeons aim for a much shorter period of time. For kidney transplants, as the cold ischemia time increases, the risk of delayed function of the kidney increases. Sometimes, the kidney function is delayed enough that the recipient requires temporary dialysis until the transplanted kidney begins to function.

In recent years novel methods of organ preservation have emerged that may be able to improve the quality of donated organs or assess their viability. The most widely used technique involves machine perfusion of the organ at either hypothermic (4-10 °C) or normothermic (37 °C) temperatures. Hypothermic perfusion of kidneys is a relatively widespread practice. For the heart normothermic preservation has been used in which the heart is provided with warm oxygenated blood and so continues to beat ex-vivo during its preservation. This technique has also been applied to lungs and led to the emergence of donor lung reconditioning centres in North America. For the liver, hypothermic and normothermic techniques are being used with evidence to suggest that both may be beneficial.

HOPE Act:

The HOPE (HIV Organ Policy Equity) Act allows for clinical research on organ transplantation from HIV+ donors to HIV+ recipients. The Act was passed by Congress in 2013 and officially changed OPTN policy to allow for its implementation in November, 2015. Prior to the HOPE Act, it was banned to acquire organs from any potential donor who was known to have, or even suspected to have, HIV. According to UNOS, in the first year of implementation, 19 organs were transplanted under the HOPE Act. Thirteen of those organs transplanted were kidneys and 6 were livers.

Ethics of organ transplantation:

Although the procedure of organ transplantation has become widely accepted, there are still a number of ethical debates around related issues. The debates center around illegal, forced or compensated transplantation like organ theft or organ trade, fair organ distribution, and to a lesser degree, animal rights and religious prohibition on consuming some animals such as pork.

There is a shortage of organs available for donation with many patients waiting on the transplant list for a donation match. About 20 patients die each day waiting for an organ on the transplant list. When an organ donor does arise, the transplant governing bodies must determine who receives the

organ. The UNOS computer matching system finds a match for the organ based on a number of factors including blood type and other immune factors, size of the organ, medical urgency of the recipient, distance between donor and recipient, and time the recipient has been waiting on the waitlist.

Because of the significant need for organs for transplantation, there is ethical debate around where the organs can be obtained from and whether some organs are obtained illegally or through coercion. In 2005, China admitted to using the organs of executed prisoners for transplant. Due to religious tradition of many Chinese people who value leaving the body whole after death, the availability of organs for transplant is much more limited. Almost all the organs transplanted from deceased donors came from executed prisoners. Since then, China has repeatedly been found to have a rampant black market for organs for transplant, including continued use of organs from executed prisoners without their consent and targeting young army conscripts for their organs. In 2014, China promised that by January 1, 2015, only voluntary organ donors would be accepted. China has worked to increase the number of voluntary organ donors as well as to convince the international community that they have changed their organ procurement practices after many prior failed attempts to do so. According to the former vice-minister of health, Dr. Huang Jiefu, the number of voluntary organ transplants increased by 50% from 2015 to 2016.

3. Compare the role of Endoscopic versus open surgical treatment for chronic pancreatitis.

Discuss the current recommendations for pain management of chronic pancreatitis. 6+4

Answer. Endoscopic versus open surgical treatment for chronic pancreatitis:

- Uncombined Endoscopic Pancreatic Stone Removal:

Good candidates for uncombined endoscopic pancreatic stone removal are those with three or fewer stones, those with stones at the pancreatic head or body, those free of pancreatic duct stricture closer to the duodenum than the pancreatic stones, and those with pancreatic stones 5 mm or smaller without impaction

- Endoscopic Pancreatic Stone Removal Combined with Extracorporeal Shock Wave Lithotripsy:

If extracorporeal shock wave lithotripsy is performed before endoscopy treatment, multiple stones, large stones (5 mm or bigger), stones located within the stricture site, and impacted stones can also be removed endoscopically. The success rate of endoscopic pancreatic stone removal without extracorporeal shock wave lithotripsy is reportedly less than 10%.

Endoscopic pancreatic stone removal combined with extracorporeal shock wave lithotripsy is recommended for patients with relapsing chronic pancreatitis with pancreatic stones. However, depending on the size and number of stones, even uncombined endoscopic pancreatic stone removal or uncombined extracorporeal shock wave lithotripsy also allows for a safety treatment.

Treatment of pancreatic stricture with plastic stent:

Problems: The treatment goal for intense pancreatic duct stricture associated with chronic pancreatitis is to dilate the stenotic site sufficiently so that the impaired pancreatic juice outflow can be alleviated. However, advancing the guidewire beyond the stenotic area is sometimes difficult because of conditions such as tortuous or curved pancreatic duct, and pancreatic stone impaction, thus requiring this procedure to be combined with extracorporeal shock wave lithotripsy in many

patients. Furthermore, pancreatic duct stricture and pancreatic cancer should be distinguished from each other.

Plastic Stent Types / Insertion Methods

Plastic stent s with varying diameters (5, 7, 8.5, and 10 Fr) and sizes have been supplied by manufacturers. The PS is either straight or S shaped. A stent appropriate for a given case is selected according to the intensity/location of the pancreatic duct stricture, pancreatic duct form, and the approach used (major or minor papillary approach). Recently, a type of Plastic stent for pancreatic duct made of a stent combined with a pusher as a single unit has been marketed (Advanix Pancreatic Stent, Boston Scientific) and utilized in the prevention of stent migration. The plastic stent is kept inserted either as a single stent or as multiple stents.

Duration of Plastic Stent Placement

The mean plastic stent patency period is 2–12 months. Once the plastic stent becomes obstructed, acute pancreatitis (suppurative pancreatic ductitis in some cases) can develop as a complication; hence, during long-term insertion, plastic stent needs to be renewed appropriately. If the stricture is alleviated, plastic stent withdrawal is possible, but complete alleviation of stricture is observed in 10% of all cases or fewer .

Timing for Plastic Stent Removal

In a study on plastic stent withdrawal upon confirmation of alleviated stricture through pancreatography, the median total plastic stent insertion period for the withdrawn cases was 23 months and the percentage of cases that required plastic stent reinsertion for pain relapse within 1 year after withdrawal was 30% . In a study on periodical renewal of the plastic stent at intervals of two months and withdrawal of the plastic stent at six months after first insertion, the pain relapse rate at one year after plastic stent withdrawal was 48%..

Treatment of Pancreatic Duct Stricture with Multiple Plastic Stents

In a previous study, multiple plastic stents were inserted in patients in whom stricture could not be resolved by conventional plastic stent treatment . According to the report, stricture was alleviated in 18 of 19 patients when two to four plastic stents (8.5 to 11.5 Fr) were kept inserted for 6–12 months.

Plastic stent-related complications occurred in 6–39% of all cases, with mild pancreatitis being the major complication. Stent migration and pancreatic abscesses were also reported.

TREATMENT OF PANCREATIC DUCT STRICTURE BY USING A METALLIC STENT

Recently, the use of metallic stents has expanded to include cases of pancreatic duct stricture such as benign bile duct stricture.

TREATMENT USING ENDOSCOPIC ULTRASOUND

Endoscopic Ultrasound-Guided Drainage of the Main Pancreatic Duct

In cases for which transpapillary pancreatic duct stenting is not possible for reasons such as intense stricture, postoperative state, divisum, and large stones, puncture drainage of the pancreatic duct with a dilated caudal segment via the digestive tract is performed under endoscopic ultrasonography guidance.

Transpapillary Rendezvous Approach

Transluminal Approach

Results

The symptom disappearance rate with this approach is 69%

Perforation, bleeding, pancreatitis, fever, and pain were observed as complications [53-57]. Migration and stent obstruction occurred at a high incidence (20–55%).

ENDOSCOPIC VS SURGICAL DRAINAGE OF THE PANCREATIC DUCT IN PATIENTS WITH CHRONIC PANCREATITIS

Current Status

Because surgery has been reported to involve a high incidence of complications (18–53%) and high mortality rate (0–5%) and because patients tend to select noninvasive treatment, surgical pancreatic duct drainage for treatment of relapsing obstructive chronic pancreatitis is often selected for patients who fail to respond to endoscopic treatment.

It is indicated for symptomatic cases where pancreatic duct stricture is intense or the presence of large pancreatic stones makes endoscopic treatment difficult. The operative procedure usually used for this purpose is side-to-side pancreatojejunostomy.

Surgical Procedures to Treat Pain in Chronic Pancreatitis

- Puestow Procedure or Longitudinal Side-to-Side Pancreaticojejunostomy. ...
- Duodenum-Preserving Pancreatic Head Resection (DPPHR) ...
- The Frey Procedure.
- Beger's Procedure.

  - A Cochrane review of endoscopic or surgical intervention for painful CP pooled the data of both randomized trial. The pooled data showed that there was a higher proportion of patients with pain relief in the surgical group compared to the endoscopic group
  - One study revealed that In the long term, symptomatic patients with advanced chronic pancreatitis who underwent surgery as the initial treatment for pancreatic duct obstruction had more relief from pain, with fewer procedures, than patients who were treated endoscopically. Importantly, almost half of the patients who were treated with endoscopy eventually underwent surgery.
  - In patients with chronic intractable pain secondary to CP, evidence now supports proceeding to surgery earlier over endoscopy due to superiority in success rate, pain relief and quality of life. Surgery may need to be considered at an earlier phase than it is now, preferably within 3 years of symptomatic CP

- Surgical therapy over endoscopic therapy for chronic pancreatitis and pancreatic duct obstruction.
- In recent years, new treatment modalities for pancreatic stones have been de- veloped. ESWL, endoscopic therapy, and LPJ are effective for stone removal from large pancreatic ducts, especially the MPD, and for rapid, long-term pain relief.

Pain management in chronic pancreatitis:

- For pain relief, current guidelines recommend a simple stepwise escalation of analgesic drugs with increasing potency until pain relief is obtained.
- Abstinence from alcohol and smoking should be strongly advised. Pancreatic enzyme therapy and antioxidants may be helpful as initial treatment.
- Endoscopic treatment can be used in patients with evidence of ductal obstruction and may be combined with extracorporeal shock wave lithothripsy. The best candidates are those with distal obstruction of the main pancreatic duct and in early stage of disease.
- Behavioral interventions should be part of the multidisciplinary approach to chronic pain management particularly when psychological impact is experienced.
- Surgery should be considered early and after a maximum of five endoscopic interventions. The type of surgery depends on morphological changes of the pancreas. Long-term effects are variable, but high success rates have been reported in open studies and when compared with endoscopic treatment.
- Finally, neurolytical interventions and neuromodulation can be considered in difficult patients.

4. Discuss the role of USG, CT, MRI and Radio pharmaceuticals in the management of Thyroid malignancies. 10

Answer.

Role of USG in the management of thyroid malignancy:

- Ultrasonography can detect multiple nodules in patients with clinically solitary thyroid nodule. A dominant palpable nodule should be managed as solitary thyroid nodule even if ultrasonography reveals additional non palpable nodular disease. Even a 1mm size nodule could be detected with high resolution ultrasonography.
- Non palpable nodule greater than 1.0 to 1.5 cm represents an absolute indication to perform an ultrasound guided fine needle biopsy.
- It can also help in differentiating malignant from benign nodules by detecting hypoechogenicity in solid nodules (up to 55% of benign nodules are hypoechoic compared to thyroid parenchyma, making nodule hypoechogenicity less specific),presence of microcalcifications,irregularity in shape,intranodular vascular spots, absence of halo and cystic elements, which suggested high chance of malignancy. Features with the highest specificities for thyroid cancer are microcalcification,irregular margins and tall shape.
- Thyroid nodules diagnostic FNA is recommended for A) Nodules >1cm in greatest dimension with high suspicion pattern. B) Nodules 1>cm in greatest dimension with intermediate suspicion sonographic pattern C) Nodules >1.5cm in greatest dimension with low suspicious sonographic pattern. FNA biopsy is recommended for nodules smaller than 10mm if clinical information or US features are suspicious.
- US guided fine-needle aspiration of thyroid nodules has a distinct role in the primary diagnostic process of thyroid carcinoma.
- Also during the follow-up ultrasound has a clear added value: ultrasound imaging is presently the most sensitive imaging modality for the early detection of locoregional recurrence and/or

metastases, especially cervical lymph node metastases. Size and location of cervical lymph nodes are the most important predictors of metastatic disease.

- The US procedure may be easily combined with FNA biopsies from suspected lesions. US of the neck has been recommended as a standard procedure during follow-up of thyroid carcinoma.

Computed Tomography and Magnetic Resonance Imaging

- CT and MRI do not add significantly to the workup of uncomplicated thyroid nodules that are otherwise well characterized by ultrasound.
- However, either modality may be helpful in evaluating local extension in more advanced stages of thyroid cancer.
- CT or MRI is particularly appropriate for a suspicious mass (or biopsy-proven cancer) with bulky cervical lymph nodes. Additionally, either modality can be used for postoperative follow-up, particularly for suspicion of recurrent disease.
- CT is advisable in preoperative planning for larger thyroid masses that are believed to have a substernal component based on physical examination, ultrasound, or chest radiograph.
- CT scan has role in detecting local neck or upper thoracic spread and compression of neighbouring structures.
- There is no standard role for computed tomography (CT) scans in the follow-up of patients with thyroid carcinoma; the use of this modality is at the discretion of the attending physician.
- CT scans can be done to visualize the anatomic substrate of a focus of I-131 uptake or 18-FDG uptake, or possibly to demonstrate metastases in Tg-positive, I-131 negative patients.

- MRI: There is no defined role for magnetic resonance imaging (MRI) in the treatment and follow-up of thyroid carcinoma.

- MRI can serve as an imaging modality for detection of metastases. As a result of the high protein (Tg) content of PTC and FTC, cervical lymph node metastases are sometimes identified by MRI. However, the low specificity will not allow its use as a screening technique in this area.

Radiopharmaceuticals used in thyroid cancer

Radiopharmaceutical	Radiation emission	Clinical utility
^{131}I	Gamma, beta	Imaging thyroid nodules[a] Whole body imaging to stage DTC Post operative ablation of thyroid remnant Treating metastatic DTC
^{123}I	Gamma	Imaging thyroid nodules Whole body imaging to stage DTC
[^{99m}Tc]pertechnetate	Gamma	Imaging thyroid nodules Imaging local metastases[b]
[^{99m}Tc]MDP	Gamma	Identify bone metastases
^{124}I	Positron	Whole body imaging to stage DTC[b]
[^{111}In]pentetreotide	Gamma	Somatostatin receptor imaging in DTC and MCT
[^{123}I]mIBG	Gamma	Amine uptake imaging in MCT
[^{99m}Tc]DMSA(V)	Gamma	Staging of MCT
[^{18}F]FDG	Positron	Staging of DTC and MCT[b]
^{201}Tl	Gamma	Characterisation of thyroid nodule[a]
[^{99m}Tc]sestamibi	Gamma	Characterisation of thyroid nodule[a] Staging of DTC
[^{131}I]mIBG	Gamma, beta	Staging of MCT[a] Treating mIBG positive metastatic MCT
[^{90}Y]octreotide/tate	Beta	Treating [^{111}In]penteterotide positive MCT[b] Treating [^{111}In]pentetreotide positive, ^{131}I negative DTC

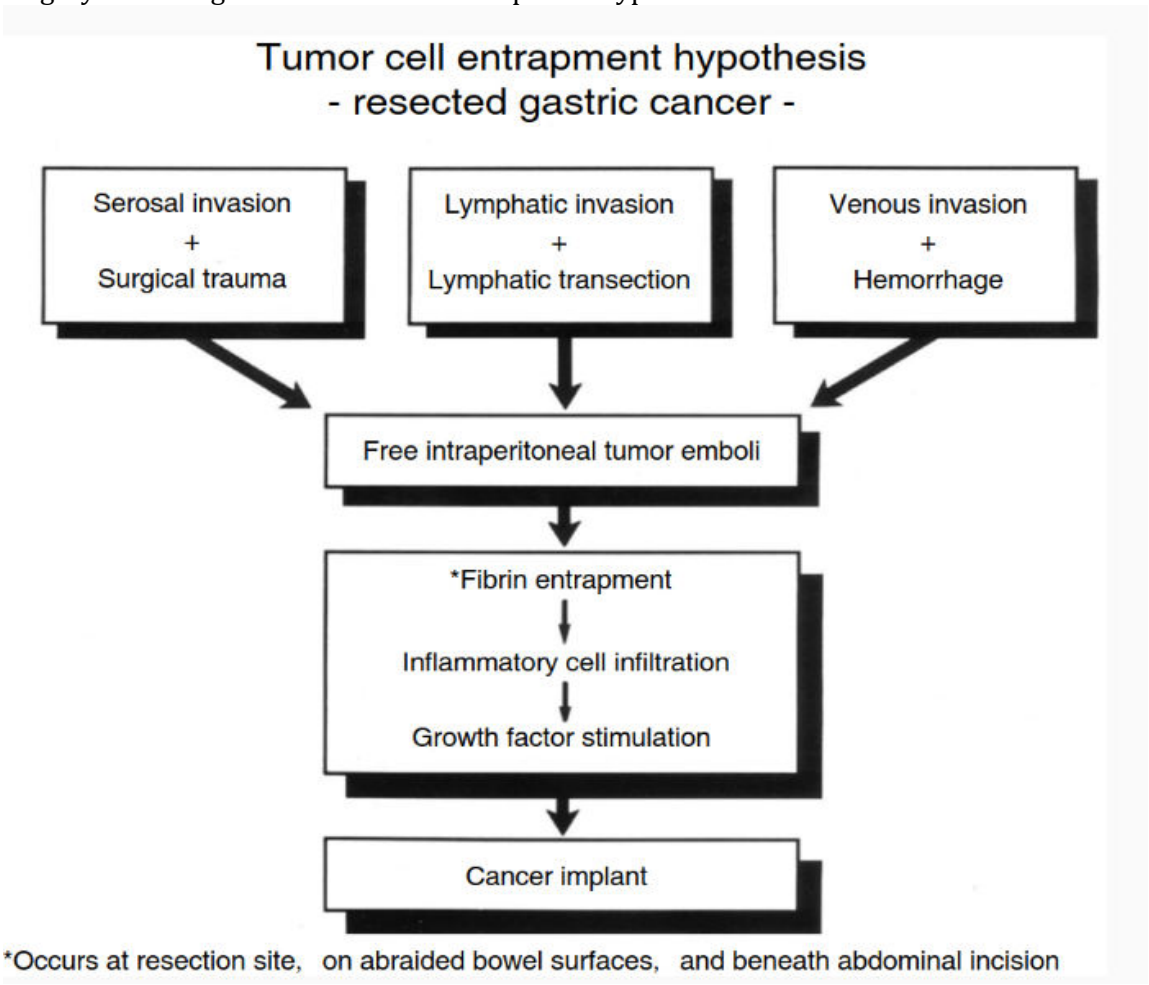
DTC, differentiated thyroid cancer; MDP, methyl di-phosphosphate; MCT, medullary cell cancer of the thyroid; DMSA, dimercaptosuccinic acid; FDG, fluorodeoxyglucose; mIBG, *meta*-iodobenzyl guanidine.
[a]No longer used routinely.
[b]Experimental.

- Following (near) total thyroidectomy, patients with differentiated thyroid cancer are usually treated with I-131 ablation of residual normal and neoplastic thyroid tissue. This serves multiple purposes: firstly, it destroys remaining (normal or neoplastic) thyroid tissue, thereby increasing the specificity of thyroglobulin measurements during the followupS.
- Secondly, I-131 may destroy occult microcarcinoma, thereby minimizing the incidence of recurrence. Thirdly, a high I-131 dose permits post-ablation I-131 whole body scintigraphy (WBS) which can detect occult metastases.
- I-131 ablation in addition to (near) total thyroidectomy significantly reduces the risk of recurrence and cancer-specific mortality in patients with differentiated thyroid cancer
- Diagnostic scintigraphy with I-131 preceding ablation is controversial; it may or may not cause 'stunning' of the remaining thyroid tissue (i.e., diminished I-131uptake) and thus reduce the efficacy of the I-131 ablative dosage
- Thallium-201 SPECT and Planar Scintigraphy Thallium-201 thallous chloride (Tl-201) scanning has no specific advantages in the follow-up of thyroid carcinoma.
- This aspecific tumour-seeking agent can be employed for the detection of I-131-negative lesions if 18-FDG PET is unavailable.

5. Discuss the role of intra-peritoneal therapy and molecular therapy in the adjuvant treatment of resectable Gastric cancers. What is the scope of neoadjuvant Tyrosine Kinase Receptor Inhibitor therapy of GIST? 3+3+4

Answer. Role of intra-peritoneal therapy in the treatment of adjuvant therapy of resectable gastric cancer:

- Intraperitoneal chemotherapy is a promising and feasible option for gastric cancer with chance of peritoneal dissemination. There were several cases with long-term prognosis where conversion surgery was achieved.
- Numerous randomized clinical trials (RCTs) have compared surgery alone with adjuvant chemotherapy, but definitive evidence is lacking. There are different regimens, including monochemotherapy; combined chemotherapy with fluorouracil derivatives, mitomycin C, and other therapies but no anthracyclines; combined chemotherapy with fluorouracil derivatives, mitomycin C, and anthracyclines;
- Possible treatments include neoadjuvant systemic chemotherapy (NAC), neoadjuvant intraperitoneal and systemic chemotherapy (NIPS), cytoreductive surgery (CRS) and perioperative chemotherapy which may include hyperthermic intraperitoneal chemotherapy (HIPEC) and/or early postoperative intraperitoneal chemotherapy (EPIC).
- Surgical treatment failure with resection site and intraabdominal tumors are the most common sites of first recurrence in gastric cancer after potentially curative resection
- Sources of recurrence after curative resection are (1) spontaneous spreading from the primary tumor; and (2) surgical trauma causing scattering of cancer cells during the surgical procedure. If serosal surface invasion has occurred within the primary tumor, then spontaneous dissemination is more common and patients are frequently found to have viable intraperitoneal cancer cells (positive cytology). Tumor cells can also seed the intraabdominal cavity during surgery according to the tumor cell entrapment hypothesis.



- Perioperative or intraoperative hemotherapy can eliminate progression of peritoneal implantation after curative surgery, however, it cannot treat residual disease within lymph nodes. Therefore, an adequate lymphadenectomy is essential. Intraperitoneal chemotherapy enters the peritoneal nodule by simple diffusion so it only penetrates to 1 or 2 mm. It is not effective in lymph nodes.

- Historical analyses of treatment failure after curative resection for gastric cancer showed that approximately 40 to 50% of patients had a first site of recurrence in their peritoneal cavity and the development of local-regional recurrence had a negative impact on overall survival.The potential role of adjuvant treatments for gastric cancer remains to be clarified. The survival results of the MRC adjuvant gastric infusion chemotherapy (MAGIC) trial suggested that patients with operable gastric cancer may benefit from perioperative regimen of epirubicin, cisplatin and infused fluorouracil (ECF).
- The role of perioperative intraperitoneal chemotherapy may be regarded as complimentary to adjuvant systemic treatment. The fundamental goal of intraperitoneal chemotherapy administration is to maximize the total amount of drug delivered into the peritoneal surface, while minimizing that delivered to the systemic circulation.
- The rationales for adjuvant intraperitoneal chemotherapy are to eradicate residual disease by direct cytotoxic effects, generated by high drug concentrations in the peritoneal cavity and to reduce systemic toxicity. However, intraperitoneal chemotherapy has several foreseeable shortcomings in the management of gastric cancer. Firstly, the depth of drug concentration by simple diffusion was limited to 1 or 2 mm.Therefore, in patients with macroscopic peritoneal carcinomatosis, the efficacy of this intraperitoneal delivery is questionable. Several centers have utilized peritonectomy procedures to remove all macroscopic disease, followed by intraperitoneal chemotherapy.
- This approach is associated with relatively higher morbidity and cost, and therefore should be restricted to selected patients in experienced peritonectomy centers. Secondly, gastric cancer spreads not only by the transcoelomic route, but also via lymphatic and hematogenous dissemination. The containment of disease with targeted local-regional therapy alone, in high-risk patients, may not be adequate. Thirdly, relatively higher complication rates associated with intraperitoneal chemotherapy should be recognized.

Role of molecular therapy in the treatment of adjuvant therapy of resectable gastric cancer:

- In the recent few decades, the development of molecular targeted agents has advanced explosively. Based on the ToGA trial, trastuzumab, a monoclonal antibody against HER2, was used as one of the standard options for HER2-positive gastric and EGJ adenocarcinoma in the unresectable or metastatic condition..
- Thereafter, the efficacy of ramucirumab, a monoclonal antibody VEGFR-2 antagonist, for gastric and EGJ adenocarcinoma was demonstrated by the REGARD and RAINBOW trials.
- Recently, the ONO-4538-12/ATTRACTION-2 trial indicated that nivolumab, a monoclonal antibody inhibitor of PD-1, prolonged the OS of patients with unresectable advanced or recurrent gastric and EGJ adenocarcinoma.
- The ST03 trial was designed to assess the usefulness of the addition of bevacizumab, a monoclonal antibody against VEGF in the treatment for patients with resectable gastric and EGJ adenocarcinoma
- Pembrolizumab, a humanized antibody that binds to the PD-1 receptor was suggested to be effective for advanced gastric cancer.

Scope of neoadjuvant Tyrosine Kinase Receptor Inhibitor therapy of GIST:

- Imatinib, sunitinib and regorafenib are standards of care in advanced and metastatic GISTs.
- Imatinib: first-line treatment in advanced/metastatic GISTs
- Sunitinib: second-line treatment in patients with GIST after failure of or intolerance to imatinib
- Regorafenib: a recent standard of care for GISTs
- Based on the high rate of responses observed with imatinib in patients with metastatic GIST, preoperative use of imatinib aims to reduce tumor bulk to facilitate complete surgical resection or increase the likelihood of organ preservation of initially unresectable or borderline resectable disease.
- The initial dose of imatinib of 400 mg/day is considered to be reasonable as a standard dose.
- There is not enough evidence about the appropriate treatment period of neoadjuvant imatinib therapy for advanced GIST.
- The pharmacological effect of imatinib therapy is promptly expressed, but it takes time to decrease tumor size because imatinib works as a cytostatic agent. Therefore, imatinib needs to be administered for longer periods than the usual neoadjuvant chemotherapies for carcinoma.
- GIST develops in any part of the gastrointestinal tract from the esophagus to the rectum, but has a high incidence in the stomach (60%) and the small intestine (30%). Lymph node metastasis is rarely seen, so lymph node dissection and extensive excision of associated organs is unnecessary in contrast to the radical surgery for gastrointestinal carcinoma.
- However, GIST often shows expansive development, and is often diagnosed after experiencing an increase in size without defined subjective symptoms such as obstruction, bleeding and pain. Therefore, the range of organ resection may be enlarged or multiple organ involvement may be necessary for resection of large tumors. For this reason, preoperative treatment is also expected to be favored from the viewpoint of organ/function preservation by tumor shrinkage.
- The importance of neoadjuvant treatment lies in its feasibility and its survival outcome. The feasibility of neoadjuvant imatinib therapy seems to be well established from the results of clinical trials. However, proof of the survival effectiveness of neoadjuvant-setting imatinib therapy has not been sufficiently demonstrated.
- It is expected that the long-term results of phase II study for large gastric GIST in Japan and South Korea will prove the survival benefit of neoadjuvant imatinib therapy. Clinical questions still remain about the most appropriate period of pre- and post-operative imatinib administration in the neoadjuvant protocol.
- The benefits of neoadjuvant therapy with other tyrosine kinase inhibitors against imatinibresistant GIST are also controversial. Since GIST is a rare disease and cases are limited, neoadjuvant therapy should be registered in nationwide or worldwide clinical trials/ databases to compile meaningful bodies of evidence.

6. Discuss the treatment options for primary and secondary hepatic malignancies. 5+5

Answer. Surgical

- ⊡ Resection
- ⊡ Orthotopic liver transplantation

Ablative

- ⊡ Ethanol (EtOH) injection
- ⊡ Acetic acid injection
- ⊡ Thermal ablation (cryotherapy, radiofrequency ablation, microwave)

Transarterial Embolization

- ⊡ Chemoembolization
- ⊡ Radiotherapy

Combination Transarterial and Ablative:

External Beam Radiation

Systemic

- ⊡ Chemotherapy
- ⊡ Hormonal
- ⊡ Immunotherapy

- Surgery:

  - ⊡ Most successful in patients with small tumors (smaller than 5 cm) and with good liver function
  - ⊡ Hepatectomy: portion of the liver is removed when the cancer is limited to one part of the liver
  - ⊡ Liver transplantation: used to treat cancer confined to the liver if a suitable donor is found. Must fulfill strict criteria

- Ablation of liver tumours:

  Routes:

  - ⊡ Percutaneous
  - ⊡ Laparoscopy
  - ⊡ Open method

Percutaneous technique is best choice for early stage liver tumor who are not surgical candidates.

Selection criteria:

- ⊡ Single tumor < 5cm
- ⊡ Multiple tumors< 3 nodule and < 3cm
- ⊡ No evidence of vascular invasion
- ⊡ No extrahepatic spread
- ⊡ Performance status test– 0
- ⊡ Cirrhosis with Child Pugh class A or B

Percutaneous methods:

A-Chemical ablation :-

- 1- ethanol injection
- 2- acetic acid injection

B- Thermal ablation :-

- RFA
- Microwave
- Laser ablation
- 4- Cryoablation

RFA:

- Radiofrequency ablation uses electrical current, passed through a small needle placed directly into a liver tumor, to destroy cancer cells with heat
- As the temperature within the tissue becomes elevated beyond 60°C, necrosis happens. RFA can be performed by percutaneous, surgical, or laparoscopic approaches.

Management of secondary liver malignancies:

Liver metastasis is cancer that started in another part of the body and spread to the liver. It's sometimes called secondary liver cancer or metastatic liver disease. Liver metastasis is not the same as cancer that starts in the liver (called primary liver cancer). Liver metastasis is much more common than primary liver cancer.

Some kinds of cancer are more likely to spread to the liver than others. The most common types of cancer that spread to the liver are:

- colorectal
- lung
- breast
- pancreatic
- stomach
- melanoma
- neuroendocrine

Blood tests
Blood tests are usually done to check your general health and find out how well the liver is working. The most common blood tests used to help diagnose liver metastases are liver function tests. Other blood tests that may be abnormal include a complete blood count (CBC), blood glucose (sugar) and blood clotting tests.

Sometimes tumour marker tests are done if you have had cancer before. These tests measure the amount of a specific protein in the body. For example, carcinoembryonic antigen (CEA) is a tumour marker measured in the blood. It is usually checked during follow-up after treatment for colorectal cancer. An increase in CEA levels over time could mean the cancer has come back and it may have spread to the liver.

Imaging tests

Imaging tests are an important part of diagnosing liver metastases. It is common for people to have one or more imaging tests when the doctor thinks the cancer may have spread to the liver. The imaging tests used to diagnose liver metastases include the following.

- Computed tomography (CT) scan is a common imaging test to check for liver metastases. It can also check for metastases in organs and tissues around the liver. The CT scan is usually done with contrast medium to show areas more clearly.
- Ultrasound is used to check for an enlarged liver or changes in its shape or texture. It is also used to guide a biopsy needle or laparoscope to a specific area of the liver.
- Magnetic resonance imaging (MRI) may be used to find small metastatic tumours in the liver. It is usually used when doctors are not certain about the results of other imaging tests such as CT scan or ultrasound.
- Positron emission tomography (PET) scan may be used to check for metastases in organs and tissues around the liver. It is often used when there is a history of colorectal or stomach cancer.

Find out more about a computed tomography (CT) scan, ultrasound, magnetic resonance imaging (MRI) and positron emission tomography (PET) scan.

Biopsy

A biopsy is the removal of cells or tissues so they can be examined under a microscope. It may be needed to diagnose liver metastases. It is done when the doctor can't tell if there is liver metastasis based on imaging tests or if there is no history of cancer. A biopsy may also be done to check tumour markers that help guide treatment. A percutaneous needle biopsy or endoscopic biopsy during laparoscopy may be used.

Find out more about biopsy and tumour markers.

Other tests

If liver metastases are found before the primary cancer is diagnosed, the doctor may order tests to find out where the cancer started. These tests may include:

- CT scan of the chest to check for lung cancer
- colonoscopy to check for colorectal cancer
- laparoscopy to examine organs in the abdomen and pelvis

Treatments and supportive therapies:

Chemotherapy

Chemotherapy is the most common treatment for liver metastases. It is used to help stop or slow the growth of cancer and relieve symptoms. Chemotherapy may also be used to shrink the cancer so surgery can be done, or it may be given after surgery to lower the risk of the cancer coming back. Chemotherapy is sometimes used along with other treatments such as targeted therapy.

Systemic chemotherapy means that the drugs circulate throughout the body to destroy cancer cells. It is usually given intravenously (through a needle into a vein) or orally (as a pill by mouth).

Hepatic arterial infusion (HAI) is a procedure that delivers chemotherapy directly to liver tumours. The chemotherapy is supplied through a pump to the main artery of the liver (called the hepatic artery). Floxuridine (FUDR) is the most common chemotherapy drug used in HAI.

Chemoembolization, or transarterial chemoembolization (TACE), is a procedure that delivers chemotherapy directly to liver tumours. Chemoembolization may be used to stop or slow the growth of liver metastases when the cancer has only spread to the liver.

Targeted therapy
Targeted therapy may be used to control the growth of liver metastases from some types of cancer, such as:

- bevacizumab (Avastin) or cetuximab (Erbitux) is used for colorectal cancer
- erlotinib (Tarceva) is used for pancreatic cancer

Targeted therapy is given intravenously (through a needle into a vein) or orally (as a pill by mouth). It is most often used along with chemotherapy.

Surgery
Surgery may be used to treat liver metastasis when only one area or a few areas of cancer are found. The surgery, called liver resection, removes the part of the liver that contains cancer. It is most often used for colorectal cancer that has spread to the liver.

Ablation therapy
The following ablation therapies may be used to treat liver metastases. Side effects will depend mainly on the procedure done and how much of the liver is treated.

Radiofrequency ablation (RFA) uses electrical currents to create heat that destroys cancer cells.

Cryotherapy uses extreme cold to freeze and destroy abnormal and cancerous cells or tissue. It is also called cryosurgery or cryoablation.

Percutaneous ethanol injection uses a needle to inject ethyl alcohol directly into a liver tumour. The doctor uses ultrasound or CT scan to guide the needle through the skin and into the tumour. The ethyl alcohol kills cancer cells and shrinks the tumour.

Radiation therapy
Radiation therapy is not used that often to treat liver metastases. This is because radiation can damage the liver (called radiation-induced liver disease). In rare cases, external beam radiation may be given to the whole liver to relieve symptoms (called palliative treatment). Newer radiation therapy techniques can deliver more targeted doses of radiation to the liver tumours and lower the risk of liver damage.

Radioembolization, or selective internal radiation therapy, is a procedure that delivers radiation directly to liver tumours. It uses tiny radioactive beads called microspheres. A catheter carries the radioactive beads through the hepatic artery to the liver. The beads deliver radiation only to the tumour and not to healthy liver tissue. They also block the blood supply to the tumour so the cancer can't get the oxygen and nutrients it needs to grow. Radioembolization may be used to slow the growth of liver metastases and relieve symptoms when other treatments can't be used.

Stereotactic body radiation therapy may be used when there are 1–3 small liver metastases. This is a type of external beam radiation therapy that delivers a high dose of radiation directly to a tumour. It avoids treating healthy liver tissue around the tumour with radiation. How many sessions of stereotactic radiation therapy are used depend on the size, location and number of metastases being treated, as well as other factors.

Hormonal therapy

- Hormonal therapy is a treatment that adds, blocks or removes certain hormones to slow or stop the growth of cancer cells that need hormones to grow. Drugs, surgery or radiation therapy can be used as hormonal therapy.
- Hormonal therapy may be used to help slow the growth of tumours in the liver and relieve symptoms. It is given for some types of cancer that have spread to the liver, especially breast cancer.
- Side effects of hormone therapy will depend mainly on the type of hormonal therapy. Common side effects of many types of hormonal therapy are hot flashes, weight gain and less interest in sex.

Pain medicines:
Pain can happen when the capsule around the liver is stretched. Pain medicines can be given different ways. They are usually given orally or intravenously. The most common pain medicines used for liver metastases are:

- opioids such as morphine and codeine
- corticosteroids such as dexamethasone
- nonsteroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen

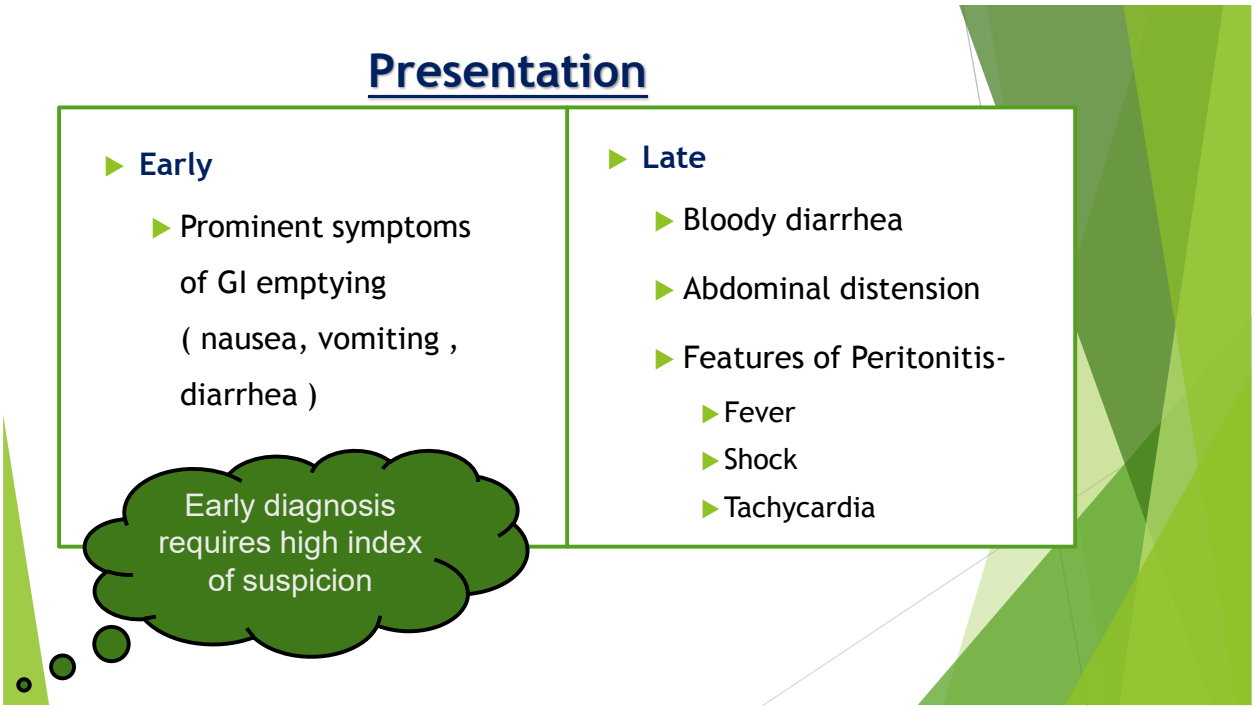
Living with liver metastases: In many cases, liver metastasis is a chronic condition. Adjusting to life with liver metastases often takes time.

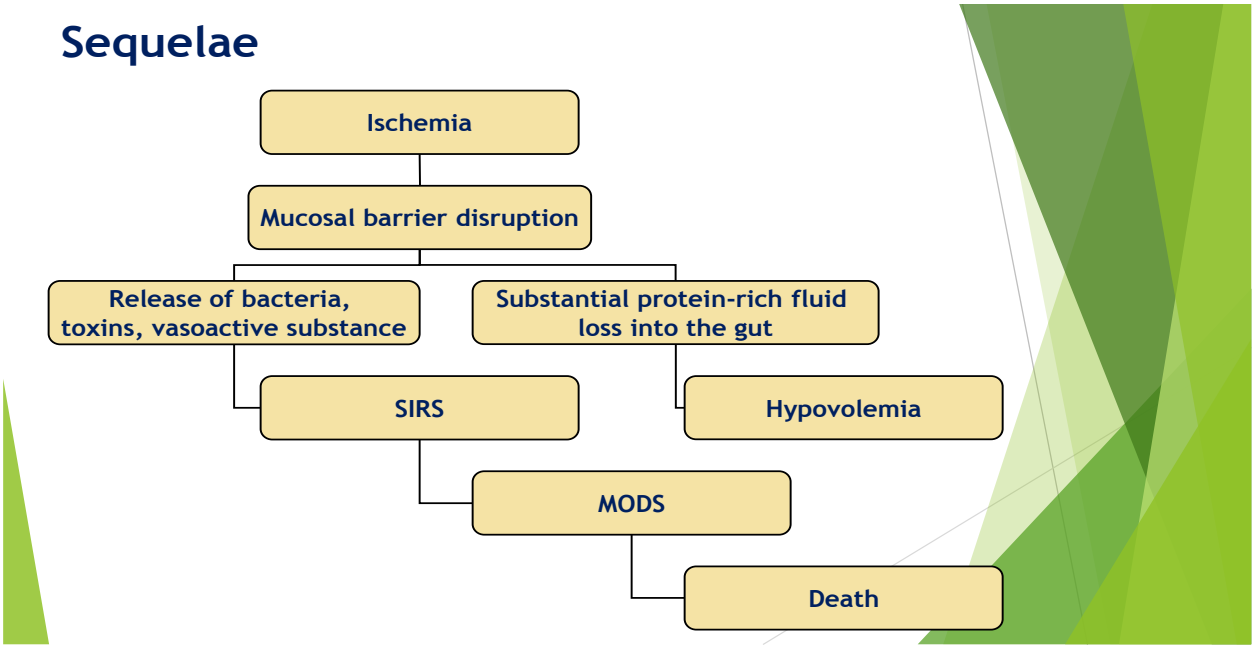
7. Define bowel ischaemia. What are the sequalae of acute and chronic bowel ischaemia? Discuss the principle of management of such patients. 2+3+5

Answer. Ischemic bowel disease encompasses a heterogeneous group of disorders caused by acute or chronic processes, arising from occlusive or nonocclusive etiologies, which result in decreased blood flow to the gastrointestinal tract. The clinical course may range from transient and reversible to fulminant.

The clinical course may range from transient and Intestinal ischemia can be classified into three types: acute mesenteric ischemia, chronic mesenteric ischemia, and colonic ischemia. Acute mesenteric ischemia may also be further subdivided into embolic mesenteric ischemia, thrombotic mesenteric ischemia, and venous mesenteric ischemia.

Acute ischaemia:



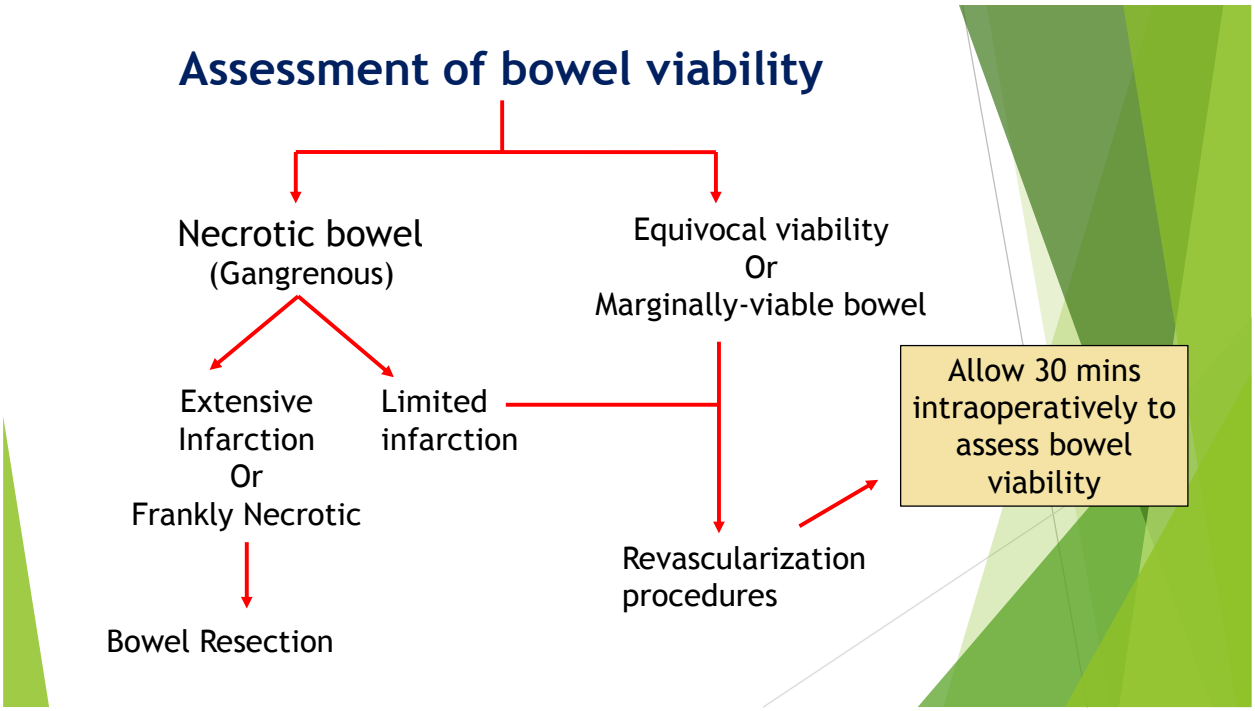


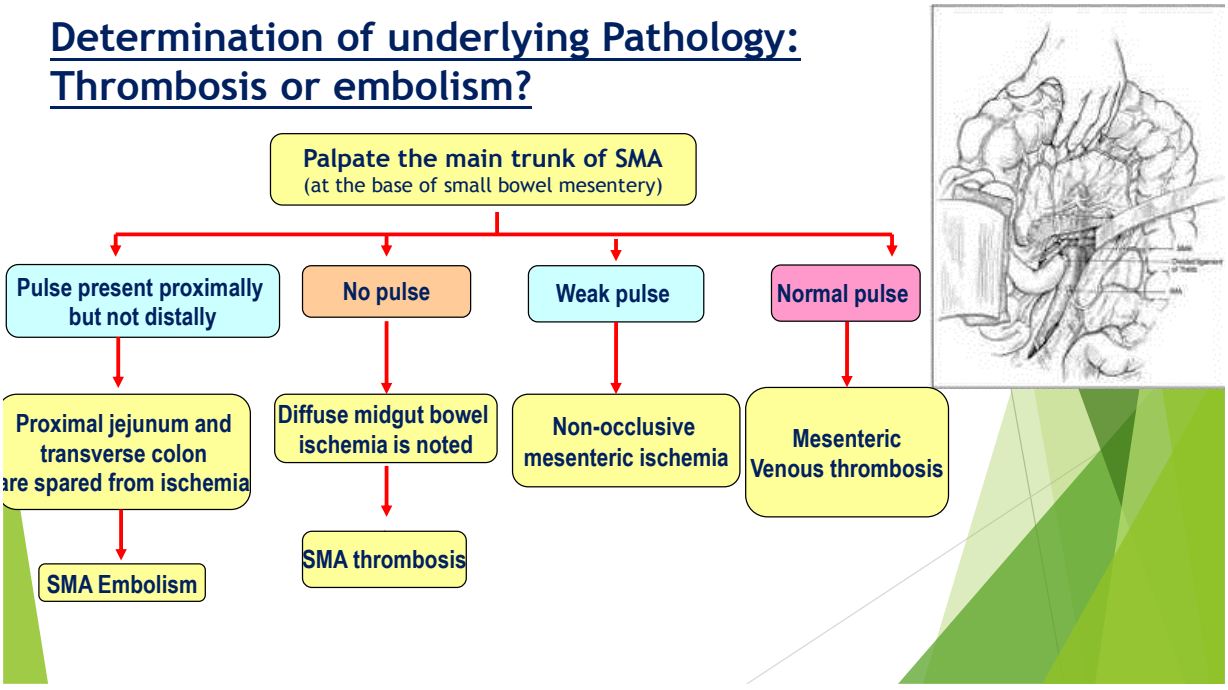
Principle of management in acute ischemia:

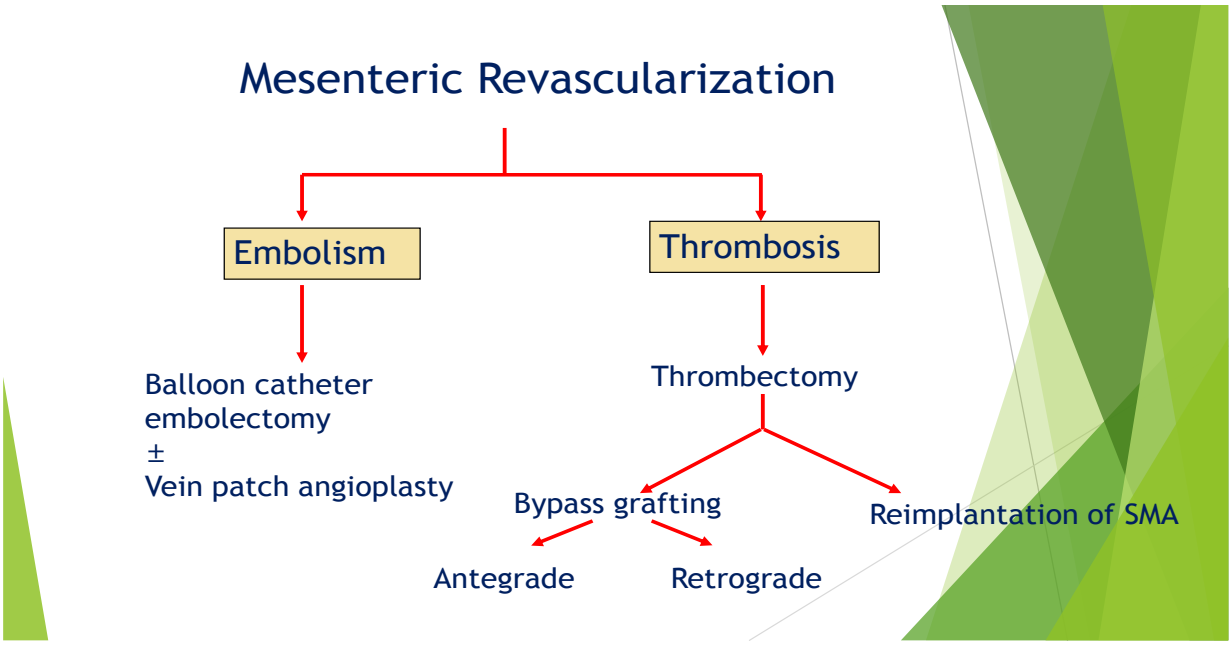
Definitive surgical exploration-

- Assessment of bowel viability
- Determination of underlying cause

- Mesenteric revascularization
- Resection of necrotic bowel
- Second look laparotomy







Chronic mesenteric ischemia is a condition in which plaque builds up in the major arteries — including the celiac and superior mesenteric arteries — that supply blood to the small intestine or small bowel.

These blood clots in the small intestine and bowels can lead to:

- Weight loss.
- Pain with eating.

Chronic mesenteric ischaemia is often multifactorial in aetiology. The most common cause is atherosclerosis involving the proximal portions of the coeliac artery, superior mesenteric artery (SMA), or inferior mesenteric artery (IMA).

Less common aetiologies include:

- Dissection
- Vasculitis
- Fibromuscular dysplasia
- Radiation
- Cocaine abuse

Chronicity of the symptoms is caused by the gradual decrease in blood flow to the intestines. The normal vascular supply to the bowel is from the coeliac artery, superior mesenteric and inferior mesenteric arteries. Extensive collateralization can occur between the vascular territories of these vessels. Because of this collateral circulation, patients may experience symptoms, not until two or three major mesenteric vessels are involved.

- Treatment:

  - Anticoagulant medications, such as Coumadin (warfarin - a blood-thinner), to reduce the risk of blood clots.
  - Angioplasty and stenting: A balloon catheter is used to attempt to open the artery and a small stent is placed inside the artery to keep it open.
  - Surgery may be performed to remove plaque (endarterectomy), bypass the blocked vessel to restore blood flow to the intestines, or remove or repair an aneurysm. The surgeon may use autologous bypass grafts or artificial grafts during the bypass procedure.

8. Discuss the role of chemotherapy/radiotherapy in management of anorectal malignancies. 10

Answer. Role of chemotherapy/radiotherapy in management of anorectal malignancies.

Role of chemotherapy/radiotherapy in rectal cancer:

- Intraoperative Radiation Therapy: Intraoperative radiation therapy (IORT) may be considered in patients with pelvic sidewall recurrence. This is performed in an operating room–radiation therapy suite. Resection with negative microscopic margins and absence of vascular invasion independently predicts improved local control and survival after resection and IORT.The major morbidities of IORT include peripheral neuropathy and ureteral stenosis.

- Adjuvant chemotherapy has become a standard treatment of advanced rectal cancer: Adjuvant therapy for rectal cancer should routinely be considered to reduce local recurrence and possibly improve overall survival.

The drugs most commonly used are:

- Fluorouracil (5FU) often given with folinic acid.
- Capecitabine
- Oxaliplatin
- Irinotecan
- Trifluridine and tipiracil .

Preoperative chemoradiotherapy followed by total mesorectal excision and postoperative chemotherapy with fluorouracil and oxaliplatin is standard treatment for stage II to stage III locally advanced rectal cancer.

Current Recommendations for Chemoradiation in Rectal Cancer Patients after Radical Resection	
Stage I	No adjuvant therapy
Stage II or III	Neoadjuvant chemoradiation for 5 weeks

Low/mid lesion	5-FU based chemotherapy with XRT (180 cGy 5 days/week x 5 weeks)
	Rest for 6 weeks
	Total mesorectal excision
	Rest for 4 weeks
	Continue 5-FU–based chemotherapy for 8 weeks
High lesion	Preop or postop chemotherapy
	Total mesorectal excision
Stage IV	LAR or APR for palliation/prevention of obstruction or bleeding
	Adjuvant chemotherapy
	5-FU + leucovorin ± irinotecan or oxaliplatin with individualized XRT

- Neoadjuvant chemoradiation, including chemotherapy with a 5-fluorouracil–based regimen, results in a modest survival benefit and decreased local recurrence over radiation therapy alone. It is generally reserved for patients with large, bulky tumors or evidence of nodal metastases (stage II/III, especially T4 lesions) in mid and low rectal tumors.

Role of chemotherapy/radiotherapy for anal canal cnacer:

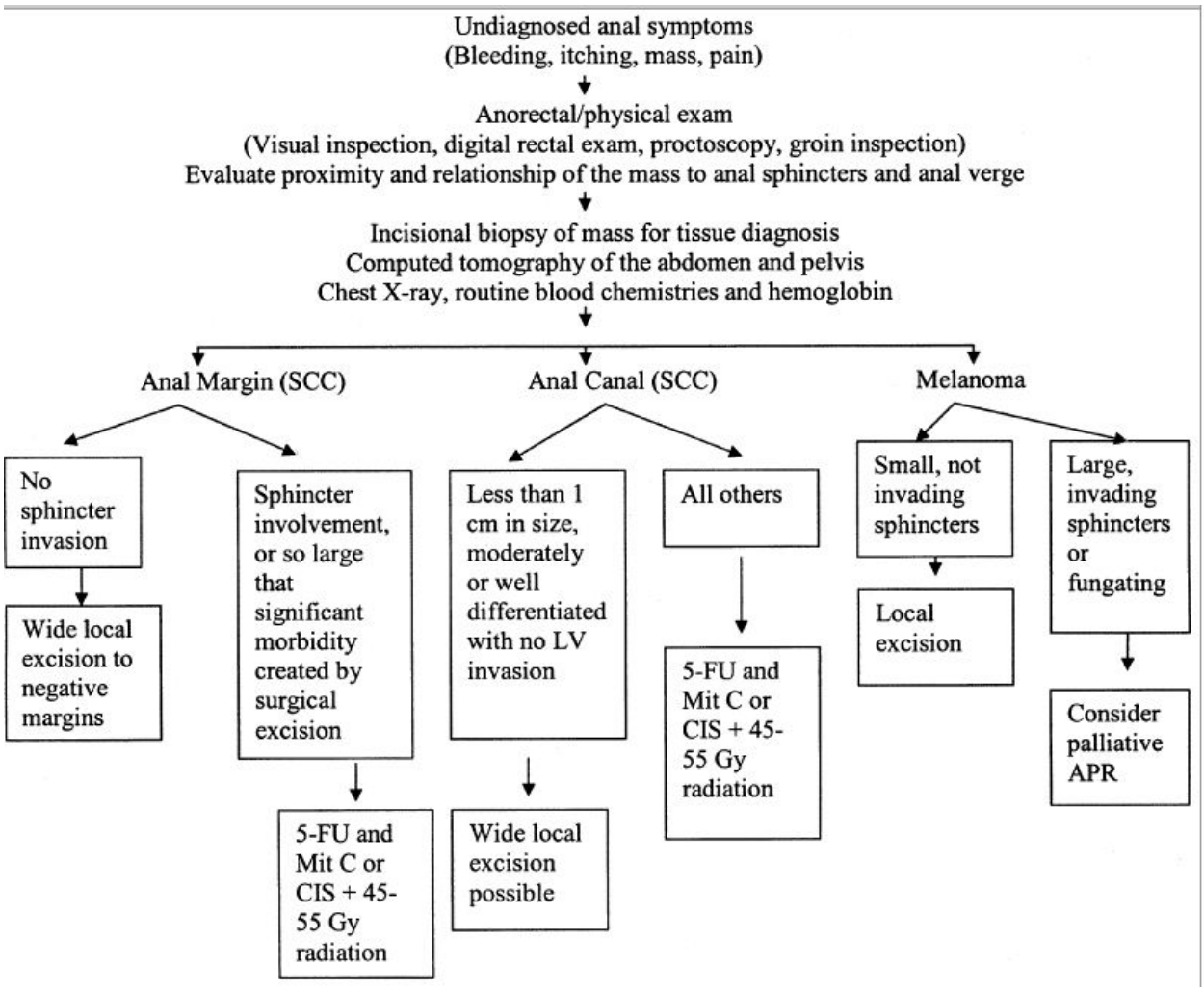
- Chemotherapy is particularly effective for treating anal cancer when given in combination with radiation therapy, as discussed above. The combined treatment allows the use of lower radiation doses and improves the likelihood of completely destroying the tumor.

  - Combined with radiation therapy (known as *chemoradiation*) as the first treatment for most anal cancers. This can often cure the cancer without the need for surgery. If the cancer doesn't go away completely after chemoradiation, more chemo might be given.
  - Given along with radiation after surgery to try to kill any cancer cells that may have been left behind. This is called *adjuvant therapy*. It's done to lower the chance of the cancer coming back.
  - Used if anal cancer has spread to distant parts of the body, such as the liver or lungs. This can help keep the cancer under control or relieve symptoms it's causing.

In most cases, 2 or more drugs are used at the same time because one drug can boost the effect of the other.

- The main drug combination used to treat anal cancer is 5-fluorouracil (5-FU) and mitomycin.
- The combination of 5-FU and cisplatin is also used, especially in people who can't get mitomycin or for advanced anal cancer.

In these treatments, the 5-FU is a liquid given into a vein 24 hours a day for 4 or 5 days. The other drugs are given more quickly on certain other days in the treatment cycle. And radiation is given 5 days a week for at least 5 weeks.



9. Mention the merits and demerits of conservative and surgical treatment options for BPH. 10

Answer. Merits and demerits of conservative and surgical treatment options for BPH.

Medical management of BPH: alpha blockers

- The rationale for alphablocker therapy in BPH

BPH is caused partly by alpha 1-adrenoceptor mediated prostatic smooth muscle contraction, and this is the rationale for alpha 1-adrenoceptor blocker treatment for symptomatic BPO.
Alpha blocker classification
Alpha blockers are categorized by their selectivity for the AR, and by their elimination half-life.

- Non-selective: phenoxybenzamine- effective IN symptom control, but high side-effect profile.
- Alpha-1, short-acting - Prazosin 2 mg twice a day
- Alpha-1, long-acting: Terazosin 5 or 10 mg daily, Doxazosin 4 or 8 mg daily
- Alpha-1a selective: Tamsulosin 0.4 or 0.8 mg daily, Alfuzosin 10 mg daily, Silodosin 4 or 8 mg daily.

No study has directly compared one alpha blocker with another in terms of efficacy or side-effects.
Indications for treatment:

- Bothersome lower urinary tract symptoms where watchful waiting has failed or the patient wishes to have treatment.
- Efficacy

Percentage of patients who respond to alpha blockers:
>25% improvement in symptoms relative to placebo,
The mean probability for improvement in symptom score after TURP is in the order of 80% (i.e. 8 out of 10 men will notice an improvement in their symptoms after TURP).

- Improvements in symptom score in men who respond to alpha blockers:

The average improvement in symptom score after TURP is about 85%.

- Side-effects:
- A substantial proportion of men stop taking their medication either because of side-effect or because of a perceived lack of effectiveness.
- Side-effects: asthenia (weakness, in 5%), dizziness (6%), headache (2%) and postural hypotension (1%), and retrograde ejaculation (8%).

Medical management of BPH: 5-alpha-reductase inhibitors:
5-alpha-reductase inhibitors inhibit the conversion of testosterone to dihydrotestosterone, the more potent androgen in the prostate. This causes shrinkage of the prostatic epithelium and therefore a reduction in prostate volume, thereby reducing the static component of benign prostatic enlargement. This takes some months to occur, so urinary symptoms will not improve initially.
Finasteride is a competitive inhibitor of the enzyme 5- alpha -reductase (type II isoenzyme) which converts testosterone to DHT.
Finasteride therefore lowers serum and intraprostatic DHT levels. Epristeride is a dual inhibitor of 5alpha-reductase. Whether it has any clinically significant advantages over finasteride remains to be established.

- Efficacy:
  - A small reduction in the risk of urinary retention.
  - Substantial reduction in the risk of urinary retention
  - Shrinking large vascular prostates probably helps reduce the frequency of haematuria in men with BPH
- Side-effects:
- Principally centre around sexual problems (e.g. loss of libido, 5%; impotence, 5%; reduced volume of ejaculate in a few percent).

Medical management of BPH: combination therapy:

A combination of an alpha blocker and a 5alpha-reductase inhibitor.

- Combination prevented progression of BPH (progression being defined as a worsening of symptom score by 4 or more, or the development of complications such as UTI or acute urinary retention).

❖ Medical management of BPH: alternative drug therapy

- Anticholinergics

For a man with frequency, urgency, and urge incontinence symptoms suggestive of an overactive bladder consider prescribing an anticholinergic (e.g. oxybutynin, tolterodine, trospium chloride, or flavoxate).

- Phytotherapy: An alternative drug treatment for BPH symptoms, and one which is widely used in Europe and increasingly in North America, is phytotherapy. 50% of all medications consumed for BPH symptoms are phytotherapeutic ones.

Surgical treatment of BPH:

⊡ Minimally invasive management of BPH: surgical alternatives to TURP:

- Transurethral radiofrequency needle ablation (TUNA) of the prostate:

➢ Low-level radiofrequency is transmitted to the prostate via a transurethral needle delivery system; the needles which transmit the energy being deployed in the prostatic urethra once the instrument has been advanced into the prostatic urethra. It is done under local anaesthetic, with or without intravenous sedation. The resultant heat causes localized necrosis of the prostate.

➢ Improvements in symptom score and flow rate are modest. Side-effects include bleeding (one third of patients), UTI (10%), and urethral stricture (2%).

No adverse effects on sexual function have been reported.

- Transurethral microwave thermotherapy (TUMT):

➢ Microwave energy can be delivered to the prostate via an intraurethral catheter (with a cooling system to prevent damage to the adjacent urethra), producing prostatic heating and coagulative necrosis. Sub-sequent shrinkage of the prostate and thermal damage to adrenergic neurons (i.e. heat-induced adrenergic nerve block) relieves obstruction and symptoms.

➢ Compared with TURP, TUMT results in symptom improvement in 55% of men and TURP in 75%. Sexual side-effects after TUMT (e.g. impotence, retrograde ejaculation) are less frequent than after TURP, but catheterization period is longer and UTI and irritative urinary symptoms are more common.

- High-intensity focused ultrasound (HIFU): A focused ultrasound beam can be used to induce a rise in temperature in the prostate, or indeed in any other tissue to which it is applied. For HIFU treatment of the prostate a transrectal probe is used. A general anaesthetic or heavy intravenous sedation is required during the treatment. It is regarded as an investigational therapy.

⊡ Invasive surgical alternatives to TURP

- Transurethral electrovaporization of the prostate (TUVP): Vaporizes and dessicates the prostate. TUVP seems to be as effective as TURP for symptom control and relief of BOO, with durable (5-year) results. Operating time and in-patient hospital stay are equivalent. Requirement for blood transfusion may be slightly less after TUVP. TUVP does not provide tissue for histological examination so prostate cancers cannot be detected.
- Laser prostatectomy: Several different techniques of˜laser prostatectomy are evolved during the 1990s.
  - ➢ Transurethral ultrasound-guided laser-induced prostatectomy (TULIP): Performed using a probe consisting of a Nd:YAG laser adjacent to an ultrasound transducer.
  - ➢ Visual laser ablation of the prostate (VLAP):This side-firing system used a mirror to reflect or a prism to refract the laser energy at various angles (usually 90Â°) from a laser fibre located in the prostatic urethra onto the surface of the prostate. The principle tissue effect was one of coagulation with subsequent necrosis.
  - ➢ Contact laser prostatectomy: Produces a greater degree of vaporization than VLAP, allowing the immediate removal of tissue.

- Interstitial laser prostatectomy (ILP): Performed by transurethral placement of a laser fibre directly into the prostate which produces a zone of coagulative necrosis some distance from the prostatic urethra.
- TULIP, VLAP, contact laser prostatectomy, and ILP have been succeeded by holmium laser prostatectomy.
- Holmium laser prostatectomy: The wavelength of the holmium: YAG laser is such that it is strongly absorbed by water within prostatic tissue. It produces vaporization at the tip of the laser fibre. Its depth of penetration is <0.5mm and thus it can be used to produce precise incisions in tissue.
  It can be used with normal saline, so avoiding the possibility of TURP syndrome.

Three techniques Holmium laser prostatectomy developed in progression:

- Vaporization (holmium-only laser ablation of the prostate, HoLAP); time consuming, suitable only for small prostates.
- Resection (holmium laser resection of the prostate, HoLRP); similar symptomatic outcome to TURP.
- Enucleation (holmium laser enucleation of the prostate, HoLEP); lobes of the prostate are dissected off the capsule of the prostate and then pushed back into the bladder.

⊡ TURP and open prostatectomy
  - TURP: Removal of the obstructing tissue of BPH or obstructing prostate cancer from within the prostatic urethra, leaving the compressed outer zone intact. An electrically heated wire loop is used, through a resectoscope, to cut the tissue and diathermy bleeding vessels.

Indications for TURP:

- Bothersome lower urinary tract symptoms which fail to respond to changes in life style or medical therapy
- Recurrent acute urinary retention
- Renal impairment due to BOO (high pressure chronic urinary retention)
- Recurrent haematuria due to benign prostatic enlargement
- Bladder stones due to prostatic obstruction

Open prostatectomy
Indications

- Large prostate (>100g)
- TURP not technically possible (e.g. limited hip abduction)
- Failed TURP (e.g. because of bleeding)
- Urethra too long for the resectoscope to gain access to the prostate
- Presence of bladder stones which are too large for endoscopic cystolitholapaxy, combined with marked enlargement of the prostate

Contraindications:

- Small fibrous prostate
- Prior prostatectomy in which most of the gland has been resected or removed; this obliterates the tissue planes

- Carcinoma of the prostate

Complications:
- Haemorrhage; urinary infection; rectal perforation (close and cover with a colostomy).

10. Discuss the role of sentinel lymph node biopsy in different cancers. 10

Answer. Role of sentinel lymph node biopsy in different cancers:

- Carcinoma breast:

- Sentinel lymph node biopsy is primarily used in women with early breast cancers (T1 and T2, N0).
- It also is accurate for T3 N0 cancers, but nearly 75% of these women will have nonpalpable axillary lymph node metastases.
- In women undergoing neoadjuvant chemotherapy to permit conservation surgery, sentinel lymph node biopsy may be used.

Contraindications to the procedure include

- Palpable lymphadenopathy,
- Prior axillary surgery, chemotherapy or radiation therapy, and
- Multifocal breast cancers.

- The combination of intraoperative gamma probe detection of radioactive colloid and intraoperative visualization of isosulfan blue dye (Lymphazurin) is more accurate than the use of either agent alone.
- On the day prior to surgery, or on the morning of surgery, the radioactive colloid is injected. Using a tuberculin syringe and a 25-gauge needle, 0.5 mCi of 0.2-micron technetium-99 sulfur colloid in a volume of 0.2 to 0.5 mL is injected (three to four separate injections) at the cancer site or subdermally.
- Subdermal injections are given in proximity to the cancer site or subareolar.
- Subsequently, in the operating room, 4 mL of isosulfan blue dye (Lymphazurin) is injected in a similar fashion, but with an additional 1 mL injected between the cancer site and the overlying skin.
- For nonpalpable cancers, the injection is guided by either intraoperative ultrasound or by a localization wire that is placed preoperatively under ultrasound or stereotactic guidance.
- It is helpful for the radiologist to mark the skin overlying the breast cancer at the time of needle localization using an indelible marker.
- In women who have undergone previous excisional biopsy, the injections are made around the biopsy cavity but not into it.
- Women are told preoperatively that the isosulfan blue dye injection will impart a change to the color of their urine and that there is a very small risk of allergic reaction to the dye (1 in 10,000).
- Anaphylactic reactions have been documented. The use of radioactive colloid is safe and radiation exposure is very low.

- By using a combination of isotope lymphatic mapping, an intraoperative hand-held gamma probe, and intraoperative injection of blue dye, the SLN could be identified in more than 95% of cases in the groin and axilla, with identification in the head/neck region being slightly lower (85%).

- ❖ A hand-held gamma counter is then employed transcutaneously to identify the location of the sentinel lymph node.
- ❖ The gamma counter is employed to pinpoint the location of the sentinel lymph node.
- ❖ As the dissection continues, the signal from the probe increases in intensity as the sentinel lymph node is approached.
- ❖ The sentinel lymph node also is identified by visualization of isosulfan blue dye in the afferent lymph vessel and in the lymph node itself.
- ❖ The lowest false-negative rates for sentinel lymph node biopsy have been obtained when all blue lymph nodes and all lymph nodes with radiation counts greater than 10% of the 10-second ex vivo count of the sentinel lymph node are harvested (10% rule).
- ❖ . This procedure is repeated until residual radioactivity in the surgical bed is less that 10% of the 10-second ex vivo count of the most radioactive sentinel lymph node. ii.

- Malignant melanoma: Management of Regional Lymph Nodes:

- ❖ After WLE of the primary tumor, the most common sites of first recurrence are regional (lymph nodes, in-transit metastases, and local recurrences).
- ❖ Nodal metastases generally appear in the basin or basins draining from the primary site. This is a predictable pattern for extremity melanomas; however, truncal and head and neck melanomas may drain to more than one site.
- ❖ Lines of drainage for truncal melanomas are divided by the midline and the line of Sappey, which extends from the umbilicus across the iliac crest and around to the spine at the level of L2.
- ❖ This sequence of recurrences led surgeons to conclude that resection of nodal basins containing occult metastases could provide an increase in survival. This procedure, termed elective lymph node dissection (ELND), was commonly practiced.

- As prognostic factors became better understood, it was postulated that patients with thin tumors (<1 mm in thickness) would have a low risk of metastases at any site and patients with thick tumors (>4 mm in thickness) would have a high risk of distant as well as regional metastases. In contrast, patients with intermediate-thickness melanoma (1-4 mm) would have an elevated risk for nodal metastases without a high risk for distant disease.

Development of the SLN concept ended one debate over ELND, changed clinical management, and opened a new series of questions about the tumor biology of melanoma.

- There was great anatomic variation resulting in drainage to multiple or uncommon sites.
- Detailed pathologic analysis of the sentinel nodes via step sections enabled detection of micrometastases that could be missed by standard techniques.
- The probability of finding a positive sentinel node can be predicted by using a nomogram derived from multifactorial analysis.
- In most cases a positive sentinel node was the only positive node.
- No prognostic factors were found that accurately identified a subpopulation of SLN-positive patients at zero risk of harboring other positive nodes.

- Carcinoma penis: Not used nowadays. Biopsy of the lesion is taken to confirm the diagnosis.

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2017

PAPER IV

1. **"Flow guided intraoperative fluid therapy has been shown to reduce complications and hospital stay in patients undergoing major abdominal surgery"- Discuss. Criticize the basis of recent advances the role of colloids as resuscitation fluid. 6+4**
2. **Discuss the role of EU in evaluation of cystic lesions of pancreas and IPMN. Give the novel therapeutic options of EUS. 3+2+5**
3. **What is Carcinoid syndrome? Discuss the management of Gastro-intestinal carcinoids. 2+8**
4. **Discuss the advantages and disadvantages of Robotic Surgery. Discuss its present day role in colorectal surgery. 5+5**
5. **What are the types of intestinal failure? Discuss the management of Type 3 failure. 3+7**
6. **What would be the precise roll of PET-CT scan in the evaluation of colorectal cancer? Discuss the measures to improve the resectability of nonresectable CRC liver metastasis. 4+6**
7. **Algorithm of screening of common malignancies in India in the perspective of National Health Mission. 10**
8. **Give an outline of Biological Mesh and their clinical use. 10**
9. **Recent advances in management of carcinoma prostate. 10**
10. **A 35 year old lady, G2P2, menarche at age 12 years on OCP has a strong family history of breast cancer. She is detected to be carrier of BRCA 1 mutation. How would you proceed for Surveillance and undertake prevention strategies for her. 5+5**

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2017

PAPER IV

1. "Flow guided intraoperative fluid therapy has been shown to reduce complications and hospital stay in patients undergoing major abdominal surgery"- Discuss. Criticize the basis of recent advances the role of colloids as resuscitation fluid. 6+4

Answer.Flow guided intraoperative fluid therapy:

Commonly used colloids include:

- Gelatins;
- Hetastarch;
- Albumin;
- Plasma protein fraction;
- Dextran.

There has been criticism of research, however, because tests involved a single colloid type only but the conclusions drawn were applied to the whole classification of colloids. Those who support the use of colloids argue that because in hypovolaemia the intravascular space is the site of injury, fluid resuscitation should be aimed at the optimal restoration of the intravascular space.

Advantages and disadvantages:

- Colloids are better than crystalloids at expanding the circulatory volume, because their larger molecules are retained more easily in the intravascular space and increase osmotic pressure.
- However, excessive use of colloids can precipitate cardiac failure, and pulmonary and peripheral oedema. Although the pulmonary oedema caused by excessive use of colloids is delayed in comparison with that caused by crystalloids, it is more sustained. Schierhout and Roberts (1998) also found that fluid resuscitation using colloids can cause pulmonary oedema as well as anaphylactic shock and they can lead to a small increase in the rate of death.
- Gelatins can cause anaphylactic reactions and there is concern regarding the possible transmission of bovine spongiform encephalopathy.
- In addition, colloids are required for fluid challenges, as 200ml of colloid solution will re-expand intravascular volume by 200ml (Webb, 1999).

Comparisons

- The selection of the type of fluid to use depends on the primary origin of the exact kind of fluid loss, the condition of the patient and the preference of the prescribing clinician (Krau, 1998).
- It is generally agreed that colloid solutions act more promptly to secure homeostasis, but some studies did indicate that crystalloid solutions are adequate for volume replacement (Alderson et al, 2001; Schierhout and Roberts, 1998).
- McIlroy and Kharasch concluded that rapid colloid infusion increased blood volume and therefore cardiac output more effectively than crystalloid infusion.
- Krau's (1998) study showed that patients who received colloids experienced reduced fluid requirements, superior haemodynamics performance and shortened intensive care requirements in comparison with those who received crystalloids.
- However, the Cochrane Report (Alderson et al, 2001) states that there is no evidence to indicate that use of colloids, although effective at expanding the circulation, improves mortality in the critically ill patient. The same report goes so far as to suggest that there is little justification for the use of colloids outside the context of randomised controlled trials.
- A systematic review by Choi et al (1999) highlights the need for further trials and indicates that insufficient data is available to suggest abandoning the use of colloids in practice. Schortgen et al (2001) assert that the little evidence that exists is contradictory.
- It is important to remember that the choice of fluid for resuscitation is only one small part of measures taken in the quest for reduced mortality.
- There is little conclusive evidence that mortality or morbidity outcomes are affected by the choice of either colloid or crystalloid fluid and mortality has not been found to be related to the specific fluid used for resuscitation.

In summarizing these most recent recommendations and with addition of the literature that emerged over the past couple of years, the following conclusions can be drawn.

- **Colloids at large:** There has not been a clear benefit associated with the use of expensive colloids compared to inexpensive crystalloids. Colloids as a whole have, however, shown to have increased mortality in patients with TBI. No indications currently exist for the routine use of colloids over crystalloids.
- **Albumin:** There is no evidence to support the unique benefit of use of albumin as a resuscitation fluid. With the inclusion of the latest ALBIOS trial, mortality benefit in sepsis has not thus far been proven. In light of the cost and limited shelf life, the use of albumin as a resuscitation fluid is not supported.
- **HES:** The benefit of using HES has been refuted. To the contrary, HES is associated with increased harm. Though it is not clearly associated with increase in mortality, evidence clearly shows increased AKI and use of RRT associated with the use of HES. It is further associated with coagulopathy and increased use of blood transfusion. The effects seem to be dose dependent, but no consensus has been reached as to a safe dose of HES. As such, the use of HES in resuscitation should be avoided.
- **Dextran and gelatins:** Other synthetic colloids (dextran and gelatins) are not well studied in the literature. Although there is no evidence showing harm beyond what is seen with

other colloids, there is also no evidence showing benefit. In light of the lack of evidence, and the theoretical potential for adverse effect, the suggestion is not to use gelatins or dextran.

AKI: acute kidney injury
HES: hydroxyethyl starch
RRT: renal replacement therapy
TBI: traumatic brain injury

2. Discuss the role of EU in evaluation of cystic lesions of pancreas and IPMN. Give the novel therapeutic options of EUS. 3+2+5

Answer. Cystic lesions of pancreas:

- **unilocular**
  - pancreatic pseudocyst
  - intraductal papillary mucinous neoplasms (IPMN)
  - serous cystadenoma uncommonly uni/macrolocular
  - pancreatic cysts occur in association with
    - von Hippel Lindau syndrome
    - autosomal dominant polycystic kidney disease (ADPKD)
    - cystic fibrosis
- **macrocystic: multilocular**
  - mucinous cystic neoplasm(s) of pancreas: usually body and tail
  - intraductal papillary mucinous neoplasms (IPMN)
  - serous cystadenoma uncommonly uni/macrolocular
  - acinar cell cystadenocarcinoma
- **microcystic**
  - serous cystadenoma: usually head; 30% have central scar
- **cystic with a solid component**
  - macrocystic tumours can also have a solid component
  - solid pseudopapillary tumour of pancreas
  - primary ductal pancreatic tumour with cystic degeneration
  - cystic degeneration of islet cell tumours
    - insulinoma
    - glucogonoma
- cystic teratoma
- metastases to pancreas

Retroperitoneal lesions, extrinsic to the pancreas, can of course mimic pancreatic cystic lesions, when close to the gland. Examples include:

- cystic lymphadenopathy (e.g. necrotic)
- duodenal diverticulum

Endoscopic Ultrasound: Endoscopic ultrasound is an excellent imaging technique for detecting signs predictive of malignancy or aggressiveness in cystic pancreatic lesions. Such signs include internal septations, mural nodules, solid masses, vascular invasion, and lymphatic metastasis.

An additional benefit is its capability for sampling fluid and solid components and depicting debris and wall thickness.

Endoscopic ultrasound also shows the details of the pancreatic parenchyma and the pancreatic duct.

However, endoscopic ultrasound is invasive and operator dependent, and these limitations have led to considerable variability in determining accuracy in differentiating benign and malignant lesions.

Currently, endoscopic ultrasound with or without aspiration is used in the following instances: indeterminate MDCT or MRCP findings; care of patients at high surgical risk owing to co-morbid conditions or advanced age, which precludes them from undergoing extensive surgery; and confirmation of the malignant status of a cystic lesion before it is resected.

Endoscopic ultrasound–guided cyst fluid aspiration is often performed in conjunction with endoscopic ultrasound for definitive diagnosis.

WHO classification of pancreatic cystic neoplasms:

I. **Serous cystic neoplasms:**
   - **Serous cystadenoma**
   - **Serous microcystic adenoma**
   - **Serous oligocystic adenoma**
   - **Serous cystadenocarcinoma**

II. **Mucinous cystic neoplasm:**
   - **Mucinous cystadenoma**
   - **Mucinous cystic neoplasm with moderate dysplasia**
   - **Mucinous cystadenocarcinoma**
     - **Noninvasive**
     - **Invasive**

III. **Intraductal papillary mucinous neoplasm:**
   - **Intraductal papillary mucinous adenoma**
   - **Intraductal papillary mucinous neoplasm with moderate dysplasia**
   - **Intraductal papillary mucinous carcinoma**
     - **Noninvasive**
     - **Invasive**

IV. **Solid pseudopapillary neoplasm**

In patients with suspected IPMNs, preoperative evaluation attempts to define the presence or absence of malignancy,involvement of the main duct and/or side branches, and the longitudinal extent of involvement within the pancreas.

- **EUS- Detect communication with pancreatic duct and detect mural nodules. Sample cystic fluid and biopsy.**

Therapeutic role of EUS:

- EUS-guided drainage of intra-abdominal collections:Drainage of peripancreatic fluid collections.
- Gall bladder drainage: Cholecystectomy is the treatment of choice in patients with acute cholecystitis. However, in certain group of patients, this is not an option due to multiple comorbidities.
- EUS-guided biliary drainage: The three options include:

  i. EUS-guided biliary drainage—transduodenal—for distal biliary strictures.
  ii. EUS-guided biliary drainage—transgastric—for proximal biliary strictures, accessed through the left lobe of the liver.
  iii. EUS-guided rendezvous—for patients who have diverticulum or the ampulla is not clearly visible.

- **EUS-guided coeliac plexus neurolysis/block.**

- **EUS-guided treatment of tumours:**

- EUS allows accurate targeting for the delivery of various substances directly into pancreas, liver or subepithelial lesions.
- EUS-guided fine-needle injection (FNI) has been reported for the treatment of GI stromal tumours, insulinomas, hepatic metastases, oesophageal cancer, cystic neoplasms of the pancreas and pancreatic adenocarcinoma.
- Various biological antitumour agents have been introduced into pancreatic and oesophageal cancers under EUS-guided FNI for control of locally advanced disease. Although long-term results are not well studied, preliminary results suggest that these approaches are generally safe and may prove to be an adjunct or alternative to traditional chemoradiation therapies.
- Cyber knife stereotactic radiotherapy has been used to treat lung, mediastinal and pancreatic tumours. It delivers precise directed beams of radiation to the tumour using real-time image guidance. The radiographic markers are placed around the tumour either surgically or using transabdominal ultrasound. However, EUS-guided fiducial placement for locally advanced or recurrent pancreatic cancer seems to be a successful alternative. However, this is still in the early stages of being established as a mode of delivering treatment and is only being used in research trials.

- EUS in the management of GI bleeding: Upper GI bleeding is a common medical emergency with a mortality of 10%, and therapeutic endoscopy is the main modality of treatment. In clinical practice, it is sometimes difficult to achieve haemostasis, especially in gastric variceal bleeds. If endoscopy fails, then they are often referred for transjugular intrahepatic portosystemic shunt. It is contraindicated in patients with encephalopathy and right heart failure. EUS may be used as an alternative to achieve haemostasis in this group of patients.

- EUS-guided tissue ablation: There is accumulating data on the EUS-guided ablation of cystic and solid pancreatic tumours but the use of these techniques should be within research protocols until results from larger, prospective clinical trials are available.

- Other indications: The other indications for interventional EUS, which are in very preliminary stages, include EUS-guided fine-needle tattoo injection for small tumours, EUS-guided angiography, EUS-guided Botox injection and EUS-guided gastroenterostomy.

3. What is Carcinoid syndrome? Discuss the management of Gastro-intestinal carcinoids. 2+8

Answer. Carcinoid syndrome: Carcinoid syndrome is a paraneoplastic syndrome comprising the signs and symptoms that occur secondary to carcinoid tumors. The syndrome includes flushing and diarrhea, and less frequently, heart failure, emesis and bronchoconstriction. It is caused by endogenous secretion of mainly serotonin and kallikrein.

Management:

Diagnosis: With a certain degree of clinical suspicion, the most useful initial test is the 24-hour urine levels of 5-HIAA (5-hydroxyindoleacetic acid), the end product of serotonin metabolism. Patients with carcinoid syndrome usually excrete more than 25 mg of 5-HIAA per day.

Imaging: For localization of both primary lesions and metastasis, the initial imaging method is Octreoscan, where indium-111 labelled somatostatin analogues (octreotide) are used in scintigraphy for detecting tumors expressing somatostatin receptors. Median detection rates with octreoscan are about 89%, in contrast to other imaging techniques such as CT scan and MRI with detection rates of about 80%. Gallium-68 labelled somatostatin analogues such as ^{68}Ga-DOTA-Octreotate (DOTATATE), performed on a PET/CT scanner is superior to conventional Octreoscan.

Usually, on a CT scan, a spider-like/crab-like change is visible in the mesentery due to the fibrosis from the release of serotonin. ^{18}F-FDG PET/CT, which evaluate for increased metabolism of glucose, may also aid in localizing the carcinoid lesion or evaluating for metastases. Chromogranin A and platelets serotonin are increased.

Localization of tumour:

- Tumour localization may be extremely difficult. Barium swallow and follow-up examination of the intestine may occasionally show the tumor. Capsule video endoscopy has recently been used to localize the tumor. Often laparotomy is the definitive way to localize the tumour. Another form of localizing a tumor is the Octreoscan. A tracer agent of Indium 111 is injected into a vein where then the tumors absorb the radionuclide Indium 111 and become visible on the scanner. Only the tumors absorb the somatostatin agent Indium 111 making the scan highly effective.
- ^{123}I-MIBG will also concentrate in carcinoid tumours, including the low percentage (~15%) that are negative with ^{111}In-octreotide

Treatment:

For symptomatic relief of carcinoid syndrome:

- Octreotide (a somatostatin analogue which decreases the secretion of serotonin by the tumor and, secondarily, decreases the breakdown product of serotonin (5-HIAA))
- Telotristat ethyl (Xermelo) along with a somatostatin analogue in patients not responding to somatostatin analogue monotherapy is a tryptophan hydroxylase inhibitor and reduces the production of serotonin.
- Peptide receptor radionuclide therapy (PRRT) with lutetium-177, yttrium-90 or indium-111 labeled to octreotate is highly effective
- Methysergide maleate (antiserotonin agent but not used because of the serious side effect of retroperitoneal fibrosis)
- Cyproheptadine (an antihistamine drug with antiserotonergic effects)

Alternative treatment for qualifying candidates:

- Surgical resection of tumor and chemotherapy (5-FU and doxorubicin)
- Endovascular, chemoembolization, targeted chemotherapy directly delivered to the liver through special catheters mixed with embolic beads (particles that block blood vessels), used for patients with liver metastases.

4. Discuss the advantages and disadvantages of Robotic Surgery. Discuss its present day role in colorectal surgery. 5+5

Answer. Advantages:

- Major advances aided by surgical robots have been remote surgery, minimally invasive surgery and unmanned surgery.
- Due to robotic use, the surgery is done with precision, miniaturization, smaller incisions; decreased blood loss, less pain, and quicker healing time.
- Articulation beyond normal manipulation and three-dimensional magnification helps resulting in improved ergonomics.

- Due to these techniques there is a reduced duration of hospital stays, blood loss, transfusions, and use of pain medication.
- The existing open surgery technique has many flaws like limited access to surgical area, long recovery time, long hours of operation, blood loss, surgical scars and marks.
- Compared with other minimally invasive surgery approaches, robot-assisted surgery gives the surgeon better control over the surgical instruments and a better view of the surgical site. In addition, surgeons no longer have to stand throughout the surgery and do not tire as quickly. Naturally occurring hand tremors are filtered out by the robot's computer software. Finally, the surgical robot can continuously be used by rotating surgery teams.
- A Medicare study found that some procedures that have traditionally been performed with large incisions can be converted to "minimally invasive" endoscopic procedures with the use of the **Da Vinci Surgical System**, shortening length-of-stay in the hospital and reducing recovery times. But because of the hefty cost of the robotic system it is not clear that it is cost-effective for hospitals and physicians despite any benefits to patients since there is no additional reimbursement paid by the government or insurance companies when the system is used.

Disadvantages:

- Currently, the major limiting factor that is stunting the development of robotic surgery is that of “latency” which is the time delay between the instructions issued by the surgeon and the movement of the robot which responds to the instructions. With the current level of technology, the surgeon must be in close proximity.
- Robotic technology is extremely expensive both in terms of capital costs, as well as running expenses and will require the training of specialized personnel to properly repair and care for it. Such expenses may far outweigh any savings earned at the present time.

Role of Robotic Surgery in Colorectal Surgery:

Robotic surgical systems are a step up from both traditional open surgery and minimally invasive laparoscopic procedures because Surgeons benefit from:

- **Better visualization.** Robotic surgery provides physicians with a high-resolution three-dimensional screen that provides greater visualization and depth perception of the surgical field.
- **Enhanced dexterity.** The robotic arm can mimic the way a wrist would move. You can rotate it 360 degrees and bend it back or forward. This is an improvement over laparoscopic instruments, which are straight like chop sticks with no degree of movement.
- **Improved precision.** Physicians can also precisely move the robotic arm and hand, and the movement is scalable. For instance, the physician can move an inch outside the body and program that movement to be one-third of an inch inside the body.

Application of Robotic Surgery in Colon Cancer:

- **Hybrid technique:** Hybrid technique is a technique that required two minimums invasive systems in a single patient, thus surgeon have to be adapted and skillful in both laparoscopic and robotic systems. The first part of procedure starts with laparoscopic system to facilitate splenic flexure mobilization as well as mobilization of left colon and IMA ligation branches. Then robotic system comes afterword to pelvic side, as the main advantages maximize during rectal dissection by robotic system utilization].
- **Single port robotic surgery:** Efforts are challenging to further concentrate on the cosmetic outcome of robotic surgery as well as reduce port-related morbidities.
- **Da Vinci xi System:** Several limitations in robotic Si version in **colorectal surgery**, for instance: inability to perform multi-quadrant operation, fixed heavy arms, need of re-docking and risk of collisions which disrupt working channel and might extent operative time further. Recently, a new innovation of Da Vinci Xi has admitted in the market, which contributed to overcome obstacles and limitations of the previous platform. Rectal cancer surgery is a good example to look at how Da Vinci Xi platform works in multi-quadrant areas smoothly, however potential risk of collision is possible, since totally robotic pelvic procedure hasn't standardized in Da Vinci Xi yet.

Application of Robotic Surgery in Rectal Cancer:

- **Total mesorectal excision**

- Caution dissection at inferior mesenteric artery (IMA) root, where superior hypogastric plexus network lied there. If injured, might end with retrograde ejaculation.
- Mobilization of the rectosigmoid colon from the gonadal vessels and ureters, the hypogastric nerves are at risk at this level. Therefore, the correct surgical plane should be between the rectal proper fascia and prehypogastric nerve fascia.
- Caution at inferior mesenteric vain (IMV) ligation, as collateral vessel crossing IMV root, if injured, could contribute in blood supply cut down then increase risk of anastomotic leakage.
- Avoid blunt dissection in the posterior pelvic side, particularly at recto-sacral fascia to avoid fascia avulsions and presacral bleeding.
- Anterior liner incision at the peritoneum reflection with intensive caution to 3 important structure, which are seminal vesicles in men or vaginal wall in women, watch neurovascular bundles from the pelvic plexus run along the tip of the seminal vesicle (2 o'clock and 10 o'clock directions), and lastly, as deeper you proceed with anterior dissection, as better recognition of Denonviliers fascia will be, where posterior dissection is recommended to avoid troublesome bleeding and nerves damage, unless if the tumor located anteriorly or threating up front structure, then consider taken down Denonviliers fascia with the specimen
- Final step is to keep circumferential dissection all around the rectum to avoid coning of the mesorectum at the pelvic floor

- **The inter-sphincteric resection (ISR)**: It is an extended procedure to TME steps with further dissection on the pelvic floor.

- **Abdominoperineal resection (APR).**
- **Hemi-elevator excision.**
- **Robotic-assisted lateral pelvic lymph node dissection [LPLND].**

5. What are the types of intestinal failure? Discuss the management of Type 3 failure. 3+7

Answer. Introduction: Intestinal failure occurs when a person's intestines can't digest food and absorb the fluids, electrolytes and nutrients essential to life and normal development. Patients must then receive TPN, which provides liquid nutrition through a catheter or needle inserted into a vein in the arm, groin, neck or chest.

Types: Intestinal Failure can be categorised into three types:

- **Type1:** This type of intestinal failure is short term, self –limiting and often peri -operative in nature. This type is common and these patients are managed successfully in a multitude of healthcare settings, especially surgical wards, including all units which perform major, particularly abdominal surgery. Some patients on high dependency units (HDU) or intensive care units (ICU) will also fall into this category.
- **Type 2:** This occurs in metabolically unstable patients in hospital and requires prolonged parenteral nutrition over periods of weeks or months. It is often associated with sepsis, and may be associated with renal impairment. These patients often need the facilities of an intensive care or high dependency unit for some or much of their stay in hospital. This type of intestinal failure is rare and needs to be managed by a multi-professional specialist intestinal failure team. Poor management of type 2 intestinal failure increases mortality and is expected to increase the likelihood of later development of type 3 intestinal failure.
- **Type 3:** This is a chronic condition requiring long term parenteral feeding. The patient is characteristically metabolically stable but cannot maintain his or her nutrition adequately by absorbing food or nutrients via the intestinal tract. These are, in the main, the group of patients for which HPN or electrolyte (HPE) are indicated.

Treatment: The clinical features of intestinal failure include intractable diarrhoea or a high stomal output, weight loss, dehydration, vitamin and mineral deficiency, and malnutrition. Acute intestinal failure is usually temporary and often attributable to infection or perioperative complications. Chronic intestinal failure results from intestinal resection(s), gastrointestinal disease or small bowel dysfunction.

Management Specific management depends on the amount, type and integrity of the remaining bowel, as the presence of even part of the large bowel can significantly increase absorption. The aim is to maximise gastrointestinal function and, where necessary, supplement fluid and nutrient intake by the least invasive means, thus providing the individual with the best possible quality of life.

- Maximising gastrointestinal function: There are a number of sites in the gastrointestinal tract that affect the rate of gastric emptying and thus influence gastrointestinal motility. These sites (or brakes) occur in the stomach, the proximal small bowel, the distal small bowel, and the colon and rectum.

- Absence of any or all of these sites will lead to decreased intestinal transit time, high intestinal fluid loss and reduced absorption of fluid and nutrients. (Intestinal transit time refers to the time that food and fluids remain in the gastrointestinal tract). Increasing intestinal transit time is therefore an important consideration in optimising gastrointestinal function as it will increase fluid and nutrient absorption and decrease intestinal losses.

- Medication Anti-diarrhoeal medications such as loperamide and codeine phosphate are commonly used to reduce motility and enhance absorption. To maximise their effectiveness they should be taken half an hour before food. An additional dose before bedtime can be of enormous psychological benefit by reducing the fear of incontinence or leakage from a stoma.
- Anti-secretory medications such as histamine 2 (H2)-receptor antagonists or proton pump inhibitors can lead to a reduction in output from the gastrointestinal tract by reducing the secretion of gastric acid. Large doses of both anti-diarrhoeal and anti-secretory medications may be necessary to compensate for the decreased intestinal transit time and impaired absorption.

Nutritional Support in Intestinal Failure:

- Reducing the intake of hypotonic fluids Arguably, the most important intervention in maximising gastrointestinal function is to reduce the amount of hypotonic fluid (such as water, tea, coffee and squash) entering the intestine, as this will significantly reduce the amount of fluid the intestine has to assimilate. Without an appreciation of the mechanisms affecting absorption in the jejunum, this intervention may appear to be illogical.
- The sodium concentration in the jejunum is maintained at 90mmol/litre. Drinking hypotonic fluid dilutes the sodium concentration causing a net efflux of sodium from the plasma in order to restore the concentration to 90mmol/litre.
- Facilitating small bowel adaptation A final consideration in maximising intestinal function is facilitating small bowel adaptation. Following intestinal resection the remaining bowel undergoes structural and functional changes. The small bowel dilates and lengthens and there is a reduction in motility. These changes result in increased intestinal function.
- Patients with intestinal failure are encouraged to eat for a number of reasons. In addition to being important in small bowel adaptation, the presence of nutrients within the intestine is also important in maintaining normal gastrointestinal flora and the gut barrier function, for example, preventing infection - factors that can impact on intestinal function.
- Supplementing fluid/nutrient intake The small intestine transports between 7-9 litres of fluid a day, absorbing about 80 per cent of this so that only about 1-2 litres enters the colon. The colon absorbs fluid, so that only 100-200ml is actually excreted each day. A reduction in absorptive area, such as in someone with a proximal small bowel stoma or enterocutaneous fistula, will result in a greater volume of fluid excreted and subsequent fluid and electrolyte imbalance and a degree of malabsorption.
- The need for fluid and nutrient replacement is determined by a number of factors, namely, the amount of available intestine, the volume of daily intestinal losses, and the ability to maintain a satisfactory weight. Individuals with less than 75cm of jejunum, an intestinal output of greater than 2500ml/day, and absorption below about one-third of all energy taken orally will usually be dependent on long-term parenteral nutrition. Those with 75-

100cm of jejunum, and average daily outputs of about 1200-2500ml/day, may require parenteral supplementation of fluid while being able to maintain their nutritional status with an enteral regime including food and/or supplemental enteral nutrition.

- While long-term parenteral supplementation of fluids and nutrients will help prevent dehydration and malnutrition, it imposes restrictions on an individual's daily life. Large fluid volumes usually mean infusion times of at least 12 hours, and while cyclical infusion overnight permits freedom from the infusion pump during the day, the patient may suffer disrupted sleep due to the need to pass urine frequently during the night.
- It is important to note that even though a patient may be dependent on parenteral nutrition or fluid, this does not mean that other aspects of their treatment regimen can be relaxed. Fluid and nutrient needs are determined by a patient's average daily fluid balance and if there is a significant shift in this - for example, by drinking excessive amounts of hypotonic fluid or not taking medication - they will still become dehydrated.

New Therapeutic Agents:

- Growth hormone, for example, has received approval from the US Food and Drug Administration (FDA) for the management of short bowel syndrome. Various treatment strategies with growth hormone and other agents are being tried in patients with short bowel syndrome. In one randomized controlled trial, a combination of an adequate diet plus growth hormone plus glutamine produced results that were superior to dietary therapy alone.
- Another hormone, glucagon-like peptide (GLP)-2, may have a role in stimulating intestinal mucosal adaptation in patients with short bowel syndrome, although its mechanism of action is not completely clear. This agent is now undergoing evaluation in a phase 3 trial.

➢ Intestinal Failure and Transplantation:

An intestinal transplant is a last-resort treatment option for patients with intestinal failure who develop life-threatening complications from total parenteral nutrition (TPN). Long-term TPN can result in complications including bone disorders, catheter-related infections and liver failure. Over an extended period of time, TPN also can damage veins used to administer the nutrition via the catheter.

An Intestinal transplant is a complex procedure requiring a highly skilled multidisciplinary transplant team. An isolated Intestinal transplant surgery takes approximately three to four hours to complete whereas a multivisceral (multi-organ) transplant operation can take up to twelve hours.

There are three major types of intestinal transplants:

❖ Isolated intestinal (Small Bowel) Transplantation:

In an isolated intestinal transplant, the diseased portion of the small intestine is removed and replaced with a healthy small intestine from a donor. In an isolated intestinal transplant, the

disease limited to the small bowel only without liver failure. This procedure can be lifesaving for patients with irreversible intestinal failure that has become life-threatening.

❖ **Combined Liver and Intestinal Transplantation:**

Combined liver and intestine transplantation is done for patients with both liver and intestinal failure. IN In this procedure, the diseased liver and intestine are removed and replaced with a healthy liver and intestine from an organ donor. Complications of intravenous nutrition (TPN) are the main cause of liver failure attendant to intestinal failure. Without a transplant, patients with intestinal and liver failure have an expected median survival of 6 - 12 months while continued on TPN.

❖ **Multivisceral Transplantation:**

Multivisceral transplantation is performed where two or more intra-abdominal organs (including the intestines) are failing. The transplanted organs may include the stomach, duodenum, pancreas, intestine, and liver. This complex procedure can be life-saving for patients with combined abdominal organ failure resulting diseases such as Gardner's syndrome (familial colorectal polyposis), a pre-malignant colorectal condition and intestinal pseudo-obstruction (decreased ability of the intestines to push food through).

6. What would be the precise roll of PET-CT scan in the evaluation of colorectal cancer? Discuss the measures to improve the resectability of nonresectable CRC liver metastasis. 4+6

Answer. Role of PET-CT:

PET is considered particularly effective in identifying whether cancer is present or not, if it has spread, if it is responding to treatment, and if a person is cancer free after treatment. Cancers for which PET is considered particularly effective include lung, head and neck, colorectal, esophageal, lymphoma, melanoma, breast, thyroid, cervical, pancreatic, and brain as well as other less-frequently-occurring cancers.

- **Early Detection:** Because PET images biochemical activity, it can accurately characterize a tumor as benign or malignant, thereby avoiding surgical biopsy when the PET scan is negative. Conversely, because a PET scan images the entire body, confirmation of distant metastasis can alter treatment plans in certain cases from surgical intervention to chemotherapy.
- **Staging of Cancer:** PET is extremely sensitive in determining the full extent of disease, especially in lymphoma, malignant melanoma, breast, lung, colon and cervical cancers. Confirmation of metastatic disease allows the physician and patient to more accurately decide how to proceed with the patient's management.
- **Checking for recurrences:** According to the literature (see “Sources”), PET is currently considered to be the most accurate diagnostic procedure to differentiate tumor recurrences from radiation necrosis or post-surgical changes. Such an approach allows for the development of a more rational treatment plan for the patient.

- **Assessing the Effectiveness of Chemotherapy:** The level of tumor metabolism is compared on PET scans taken before and after a chemotherapy cycle. A successful response seen on a PET scan frequently precedes alterations in anatomy and would, therefore, be an earlier indicator of tumor response than that seen with other diagnostic modalities.

Colorectal cancer and PET

- As with all types of cancer, early diagnosis of colorectal cancer is key to its cure. Colorectal cancers probably develop slowly over a period of several years. Before a true cancer develops, there are often earlier changes in the lining of the colon or rectum. If found early, before it has metastasized, the disease is considered curable. However, as the tumor spreads to lymph nodes, a patient's chance of living at least five years drops to 40 - 60%. If the cancer has already spread to distant organs, the long-term survival may be lower.
  As it relates to the diagnosis of early colorectal cancer, a study found that PET was capable of noninvasively detecting an early colon cancer as small as 16mm as well as other cancers in the whole body and considered it to be a suitable screening examination.
- Before PET, it was extremely difficult to monitor patients for suspected recurrence of colorectal cancer. The other techniques available for staging and assessment of potential recurrences may lack sensitivity and precision and frequently result in diagnostic and therapeutic delays. One study found that the sensitivity and specificity of PET/CT to colon cancer recurrence in patients after resection were 96.5% and 82.1% respectively.
- In many colorectal cancer patients, pelvic CT could demonstrate a suspicious mass, but cannot distinguish mass tumor recurrence from postoperative or post radiation scar or is a recurrent cancer that must be treated. Further evaluation usually involves a biopsy. A positive biopsy is highly predictive of recurrence but because it is impossible to sample the entire mass, a negative biopsy cannot exclude recurrence.
- Imaging with PET is critical in looking for the return of the cancer. In many patients with colorectal cancer, a mass may develop in the pelvis. A PET scan can identify whether the mass is suspicious of being cancerous because it will pick up the radioactive glucose and be seen on the scan results. If, however, the mass is scarring caused by the radiation treatments, no glucose uptake will be seen in the area of the mass. Reports in the scientific literature find that, in some tumours, PET correctly identifies detected lesions up to 95% of the time; however, the final word will of course rest with the pathology if a biopsy is performed.
- PET can be used to image tumor response to therapy and to detect recurrence in successfully treated lesions. After surgery and other treatments, PET is an extremely important tool in monitoring whether any cancer cells have returned and if treatment should be re-started.
- PET can find with near 100% certainty after a single course of chemotherapy if a patient with metastatic colorectal cancer is not responding positively to treatment.
- PET is capable of showing the extent of the disease (called staging) of colorectal cancer. For patients whose cancer is newly diagnosed, it is important to determine if the cancer has spread to other parts of the body so that appropriate treatment can be commenced, while avoiding unnecessary therapies at the same time.
  Colorectal cancer is less likely to recur after 5 years of there being no evidence of the disease; thus most patients who live 5 years without recurrence are considered cured. In the

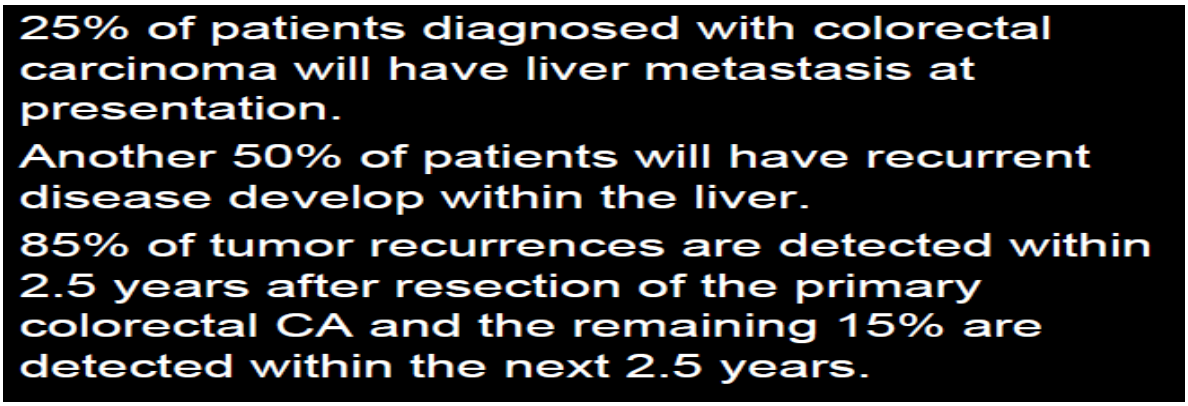
interim, however, ensuring that PET is a part of regular follow-up testing is important according to researchers.

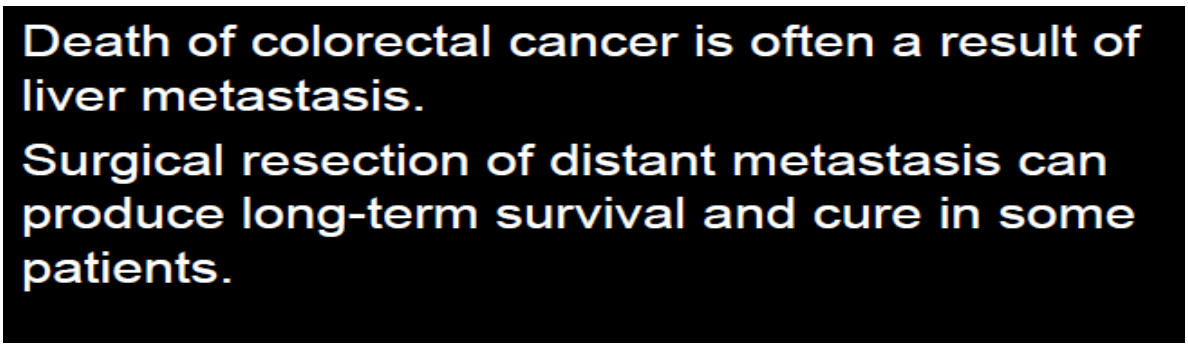
- In colorectal cancer, if the lymph nodes near the tumour or if a distant organ such as the liver has become involved by the cancer, they will take up more of the radioactive glucose. Whether or not distant organs are involved is a critical factor in deciding what the surgical and medical treatment will be. Some studies have shown that even if the cancer has spread in a limited fashion outside the colon, surgery combined with chemotherapy can be done to remove these other tumours and reduce the chance of recurrence.

The benefits of PET include:

- Often replaces multiple medical testing procedures with a single exam, while producing imaging information of superior quality
- May validate and/or alter patient management and care
- May reduce or eliminate ineffective and unnecessary surgical or other medical treatments and hospitalization
- May reduce significantly overall healthcare costs and avoids needless pain to the patient.
- It is done in approximately two hours and provides interpretation virtually immediately
- May show the progress of disease and how the body responds to treatment
- May diagnose disease before it shows up on other tests

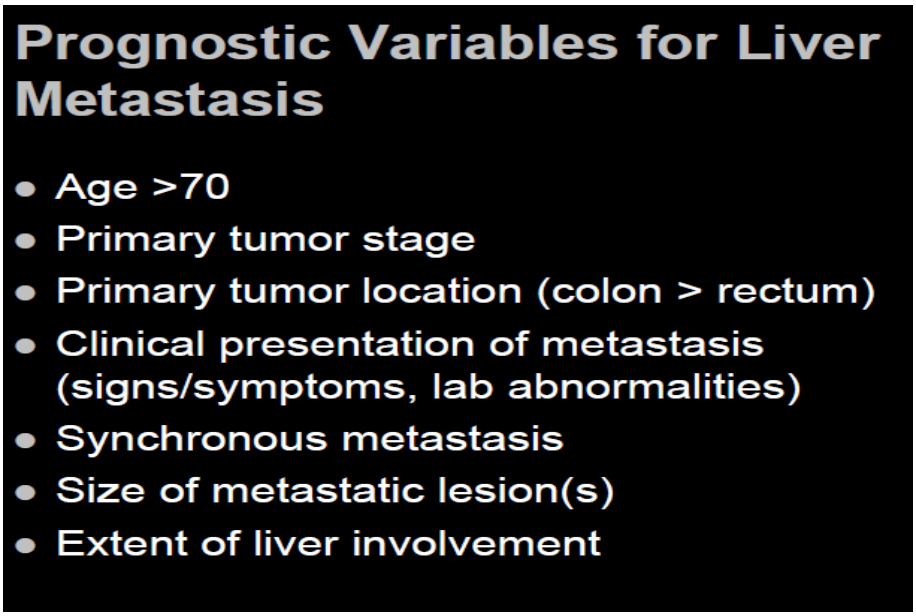
Liver metastasis from colorectal cancer- improving resectability:

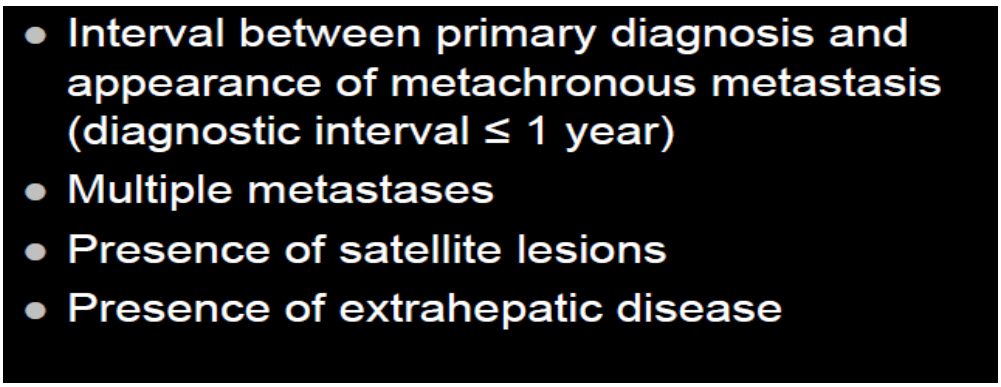




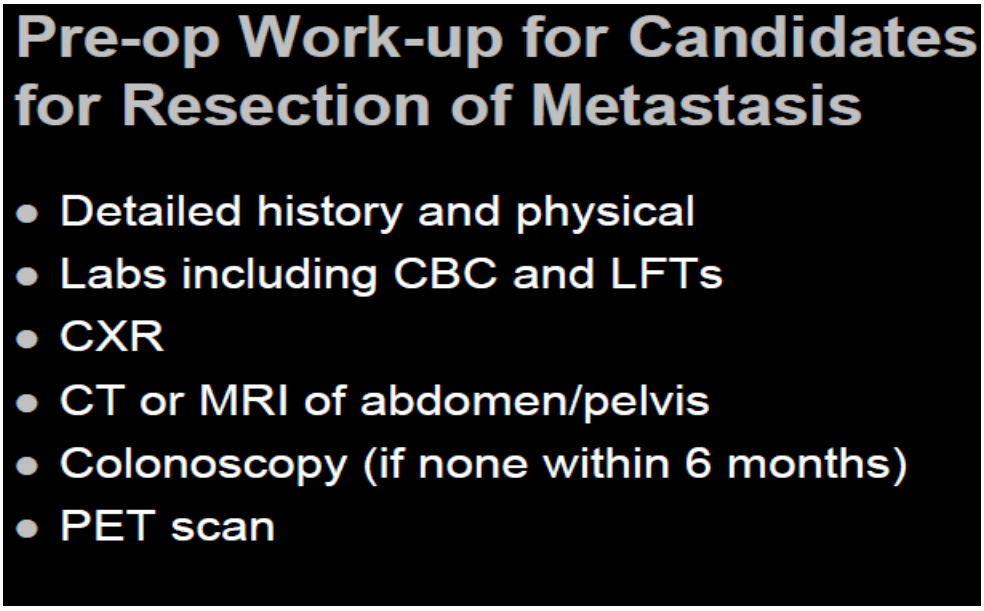
During the past two decades the five-year survival rates for hepatic colorectal metastases patients have almost doubled, from 30% to 60%. The introduction of new chemotherapeutic agents and the shift in the criteria of surgical resection were the main factors in this progress. Previous absolute or relative contraindications to resection included the presence of extrahepatic disease, involvement of hepatic pedicle lymph nodes, and an inadequate resection margin of < 1 cm. All above contraindications for hepatic resection have been challenged and have already lost their importance in patient selection for hepatectomy.

- The current criteria focus on what should be left after hepatic resection. Previous criteria for resection, such as the size, location, number of intrahepatic metastases, and the presence of bilobar or extrahepatic disease have been largely abandoned. Nowadays, the definition of resectability includes a complete resection with tumor-free surgical margins (R0 resection), sparing at least two liver segments having an independent inflow, outflow, and biliary drainage. The amount of the liver remnant after resection should not be less than 20% and 30% of the total liver volume in normal and cirrhotic patients, respectively. This can be accurately predicted by computed tomography (CT) or magnetic resonance imaging (MRI) during preoperative evaluation.





Preoperative investigations before resection of colorectal liver metastases are focused on: (1) determining the diagnosis; (2) anatomically defining the lesion in the liver parenchyma for surgical planning; and (3) meticulous staging to rule out extrahepatic disease.



- Patient selection for resection:

Criteria for absolute Unfit for surgery –

- Nontreatable extrahepatic disease,unresectability.
- Involvement of more than 70 percent of the liver or six vsegments.
- Radiographic evidence of involvement of the hepatic artery, major bile ducts, main portal vein, or celiac/paraaortic lymph nodesModern multidisciplinary consensus defines resectable .
- CRC liver metastases simply as tumors that can be resected completely, leaving an adequate liver remnant
- Criteria for resectability:
- General criteria for fitness1. Good performance status.
- Absence of extra hepatic disease.
- Specific Criteria that decides the outcome
  1. Risk of recurrence.
  2. Clinical Risk Score for CRC
  3. Anatomical criteria for respectability
     - Number of metastases.
     - Precise location
     - Relationship with the portal pedicle and the hepatic veins.
- Clinical Risk Score - 5 clinical criteria each assigned 1 point:1) Node-positive primary2)<12 month disease-free interval3) >1 liver tumors4) Largest tumor >5 cm5) CEA >200 ng/mL.

- Principles of Resection in Colorectal Liver Metastases: An R0 resection of both the intra- and extrahepatic vdisease sites must be feasible. At least two adjacent liver segments vneed to be spared. Vascular inflow and outflow, as well as biliary drainage vto the remaining segments, must be preserved. The volume of the liver remaining after resection (i.e., the future liver remnant) must be adequate
- Preoperative Patient Evaluation:
  - Colonoscopy, Chest / abdominal/ pelvic CT
  - CBC, Platelets,
  - CEA
  - Determination of tumor K- RAS status
  - Needle biopsy – if clinically indicated PET – CT only if potentially surgically curable M1 disease
- Conversion therapy for initially unresectable metastases Induction chemotherapy in patients with isolated but initially unresectable CRC liver metastases.

7. Algorithm of screening of common malignancies in India in the perspective of National Health Mission. 10

Answer.

Prevention of cancers

- Create awareness about the ills of tobacco and advocate avoidance
- Encourage and assist habitual tobacco users to quit the habit
- Promote healthy dietary practices and physical activity

Early detection of cancers

- Create awareness about the early warning signs of cancer
- Encourage breast awareness
- Encourage oral self-examination
- Create awareness about symptoms of cervical cancer
- Examine, as a routine, the oral cavity of patients with history of tobacco use
- Offer clinical breast examination to any woman over 30 years presenting to the health centre
- Offer screening for cervical cancer to any women over 30 years presenting to the health facility
- Promptly refer any person with a suspicious lesion for accurate diagnosis and appropriate treatment

Warning signals for Cancers

C Change in bowel or bladder habits

A A wound that does not heal

U Unusual bleeding or discharge

T Thickening or lump in the breast or elsewhere

I Indigestion or difficulty in swallowing

O Obvious change in a wart or mole

N Nagging cough or hoarseness of voice

Treatment of cancers

- Ensure that every patient complies with therapy advised
- If follow up care is required at the health centre level, make sure that detailed instructions are provided by the treating institution.

Palliative care

- Ensure that the patient is free from pain as far as possible. Learn and practice the WHO step-ladder approach of pain management; refer to the appropriate centre for oral morphine.
- Achieve control of unwanted symptoms to the extent possible
- Provide psychological support to the patient to accept the diagnosis and treatment
- Involve the family in diagnosis, treatment and care as far as possible

Cervical cancer screening: Visual Inspection with Acetic acid (VIA)

Visual inspection of the uterine cervix, after application of **3 - 5%** acetic acid (VIA) is a simple test for the early detection of cervical pre-cancerous lesions and early invasive cancer. The results of VIA are immediately available and do not require any laboratory or specialist support. The categorization of the results of VIA depends upon the colour changes observed on the cervix. This test can be performed **by any trained paramedical health worker and not necessarily only by a doctor. Only minimal duration training is all that is required for performing this test.**

Exclusion criteria:

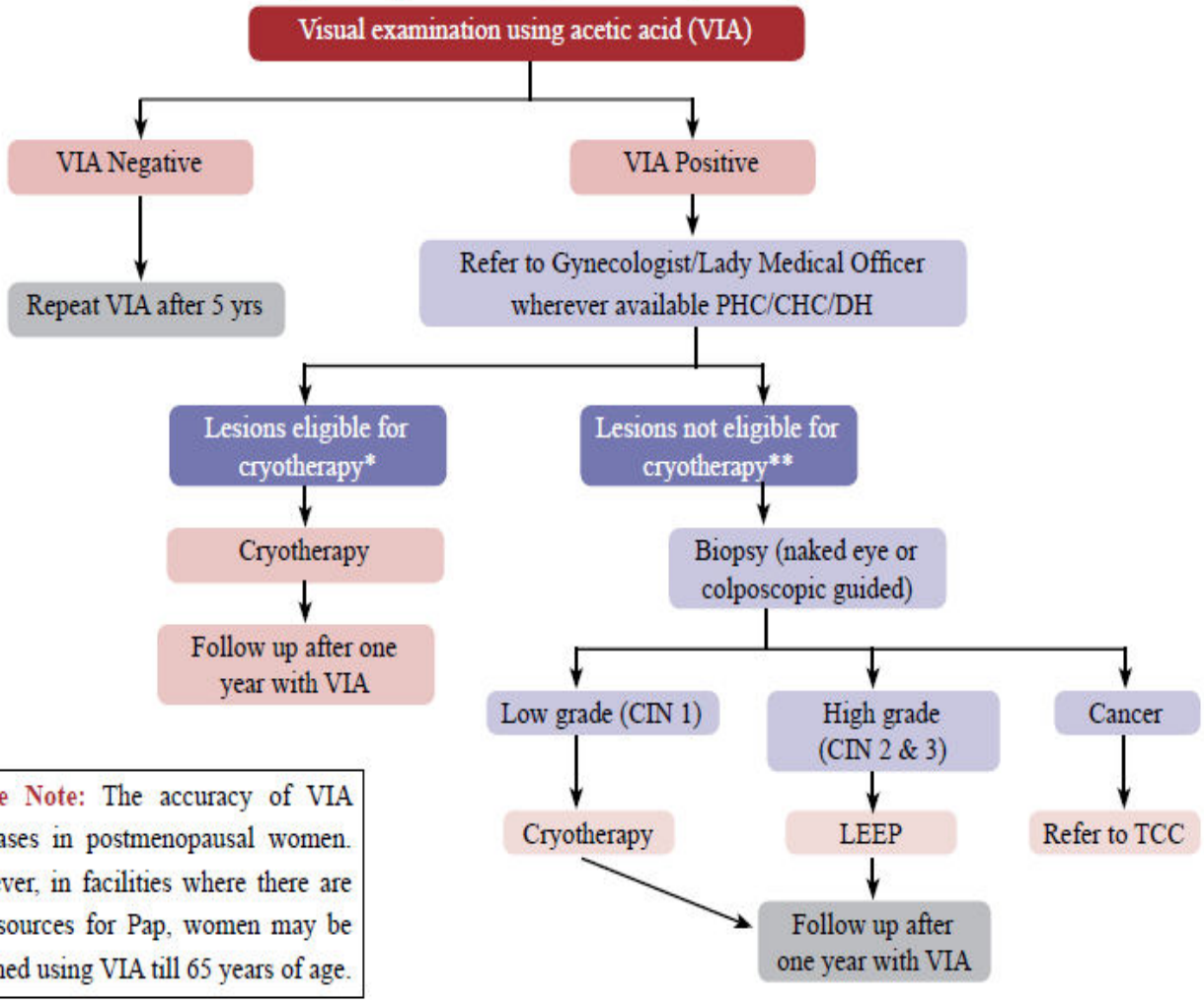
1. Menstruation
2. Pregnancy
3. Within 12 weeks of delivery / abortion
4. Previous history of treatment for Cancer Cervix

If any woman who does not fall under inclusion criteria but having any symptoms, should also be immediately referred to MO PHC for further evaluation.

Criteria for categorizing VIA test results as negative or positive or invasive cancer

VIA CATEGORY	DESCRIPTION
NEGATIVE	▪ No aceto-white lesions ▪ Transparent lesions or faint patchy lesions without definite margins ▪ Nabothian cysts becoming aceto-white ▪ Faint line like aceto-whitening at the junction of columnar and squamous epithelium
POSITIVE	▪ Aceto-white lesions far away from the transformation zone ▪ Distinct, opaque aceto-white area ▪ Margin should be well defined, may or may not be raised ▪ Abnormality close to the squamo-columnar junction in the transformation zone and not far away from the os.
INVASIVE CANCER	Obvious growth or ulcer in the cervix. Aceto-white area may not be visible because of bleeding.

Algorithm for Screening and management of Cervical Cancer



Please Note: The accuracy of VIA decreases in postmenopausal women. However, in facilities where there are no resources for Pap, women may be screened using VIA till 65 years of age.

***Eligibility for cryotherapy:**

- The lesion should not be spread over more than 2 quadrant of cervix
- The entire lesion is located in the ectocervix without extension to the vagina and/or endocervix.
- The lesion is visible in its entire extent
- The lesion can be adequately covered by the largest available cryotherapy probe.
- There is no suspicion of invasive cancer

**** Cryotherapy not recommended if:**

Symptoms:

- 1. Postcoltal bleeding
- 2. Postmenopausal bleeding

Examination:

- 3. Overt cervical growth
- 4. Irregular surface
- 5. Bleeds on touch

Screening for Oral Cancer

Risk factors

Tobacco chewing is the single most important risk factor for oral cancer. Other risk factors include alcohol use, betel nut chewing, and chronic trauma to oral mucosa by sharp tooth or ill-fitting dentures. Chronic exposure to these risk factors causes changes in the oral mucosa and these changes are visible as pre-cancerous lesions. Over a period of time, malignancy may develop in these lesions.

Pre-cancerous lesions

Pre-cancerous lesions or conditions are local/generalized disturbances that predispose to malignancy in a particular site. Leucoplakia, erythroplakia, palatal changes associated with reverse smoking or beedi smoking and submucous fibrosis are local pre-cancerous lesions. Plummer Vinson syndrome, syphilis, and erosive lichen planus are generalized pre-cancerous conditions. All these conditions are amenable to early diagnosis, and treatment is possible in many cases.

Leucoplakia

This is defined as a white patch that cannot be characterized as any other disease clinically or pathologically
They can be of 4 types:

a. Homogeneous leucoplakia: Low risk of cancer
b. Ulcerated or erosive leucoplakia: High risk of cancer
c. Speckled or nodular leucoplakia: High risk of cancer
d. Verrucous leucoplakia: Very high risk of cancer

Two or more types of leucoplakia may be present in the oral cavity at the same time. Confirmatory diagnosis is by biopsy.

Erythroplakia

This is a bright, velvety area sometimes surrounded by faint plaques which cannot be characterized as any other lesion clinically or pathologically About 90% of these lesions show cellular dysplasia or malignancy. The risk of malignancy in erythroplakia is higher than in leucoplakia.

The most common cancer seen in the oral cavity is squamous cell carcinoma. It presents as a painless ulcer, mass or fissure. As the disease advances, patient may have excessive salivation, trismus, and difficulty in chewing, swallowing or cervical lymphadenopathy. Distant metastases are uncommon in oral cancers.

Inclusion criteria: Any individual aged 30 years and above should be screened at all screening centres

Any abnormal finding on oral visual examination should be considered as positive and patient should be managed according to screening and management algorithm for oral cancer.

Screening for breast cancer

Breast cancer is the commonest cancer among women all over the world. Some of the risk factors for breast cancer are:

- Reproductive and hormonal factors – The older a woman is when she has her first child, the greater her chance of having breast cancer. Early menarche (before age 12), late menopause (after age 55) or never had children are also at greater risk. Women who take menopausal hormone therapy (oestrogen and progesterone) for five years or more after menopause also appear to have an increased risk.
- Family History: Risk of Breast cancer increases in women with a first-degree relative with breast cancer
- Other factors:
  - Being obese after menopause
  - Physical inactivity.
  - Alcohol intake: some studies suggest that the risk of breast cancer increases with increased intake of alcoholic beverages.

High Risk Group for occurrence of breast cancer

- Personal history of Breast Cancer
- Family History of Breast/ Ovarian/Colon Cancer
- Chronic Benign Breast Diseases

Prompt diagnosis of breast cancer in the early stage is very important. This is possible by increasing the level of awareness among women and health care professionals. The following methods may be used for early detection.

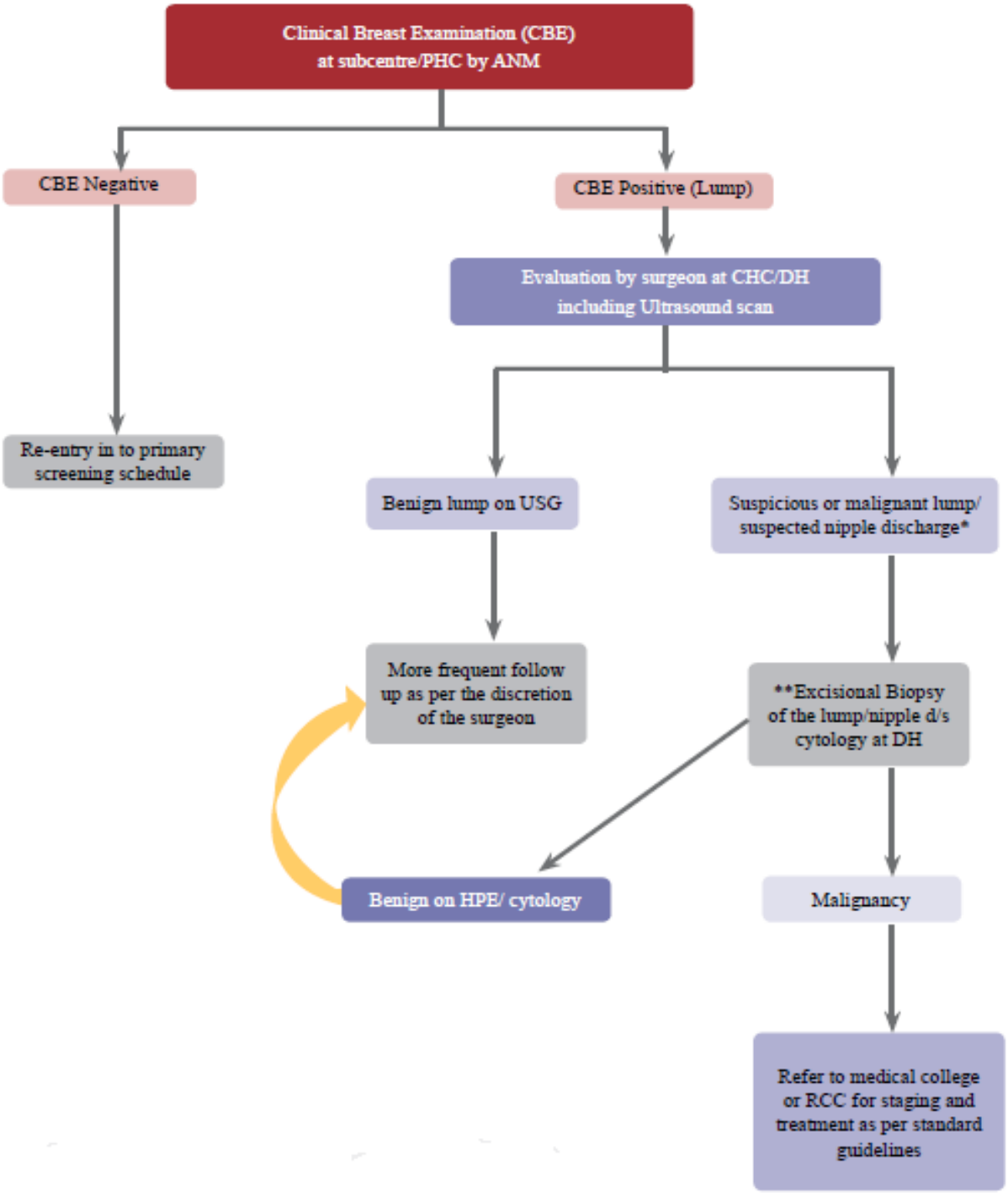
Breast awareness: The first person to detect any lump in the breast is the woman herself which is by teaching the woman to be aware of any of the following signs at the earliest possible –

- A change in size
- A nipple that is pulled in or changed in position or shape
- A rash on or around the nipple
- Discharge from one or both nipples
- Puckering or dimpling of skin
- Lump or thickening in the breast
- Constant pain in the breast or armpit

In case a woman notices any such change, she should promptly visit the health centre or health professional.

All women > 30 years will be received by the Staff Nurse /ANM at the screening centre, will be provided a pre-procedure counselling, and then screened using Clinical Breast Examination (CBE). Clinical Breast Examination is to be performed by a trained physician or a nurse or a health worker.

Algorithm for screening and management of breast cancer:



8. Give an outline of Biological Mesh and their clinical use. **10**

Answer. Biologic mesh (or **biomesh**) is a type of surgical mesh made from an organic biomaterial (such as porcine dermis, porcine small intestine submucosa, bovine dermis or pericardium, and the dermis or fascia lata of a cadaveric human).

Basic science of biologic meshes

Most often derived from human or porcine dermis, these materials have been processed to acellular, porous extracellular matrix scaffolds of collagen and elastin. Some source growth factors remain and attract endothelial cells and subsequent fibroblasts into the mesh. These host cells release additional chemoattractants that signal the migration of other structural cells. The three-dimensional nature of the mesh and porosity allow cells to enter the mesh and adhere. What happens from there is a cycle of remodeling consisting of degradation of the biologic mesh and regeneration of the collagen scaffold with host tissue. The balance of this degradation and rebuilding process, and the speed with which it occurs, influences the ultimate strength and structure of the biologic mesh hernia repair.

The processing of the biologic mesh for production is by and large a proprietary procedure, making it difficult for surgeons to access information and answer several questions about the final products. These uncertain areas include decellularization, the sterilization process, the source of human dermis in terms of donor age and body part, and the crosslinking process. The cells are removed from the grafts in different ways: physical means such as dessication, chemical processes, or enzymatic reactions. Some of the products are terminally sterilized while others are not, resulting in variations in storage and pre-use hydration requirements. Sterilization options include gamma radiation, ethylene oxide, or hydrogen peroxide. Some companies instill chemicals, such as gluteraldehyde, into the biologic graft to induce additional crosslinking bonds in the graft to slow down the degradation process in the hope of leading to a stronger host collagen framework. However, this is a not a natural feature of the donor tissue and there is concern about the lack of remodeling in too heavily crosslinked grafts. This unintended feature could result in a poorly integrated graft and foreign body reaction, similar to some permanent synthetic meshes.

The advantage of crosslinked mesh versus non-crosslinked mesh remains a controversial area. Early investigation at Washington University presented at the 2009World Hernia Congress and the 2010 American Hernia Society Meeting showed increased stiffness for two crosslinked biologic mesh products (porcine dermis and bovine pericardium) compared to the non-crosslinked bovine pericardium mesh. Greater cell infiltration was seen in the non-crosslinked mesh. Future investigation is warranted as to whether these characteristics are clinically important or if the crosslinked mesh poses an increased risk for infection by preventing collagen breakdown and macrophage migration.

Indications for use

The theoretical advantage of biologic mesh over synthetic mesh has appealed to surgeons, mostly in the United States. These meshes are not widely favored nor used in Europe and elsewhere due to the high cost of the biologic mesh over its cheaper and more widely applicable synthetic mesh counterpart. Over the last decade, surgeons have utilized biologic mesh in a variety of cases ranging from primary ventral and inguinal hernia repair in non-infected fields, recurrent hernias, reinforced hernia repair, hernia prophylaxis, and the most widely used application, hernia repair in the contaminated or potentially contaminated field.

- **Non contaminated setting:** The use of biologic mesh in primary or recurrent ventral or inguinal herniorrhaphy in the noncontaminated and previously uninfected field is difficult to justify due to the high material cost without added benefit. There is very little data regarding the performance of biologic mesh in these settings.

  - **Bridging the gap:** The poor performance of the mesh in terms of laxity in a bridging repair makes this an unacceptable repair in the noncontaminated setting.
  - **Reinforcement of the repair:** The use of allograft or xenograft as reinforcement of a primary ventral hernia repair is felt to be a more sound approach. This fits with what we know of the science of biologic meshes in that placement in well-vascularized tissue is favorable for the ingrowth and remodeling process.

- **Contaminated Setting:** The presence of contamination may limit the applicability of permanent synthetic mesh in some hernia repairs. Biologic mesh may be acceptable for this purpose or for placement in open wounds as a staged closure in complex abdominal wall reconstruction.

  - **Prophylaxis during stoma creation:** The role of biologic mesh has been explored in prevention of parastomal hernias. An ongoing study of human dermis allograft placed at the time of construction of ileal conduits after cystectomy shows promising results with a decreased risk of hernia occurrence (30.4% v. 6.3%). Biologic mesh has also been used in the treatment of parastomal hernias where infection is a concern. With increasing reports of prophylactic synthetic mesh placement at the time of ostomy construction, the use of biologic mesh in this preventative setting may decline.

  - **Hiatal Hernias:** Biologic mesh has been utilized in the reinforcement of paraesophageal hernia repair. The recommendation for mesh reinforced hiatal repair is made with some caution; significant mesh complications, ranging from mesh erosion to esophageal stenosis and fibrosis.

9. Recent advances in management of carcinoma prostate. 10

Answer. Screening:

- The incidence of prostate cancer increases with age and post-mortem data demonstrates histological prostate cancer in approximately 30% of all men their 40s and in up to 90% of men in their 80-90s.
- The multi-centre European Randomized Study of screening for Prostate Cancer in 1994 is the only study to show a significant benefit from screening with 0.4% of the patients assigned to PSA screening dying from prostate cancer, compared to 0.5% in the control group.
- The United States preventative services task force recommended against PSA testing in men aged ≥ 75 years.
- Urological Association recommends screening in the 55-69 age groups only after an informed shared desicion discussing potential benifits and risks has taken place.

Diagnosis:

- **Transrectal Ultrasound-Guided Biopsies:**

- Transrectal ultrasound-guided (TRUS) biopsy has been the staple prostate cancer diagnostic procedure for over two decades. This can be easily performed in an office or day care setting.
- There have been many criticism of this technique. Analysis of radical prostatectomy specimens have found that 20-25% of patients may harbour anterior tumours, which can be missed by the transrectal approach.
- In addition over 30% patients will be found to have a tumour after re-biopsy with a negative initial biopsy and persistent concern for prostate cancer.
- Another concern with TRUS biopsies has been associated sepsis rate up to 6% due to passage of the needle through rectal flora.

- **Transperineal biopsies:**

- It has got improved accuracy with sepsis rate<1%.
- Acute urinary retention more common.

- **Multiparametric MRI:**

- Negative predictive value is between 80%-90%.
- Targeted biopsies can be performed.

Natural history of prostate cancer:

- With watchful waiting 72% of patients with mainly clinically detected prostate cancer are alive after 23 years follow-up.
- From the hormone therapy arm of the SPCG – 7 (Scandinavian prostate cancer group-7) study where the majority of patients had T3 disease, the cancer specific survival was 76.1% at 10 years.

Treatment:

- **Active Surveillance:**

- Active surveillance protocols were implemented in an attempt to defer radical treatment patients and thus avoid their potential significant side effects.
- Most protocols involve repeat biopsy and PSA doubling time.

- **Radical prostatectomy:**

- **Inclusion criteria:**

    - Patient's age < 75 years.

- Clinical T1 or T2 disease.
- A life expectancy>10 years.
- PSA<50 years.

A study showed that in patients with a PSA > 10ng/ml, radical prostatectomy was associated with 7.2% reduction in cancer specific mortality.

Comparing the surgical methods for robotic, laparoscopic or open radical prostatectomy, a significant difference in oncological outcomes has not been shown.

- **Radiotherapy:**

  - **The current standard of care is intensity modulated radiotherapy (IMRT).**
  - **Brachytherapy:**

    Generally accepted patient selection criteria for low dose brachytherapy include:

    - Stage c T1b –T2a, N0,M0
    - Gleason score<6
    - PSA<10ng/dl
    - <50% biopsy cores involved with cancer.
    - Prostate volume of < 50 cc
    - International Prostatic Symptom Score < 12

- **Minimally invasive treatments:**

  - Cryotherapy
  - High intensity focussed ultrasound (HIFU)

Metastatic prostatic cancer:

- Treatment of advanced and metastatic prostate cancer has largely been with hormonal manipulation/androgen deprivation therapy by either blockade of the androgen receptor, by disrupting the hypothalamic-pitutary-gonadal axis (LHRH antagonists/agonists) or by preventing secretions with bilateral orchidectomy.
- Surgical or chemical castration is the ultimate goal, where currently the aim for a testosterone level of <20ng/ml (0.7nmol/L).
- After 18-24 months patients eventually develop a castrate resistance state where PSA continue to rise despite castrate testosterone levels. The current definition is three consecutive rises, one week apart with 2 PSAs rising > 50% over the nadir.
- Classically, initial treatment has been the use of maximum androgen blockade with the addition of anti-androgens such as bicalutamide to the LHRH agonist.
- Chemotherapy with docetaxel + prednisolone can also be used.
- Recently, although newer treatments such as abiraterone, enzalutamide and cabazitaxel have become available, which have been assessed in the pre and post docetaxel setting.

- Abiraterone is a CYP17 inhibitor which prevents intracellular testosterone synthesis and usually administered alongside prednisolone.
- Enzalutamide is a new anti – androgen which blocks the androgen receptor and also prevents its translocation and transcription.
- Cabazitaxel is a taxane derivative.

Recent work has focussed into chemoreduction and two large database studies have shown improved survival in patients who have had radical treatments.

10. A 35 year old lady, G2P2, menarche at age 12 years on OCP has a strong family history of breast cancer. She is detected to be carrier of BRCA 1 mutation. How would you proceed for Surveillance and undertake prevention strategies for her. 5+5

Answer.

Risk management strategies for BRCA1 mutation carriers include the following:

- Risk-reducing mastectomy and reconstruction.
- Risk-reducing salpingo-oophorectomy.
- Intensive surveillance for breast and ovarian cancer.
- Chemoprevention

- The oral selective estrogen receptor (ER) modulator, tamoxifen, taken daily for 5 years, substantially reduces breast cancer risk for women who are at increased risk owing to their family cancer history, reproductive risk factors, or personal history of atypical hyperplasia or lobular carcinoma in situ.Moreover, this benefit is sustained for at least 5 years after ceasing tamoxifen.
- Most breast cancers in *BRCA1* mutation carriers are ER negative at the time of diagnosis.
- Tamoxifen can reduce hormone receptor-negative tumors in *BRCA1* mutation carriers, consistent with the prevention properties afforded by BSO.
- In fact, there is strong evidence that female hormones play a critical role in the early ontogeny of *BRCA1*-associated breast cancer. As noted above, BSO in premenopausal *BRCA1* mutation carriers is associated with reduced breast cancer risk.
- For premenopausal women, the main serious side effect of tamoxifen is deep venous thrombosis. The absolute risk, however, is small and similar to the risk associated with the combined oral contraceptive pill. Due to its agonist activity in endometrial tissue, tamoxifen is also associated with endometrial hyperplasia and increased endometrial cancer risk, although the latter appears to be largely confined to women above the age of 50 years.

- Prophylactic surgery (bilateral mastectomy, bilateral salpingo-oophorectomy or a combination of both procedures) has proved to be the most effective risk-reducing strategy.
- Histologically, BRCA1-related breast cancers are predominantly of the basal subtype, with predominant lymphocytic infiltration, and are often more aggressive and associated with negative prognostic factors, as characterised by numerous mitoses, pleomorphic pattern, poor differentiation and higher proliferation rates , as well as a negative oestrogen and progesterone receptors status. Moreover, a lack of HER-2 expression was observed in breast cancer tumours of BRCA1 carriers.

- Most ovarian cancers associated with germ line BRCA mutations are diagnosed at a younger age and are ultimately determined as high-grade and advanced-stage serous carcinomas.
- Women who have an increased risk of breast and ovarian cancer are advised to consider risk-reducing strategies; however, such methods vary in their effectiveness. These strategies include surveillance (breast self-examination, clinical breast examination, screening using mammography and breast magnetic resonance imaging (MRI), trans-vaginal ultrasound scanning and serum (CA125), chemoprevention and prophylactic surgery (salpingo-oophorectomy and/or mastectomy).

❖ Surveillance

- The efficacy of surveillance in BRCA1/2 mutation carriers is difficult to determine. Importantly, it has been suggested that some BRCA1/2carriers will not develop cancer during their lifetime, although the identification of such individuals is currently impossible.
- The concept of surveillance is based on early detection of cancer rather than cancer prevention.
- It is suggested that women at a high risk of developing breast cancer should perform a monthly breast self-examination, and also undergo bi-annual clinical examination and annual digital mammography.
- Owing to the fact that the sensitivity of mammography is significantly reduced in younger women because of their dense breast tissue and rapid development of breast cancer in BRCA1/2 mutations, the use of alternative and more sensitive imaging modalities, such as MRI at shorter intervals, has been recommended.
- Undoubtedly, surveillance is the least invasive option; however, such a method is associated with various negative consequences, such as increased anxiety, false reassurance, and unnecessary biopsies.
- Although MRI is an effective surveillance modality in BRCA mutation carriers--especially in younger women--a significant proportion of women are still found to have node positive breast cancer at the time of diagnosis.
- Furthermore, whilst regular surveillance in women at an increased familial risk of breast cancer is associated with a good clinical outcome if they carry BRCA2 mutations or no detectable mutation, the outcome in carriers of BRCA1 mutations is significantly worse, even in the instance that their tumours are diagnosed at an apparently early stage.
- The impact of regular breast screening in this context on overall survival ultimately remains unclear, and further research is required in order to evaluate the effect of different breast-screening strategies according to the mutation type, type and frequency of screening modality, and age.

Prophylactic bilateral mastectomy (PBM): There are no randomised controlled trials which have previously examined the potential impacts of PBM on survival; therefore, evidence has been derived from retrospective and short follow-up prospective studies in addition to hypothetical mathematical models with variable estimates.

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

MS (General Surgery) Examination, 2016

PAPER - IV

Time Allowed: 3 Hours **Full Marks: 100**

Attempt all questions (ten marks for each question)

1. **A fifty year old lady presenting with bright red blood per rectum was sent for colonoscopy which revealed an apple – core lesion at 12 cm from the anal verge. The biopsy revealed moderately differentiated adenocarcinoma. CT scan of abdomen/pelvis demonstrated a large mass in rectum measuring 5x4 cm with no liver metastatic liver or adenopathy. MRI of pelvis revealed a rectal mass with excessive mesorectal lymphadenopathy.**
   a. **Give a precise TNM stage of her disease (AJCC 7th Edition, 2010) along with the staging system. Mention few selected pathologic prognostic factors for the disease and precise management protocol for the lady in detail with references to the evidences. 1+3+3+3**

2. **CEAP classification and endovenous treatment of varicose veins. 10**
3. **a) Types of rejection following transplant. 6+4**
   b) Management of acute rejection.
4. **Classification and modalities of management of iatrogenic duodenal perforation from ERCP. Marshal score vis – a – vis SOFA score – morbimortality indicators in severe acute pancreatitis. 5+5**
5. **a) Define early gastric cancer. 5+5**
   b) Diagnosis and management of early gastric carcinoma.
6. **Recent concept of management of penetrating injuries of abdomen. 10**
7. **What are the components of the enhanced recovery after surgery (ERAS) protocol? Barriers in its implementation. 6+4**
8. **Role of FDG PET CT Scan in Gastrointestinal surgery. 10**
9. **A 65 year old male with a lifelong history of reflux disease has been followed with routine oesophagogastroduodenoscopy which of late revealed an early oesophageal cancer 3 cm proximal to GE junction in the setting of Barret's oesophagous. Patient prefers for an endoscopic management.**
   With all facilities at your disposal, how would you workup precisely stage (enumerate investigations) the disease (give the AJCC staging) to assess the patient's eligibility for an endoscopic management? What are the endoscopic options of management of early oesophageal cancers? How would you councel the patient?
10. **Management strategy for incidentally detected carcinoma gall bladder. 10**

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Answer. Rectal cancer staging:

TNM staging

Primary tumour staging (T)

- **Tx:** primary tumour cannot be assessed
- **T0:** no evidence of primary tumour
- **Tis:** carcinoma in situ: intraepithelial or invasion of lamina propria
- **T1:** tumour invades submucosa
- **T2:** tumour invades muscularis propria
- **T3:** tumour invades through the muscularis propria into the subserosa or into non-peritonealised perirectal tissues
    - **T3a:** tumour extends <1 mm beyond muscularis propria
    - **T3b:** tumour extends 1-5 mm beyond muscularis propria
    - **T3c:** tumour extends 5-15 mm beyond muscularis propria
    - **T3d:** tumour extends 15 mm beyond muscularis propria
- **T4:** tumour invades directly into other organs or structures and/or perforates visceral peritoneum
    - **T4a:** tumour penetrates to the surface of the visceral peritoneum
    - **T4b:** tumour directly invades or is adherent to other organs or structures

Regional lymph nodes (N)

The size cut off for mesorectal nodes is usually taken at 5mm

- **Nx:** regional nodes not assessed

- **N0:** no regional lymph nodes
- **N1:** metastasis in 1-3 regional (peri-rectal) lymph nodes
    - **N1a:** metastasis in one regional lymph node
    - **N1b:** metastasis in 2-3 regional lymph nodes
    - **N1c:** tumour deposit(s) in the subserosa, mesentery, or nonperitonealized pericolic or perirectal tissues without regional nodal metastasis
- **N2:** metastasis in 4 or more regional lymph nodes
    - **N2a:** metastasis in 4-6 regional lymph nodes
    - **N2b:** metastasis in 7 or more regional lymph nodes

Metastases

- **Mx:** cannot be assessed
- **M0:** no distant metastasis
- **M1:** distant metastasis
    - **M1a:** metastasis confined to one organ or site (for example, liver, lung, ovary, nonregional node)
    - **M1b:** metastases in more than one organ/site or the peritoneum

Stage groupings

- **stage 0:** Tis N0 M0
- **stage I:** T1-2, N0 M0
- **stage II**
    - **IIa:** T3, N0, M0
    - **IIb:** T4a, N0, M0
    - **IIc:** T4b, No, Mo
- **stage III**
    - **IIIa:** T1-2, N1, M0
    - **IIIb:** T3-4, N1, M0
    - **IIIc:** T3-4b, N2, M0
- **stage IV:** any T, any N M1

TNM Staging of this lesion is T3c N2b M0 – Stage is IIIc.

Prognostic pathological factors:

- **Local Extent of Tumor Assessed Pathologically**
- **Regional Lymph Node Metastasis Assessed Pathologically**
- **Blood or Lymphatic Vessel Invasion**
- **Blood or Lymphatic Vessel Invasion**
- **Preoperative CEA Elevation**
- **Histologic Grade**
- **Radial Margin (Specimens With Nonperitonealized Surfaces)**
- **Histologic Type**
- **Tumor Classification After Neoadjuvant Therapy**
- **Histologic Features Associated With MSI-H: Host Lymphoid Response to Tumor and Medullary or Mucinous Histologic Type**
- **High Degree of MSI**
- **Histologic Type: Medullary Carcinoma, Mucinous Carcinoma**

- **Loss of Heterozygosity at 18q and Allelic Loss of deleted in Colon Cancer Gene**
- **Tumor Border Configuration**

Management protocol:

- Following surgical removal of rectal cancer, the cancer is referred to as Stage III rectal cancer if the final pathology report shows that the cancer has invaded any of the local lymph nodes, but cannot be detected in other locations in the body.
- A variety of factors ultimately influence a patient's decision to receive treatment of cancer. The purpose of receiving cancer treatment may be to improve symptoms through local control of the cancer, increase a patient's chance of cure, or prolong a patient's survival. The potential benefits of receiving cancer treatment must be carefully balanced with the potential risks of receiving cancer treatment.
- The following is a general overview of the treatment of Stage III rectal cancer. Circumstances unique to your situation and prognostic factors of your cancer may ultimately influence how these general treatment principles are applied. The information on this Web site is intended to help educate you about your treatment options and to facilitate a mutual or shared decision-making process with your treating cancer physician.
- Most new treatments are developed in clinical trials. Clinical trials are studies that evaluate the effectiveness of new drugs or treatment strategies. The development of more effective cancer treatments requires that new and innovative therapies be evaluated with cancer patients. Participation in a clinical trial may offer access to better treatments and advance the existing knowledge about treatment of this cancer. Clinical trials are available for most stages of cancer. Patients who are interested in participating in a clinical trial should discuss the risks and benefits of clinical trials with their physician. To ensure that you are receiving the optimal treatment of your cancer, it is important to stay informed and follow the cancer news in order to learn about new treatments and the results of clinical trials.

Neoadjuvant Therapy

Neoadjuvant therapy refers to treatment given prior to surgery. Many patients with Stage III rectal cancer receive neoadjuvant chemotherapy and radiation therapy; the goals are to reduce the risk of cancer recurrence and to shrink the cancer prior to surgery. If patients are in poor health and unable to tolerate chemotherapy and/or radiation therapy, surgery may be the initial treatment.

Surgical Treatment

The standard surgical procedures used to remove Stage III rectal cancer include low anterior resection (LAR) or abdominoperineal resection (APR). The choice of operation depends on the location of the rectal cancer.

An LAR involves an incision across the abdomen and removal of the cancerous part of the rectum along with some surrounding tissue and lymph nodes. This is often done for cancers that are in the upper part of the rectum. Lower cancers may be treated with removal of the rectum along with extensive removal of surrounding tissues (total mesorectal excision). Depending on where the cancer was and how much of the rectum was removed, the colon may be reconnected to the remaining part of the rectum or to the anus. When possible, the surgery will allow a patient to continue to pass waste through the anus. Some patients, however, may require a temporary or

permanent colostomy (an artificial opening that allows waste to pass from the colon to the outside of the body).

If the cancer is very low in the rectum (near the anus), a patient may need to have an abdominoperineal resection (APR). This involves an incision in the abdomen and an incision around the anus. Because both the rectum and the anus are removed, an APR requires a permanent colostomy.

Adjuvant Therapy

The goal of providing additional treatment after surgery (adjuvant therapy) is to reduce the risk of cancer recurrence by eliminating any remaining cancer. For patients who received neoadjuvant (before-surgery) chemotherapy and radiation therapy, additional chemotherapy is often given after surgery. If patients did not receive neoadjuvant therapy, they may be treated with both chemotherapy and radiation therapy after surgery.

Strategies to Improve Treatment

The progress that has been made in the treatment of rectal cancer has resulted from improved surgical techniques, the development of adjuvant and neoadjuvant chemotherapy and radiation therapy treatments and participation in clinical trials. Future progress in the treatment of rectal cancer will result from continued participation in appropriate clinical trials. Currently, there are several areas of active exploration aimed at improving the treatment of stage III rectal cancer.

New Adjuvant Chemotherapy Regimens: Several new chemotherapy drugs show promising activity for the treatment of advanced or recurrent rectal cancer. Development of new multi-drug chemotherapy treatment regimens that incorporate new or additional anti-cancer therapies for use as neoadjuvant and/or adjuvant treatment is an active area of clinical research.

Laparoscopic surgery: Laparoscopic surgery is used for many types of surgery with the short-term advantages of less pain, fewer wound complications, quicker post-operative recovery, and shorter hospital stays. Instead of making one long incision in the abdomen, the surgeon makes several smaller incisions. Special long instruments are inserted through these incisions to remove part of the rectum and lymph nodes. One of the instruments has a small video camera on the end, which allows the surgeon to see inside the abdomen. Once the diseased part of the rectum has been freed, one of the incisions is made larger to allow for its removal.

Laparoscopic-assisted surgery appears to be about as likely to be curative as the standard approach for earlier-stage cancers. However, there is still limited information from randomized trials about the approach. In addition, laparoscopic surgery requires special expertise and patients need to be treated by a skilled surgeon who has done a lot of these operations.

Improved Approaches to Radiation Therapy: As the technology for radiation therapy has evolved, important advances have been made in the ability of physicians to precisely target the area of the cancer. The goal is to deliver effective doses of radiation to the cancer while sparing healthy tissue to the extent possible. One newer approach to delivering radiation therapy is intensity modulated radiation therapy (IMRT). IMRT starts with a three-dimensional image of the cancer, and allows physicians to deliver different doses of radiation to different areas. The potential advantages for patients include both better tumor control and fewer side effects.

Targeted Therapies: Targeted therapies are anticancer drugs that interfere with specific pathways involved in cancer cell growth or survival. Some targeted therapies block growth signals from reaching cancer cells; others reduce the blood supply to cancer cells; and still others stimulate the immune system to recognize and attack the cancer cell. Depending on the specific "target", targeted therapies may slow cancer cell growth or increase cancer cell death. Targeted therapies may be used in combination with other cancer treatments such as conventional chemotherapy. Targeted therapies that have shown a benefit for selected patients with advanced rectal cancer include bevacizumab, cetuximab, panitumumab.

2. CEAP classification and endovenous treatment of varicose veins. 10

Answer. Classification of chronic lower extremity venous disease

Mark	***Definition***
C	Clinical signs (grade$_{0\text{-}6}$), supplemented by ($_s$) for symptomatic and ($_a$) for asymptomatic presentation
E	Etiologic Classification (Congenital, Primary, Secondary)
A	Anatomic Distribution (Superficial, Deep, or Perforator, alone or in combination)
P	Pathophysiologic Dysfunction (Reflux or Obstruction, alone or in combination)

CEAP Clinical classification of chronic lower extremity venous disease

Class	***Clinical signs***
0	No visible or palpable signs of venous disease
1	Teleangiectases, reticular veins, malleolar flare
2	Varicose veins
3	Edema without skin changes
4	Skin changes ascribed to venous disease (pigmentation, venous eczema, lipodermatosclerosis)
5	Skin changes (as defined above) in conjunction with healed ulceration
6	Skin changes (as defined above) in conjunction with active ulceration

Endovascular therapy:

a. **Radio frequency (RF) ablation:** The intervention employs radiofrequency (RF) energy mediated heating of the vein wall to destroy the intima and denature collagen in the media with resulting fibrous occlusion of the vein. The procedure is usually performed under conscious sedation and local anesthesia in an outpatient setting. The catheter is preferably introduced into the saphenous vein at the knee percutneously under ultrasound (US) guidance or through a small incision and direct exposure of the vein. The position of the catheter at the saphenofemoral junction is confirmed by US. Local tumescent anesthetic is instilled in the subcutaneous tissues superficial to the vein under US guidance. The vein wall temperature is allowed to equilibrate at 85° Cafter turning on the circuit and graduated withdrawal of the catheter is performed at a rate of 3 cm/min. The heating is controlled by

monitoring temperature and impedance of the vein wall via a feedback system. Veins up to 12 mm in diameter are treated. The mechanics of the surgical procedure are relatively straight forward with a few caveats. The treated vein should be relatively straight, free of severe tortuosity or thrombus and without aneurysm. Contraindications include a post phlebitic vein that cannot be accessed, a mega saphenous vein (>12 mm), and significant dilation of the proximal saphenous vein with an aneurysmal SFJ.

b. **Endovenous laser therapy**: Endovenous laser therapy (EVLT) is similar to RF ablation, but laser energy is used for ablation of the saphenous vein. The procedure is faster and easier to perform than RF ablation and there is no size limitation of the saphenous vein that can be treated. Both the 810-nm and the 940-nm diode lasers are effective in inducing thrombotic vessel occlusion. Laser-induced indirect local heat injury of the inner vein wall by steam bubbles originating from boiling blood is proposed as the pathophysiological mechanism of action of EVLT. This causes collagen contraction and endothelial damage. The result is thickening of the vein wall and contraction or thrombosis of the lumen. The use of diode laser energy to ablate the saphenous vein is a method that obviates the need for general anaesthesia and is associated with less pain than traditional surgical stripping of the great saphenous vein.

3. a) Types of rejection following transplant. 6+4

b) Management of acute rejection.

Answer. Types of rejection following transplant:

Hyperacute rejection (HAR) is mediated by preformed antibodies that bind to antigens of ABO blood groups, non-self HLA, and xenografts that are similar to antigens found on bacteria and viruses. It results in immediate tissue oedema, haemorrhage, and thrombosis.

Acute rejection is a function of both the innate and the adaptive immune system, triggered by the recognition of foreign MHC and foreign peptides presented by self-MHC, by T cells, and results in tissue destruction over days to many months after transplant.

Chronic rejection is a poorly understood vasculopathy that occurs over years. It is probably a function of the adaptive immune system mediated predominantly through indirect recognition.

Acute Rejection: Definitions

(Adapted from Banff '07 Update)

Antibody-Mediated:	**T cell-Mediated:**
"Rule of Three" PMNs >> monocytes •1. C4d+ •2. Presence of antidonor antibodies (DSA) •3. Acute tissue injury: I. ATN-like (minimal inflammation) II. Capillary and/or glomerular inflammation and/or thromboses III. Arterial inflammation	"Is it in the tubules/interstitum, or in the vessels?" Monocytes >> PMNs IA: >25% interstitial infiltration, 4-10 mononuclear cells/tubular cross-section IB: >25% interstitial infiltration, >10 mononuclear cells/tubular cross-section IIA: Intimal arteritis -mild-to-moderate (0-25% of lumenal area) IIB. Intimal arteritis -severe (>25% of lumenal area) III. Transmural arteritis and/or fibrinoid change and necrosis of medial smooth muscle cells with accompanying lymphocyte inflammation
"Suspicious" 2 of 3 above (C4d, DSA or injury)	*Borderline* 10-25% interstitial infiltration, <4 mononuclear cells/tubular cross-section

Acute rejection-Treatment

Antibody-Mediated:	T cell-Mediated:
IVIg Plasmapheresis Rituximab Novel therapies	High dose corticosteroids Depleting T cell therapy (rATG, ATGAM) Novel therapies

Steroids vs depleting Ab for acute rejection?

- Meta-analysis of 14 trials (965 patients) compared therapies for first AR episodes
- Ab was better than steroid in reversing rejection (RR 0.57) and preventing graft loss (death-censored RR 0.74)
- No difference in preventing subsequent rejection or death at 1 year

- Biopsy is recommended before treating acute rejection, unless the biopsy will substantially delay treatment.
- Subclinical and borderline acute rejection should be treated.
- Administer corticosteroids for the initial treatment of acute cellular rejection.
- Recommendation is to add or restore maintainance prednisone in patients not on steroids who have a rejection episode.
- It has been suggested to use lymphocyte-depleting an- tibodies or OKT3 for acute cellular rejections that do not respond to corticosteroids, and for recurrent acute cellular rejections.
- It is better treating antibody-mediated acute re- jection with one or more of the following alterna- tives, with or without corticosteroids
    - Plasma exchange;
    - Intravenous immunoglobulin;
    - Anti-CD20 antibody;
    - Lymphocyte-depleting antibody.
    - For patients who have a rejection episode, it is better to add mycophenolate if the patient isnot receiving mycophenolate or azathioprine, orswitching azathioprine to mycophenolate, OKT3, muromonab (anti–T-cell antibody)

4. **Classification and modalities of management of iatrogenic duodenal perforation from ERCP. Marshal score vis – a – vis SOFA score – morbimortality indicators in severe acute pancreatitis. 5+5**

Answer. There are two proposed classifications of ERCP-related perforations.

In 1999, Howard et al classified perforations into three distinct types:
Type I, guidewire perforation;
Type II, periampullary perforation;

Type III, duodenal perforation remote from the papilla.

In 2000 Stapfer et al classified ERCP-related perforations into four types, based on the mechanism, anatomical location and severity of injury, which may predict the need for surgery. The Stapfer classification is the most commonly used and it divides perforations into:

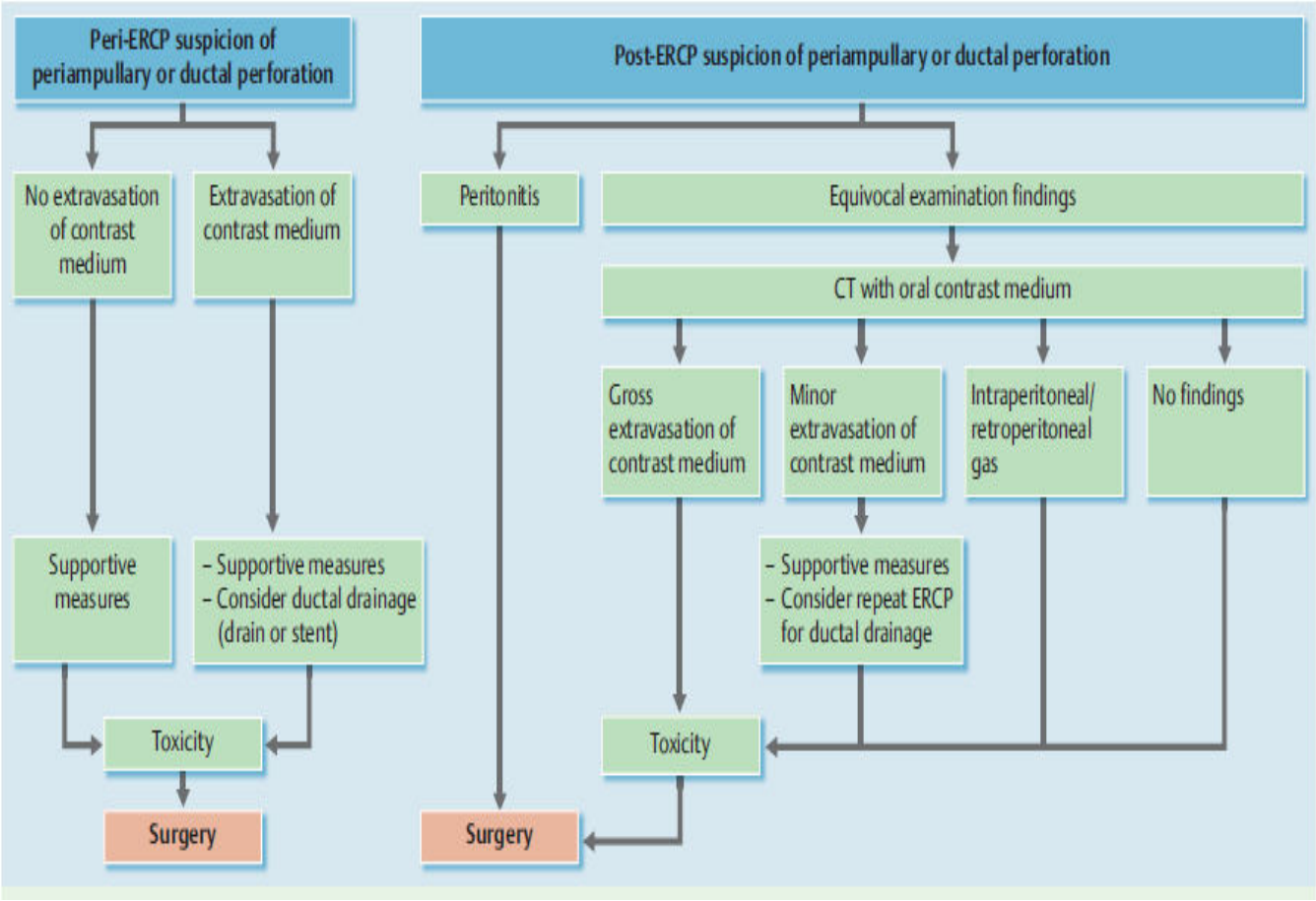
Type I, lateral or medial wall duodenal perforation;

Type II, perivaterian injuries;

Type III, distal bile duct injuries related to guidewire-basket instrumentation and

Type IV, retroperitoneal air alone. Type IV is questionable and it is not a true perforation. Due to the excess compression of air in the duodenum, air bubbles can leak through the sphincterotomy area outside the duodenal lumen, into the retroperitoneal space.

Algorithm for the management of iatrogenic perforations (types II, III, IV according to Stapfer et al. related to endoscopic retrograde cholangiopancreatography (ERCP).



Endoscope related perforations (type I) should be referred for immediate surgery, unless endoscopic closure can be achieved. Endoscopic closure using fibrin glue, endoloops and endoclips or an over the scope clipping device has been described.

Individual components of the BISAP scoring system

BUN > 25 mg/dl
Impaired mental status (Glasgow Coma Scale Score < 15)
SIRS
SIRS is defined as
two or more of the following:
(1) Temperature of < 36 or > 38 °C
(2) Respiratory rate > 20 breaths/min or P_aCO_2 < 32 mm Hg
(3) Pulse > 90 beats/min
(4) WBC < 4,000 or > 12,000 cells/mm^3 or > 10% immature bands
Age > 60 years
Pleural effusion detected on imaging

BISAP, bedside index for severity in acute pancreatitis; SIRS, systemic inflammatory response syndrome.
One point is assigned for each variable within 24 h of presentation and added for a composite score of 0–5.

Criteria for organ failure based on Marshall scoring system:

Organ system	Score				
	0	1	2	3	4
Respiratory (P_aO_2/F_IO_2)	>400	301–400	201–300	101–200	<101
Renal (serum creatinine, mg/dl)	≤1.5	>1.5 to ≤1.9	>1.9 to ≤3.5	>3.5 to ≤5.0	>5.0
Cardiovascular (systolic blood pressure, mm Hg)	>90	<90, fluid responsive	<90, fluid unresponsive	<90, pH <7.3	<90, pH <7.2

- The Sequential Organ Failure Assessment (SOFA) score is a mortality prediction score that is based on the degree of dysfunction of 6 organ systems.
- The score is calculated on admission and every 24 hours until discharge using the worst parameters measured during the prior 24 hours.
- The scores can be used in a number of ways:
    - As individual scores for each organ to determine progression of organ dysfunction.
    - As the sum of scores on one single ICU day.
    - As the sum of the worst scores during the ICU stay.
- It is believed to provide a better stratification of the mortality risk in ICU patients given that the data used to calculate the score is not restricted to admission values.

Variables	SOFA Score 0	1	2	3	4
Respiratory Pao_2/Fio_2, mm Hg	>400	≤400	≤300	≤200†	≤100†
Coagulation Platelets $\times 10^3/\mu L$‡	>150	≤150	≤100	≤50	≤20
Liver Bilirubin, mg/dL‡	<1.2	1.2-1.9	2.0-5.9	6.0-11.9	>12.0
Cardiovascular Hypotension	No hypotension	Mean arterial pressure <70 mm Hg	Dop ≤5 or dob (any dose)§	Dop >5, epi ≤0.1, or norepi ≤0.1§	Dop >15, epi >0.1, or norepi >0.1§
Central nervous system Glasgow Coma Score Scale	15	13-14	10-12	6-9	<6
Renal Creatinine, mg/dL or urine output, mL/d‖	<1.2	1.2-1.9	2.0-3.4	3.5-4.9 or <500	>5.0 or <200

*Norepi indicates norepinephrine; Dob, dobutamine; Dop, dopamine; Epi, epinephrine; and Fio_2, fraction of inspired oxygen.
†Values are with respiratory support.
‡To convert bilirubin from mg/dL to µmol/L, multiply by 17.1.
§Adrenergic agents administered for at least 1 hour (doses given are in µg/kg per minute).
‖To convert creatinine from mg/dL to µmol/L, multiply by 88.4.

5. a) Define early gastric cancer. **5+5**

b) Diagnosis and management of early gastric carcinoma.

Answer. Early gastric cancer (EGC) is defined as being confined to the mucosa or the submucosa, regardless of the presence or absence of regional lymph node metastasis.

The Japanese Gastric Cancer Association classification has good correlation with the T staging as described in the TNM staging. T1 disease corresponds to M or SM according to Japanese classification, T2 disease with MP or SS, T3 with SE, and T4 disease with SI.
TX : Primary tumor cannot be assessed
T1 : Tumor invasion of mucosa and / or muscularis mucosa (M) or submucosa (SM)
T2 : Tumor invasion of muscularis propria (MP) or subserosa (SS)
T3 : Tumor penetration of serosa (SE)
T4 : Tumor invasion of adjacent structures (SI)
By definition, early gastric cancer is T1 disease according to TNM staging or M/SM disease as per the Japanese classification. The depth of invasion (M, SM1, SM2) are determined and recorded only when the vertical margin (VM) is negative (SM1; submucosal invasion < 0.5mm, SM2; invasion >

0.5mm). This further subdivision of SM into SM1 and SM2 has been considered because SM2 disease has a significantly greater rate of lymph nodal involvement than SM1 disease.

Investigations
Computed tomography (CT) remains the modality of choice for staging of gastric cancer. The sensitivity of a CT scan to determine nodal status ranges from 50% to 95% and specificity from 40% to 99%. For assessing depth of invasion, endoscopic ultrasonography (EUS) remains the primary choice for determining T staging.

Endoscopy: Conventional endoscopy is the standard investigation for gastric cancer. To detect early gastric cancers chromoendoscopy has more role than conventional endoscopy. Magnified endoscopyis also practiced. Lateral extent of the tumor must be identified for endoscopic resection and this is well seen by chromoendoscopy. Dyes used in chromoendoscopy are indigocarmine with or without acetic acid, congo red-methylene blue.
Tumor size, location or depth of tumor do not affect the clarity of the images. Lee et al showed that the borders of the lesions were distinct in 66.9% with conventional endoscopy and in 84.1% with acetic acid- indigocarmine (AI) chromoendoscopy ($P < 0.001$). Compared with conventional endoscopy, chromoendoscopy clarified the border in a significantly higher percentage of differentiated adenocarcinomas .

Staging
The current AJCC tumor-node-metastasis (TNM) staging classification remains the best prognostic system for assessing survival from gastric adenocarcinoma . In 1997, nodal classification changed from using the location of the involved lymph nodes to the number (pN1, 1–6 nodes; pN2, 7–15 nodes; pN3, >15 nodes). At least 15 lymph nodes are required for proper staging . Metastatic lymph node ratio (MLR) is the ratio between metastatic lymph nodes and total evaluated lymph nodes as opposed to the total number of positive nodes and is valuable in cases of inadequate lymph node evaluation.

Management
Surgery: Proximal subtotal gastrectomy, total gastrectomy and Roux en Y reconstruction with or without jejunal 'J' pouch and distal radical gastrectomy are the commonly performed surgeries for proximal and distal gastric cancers respectively. Most of these surgeries are performed for more advanced gastric cancers but are also often appropriate for early gastric cancers.

Laparoscopic surgery In the revised Japanese Gastric Cancer Treatment Guidelines, laparoscopyassisted gastrectomy is classified as an investigational procedure eligible for stage IA and IB cancers only.
Endoscopic mucosal resection [EMR] - Also known as "Strip biopsy". EMR are indicated in well differentiated adenocarcinoma , tumor ≤ 20 mm in elevated type , ≤
10 mm in depressed type, not associated with peptic ulcer and invasion limited to the mucosa.
Advantages-minimal invasion, low cost, patient tolerance, and better patient quality of life after the operation.
Disadvantages -larger-sized lesions cannot be resected completely by EMR at one time. Thus, the entire pathologic specimen cannot be submitted for proper analysis.

Types- EMR-precut,EMR-cap, and EMR-ligation
Endoscopic submucosal dissection (ESD): - was developed for en bloc resection of large lesions among the intramucosal gastric cancers. ESD used the technique of improved needle-knife under

endoscopy to strip the tumors directly from the submucosal layer. ESD had a relatively higher incidence rate of complications such as bleeding and perforation.
 more operation time was needed in the ESD group than in the EMR group
 higher en bloc resection rate and higher histologically complete resection rate in ESD compared to EMR [even for tumors <20mm]
 lower recurrence rate in ESD than EMR
 Perforation was more common in ESD but bleeding was similar in both procedures
 tumor location in the upper and middle portions of the gastric body, ulceration, unskillful operationand blind hemostasis and lesion size > 3 cm are all considered as risk factors of perforation. If this occurs, it is repaired by metal clips and majority do not require surgical operations.
Elective lymph node dissection: The degree of lymph node dissection was traditionally based on the Japanese staging system in which nodal stations were assigned into groups N1, N2, or N3.
D1 dissection - If a dissection removes N1 nodes (perigastric nodes along the left and right pericardial nodes, lesser and greater curvature, suprapyloric and infrapyloric)
D0 dissection - anything less than a D1
D2 dissection - D1 plus removal of nodes along the left gastric artery, common hepatic artery, celiac trunk, and splenic artery.
D3 dissection - D2 plus removal of nodes along the hepatoduodenal ligament and root of themesentery.
D4 dissection- D3 plus removal of para-aortic and paracolic lymph nodes.
These terminologies for lymph node dissection are for gastric cancers in general and are not meant only for early gastric cancer. D1 dissection is classified as conservative lymph node dissection (CLND) and D2 to D4 dissections are considered extended lymph node dissections (ELND).
Dutch trial and the Medical Research Council (MRC trial) showed no benefit when comparing D1 and D2 dissection and increased morbidity and mortality in D2 group.
These trials have serious limitations and a final view about the benefits of D2 dissection cannot be made at present. Lymph node dissection may be avoided in intramucosal disease (M) and superficial submucosal invasion (SM1). However, the risk of lymph node metastasis is significant in EGC with deeper submucosal invasion (SM2) and D2 lymphadenectomy is probably an appropriate surgery for SM2 group of early gastric cancer and for the other advanced but resectable gastric cancers.

6. Recent concept of management of penetrating injuries of abdomen. 10

Answer. Penetrating abdominal injury

The management of abdominal trauma varies according to the following factors:

- Mechanism and location of injury
- Hemodynamic and neurologic status of the patient
- Associated injuries
- Institutional resources

The incidence of penetrating injury will vary from hospital to hospital and region to region. Some institutions will have a very low incidence of penetrating trauma, and yet it is vital that penetrating injury is treated differently to blunt trauma. The mechanisms and physical characteristics of injury are different, as are the relevance and accuracy of investigations and the methods and timing of repair.

Priorities

Patients with significant penetrating abdominal injury tend to fall into 3 major categories:

Presentation	Injury Type	Management priority
Pulseless	Major vascular injury	Emergency laparotomy Consider ED thoracotomy
Haemodynamically unstable	Vascular and/or solid organ injury AND/OR Haemorrhage from other sites	Identify & control haemorrhage
Haemodynamically Normal	Hollow viscus injury Pancreas or renal	Identify presence of gastrointestinal, diaphragmatic or retroperitoneal injury

The appropriate investigations and management pathway vary with each of these clinical presentations.

The management of abdominal trauma varies according to the following factors:

- Mechanism and location of injury
- Hemodynamic and neurologic status of the patient
- Associated injuries
- Institutional resources

Management of the patient with penetrating abdominal trauma continues to evolve. After many years of obligatory exploration, expectant management of selected patients has become commonplace.

Much of the present controversy involves the determination of which patients or, more specifically, which injury patterns are suitable for expectant management. Several different methods have been used to establish the injuries present and therefore the need for operative intervention in patients with penetrating abdominal trauma. Most trauma centers use an algorithm with multiple diagnostic modalities whose uses are based on the pattern of injuries and the clinical status of the patient.

Adjuncts the the initial evaluation of the trauma patient can provide clues to significant intra-peritoneal injury:

- Chest X-ray
  An erect chest radiograph may identify sub-diaphragmatic air. This must be interpreted with some caution in the absence of peritonitis, as air may be entrained into the peritoneal

cavity with a stab or gunshot wound. However it certainly signals peritoneal penetration and warrants further investigation.

- Nasogastric Tube
  Blood drained from the stomach will identify gastric injury.
- Urinary catheter
  Macroscopic haematuria indicates a renal or bladder injury. Microscopic injury suggests but is not pathognomonic of ureteric injury.
- Rectal examination
  Rectal blood indicates a rectal or signmoid penetration. Protoscopy & sigmoidoscopy should be performed (see below)

Options for evaluation

Further evaluation requires the use of one or more of the following diagnostic modalities:

- Serial Physical Examination (PE)
- Local Wound Exploration (LWE)
- Diagnostic Peritoneal Lavage (DPL)
- Ultrasound (FAST)
- CT Scan
- Laparoscopy
- Laparotomy

FAST

The role of FAST in penetrating trauma has not been fully evaluated. While FAST is sensitive for pericardial fluid, it appears to have a high false negative rate for intra-abdominal injury. This may improve if serial FAST scans are performed. Ultrasound as yet cannot detect the small amounts of fluid which may be associated with a hollow viscus injury.

- A positive FAST indicates peritoneal penetration, but is poor at discriminating for injuries requiring intervention
- A negative FAST does not exclude significant abdominal injury.

It is therefore impossible to recommend FAST as the only investigation for the assessment of penetrating intra-abdominal injury. It MAY have a role in combination with other investigations.

CT Scan

As the technology has improved, CT scanning is finding more and more of a role in the evaluation of penetrating abdominal injury. Most studies recommend a multidectector (multislice) scanner with triple-contrast protocol (intravenous, oral and rectal), although it is not clear how important the GI contrast is for the detection of bowel injury. Of all the diagnostic modalities listed, CT gives the best assessment of retroperitoneal structures.

The CT features of penetrating bowel injury are:

- Signs of peritoneal violation
  - Free intra-peritoneal air

    - Free intra-peritoneal fluid
    - Wound track extending through peritoneum

- Signs of bowel injury
    - Wound track extending to bowel wall
    - Bowel wall defect
    - Bowel wall thickening
    - Intra-luminal contrast leak
    - (not free intra-peritoneal air - may have been entrained through peritoneal wall)

- Other signs of intra-peritoneal injury
    - Intravenous contrast extravasation
    - Diaphragmatic tear (especially on re-formats)

The use of CT for penetrating intra-abdominal injury remains in its infancy, and not all CT scanners have the resolution or software capabilities necessary to achieve the sensitivity and specificity rates quoted in the literature. Interpretation of the scans is also difficult and requires multiple passes on different 'window' settings by a trained and experienced trauma radiologist.

Laparoscopy

Laparoscopy is also a technology somewhat in its infancy, and remains very user dependent. A full trauma laparoscopy for the evaluation of penetrating injury requires general anaesthesia and complete examination of intra-peritoneal contents, including visualization of the whole small bowel and intra-peritoneal colon. In most studies laparoscopy has a significant false negative, primarily from missed bowel injuries. Laparoscopy is also limited in the evaluation of retroperitoneal injury.

Laparoscopy is the diagnostic method of choice for the diagnosis of suspected diaphragmatic injury. Many diaphragmatic lacerations can also be repaired via the laparoscope.

Laparoscopy may also have a role in patients who have localized tenderness or develop a white cell count or fever without generalized peritonitis after a period of clinical observation. Laparoscopy may be useful to confirm that a wound is tangential and does not enter the peritoneal cavity - although many of the methods above have advantages over laparoscopy for this indication.

Laparotomy

Exploratory laparotomy for all penetrating abdominal wounds still has a role in resource-limited environments, or occasionally in cases of multi-cavitary injuries. For most situations however the non-therapeutic laparotomy rate will be unacceptable high. With the incidence of complications with a negative laparotomy at of 12%-41%, with hospital stays of 4-8 days, , it is difficult to support such a strategy where adjunctive methods such as CT or DPL are available and serial physical examination has such a low missed injury rate.

Recommended approaches:

Which diagnostic tree a hospital chooses for the evaluation of penetrating injury will be dependent on numerous factors, including trauma patient load, surgical team availability and coverage, the

availability of multidetector CT scanners and trauma radiologists, and access to the operating room and critical care beds.

Many different systems are used around the world. The following recommendations are in order of preference and are by no means the only possibilities. Each choice is associated with the caveats listed above.

- Serial physical examination
- Multidetector CT
- Local Wound Exploration AND either:
  - Diagnostic Peritoneal Lavage OR
  - Laparoscopy

7. What are the components of the enhanced recovery after surgery (ERAS) protocol? Barriers in its

implementation. 6+4

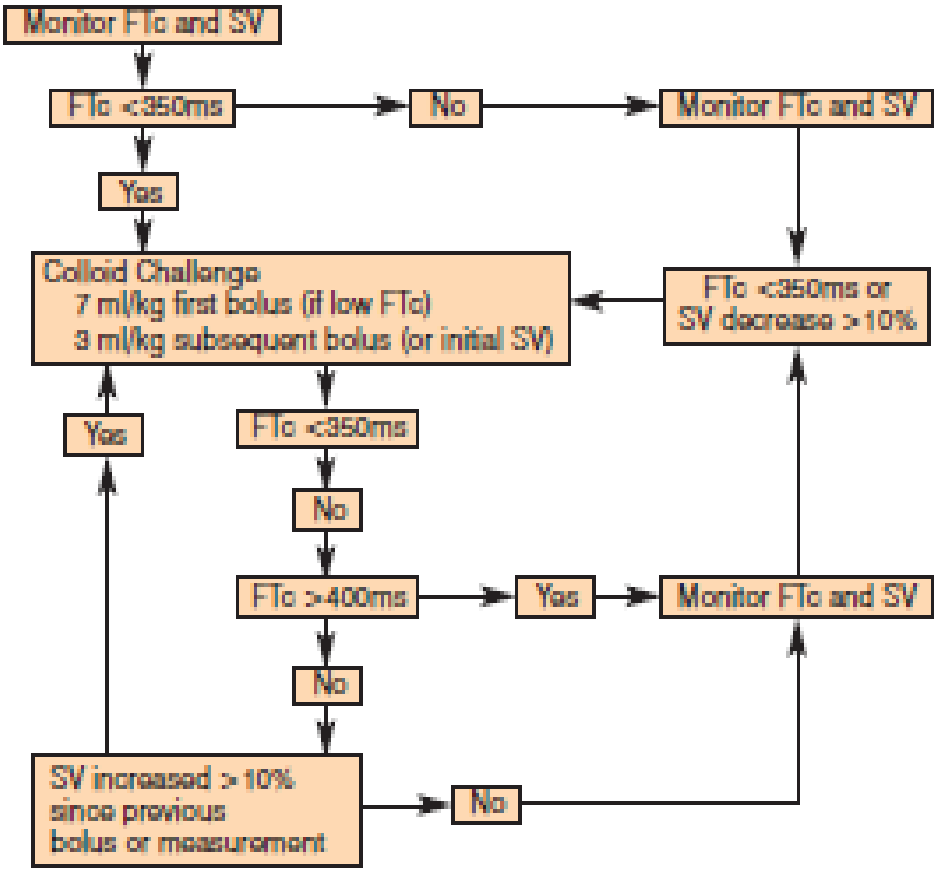
answer. Components are:

Pre-operative recommendations

I. Pre-operative counselling and training.
II. A curtailed fast (6 hours to solids and 2 hours to clear liquids) and pre-operative carbohydrate loading.
III. Avoidance of mechanical bowel preparation.
IV. Deep vein thrombosis prophylaxis using low molecular weight heparin.
V. A single dose of prophylactic antibiotics covering both aerobic and anaerobic pathogens.

Peri-operative recommendations

I. High (80%) inspired oxygen concentration in the peri-operative period.
II. Prevention of hypothermia.
III. Goal directed intra-operative fluid therapy.

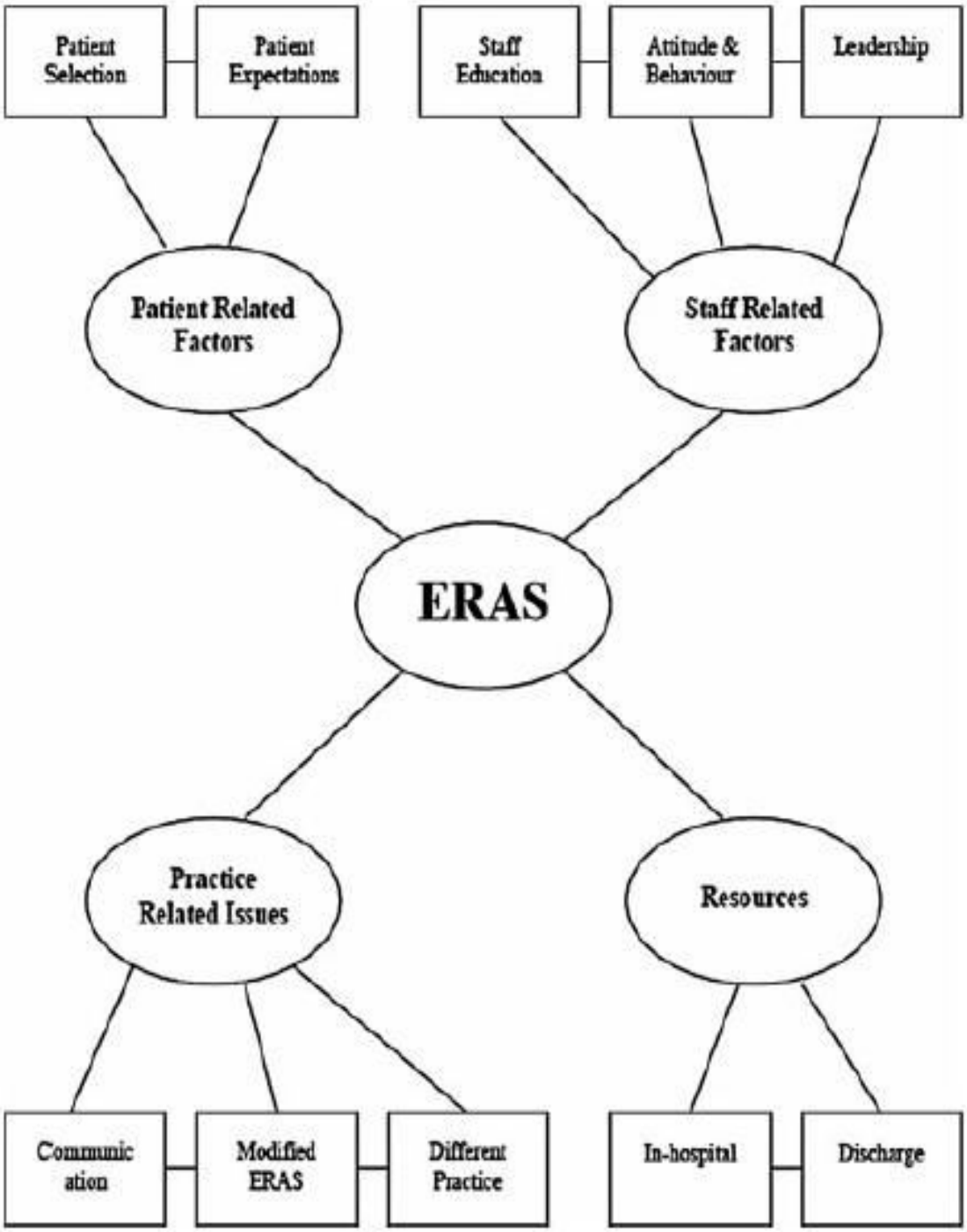


IV. Preferable use of short and transverse incisions for open surgery.
V. Avoidance of post-operative drains and nasogastric tubes.
VI. Short duration of epidural analgesia and local blocks.

Post-operative recommendations

I. Avoidance of opiates and the use of Paracetamol and non steroidal anti-inflammatory drugs (NSAIDS).
II. Early commencement of post-operative diet.
III. Early and structured post-operative mobilisation.
IV. Administration of restricted amounts of intravenous fluid.
V. Regular audit.

Barriers to implementation and functioning of ERAS programs:



8. Role of FDG PET CT Scan in Gastrointestinal surgery. 10

Answer. ^{18}FDG-PET has been widely used to evaluate various types of malignant tumors, including lung, oesophageal, and colorectal cancer and lymphomas.

- In colorectal cancer:

Initial Staging of Colorectal CancerFDG PET is sensitive for primary colorectal carcinoma; however, it does not supplant the current morphologic imaging modalities at initial staging, as FDG PET scanners lack the resolution required to evaluate the depth of tumor penetration through the bowel wall. At the primary site, the negative predictive value of FDG PET is greater than the positive predictive value (100% vs 90%) due to the false-positive FDG PET findings of inflammatory processes.

Recurrent Colon Cancer and Evaluation of Response to Therapy:

In patients treated with novel therapies such as radio-frequency ablation or a combination of cryotherapy and hepatic artery chemotherapy, FDG PET may be more accurate than CT in distinguishing posttherapy changes from recurrent or residual tumour.

The timing of FDG PET after therapy is crucial, as the so-called flare phenomenon may cause a temporary increase in FDG metabolism in responding lesions shortly after initiation of chemotherapy. It is therefore recommended that response to chemotherapy be evaluated at least after completion of therapy to avoid false-positive results.

Local-Pelvic Recurrence:

FDG PET accurately demonstrates recurrent colorectal cancer in patients who have indeterminate findings at CT or MR imaging.

9. A 65 year old male with a lifelong history of reflux disease has been followed with routine oesophagogastroduodenoscopy which of late revealed an early oesophageal cancer 3 cm proximal to GE junction in the setting of Barret's oesophagous. Patient prefers for an endoscopic management.

With all facilities at your disposal, how would you workup precisely stage (enumerate investigations) the disease (give the AJCC staging) to assess the patient's eligibility for an endoscopic management? What are the endoscopic options of management of early oesophageal cancers? How would you councel the patient?

Answer. Accurate staging of disease in patients with newly diagnosed esophageal cancer is necessary in order to instigate appropriate curative or palliative therapy.

The following guidelines are suggested for the initial work-up of patients with newly diagnosed esophageal cancer.

All patients should initially undergo a thorough history and physical exam, in order to detect gross evidence of metastatic disease. In addition, complete upper gastrointestinal endoscopy and/or a barium upper gastrointestinal series is indicated to assess for mucosal extent of disease. If these modalities show a large degree of gastric involvement, then the stomach may not be suitable for interposition at the time of esophagectomy; in such patients, a colonic interposition may be necessary.

A computed tomography (CT) scan of the chest and abdomen with bolus administration of intravenous contrast should then be performed. The CT is used to evaluate the primary tumor for

invasion of adjacent structures (T4 disease); if the CT shows findings of gross, unequivocal invasion, then surgery is not indicated. Equivocal invasion, however, requires proof before denying the patient surgery. An intervening fat plane between an esophageal tumor and an adjacent structure in the mediastinum (e.g. central airway, aorta, pericardium) accurately indicates lack of invasion. However, in the majority of cases, the converse is not true: lack of a fat plane does not necessarily indicate invasion, either for cachectic patients or for those with normal body weight. Furthermore, adjacent fat planes may be obscured in patients who have undergone radiation therapy. In addition, minimal invasion of some structures, such as pericardium or aortic adventitia, may be resectable. CT findings suggesting central airway invasion should be proven via bronchoscopy and biopsy, and, in fact, all patients with an upper or middle third esophageal cancer should undergo preoperative bronchoscopy to exclude airway invasion before esophagectomy. Confirmation of suspected pericardial or aortic invasion is more difficult; endoscopic ultrasound (EUS) or intravascular ultrasound (IVUS) may be helpful in this regard, although most often the diagnosis is confirmed only during attempted esophagectomy. Unresectable invasion of the aorta or pericardium is actually very uncommon, and care should be taken not to overdiagnose such findings.

CT is also used to look for evidence of distant metastatic disease to non-regional lymph nodes, lungs, abdominal viscera, and other sites; such distant disease would preclude surgical resection. Positron emission tomography (PET) imaging has been shown to be more accurate than CT in diagnosing distant metastases. Therefore, if CT shows apparently resectable disease, PET may then be employed to search for previously occult distant metastases; suspicious lesions at PET should be biopsied to obtain tissue proof, whenever possible. Assuming the PET study shows no evidence of distant metastatic disease, a patient may then be examined with EUS for better staging evaluation of the primary tumor (T stage) and regional lymph nodes (N stage); suspicious lymph nodes detected by EUS (regional or celiac axis) should undergo EUS guided fine needle aspiration biopsy.

At some institutions, patients with T1N0 disease at EUS and M0 disease at CT and PET proceed right to surgery; on the other hand, those with deeper penetration of tumor and/or tumor involvement of regional lymph nodes undergo neoadjuvant chemoradiation therapy followed by surgery. Patients with distant metastases (M1 disease) are usually treated non-surgically, with chemoradiotherapy. Laparoscopy is performed at some centers to evaluate for occult abdominal metastases, especially for tumors arising at the gastroesophageal junction, although this is not common practice.

A recently published cost effectiveness study comparing CT, EUS with fine needle aspiration biopsy (EUS-FNA), PET and thoracoscopy/laparoscopy found that the combination of CT plus EUS-FNA was the most inexpensive strategy and offered more quality adjusted life-years, on average, than all other strategies except for PET plus EUS-FNA. The latter approach, although slightly more effective, was also more expensive; this strategy was recommended unless resources were scarce or PET was unavailable.

In summary, all patients with a new diagnosis of esophageal cancer need a good quality CT scan of the chest and abdomen for staging purposes. At many institutions, fluorodeoxyglucose (FDG) PET scanning is also performed, primarily to look for occult distant metastases, and EUS is obtained for better evaluation of the primary tumor and regional lymph nodes.

Chest radiograph

Many indirect signs can be sought on a chest radiograph and these include:

- widened azygo-oesophageal recess with convexity toward right lung (in 30% of distal and mid-oesophageal cancers)
- thickening of posterior tracheal stripe and right paratracheal stripe >4 mm (if tumour located in upper third of oesophagus)
- tracheal deviation or posterior tracheal indentation/mass
- retrocardiac or posterior mediastinal mass
- oesophageal air-fluid level
- lobulated mass extending into gastric air bubble (Kirklin sign)
- repeated aspiration pneumonia (with tracheo-oesophageal fistula)

Fluoroscopy/Barium Swallow

- irregular stricture
- pre-stricture dilatation with 'hold up'
- shouldering of the stricture

Endoscopic US

It is the most accurate imaging modality for the T staging of esophageal cancer

It defines the layers of the esophageal wall hence can differentiate T1, T2, and T3 tumors

The esophagus consists of five layers.

- the first hyperechoic layer represents the interface between the balloon and the superficial mucosa.
- the second hypoechoic layer represents the lamina propria and muscularis mucosae.
- the third hyperechoic layer represents the submucosa
- the fourth hypoechoic layer represents the muscularis propria
- the fifth layer represents the interface between the adventitia and surrounding tissues

CT

- eccentric or circumferential wall thickening >5 mm
- peri-oesophageal soft tissue and fat stranding
- dilated fluid- and debris-filled oesophageal lumen is proximal to an obstructing lesion
- tracheobronchial invasion appears as displacement of the airway (usually the trachea or left mainstem bronchus) as a result of mass effect by the oesophageal tumour
- aortic invasion

FDG PET/CT

PET/CT is useful for detecting esophageal primary tumors yet it has little role in helping determine the specific T classification because it provides limited information about the depth of tumor invasion

PET/CT is also superior to CT for detecting lymph node metastases and can depict metastases in normal-sized lymph nodes through the uptake of FDG

PET/CT has a primary role in depiction of distant sites of metastatic disease

The most common sites of distant metastases detected at PET (but frequently missed at CT) are the bones and liver.

Staging

TNM staging

- **T staging**
  - **Tx:** primary tumour cannot be assessed
  - **T0:** no evidence of primary tumour
  - **Tis:** high-grade dysplasia
  - **T1:** invades lamina propria, muscularis mucosae or submucosa
    - **T1a:** invades lamina propria or muscularis mucosae
    - **T1b:** invades submucosa
  - **T2:** invades muscularis propria
  - **T3:** invades adventitia
  - **T4:** direct extension into adjacent structures
    - **T4a:** (resectable) invades pleura, pericardium or diaphragm
    - **T4b:** (unresectable) invades other structures, e.g. aorta, trachea
- **N staging**
  - **Nx:** regional nodes cannot be assessed
  - **N0:** no regional lymph node metastases
  - **N1:** 1-2 regional nodes involved
  - **N2:** 3-6 regional nodes involved
  - **N3:** >7 regional nodes involved
- **M staging**
  - **Mx:** metastatic disease cannot be assessed
  - **M0:** no distant metastases
  - **M1:** distant metastases

AJCC staging groups

Staging is dependent on histological subtype, e.g. squamous cell carcinoma or adenocarcinoma. G refers to the grade of tumour and the location is in brackets. As with the TNM classification, X indicates inability to determine grade or location.

Squamous cell carcinoma

- **stage 0**: Tis N0 M0 G1, X
- **stage I**
  - stage Ia: T1 N0 M0 G1, X
  - stage Ib:
    - T1 N0 M0 G2-3
    - T2-3 N0 M0 G1,X (lower, X)
- **stage II**
  - stage IIa
    - T2-3 N0 M0 G1,X (upper, middle)
    - T2-3 N0 M0 G2-3 (lower, X)
  - stage IIB
    - T2-3 N0 M0 G2-3 (upper, middle)
    - T1-2 N1 M0
- **stage III**
  - stage IIIA
    - T1-2 N2 M0
    - T3 N1 M0
    - T4a N0 M0

Indications for Endoscopic Treatment of Superficial Esophageal Neoplasia

> The classically accepted criteria for indication of endoscopic resection for the treatment of superficial esophageal neoplasia include: in-depth involvement restricted to M1 and M2 layers (epithelium and lamina propria); maximum length of 3cm; lateral extent less than ¾ of the circumference; and a maximum of four lesions.

With improving techniques of endoscopic resection, especially after the advent of ESD, these criteria tend to expand, accepting endoscopic treatment of lesions larger than 3cm, occupying the entire circumference of the esophagus and no limit to the number of lesions, provided that all are restricted to the mucosa.

Endoscopic treatment modalities for esophageal cancer include resection (mucosectomy or ESD) and ablation techniques.
The ablation methods include photodynamic therapy, argon plasma coagulation, YAG- laser, multipolar electrocoagulation and, more recently, radiofrequency ablation.
The ablative modalities preclude histopathological analysis of the eradicated neoplastic lesion, which is crucial to define whether the endoscopic intervention was curative. Therefore, ablative methods should not be indicated for the endoscopic treatment of esophageal SCC. In this review we thoroughly discuss the role of mucosectomy and ESD in the management of superficial esophageal cancer.

Endoscopic mucosal resection

Endoscopic mucosal resection (EMR) enables accurate histological assessment of the depth of invasion of early neoplastic lesions, thus being both a diagnostic and a therapeutic intervention.

Endoscopic submucosal dissection

In contrast to EMR, where large lesions may be removed piecemeal, endoscopic submucosal dissection (ESD) allows large lesions to be removed en bloc, as well as resection of tumours arising from the muscularis propria. ESD requires extensive training, longer procedure time and is associated with an increased risk of bleeding and perforation.

Radiofrequency ablation

Radiofrequency ablation (RFA) (Medtronic) is a field ablation technique used to ablate the surface 500 μm of the gastrointestinal mucosa.

Argon plasma coagulation

APC uses argon gas to conduct electrical current to thermally ablate targeted tissue. APC is often used as an adjunct to alternative therapies, as it is cheap and easy to treat small areas of residual disease and has been demonstrated to significantly increase recurrence-free survival for the patients undergoing ablation after EMR compared with those having EMR alone.

Counseling of the patient:

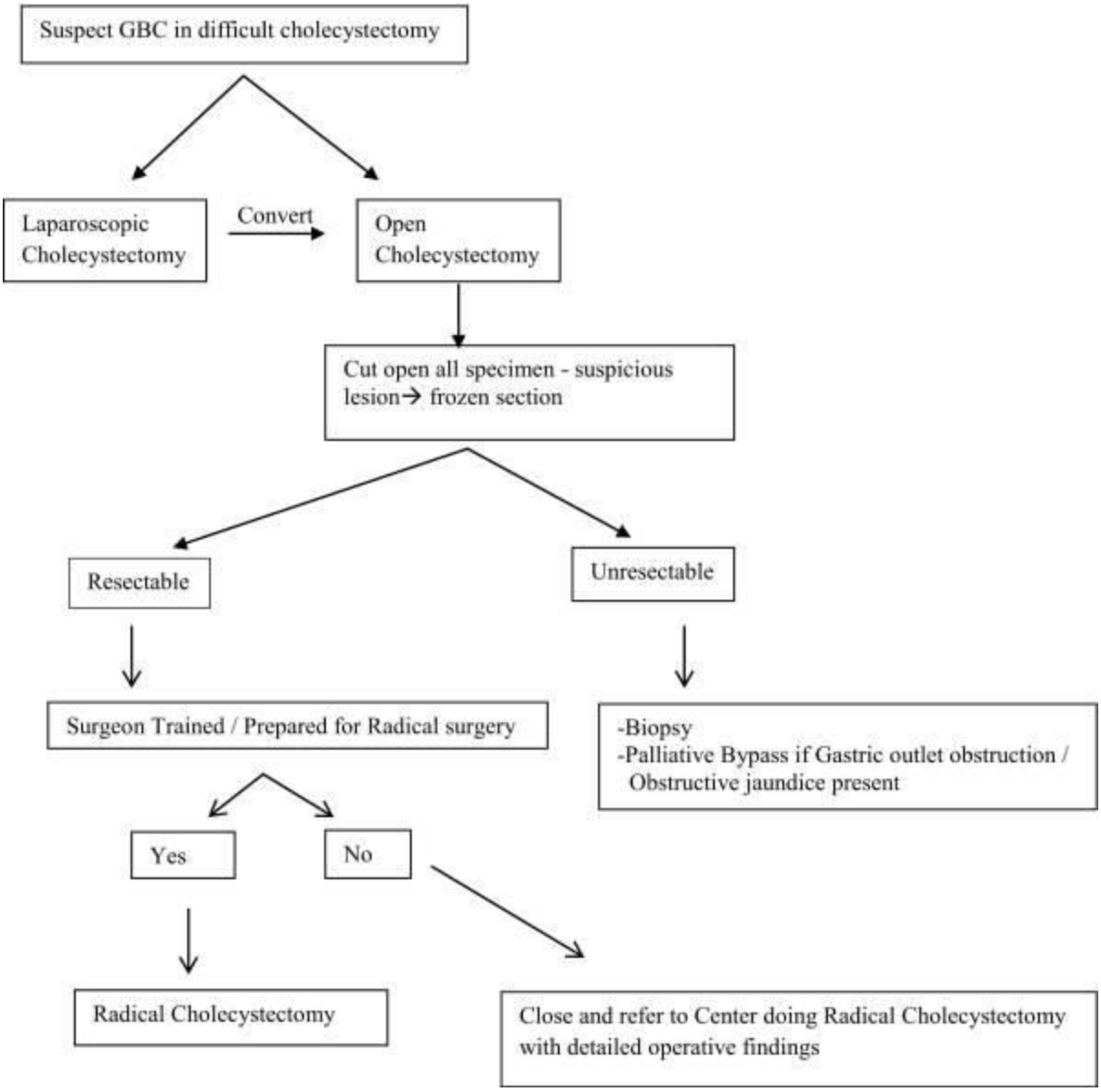
It can be hard to live with the idea that the cancer can come back.
Based on what is known today, no specific way of decreasing the risk of recurrence after completion of treatment can be
recommended. Because of the cancer itself and because
of treatment, returning to normal life may not be easy for some people. Questions related to body image, fatigue, work, emotions or lifestyle may arise. Discussing these questions with relatives, friends,or doctors may be helpful.
However, survival rates depend on several factors, including the stage of the cancer when it is first diagnosed. The 5-year survival rate of people with cancer located only in the esophagus is 41%. The 5-year survival rate for those with disease that has spread to surrounding tissues or organs and/or the regional lymph nodes is 23%. If it has spread to distant parts of the body, the survival rate is 5%.

10. Management strategy for incidentally detected carcinoma gall bladder. 10

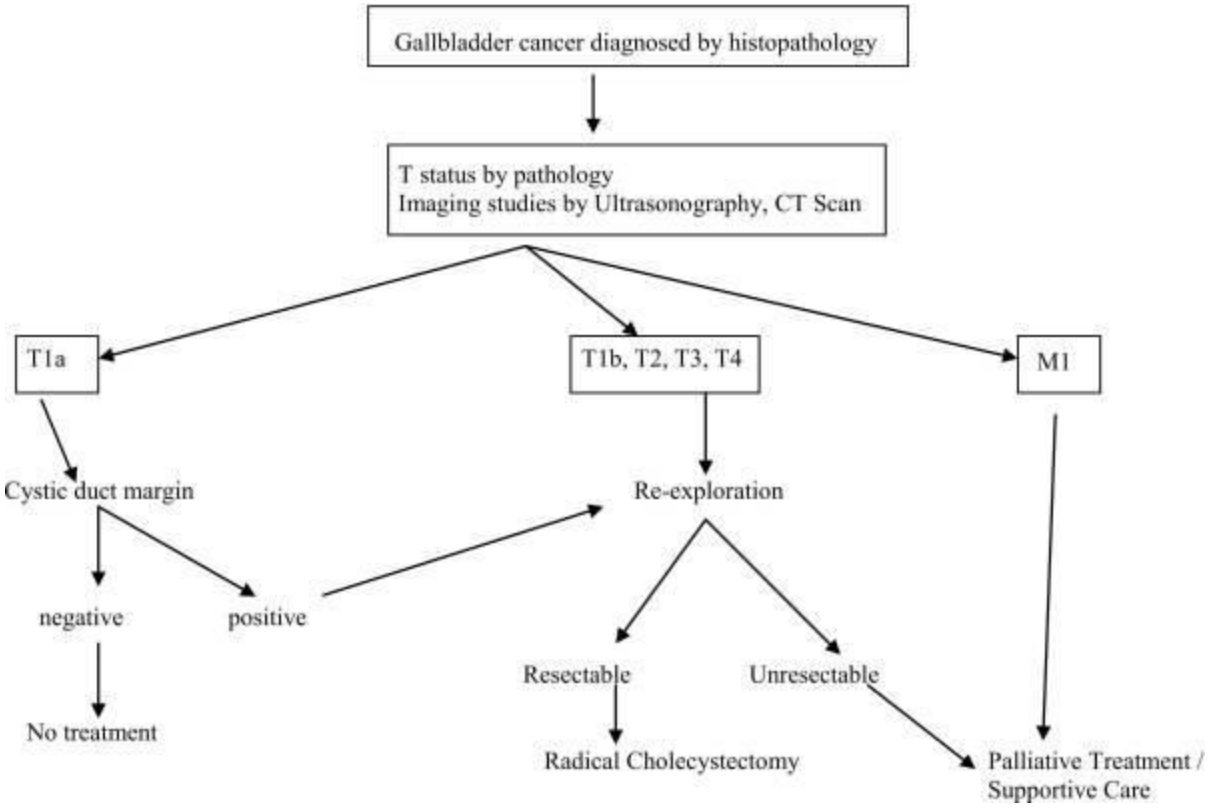
Answer. Surgical resection is the only potentially curative treatment for Gall Bladder Carcinoma. Only 10–30 % of Gall Bladder Carcinoma patients have resectable disease on presentation. Radical cholecystectomy is the standard surgical procedure performed for Gall Bladder Carcinoma. The management of Gall Bladder Carcinoma including Incidentally detected Gall Bladder Carcinoma depends on the T stage (depth of invasion).

- Incidental gall bladder carcinoma (IGBC) is defined as GBC found in histopathology analysis after removal of gall bladder tissue for symptomatic benign gall bladder disease. 70% of all GBC cases are discovered incidentally by the pathologist. Because of the increased use of laparoscopic cholecystectomy (LC) and difficulty in diagnosis of GBC preoperatively, IGBC discovered during and after LC has become more frequent.
- There is usually early cancer confined to the gall bladder and difficult to diagnose on ultrasonography. They preferentially metastasise to the regional lymph node and liver parenchyma.
- For management guidelines, patients with Incidentally detected Gall Bladder Carcinoma can be divided into two clinical groups:
    a. Those with Gall Bladder Carcinoma discovered during laparoscopic or open cholecystectomy for assumed benign disease.
    b. Patients with Gall Bladder Carcinoma diagnosed histo-pathologically after simple cholecystectomy (open/laparoscopic) for benign gallbladder disease.

Algorithmic approach for Incidentally detected Gall Bladder Carcinoma discovered during cholecystectomy for gallstone disease



Management of incidentally discovered carcinoma gallbladder on pathologic examination


Gallbladder cancer diagnosed by histopathology
T status by pathology
Imaging studies by Ultrasonography, CT Scan
T1a
T1b, T2, T3, T4
M1
Cystic duct margin
Re-exploration
negative
positive
Resectable
Unresectable
No treatment
Radical Cholecystectomy
Palliative Treatment / Supportive Care