GENERAL SURGERY BLOCK "Q"

Multisystem, Neurosurgery, GIT

a) MULTISYSTEM
(Vitamins, Bariatric Surgery and Nutritional Support External and parenteral Nutrition)

b) NEUROSURGERY
(Intracranial space occupying lesions, benign, malignant and infectious, Head Injury and Syringomyelia)

c) GASTROINTESTINAL TRACT DISEASES
(Dysphagia, Obstructive jaundice, Carcinoma head of pancreas, acute appendicitis. Acute and chronic pain abdomen, intestinal obstruction, intestinal perforation, hernias, constipation, Ulcerative colitis, Crohn's Disease, Colorectal cancers)

MODULE:

a) **Multisystem (Vitamins and Bariatric Surgery)**

Learning Objectives:

By the End of this Module/chapter, students of final year MBBS and 3rd year BDS should be able to know about all Vitamins and to explain briefly Bariatric surgery, its type and complications.

Introduction to vitamins

- Vitamins are essential organic compounds required by the body in small amounts for various physiological processes.
- They play vital roles in maintaining overall health, including supporting immune function, facilitating energy production, and promoting cell growth and repair.
- Vitamins are classified into two main categories:

Fat-soluble (such as vitamins A, D, E, and K) & water-soluble (including the B Vitamins and vitamin C).

- A balanced diet rich in a variety of foods, including fruits, vegetables, whole grains and lean proteins, is the best way to obtain the necessary vitamins naturally.
- Deficiencies or excesses of certain vitamins can lead to a range of health issues, underscoring the importance of maintaining the right balance in our diets.

Summary of All Vitamins:

• VITAMINS	VITAMIN A	VITAMIN D
OTHER NAMES	Retinol, Retinal, Retinoic acid beta-Carotene	Cholecalciferol,Ergoclciferol
ACTIVE FORM	Retinol, Retinal, Rretinoic acid	1,25-Dihydroxycholecalciferol
FUNCTION	Maintenance of reproduction Vision Promotion of growth Differentiation and maintenance of epithelial tissues Gene expression	Calcium uptake Gene expression
DEFICIENCY	Night blindness Xeropthalmia Infertility Growth retardation	Rickets (in children) Osteomalacia (in adults)
SIGNS AND SYMPTOMS	Increased visual threshold Dryness of cornea	Soft, pliable bones
TOXICITY	Yes	Yes
NOTES	Carotene not actually toxic but supplementation not recommended, excess vitamin A can increase incidence of fractures. Animal products like meat, fish, dairy, and eggs are good sources of vitamin A. Many fruits and vegetables are also rich in provitamin A and can help you meet your needs. The recommended dietary allowance (RDA) is 900 micrograms (mcg) for males, 700 mcg for females, and 300–600 mcg for children and adolescents	it's not a true vitamin because it can be synthesized in skin; application of sunscreen lotions or presence of dark skin color decreases this synthesis Few foods are naturally rich in vitamin D3. The best sources are the flesh of fatty fish and fish liver oils. Smaller amounts are found in egg yolks, cheese, and beef liver. Certain mushrooms contain some vitamin D2; in addition some commercially sold mushrooms contain higher amounts of D2 ***RDA:*** The Recommended Dietary Allowance for adults 19 years and older is 600 IU (15 mcg) daily for men and women,

	• Fresh fruits, fruit juices • Whole grains • Liver • Aquatic foods • Eggs • Fortified foods and supplements ***RDA*:** The Recommended Dietary Allowance for folate is listed as micrograms (mcg) of dietary folate equivalents (DFE). Men and women ages 19 years and older should aim for 400 mcg DFE. Pregnant and lactating women require 600 mcg DFE and 500 mcg DFE, respectively. People who regularly drink alcohol should aim for at least 600 mcg DFE of folate daily since alcohol can impair its absorption.	vitamin B12 are absorbed without intrinsic factor. One review concluded that taking 1,000 mcg daily is an effective alternative to injections While the recommended daily amount of vitamin B-12 for adults is 2.4 micrograms, higher doses have been found to be safe.

VITAMINS	VITAMIN C	VITAMIN B_6
OTHER NAMES	Ascorbic acid	Pyridoxine Pyridoxamine Pyridoxal
ACTIVE FORM	Ascorbic acid	Pyridoxal phosphate
FUNCTION	Antioxidant Coenzyme for hydroxylation reactions e.g. in procollagen: Proline →hydroxyproline Lysine→ hydroxylysine	Coenzymes for enzyme catalyzing, particularly in amino acid metabolism
DEFICIENCY	Scurvy	Rare
SIGNS AND SYMPTOMS	Sore, spongy gums Loose teeth Poor wound healing Bleeding	Glossitis Neuropathy
TOXICITY	None	Yes
NOTES	Benefits of supplementation mot established in controlled traits Fruits and vegetables are the best sources of this vitamin.	Deficiency can be induced by isoniazid Sensory neuropathy occurs at high dose Vitamin B6 is found in a variety of animal and plant foods. • Beef liver

	• Citrus (oranges, kiwi, lemon, grapefruit) • Bell peppers • Strawberries • Tomatoes • Cruciferous vegetables (broccoli, Brussels sprouts, cabbage, cauliflower) • White potatoes • ***RDA:*** The Recommended Dietary Allowance for adults 19 years and older is 90 mg daily for men and 75 mg for women. For pregnancy and lactation, the amount increases to 85 mg and 120 mg daily, respectively. Smoking can deplete vitamin C levels in the body, so an additional 35 mg beyond the RDA is suggested for smokers.	• Tuna • Salmon • Fortified cereals • Chickpeas • Poultry • Some vegetables and fruits, especially dark leafy greens, bananas, papayas, oranges, and cantaloupe ***RDA:*** The Recommended Dietary Allowance (RDA) for men ages 14-50 years is 1.3 mg daily; 51+ years, 1.7 mg. The RDA for women ages 14-18 years is 1.2 mg; 19-50 years, 1.3 mg; and 51+ years, 1.5 mg. For pregnancy and lactation, the amount increases to 1.9 mg mcg and 2.0 mg, respectively

VITAMINS	VITAMIN B_1	VITAMIN B_3
OTHER NAMES	Thiamine	Niacin Nicotinic acid
ACTIVE FORM	Thiamine pyrophosphate	NAD+, NADP+
FUNCTION	Coenzyme of enzyme catalyzing: Pyruvate→ Acetyl CoA α-ketoglutarate →succinyl CoA Ribose 5-P + Xylulose 5-P→ Sedoheptulose 7-P + glyceraldehyde 3-P branched-chain α-ketoacid oxidation	Electron transfer
DEFICIENCY	Beriberi Wernicke-Korsakoff syndrome(most common in alcoholism)	Pellagra

		and for adults >70 years it is 800 IU (20 mcg) daily. For most people, the best way to get enough vitamin D is taking a supplement because it is hard to eat enough through food. Vitamin D supplements are available in two forms: vitamin D2 ("ergocalciferol" or pre-vitamin D) and vitamin D3 ("cholecalciferol").

VITAMINS	VITAMIN K	VITAMIN E
OTHER NAMES	Menadione, Menaquinone, Phylloquinone	alpha-Tocopherol
ACTIVE FORM	Menadione, Menaquinone, Phylloquinone	any of several tocopherol derivatives
FUNCTION	gamma-Carboxylation of glutamate residues in clotting and other proteins	Antioxidant
DEFICIENCY	Newborn Rare in adults	Rare
SIGNS AND SYMPTOMS	Bleeding	Vitamin E deficiency may cause impaired reflexes and coordination, difficulty walking, and weak muscles. Premature infants with the deficiency may develop a serious form of anemia. The diagnosis is based on symptoms and results of a physical examination. Taking vitamin E supplements corrects the deficiency RBC fragility leads to hemolytic anemia
TOXICITY	Rare	None
NOTES	Vit. K produced by intestinal bacteria, deficiency common in newborns, intramuscular treatment with Vit. K	Benefits of supplementation for disease prevention not established in controlled trails

	The most common foods with high vitamin K are green leafy vegetables such as kale, collard greens, broccoli, spinach, cabbage, and lettuce	**Vitamin E is found in plant-based oils, nuts, seeds, fruits, and vegetables.** • Wheat germ oil. • Sunflower, safflower, and soybean oil. • Sunflower seeds. • Almonds. • Peanuts, peanut butter. • Beet greens, collard greens, spinach. • Pumpkin. • Red bell pepper.

VITAMINS	VITAMIN B_9	VITAMIN B_{12}
OTHER NAMES	Folic acid	Cobalamin
ACTIVE FORM	Tetrahydro-folic acid	Methylcobalamin Deoxyadenosyl Cobalamin
FUNCTION	Transfer one-carbon units; synthesis of methionine, serine, purine nucleotides and thymidine monophosphate	Coenzyme for reactions: Homocysteine→ methionine Methionine CoA→ succinyl CoA
DEFICIENCY	Megaloblastic anemia Neural tube defects	Pernicious/ Megaloblastic anemia Dementia Spinal degeneration
SIGNS AND SYMPTOMS	Anemia, Birth defects	Megaloblastic anemia Neuropsychiatric symptoms
TOXICITY	None	None
NOTES	Administration of high levels of folate can mask vitamin B12 deficiency Good sources of folate include: • Dark green leafy vegetables (turnip greens, spinach, romaine lettuce, asparagus, Brussels sprouts, broccoli) • Beans • Peanuts • Sunflower seeds	Pernicious anemia is treated with intramuscular/intravenous(mostly) or high-dose oral vitamin B12 The foods containing vitamin B12 are primarily animal meat, fish, eggs, and dairy. Vegetarians, people who are pregnant or nursing, and others who are at risk of deficiency may need to take supplements. The most common treatment for pernicious anemia is lifelong vitamin B12 injections, but small amounts of

SIGNS AND SYMPTOMS	Peripheral neuropathy (dry foam), edema and cardiomyopathy (wet foam), confusion, ataxia, memory loss, hallucination, dysregulated eye moments	Dermatitis Diarrhea Dementia
TOXICITY	None	None
NOTES	Thiamin is found naturally in meats, fish, and whole grains. It is also added to breads, cereals, and baby formulas. • Fortified breakfast cereals • Pork • Fish • Beans, lentils • Green peas • Enriched cereals, breads, noodles, rice • Sunflower seeds • Yogurt ***RDA:*** The Recommended Dietary Allowance (RDA) for men ages 19 and older is 1.2 mg daily, and for women in the same age range 1.1 mg daily. For pregnancy and lactation, the amount increases to 1.4 mg daily.	High doses of niacin used to treat hyperlipidemia A niacin deficiency is rare because it is found in many foods, both from animals and plants. • Red meat: beef, beef liver, pork • Poultry • Fish • Brown rice • Fortified cereals and breads • Nuts, seeds • Legumes • Bananas Niacin is available as a supplement in the form of nicotinic acid or nicotinamide. Sometimes the amounts in supplements are far beyond the RDA, causing unpleasant side effects of flushing. ***RDA:*** Niacin is measured in milligrams (mg) of niacin equivalents (NE). One NE equals 1 milligram of niacin or 60 mg of tryptophan. The Recommended Dietary Allowance (RDA) for adults 19+ years is 16 mg NE for men, 14 mg NE for women, 18 mg NE for pregnant women, and 17 mg NE for lactating women.

VITAMINS	VITAMIN B_2	VITAMIN B_7	VITAMIN B_5
OTHER NAMES	Riboflavin	Biotin	Pantothenic acid
ACTIVE FORM	FMN, FAD	Enzyme-bound biotin	Coenzyme A
FUNCTION	Electron transfer	Carboxylation reactions	Acyl carrier
DEFICIENCY	Rare	Rare	Rare
SIGNS AND SYMPTOMS	Dermatitis Angular stomatitis	Dermatitis	Vitamin B5 deficiency is rare, but may include symptoms such as fatigue, insomnia, depression, irritability, vomiting, stomach pains, burning feet, and upper respiratory infections.
TOXICITY	None	None	None
NOTES	Riboflavin is found mostly in meat and fortified foods but also in some nuts and green vegetables. • Dairy milk • Yogurt • Cheese • Eggs • Lean beef and pork • Organ meats (beef liver) • Chicken breast • Salmon • Fortified cereal and bread • Almonds • Spinach ***RDA:*** The Recommended Dietary Allowance	Food Sources • Beef liver • Eggs (cooked) • Salmon • Avocados • Pork • Sweet potato • Nuts, seeds RDA (Recommended Dietary Allowance) does not exist for biotin because there is not enough evidence to suggest a daily amount needed by most healthy people. Instead, there is an AI (Adequate Intake) level, which is assumed to	Pantothenic acid is found in almost all plant and animal foods to some degree, because the vitamin is found in all living cells. The best sources are beef, chicken, organ meats, fortified cereals, and some vegetables. • Fortified cereals • Organ meats (liver, kidney) • Beef • Chicken breast • Mushrooms • Avocados • Nuts, seeds • Dairy milk • Yogurt

	(RDA) for men and women ages 19+ years is 1.3 mg and 1.1 mg daily, respectively. For pregnancy and lactation, the amount increases to 1.4 mg and 1.6 mg daily, respectively.	ensure nutritional adequacy. ***AI:*** The AI for biotin for men and women 19 years and older and for pregnant women is 30 micrograms daily. Lactating women need 35 micrograms daily.	• Potatoes • Eggs • Brown rice • Oats • Broccoli ***RDA:*** The Recommended Dietary Allowance (RDA) for men and women ages 19+ years is 5 mg daily. For pregnancy and lactation, the amount increases to 6 mg and 7 mg daily, respectively.

Bariatric Surgery/Metabolic Surgery;

Definition;

The phrases 'metabolic' or 'diabetes' surgery are increasingly being used in conjunction with, or instead of, 'bariatric surgery' owing to the highly effective way that surgery improves the metabolic syndrome, with weight loss being a welcome additional effect. Type 2 diabetes is part of the 'metabolic syndrome', which includes high blood pressure, dyslipidemia and polycystic ovary syndrome.

Summary of updates to National Institute for Health and Care Excellence (NICE) guidance on bariatric surgery, 2014 (CG189).
Bariatric surgery is a treatment option for anyone with BMI ≥40 kg/m^2
Offer an expedited assessment for people with BMI ≥35 kg/m^2 with onset of type 2 diabetes in past 10 years
Consider an assessment for people with BMI of 30–34.9 kg/m^2 with onset of type 2 diabetes within 10 years
Consider an assessment for people of Asian origin with onset of type 2 diabetes at a lower BMI than other populations
Bariatric surgery is the option of choice for adults with BMI >50 kg/m^2 when other interventions have not been effective
People fitting the above criteria are also required to be receiving or to receive assessment in a specialist weight management service before referral to a surgical team

Different Laparoscopic Bariatric Procedures are;

- *Sleeve gastrectomy*
- *Roux-en-Y gastric bypass*
- *Gastric banding*
- *Biliopancreatic diversion/duodenal switch*
- *Single-anastomosis duodenoileal bypass with sleeve gastrectomy*
- *One-anastomosis gastric bypass*

Estimated early surgical complication rates, operative mortality after sleeve gastrectomy, Roux-en-Y or one- anastomosis gastric bypass, and gastric banding, and late complications.			
	Early	**Mortality**	**Late**
Sleeve gastrectomy	Leak at angle of His (1–2%)	0.1%	Gastro-esophageal reflux
	Intra-abdominal bleed (2–3%)		Barrett's esophagus
	DVT/PE (<1%)		Weight regain
Gastric bypass	Anastomotic leak (<1%)	0.1%	Internal hernia
	Intra-abdominal bleed (2–3%)		Chronic abdominal pain
	Unspecified obstruction (1–2%)		Malnutrition if long limb bypass
	DVT/PE (<1%)		Anastomotic ulcer/stricture
			Weight regain
Gastric band	Access port infection (1%)	0.05–0.1%	Band infection ✓
	DVT/PE (<0.1%)		Tubing leak ✓
			Slippage ✓
			Erosion into stomach ✓
			Band intolerance ✓
			Failure to lose weight/weight regain

Summary of British Obesity and Metabolic Surgery Society (BOMSS) biochemical guidance after bariatric surgery.
Blood tests all patients should have at baseline
Full blood count, including hemoglobin, ferritin, folate and vitamin B12 levels, urea and electrolytes, liver function tests, vitamin D, Ca^{2+}, parathormone, HbA1c, lipid profile
Postoperatively
After gastric banding: Annual full blood count, urea and electrolytes, HbA1c, fasting glucose, lipids as appropriate ***After sleeve gastrectomy, forms of gastric bypass, BPD/DS, SADI-S:*** As for banding + liver function tests, ferritin, folate, vitamin D, Ca^{2+}, parathormone at 3, 6, 12 months then annually; vitamin B12 at 6, 12 months then annually; zinc, copper annually; vitamins A, E, K, selenium if concern (e.g. steatorrhoea, night blindness, unexplained fatigue, anaemia, metabolic bone disease, chronic diarrhea, heart failure)

Malabsorption, percent excess weight loss (% EWL) [a] and diabetes remission after bariatric surgery.

	Protein/Calorie Malabsorption	**3-Year % EWL**	**3-Year % Diabetes remission**
Sleeve Gastrectomy	No	50-60%	50%
Gastric bypass	No	50-60%	50%
OAGB	Yes	60-80%	80%
Gastric band	No	40- 50%	20%
BPD/DS, SADI-S	Yes	70-80%	80%

BPD, biliopancreatic diversion; DS, duodenal switch; OAGB, one-anastomosis gastric bypass; SADI-S, single-anastomosis duodenoileal bypass with sleeve gastrectomy.

[a] %EWL refers to the excess weight lost above a notional upper normal body mass index of 25 kg/m^2. Per cent weight loss is another way of measuring weight change, preferred by physicians.

Definitions of overweight and obesity.[a,b]
Adult weight status BMI (kg/m^2)
Normal 18.5–24.9
Overweight 25.0–29.9
Class 1 obesity 30.0–34.9
Class 2 obesity 35.0–39.9
Class 3 obesity ≥40.0

Body mass index (BMI) = weight (kg)/height (m) ^{2}

[a]Obesity for children is defined as BMI at or above the 95th centile. B' Super obesity' is a term commonly used to describe BMI

≥49.9 kg/m^2

Conditions that are associated with severe and complex obesity.
Type 2 diabetes Hypertension Dyslipidemia Obstructive sleep apnea Arthritis and functional impairment Gastro-esophageal reflux disease Non-alcoholic fatty liver disease/non-alcoholic steatohepatosis Polycystic ovary syndrome Clinical depression Various cancers, in particular endometrial cancer

Nutrition in Surgical Patients

Optimal nutritional status, both pre- and postoperatively, is a key factor in reducing perioperative complications and improving surgical outcomes. However, the pathologies

requiring surgical intervention often contribute to malnutrition, and a lack of appreciation of preoperative nutritional status can unnecessarily increase the risk of the operation and compromise recovery from surgery

NUTRITIONAL ASSESSMENT

The nutritional status of an individual can be assessed by the ABCD of anthropometry, biochemistry, clinical evaluation and dietary assessment.

Types of Nutrients:

A) Macro Nutrients
B) Micro Nutrients

A) Macro Nutrients

Carbohydrate

Glucose is the main substrate for the central nervous system and certain haematopoietic cells, which require the equivalent of 2 g/kg of glucose per day. Dietary guidelines therefore recommend that carbohydrates form 45–65% of the total caloric intake per day.

Protein

In the ill patient population, daily nitrogen requirements increase from approximately 0.15 g/kg per day to 0.25 g/kg per day. This is equivalent to a daily protein intake of 1.5 g/kg ideal body weight or around 20% of total energy requirements, in order to reduce nitrogen losses at times of illness.

Fat

Dietary fat consists of triglycerides of saturated and unsaturated fatty acids. Of these, the unsaturated fatty acids linoleic acid and linolenic acid are particularly notable, as they cannot be synthesised *in vivo* from non-dietary sources and are therefore considered essential fatty acids. Emulsions of long-chain triglycerides are now routinely used in parenteral nutrition, in which a mixture of glucose (a minimum of 100–200 g per day) and fat (100–200 g per week) is delivered. The combination of fat and glucose delivery minimises metabolic complications associated with parenteral nutrition, improves substrate utilisation and reduces fluid retention and carbon dioxide production.

B) Micro Nutrients

Vitamins, minerals and trace elements

Vitamins B and C are important in optimising recovery from illness, in particular for collagen formation and wound healing. Vitamin C requirement in the postoperative period increases to 60–80 mg per day. It is important to consider the need for supplemental vitamin B12, especially in patients who have undergone gastric surgery and in those with a history of alcohol dependence. Surgical procedures or medical conditions associated with a reduction in pancreatic or biliary enzymes in the intestinal tract (e.g. obstruction of the biliary or pancreatic ducts) will result in malabsorption of the fat-soluble vitamins A, D, E and K. Increased intestinal losses such as in chronic diarrhoea can cause hypernatremia, hypokalaemia and hypophosphatemia, which will all need monitoring and replacement. Trace elements such as magnesium, zinc and iron are important cofactors in metabolic processes and may be reduced as part of the

inflammatory response. Replacement of these elements is necessary to ensure appropriate utilisation of amino acids and avoidance of refeeding syndrome.

REFEEDING SYNDROME.

One of the most significant metabolic complications of both parenteral and enteral feeding is refeeding syndrome. This occurs in the first days after feeding is commenced in patients who have been severely malnourished.

The main underlying pathological process is one of hypophosphatemia, resulting in fluid and electrolyte shifts between the intra- and extracellular compartments. Patients may develop arrhythmias, muscle weakness, respiratory or cardiac failure, oedema, lethargy or seizures; at its most severe the syndrome can be fatal. Laboratory tests will reveal low levels of phosphate, potassium, calcium and magnesium and a lactic acidosis. Nutritional support in this group of patients should be started at a maximum of 10 kcal/kg per day, aiming to increase levels slowly to meet full needs by 4–7 days. Frequent monitoring and replacement of the electrolytes listed above is essential. Nutritional support should include supplementary thiamine, vitamin B, multivitamins and trace elements.

Determine Nutrition Requirement

(25*70)

STEP 1: DETERMINE THE ENERGY REQUIREMENT (For 70 kg patient).

- In a healthy adult: 25-30 Kcal/kg/day. For 70 kg the calorie requirement will be 25x70=2000 Kcal (approx.). 70% of calories should come from carbohydrates, and 30% from fats. (Maximum from fat is up to 60%)

STEP 2: DETERMINE THE PROTEIN REQUIREMENT (For 70 kg patient).

- Nitrogen requirement is 01 grams for 150 calories. Therefore, for 1500 calories the requirement of Nitrogen will be 1500 divided by 150 = 10 grams.
- The daily requirement of protein is 0.2 grams/kg/day. For 70 kg man it will be 0.2 ×70=14grams

STEP 3: DETERMINE THE FLUID REQUIREMENT

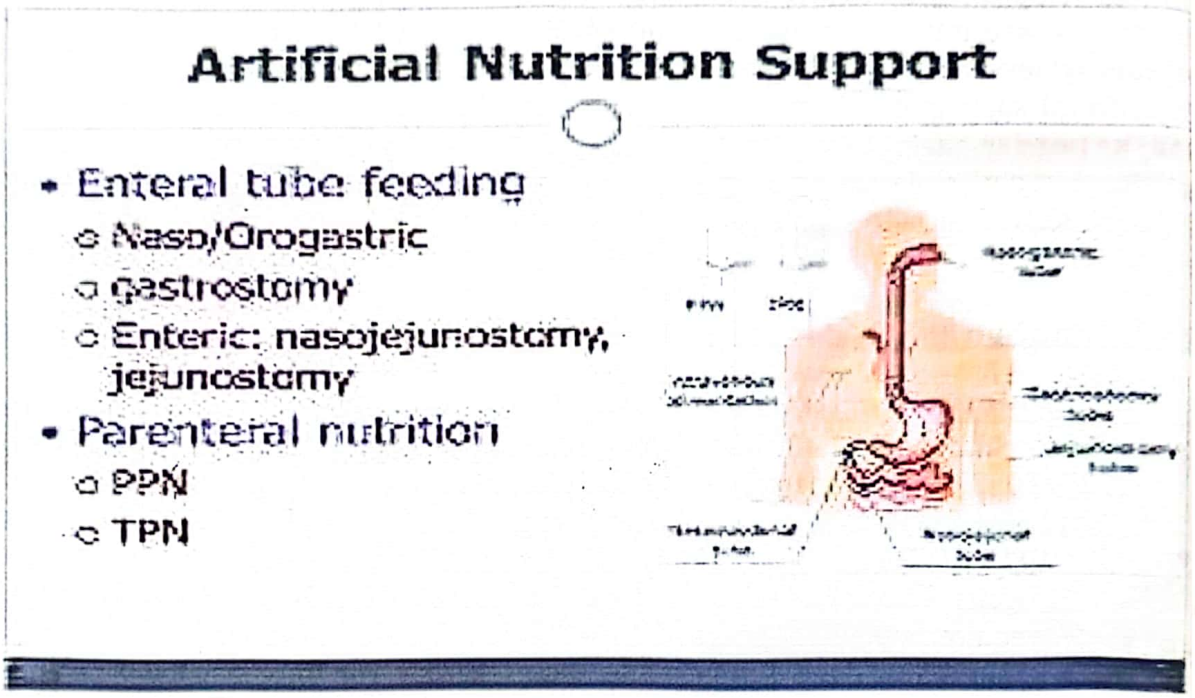
- 30ml/kg/day of maintenance fluids plus fluid replacement for output and insensible losses approx. therefore the fluid requirement will be 30 x 60 = 1800 ml. Add 500 ml of insensible loss. A 2500 ml of fluid will be sufficient in 24 hours.

STEP 4: DETERMINE ELECTROLYTE REQUIREMENTS (For 70 kg patient)

- l Na: 1-2 mmol/kg/day = 70 mmol/day

Artificial Nutritional Support

Given the importance of adequate nutrition in recovery from illness and surgery, consideration for artificial nutritional support should be given in any patient who has had inadequate nutritional intake for 5 days or more.
Two Routes are used;
A) Enteral (Gastrointestinal Route)
B) Parenteral (Central venous or peripheral venous Route



Enteral nutrition

Enteral nutrition (the delivery of nutrients into the gastrointestinal tract) should always be the preferred route of administration of nutrition where possible. Benefits of enteral nutrition include preservation of the gut mucosal barrier and immunity and prevention of gut atrophy. The use of enteral nutrition is also associated with reduced infection rates, better wound healing and a reduced length of stay compared with parenteral nutrition. Supplementary enteral nutrition can be in the form of oral supplements as well as via tube-feeding techniques such as feeding gastrostomies or jejunostomies and nasogastric or nasojejunal tubes.

Parenteral nutrition

Nutrition may need to be delivered intravenously in patients in whom adequate feeding through the alimentary tract is not possible. This can be either in addition to enteral feeding (supplemental parenteral nutrition) or the sole source of nutrition (TPN). TPN is indicated in patients who are unable to meet their nutritional requirements via absorption of nutrients from their intestinal tract. The commonest cause for this is in

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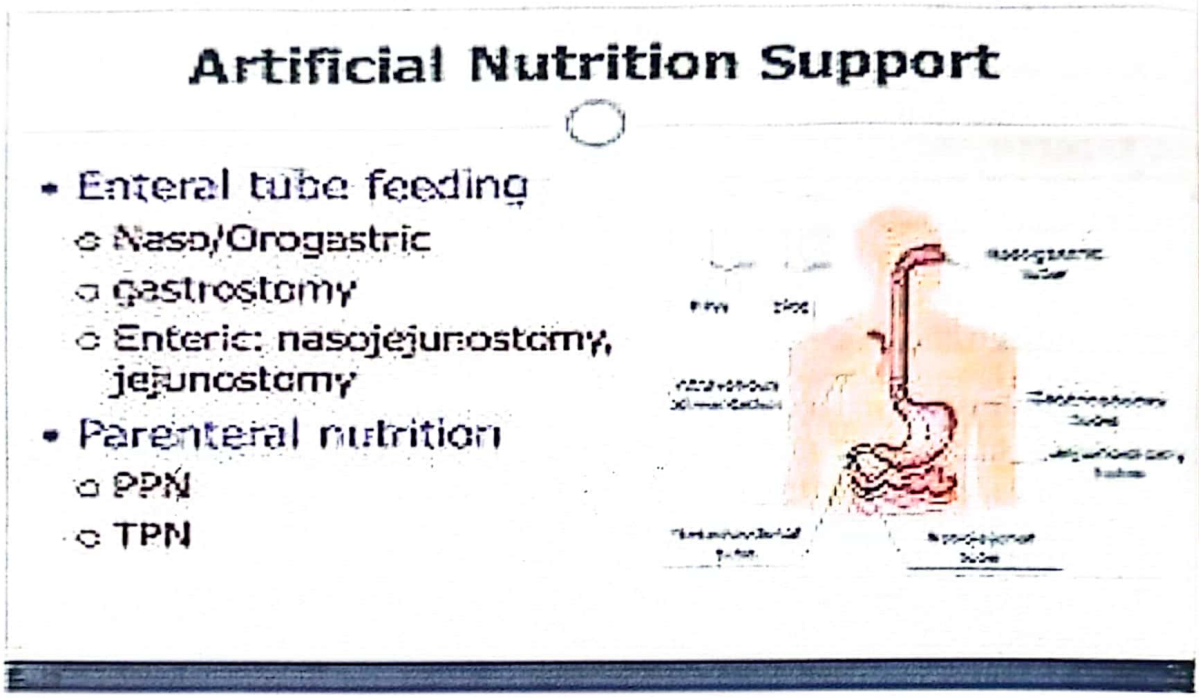

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patients with short bowel syndrome related to massive intestinal resection or a significant reduction in functional small bowel, often related to intestinal fistulation. In some cases the establishment of TPN is a temporary endeavour for a few days to minimise nutritional depletion until a route of enteral nutrition is established, e.g. awaiting the siting of a nasojejunal tube in patients with delayed gastric emptying.

Parenteral nutrition formulations have evolved over the years, but are currently commonly provided by the hospital pharmacy in the form of a 3-litre bag containing a lipid emulsion with a mixture of essential and non-essential amino acids, glucose, electrolytes, trace elements and vitamins.

ENTERAL COMPLICATIONS:

Tube related

- Malposition
- Displacement
- Blockage
- Breakage/leakage
- Local complications (e.g. erosion of skin/mucosa)

Gastrointestinal

- Diarrhoea
- Bloating, nausea, vomiting
- Abdominal cramps
- Aspiration
- Constipation

Metabolic/biochemical

- Electrolyte disorders, including refeeding syndrome
- Vitamin, mineral, trace element deficiencies
- Drug interactions

PARENTERAL COMPLICATIONS:

Insertion complications

- Pneumothorax
- Misplacement

Line complications

- Sepsis
- Thrombosis

Metabolic complications

- Electrolyte disorders, including refeeding syndrome (Hypoglycaemia most common)
- Blood sugar derangement
- Liver dysfunction
- Metabolic bone disease
- Vitamin deficiencies

Multiple Choice Questions (MCQs)

MCQ#1:
A 67-year-old woman complains of paresthesias in the limbs. Examination shows loss of vibratory sense, positional sense, and sense of light touch in the lower limbs. She is found to have pernicious anemia. Endoscopy reveals an ulcer in the body of the stomach. What does she most likely have?

(A) Excess of vitamin B_{12}
(B) Deficiency of vitamin K
(C) Cancer of the stomach
(D) Gastric sarcoma
(E) Esophageal varices
KEY C

Explanation;

Patients with pernicious anemia have achlorhydria and an increased risk (about 5%) of developing gastric carcinoma. There is a deficiency in vitamin B_{12} that leads to Megaloblastic anemia and neurologic involvement (sub-acute degeneration of the dorsal and lateral spinal columns).

MCQ#2:
A morbidly obese patient is told that he qualifies for bariatric surgery. He is given several options. He chooses to undergo a gastric bypass procedure (GBP). Which of the following is TRUE?
(A) Malabsorptive jejunoitial bypass is a more effective operation with less complications.
(B) Vertical banded gastroplasty is technically easier and more effective than gastric bypass surgery.
(C) Patients lose up to two-thirds of their excess weight.
(D) Gastrojejunal leakage rate is in excess of 20%.
(E) The gastric pouch capacity should be 100cc.
KEY C
Explanation;
There are multiple morbid obesity operations. Jejunoileal bypass has a higher incidence of both early and late complications. Gastric restrictive procedures (e.g., vertical banded gastroplasty) are generally less effective than GBP. GBP patients can be expected to lose up to two-thirds of their weight initially. The gastric pouch capacity should be no larger than 30cc. Anastomotic leak rate should be less than 5%.

MCQ#3:

TPN is initiated in a 44-year-old woman with Crohn's disease. In parenteral alimentation, carbohydrates should be provided in an optimal ratio of which of the following?
(A) 1 kcal/g nitrogen
(B) 5 kcal/g nitrogen
(C) 10 kcal/g nitrogen
(D) 100 kcal/g nitrogen
(E) 1000 kcal/g nitrogen

KEY D

Explanation; **The** baseline protein requirements are calculated as 1 g/kg/d. Following stress, there is an increased protein requirement, and protein intake should be 1.5 g/kg/d after surgery, 2 g/kg/d after polytrauma, and after sepsis. Glucose and amino acids must be infused simultaneously to appropriately utilize nitrogen. The ideal ratio is 100 non-protein kcal/g of nitrogen. In starvation, the non-protein calorie- to-nitrogen ratio of 150 kcal/g is adequate.

MCQ#4:
A 24-year-old man with multiple injuries is receiving standard TPN. The following is true regarding glutamine.
(A) It is a major fuel for the brain.
(B) It is an essential amino acid.
(C) It is a major fuel for the gut.
(D) It is synthesized de novo in the kidney.
(E) It is a component of TPN solutions.
KEY C
Explanation:
It is a major fuel for the gut. It is readily synthesized de novo in skeletal muscle, lung, and liver. Glutamine is a nonessential amino acid. It is not a component of presently available TPN solutions because of its lack of stability. Glutamine is a major fuel for the small intestinal mucosa and other replicating cells such as lymphocytes, macrophages, fibroblasts, and endothelial cells. Glucose is the primary source of fuel for the brain.

MCQ#5:

A 50-year-old man with small-bowel fistula has been receiving TPN for the previous 3 weeks through a single-lumen central venous catheter. He is scheduled for exploratory laparotomy and closure of fistula. On the morning of the day of surgery, TPN is discontinued and intra- venous infusion with balanced salt solution (Ringer's lactate) is started. An hour later, the patient is found to be anxious, sweating, and tachycardic. What is the most likely cause?
(A) Anxiety

(B) Hypoglycemia
(C) Hypovolemia
(D) Unexplained hemorrhage
(E) Hyperglycemia
KEY B
Explanation;
Patients on TPN with hypertonic glucose solutions have elevated islet-cell production of insulin. Sudden cessation of TPN can lead to rebound hypoglycemia, because pancreatic islet-cell insulin secretion is not immediately down regulated. Symptoms are attributable to high catecholamine release secondary to hypoglycemia. In general, the TPN rate should be reduced to 50 mL/h during surgery. This pre- vents both hypoglycemia and the hyperglycemia seen with higher infusion rates. Weaning from TPN should be done gradually over 24–48 hours. In instances where TPN is discontinued suddenly, a solution of $D_{10}W$ should be administered in the interim. Remember daily caloric requirement for a malnourished patient is 35kcal/kg while for average normal adult it is 25kcal/kg.

MCQ#6:
A 63-year-old man undergoes a partial gastrectomy with Bill Roth II reconstruction for intractable peptic ulcer disease. He presents several months postoperatively with a Megaloblastic anemia. Which of the following is the best treatment for this surgical complication?
a. Transfusion with 1 unit of packed red blood cells
b. Oral iron supplementation
c. Oral vitamin B_{12} supplementation
d. Intravenous vitamin B_{12} (cyanocobalamin) supplementation
e. Oral folate supplementation
KEY: D
Explanation:
Either Megaloblastic anemia due to vitamin B_{12} deficiency (due to lack of intrinsic factor, which is necessary for B_{12} absorption and is normally produced by the parietal cells of the stomach) or microcytic anemia due to iron deficiency (due to decreased iron intake and impaired absorption in the duodenum) can result after partial gastrectomy. While folate deficiency can also cause Megaloblastic anemia, it is rare after partial gastrectomy. Oral B_{12} is not a reliable method for correcting B_{12} deficiency; intravenous cyanocobalamin should be administered every 3 to 4 months for life. Other complications of partial gastrectomy includes osteoporosis secondary to impaired calcium absorption due to the Bill Roth II reconstruction (since calcium is normally absorbed in the proximal intestine—duodenum and jejunum). Also, fatty acids may also be malabsorbed due to inadequate mixing of bile salts and lipase with ingested fat, and therefore steatorrhoea may result.

MODULE- B (NEUROSURGERY PORTION)

Learning Objectives:

By the End of this module/chapter, Students of Final year MBBS/3rd year BDS should be able to explain intracranial Space occupying lesion which may be benign, malignant and infectious. They should be able to describe Syringomyelia and can understand about head injury and its management.

Intracranial Space Occupying Lesions;

A) Brain Tumors Which may be Benign or Malignant, They are;

Germ cell tumour

Metastasis + lymphoma

Pituitary tumours

Tumour-like malformations which includes Craniopharyngioma, colloid cyst, Dermoid/epidermoid

Neuroepithelia which includes, Pineal tumor, Gliomas and neuronal tumors and Medulloblastoma

Extra-axial which includes, Meningioma and vestibular schwannoma

Gliomas which includes, Oligodendrogliomas, Astrocytomas, Ependymoma and choroid plexus tumours

Brain tumors in children

Brain tumours are the most common solid tumours in children but are nonetheless seen only infrequently outside specialist units. They typically present with developmental regression and enlarging head circumference in the youngest, with head- ache, seizure and focal deficits prominent in older children.

Posterior fossa tumours are relatively more common in children, in particular:

- ✓ Medulloblastoma;
- ✓ Ependymoma;
- ✓ Pilocytic Astrocytoma.
- ✓ Treatment will typically combine surgical resection or biopsy, CSF diversion, chemotherapy and/or radiotherapy.

B) Infectious Intracranial Space Occupying Lesions are;

1) Meningitis ;

- ✓ A feared complication of neurosurgery and of head injury
- ✓ CT head allows exclusion of raised ICP prior to lumbar puncture
- ✓ CSF should be sent for microscopy and culture, and for assay of protein and glucose levels
- ✓ Treatment, pending identification of an organism, is with broad -spectrum antibiotics, including anaerobic cover

2) Brain abscesses;
   - ✓ Presenting features are those of infection and intracranial mass lesion
   - ✓ Imaging reveals a 'ring-enhancing lesion', with tumour usually the main differential
   - ✓ Early diagnosis, usually followed by drainage, is key for good outcome

3) Subdural empyema ;
   - ✓ Presenting features are similar to those of meningitis or cerebral abscess
   - ✓ Typically a crescentic collection with a contrast-enhancing rim is evident on CT
   - ✓ Drainage is the mainstay of treatment

4) Tuberculosis ;

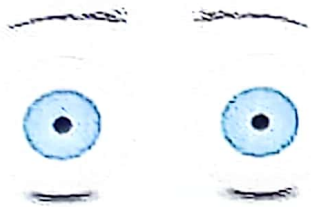
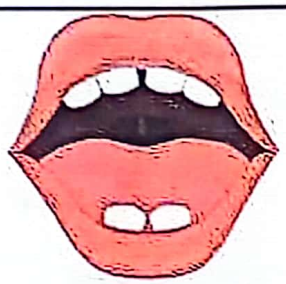
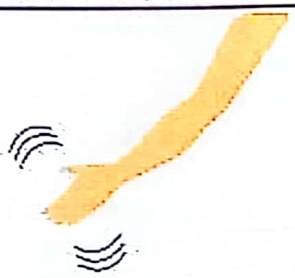
Tuberculosis (TB) infection of the central nervous system (CNS) represents haematogenous spread from primary pulmonary foci. A high index of suspicion is required, especially when population or individual risk factors are present. TB can result in a diverse but overlapping spectrum of pathology, including in the head:

- ✓ Tuberculous meningitis
- ✓ Tuberculoma
- ✓ Tuberculous abscess
- ✓ Miliary tuberculosis

Where the meninges are involved, lymphocytes can be expected to predominate in the CSF, rather than the poly- morphs seen with other bacterial meningitides. The increase in protein content and reduction in glucose concentration are also less marked. Ziehl–Neelsen staining for mycobacteria is frequently negative, and polymerase chain reaction (PCR) testing offers relatively rapid diagnosis compared with culture for acid-fast bacilli, which may take weeks. A 20- to 30-mL CSF sample allows spinning to increase the culture yield.

Management is with anti-tuberculous therapy; hydrocephalus may require shunt insertion.

HEAD INJURY AND UNCONSCIOUS PATIENT (GCS- GLASGOW COMA SCALE)

Behaviour	Response
 Eye Opening Response	4. Spontaneously 3. To speech 2. To pain 1. No response
 Verbal Response	5. Oriented to time, person and place 4. Confused 3. Inappropriate words 2. Incomprehensible sounds 1. No response
 Motor Response	6. Obeys command 5. Moves to localised pain 4. Flex to withdraw from pain 3. Abnormal flexion 2. Abnormal extension 1. No response

Rule out the cause by history

History:

- Bystanders and paramedics may give vital information on the:
- Preinjury state (fits, alcohol, chest pain)
- Mechanism and energy involved in the injury (speed of vehicles, height fallen)
- Conscious state and hemodynamic stability of the patient after the accident
- Length of time taken for extrication
- Check the medication history, especially anticoagulants and
- Antiplatelet agent

Investigations and Treatment

- X-ray Skull
- CT brain
- Causes; extradural, subdural hematoma, subarachnoid hemorrhage etc.
- Treatment; Follow ABCDE according to ATLS Protocols
- Find out the cause and treat it accordingly
- Control of raised intracranial pressure.

Multiple Choice Questions (MCQs)

MCQ#1:
A 28-year-old man is brought to the ER for a severe head injury after a fall. He was intubated in the field for his decreased level of consciousness. He is tachycardic and hypotensive. On examination, he is noted to have an obvious skull fracture and his right pupil is dilated. Which of the following is the most appropriate method for initially reducing his intracranial pressure?

- a. Elevation of the head of the bed
  b. Saline-furosemide (Lasix) infusion
  c. Mannitol infusion
  d. Intravenous dexamethasone (Decadron)
- e. Hyperventilation

Key E, ABCDE PROTOCOL (Hyperventilation)
Explanation;

Emergency measures to reduce intracranial pressure include hyperventilation, Mannitol infusion, and elevation of the head of the bed (reverse Trendelenburg position). However, in the face of inadequate volume resuscitation, osmotic diuresis with Mannitol and placement of the patient in reverse Trendelenburg may exacerbate the patient's hypotension. CT scanning should be performed as soon as possible along with neurosurgical evaluation in order to determine the need for operative drainage or decompression.

Extradural hemorrhage

- Can follow relatively minor trauma with brief loss of consciousness
- Followed by a lucid interval and then sudden deterioration
- Lentiform lesion on CT
- Require immediate transfer to a neurosurgical unit for decision on evacuation

Acute subdural hemorrhage

- High-energy injuries, or elderly/anticoagulated
- Generally require urgent evacuation by craniotomy/ Craniectomy

Chronic subdural hemorrhage

- Common in the elderly, especially those on anticoagulants
- Clinical deficits result from osmotic expansion of a degrading Clot over days/weeks
- Diffuse hypo dense lesion on CT
- Burr hole drainage is usually preferred

Specific injuries

- Traumatic versus primary subarachnoid hemorrhage is an important distinction
- Cerebral contusions arise adjacent to rough bone surfaces
- Diffuse axonal injury results from extreme accelerations of the Skull contents
- Arterial dissection is associated with fractures of the skull base
  After Head Injury or any Trauma Follow ATLS protocols of ABCDE or if external bleeding then cABCDE, small c stands for control of bleeding 1st then Airway, Breathing, Circulation, check for any Deformity and full Exposure of the patient in Primary and Secondary Survey.

Primary survey

- ✓ Ensure adequate oxygenation and circulation
- ✓ Exclude hypoglycemia
- ✓ Check pupil size and response and GCS score as soon as possible
- ✓ Check for focal neurological deficits before intubation if possible

Secondary survey

- Battle's sign, periorbital bruising and blood in the ears/nose/ mouth may point to a base of skull fracture
- Cervical spine fractures are common and must be actively excluded
- Log-roll to check the whole spine for steps and tenderness and for a per rectum examination

Traumatic subarachnoid hemorrhage

Trauma is the commonest cause of subarachnoid hemorrhage and this is managed conservatively. It is not usually associated with significant vasospasm, which characterizes aneurysmal subarachnoid hemorrhage. The possibility of spontaneous subarachnoid hemorrhage actually leading to collapse and so causing a head injury needs to be borne in mind, and formal or CT angiography may be required to exclude this.

All these Intracranial Space Occupying Lesions causes Raised Intracranial pressure and sometime Hydrocephalus.

Raised ICP (Intracranial Pressure)

Acutely raised ICP is a neurosurgical emergency. Clinical features include:

- ✓ Headache
- ✓ Nausea and vomiting
- ✓ Diplopia and blurred vision
- ✓ Drowsiness then coma

★ Hydrocephalus

The total volume of CSF is normally about 150 mL Production from the walls of the ventricles and the choroid plexus is about 20 mL/h. Hydrocephalus refers to an increase in CSF volume with ventricular enlargement, often presenting symptoms of raised ICP.

Etiology of hydrocephalus.	
Obstructive hydrocephalus	• ● Lesions within the ventricle • ● Lesions in the ventricular wall • ● Lesions distant from the ventricle but with a mass effect
Communicating hydrocephalus	• ● Post hemorrhagic • ● CSF infection • ● Raised CSF protein
Excessive CSF Production (rare).	Choroid plexus papilloma/carcinoma

Hydrocephalus and disorders of CSF flow

- ✓ Obstructive or communicating hydrocephalus may occur as a result of neurosurgical pathology or its treatment
- ✓ CT is the first line of investigation. Lumbar puncture can confirm raised CSF pressure in communicating hydrocephalus and relieve it temporarily, but is dangerous in obstructive hydrocephalus
- ✓ Normal pressure hydrocephalus is a potentially reversible cause of dementia, presenting with gait disturbance, incontinence and cognitive decline
- ✓ IIH causes headaches and even visual loss in young people; it can be managed with weight loss, acetazolamide, serial lumbar puncture and CSF diversion as a last resort

Treating hydrocephalus

- ✓ Temporary CSF diversion can be achieved with an EVD
- ✓ In the long term a shunt, usually connecting the lateral ventricles with the peritoneal cavity in the abdomen (ventriculoperitoneal shunt), is the mainstay of management
- ✓ Shunt blockage and infection are common complications
- ✓ In certain cases, obstructive hydrocephalus can be managed by endoscopic third ventriculostomy

Syringomyelia;

Patients may present with sensory disturbance, weakness of the hands, loss of pain and temperature sensation, asymmetrical abdominal reflexes or progressive kyphoscoliosis. It is associated with Arnold–Chiari malformation and spinal cord tumours. Where syringomyelia is associated with an Arnold–Chiari malformation and scoliosis, a posterior cranial fossa decompression should be carried out first to resolve the syringomyelia. The scoliosis may then be corrected at a later date

Multiple Choice Questions (MCQs)

MCQ#1:

A 63-year-old woman presents with a several- week history of headaches and difficulties with speech. A sister who lives with her claims that her language "has recently not been making much sense" and that she is a bit confused. Her condition seems to be deteriorating. On neurologic examination, she has a moderately severe aphasia, with difficulty understanding language and following commands, and she makes frequent paraphasic errors when she speaks. There are no other motor or sensory deficits. An MRI with intravenous contrast reveals the presence of a ring-enhancing mass lesion within the substance of the left temporal lobe. The lesion is approximately 3 cm in greatest diameter, poorly demarcated from the surrounding brain, and surrounded by a moderate amount of cerebral edema. Findings on routine admission tests, including a chest x-ray and serum chemistry, are unremarkable. What is the most likely diagnosis?

(A) Low-grade cerebral astrocytoma
(B) Glioblastoma multiform
(C) Metastasis to the brain from an occult primary cancer
(D) Meningioma
(E) Glomus tumor

Key B

Explanation;

Glioblastoma multiform is a highly malignant neoplasm, arising from glial cells or their precursors within the CNS. It is the most common of all primary malignancies of the CNS and its peak incidence is within the fifth to seventh decade of life. A low-grade astrocytoma is a tumor derived from glial cells of astrocytes.

MCQ#2:

A 17-year-old boy is brought to the emergency department after he was assaulted. Witnesses claim that he was hit on the head with a lead pipe, after which he was unconscious for several minutes. No seizure activity was witnessed. On arrival, he complains of a headache, particularly severe at the point where he was hit in the right fronto-parietal region. On examination, he is found to have swelling and ecchymosis over this region. He is awake, alert, and fully oriented. A complete neurologic examination reveals no deficit. Plain radiographs of the skull show a linear, non-depressed skull fracture in the fronto-parietal skull that crosses the groove of the medial meningeal artery. During the following hour, he becomes sleepier and begins to vomit. A repeat neurologic examination at that time reveals him to be lethargic but without weakness, numbness, paresthesia, or other focal deficit. What is the most likely cause of the neurologic deterioration?

A) Diffuse axonal injury (DAI)
B) Todd's phenomenon
C) Subdural hematoma
D) Epidural hematoma

E) Trigeminal ganglion hematoma
KEY D
Explanation;
This is the classic presentation of an acute epidural hematoma, transient traumatic loss of consciousness, followed by a lucid interval and then by neurologic deterioration. Epidural hematomas are frequently associated with linear skull fractures, which cause injury to the middle meningeal artery located immediately deep to the overlying fracture. They are more common in younger individuals, because in younger people, the dura mater is less firmly adherent to the inner table of the skull. Todd's phenomenon is a transient focal weakness or paralysis that results after a seizure. The particular pattern of weakness is often a clue to the site of the seizure focus within the brain.

MCQ#3:
Following a sudden impact in an accident, the 34-year-old race car driver becomes unconscious and is admitted to the hospital. A CT scan is performed, and a right space-occupying lesion is noted. What is the most likely diagnosis?
A) Corpus callosum injury
B) Pituitary apoplexia
C) Acute subdural hematoma
D) Acute epidural hematoma
E) Chronic subdural hematoma
KEY C
Explanation;

Acute subdural hematomas occur most commonly when violent accelerations or deceleration injuries of the head cause tearing of the bridging veins within the sub- dural potential space. They generally imply a much more severe injury to the brain itself than in the case of their epidural counterpart. For this reason, they are associated with cerebral contusions in over 30% of cases.

MCQ#4:
A 64-year-old woman complains of gait imbalance, headache and deterioration of mental status over the past several months. Her vision is normal. A CT scan reveals hydrocephalus, but the lumbar puncture pressure is unexpectedly low. What does she have?
A) Meningitis
B) Normal-pressure hydrocephalus
C) Sigmoid sinus thrombosis
D) *Echinococcus*
E) Glioblastoma multiform
KEY B

Explanation;
Normal-pressure hydrocephalus is a condition seen in the elderly in which there is symmetrical enlargement of the entire ventricular system. When patients with this condition are studied by lumbar puncture, it is found that despite ventriculomegaly, the ICP is abnormally low. This syndrome presents with a characteristic triad of symptoms—dementia, ataxia, and urinary incontinence

MCQ#5:
A 4-year-old boy is brought to the emergency department with the complaint of approximately 2 weeks of headache and vomiting. He was seen in the emergency department 1 week earlier with the same com- plaints. At that time, his parents were told that the probable cause was a gastrointestinal virus, and the boy was sent home. His symptoms have not improved. On general examination, the child appears somewhat dehydrated and has a dry mouth and sunken eyes. His examination findings are also remarkable for the presence of bilateral papilledema and marked nystagmus. An MRI with intravenous contrast is obtained that reveals the presence of a 2-cm mass in the posterior fossa. The mass is entirely within the fourth ventricle and appears to be arising from the vermis of the cerebellum. It enhances uniformly with contrast. The lateral and third ventricles are moderately dilated with hydrocephalus.
What is the most likely diagnosis?
A) Acoustic neuroma
B) Craniopharyngioma
C) Medulloblastoma
D) Brain metastasis
E) Polycystic cerebellar astrocytoma
KEY C
Explanation;

An astute neurologist once said that in neurologic diagnosis, as in real estate, location is everything. He alluded to the fact that in the diagnosis of neurologic ailments, one can often generate lists of possible diagnoses based solely on the location of the lesion in question. With unusual exceptions, each location within the CNS is likely to be associated with a certain type of neoplasm. The medulloblastoma (also called a primitive neuro-ectodermal tumor or PNET) is a highly aggressive and rapidly growing tumor that most often arises within the cerebellar vermis. It usually grows locally as a roughly spherical mass to bulge into and obliterate the adjacent fourth ventricle. Ependymoma or choroid plexus papilloma should also be considered in the differential diagnosis.

MCQ#6:
A severely traumatized woman is seen in the emergency room (ER) with decreased mental status. Prior to intubation, she does not open her eyes; withdraws with all of her extremities, and makes incomprehensible sounds. What is her Glasgow coma scale score?
a. 3
b. 4
c. 5

d. 6
e. 7
KEY E
Explanation;
The patient has a Glasgow coma scale (GCS) score of 7 prior to intubation (Eye opening = 1, Verbal = 2, Motor = 4). The Glasgow coma scale was developed to enable an initial assessment of the severity of head trauma. It is now also used to standardize serial neurologic examinations in the early post-injury period. It measures the level of consciousness using 3 parameters: verbal response (5 points), motor response (6 points), and eye opening (4 points); a "T" is used in lieu of a verbal score when the patient is intubated. The score is the sum of the highest number achieved in each category and ranges from 3 for a completely unresponsive patient to 15 for a fully oriented and alert patient. A score of 13 to 15 is considered a mild traumatic brain injury (TBI), 9 to 12 a moderate TBI, and 8 or less a severe TBI. The GCS score can be used to prognosticate outcome and likelihood of neurosurgical intervention.

MCQ#7:
A 45-year-old woman presents with left-sided weakness. A CT scan of the head demonstrates a well-circumscribed mass abutting the skull in the right hemisphere. Workup of the mass reveals a meningioma. Which of the following is the best next step in treatment?
a. Cerebral angiography with tumor embolization
b. Preoperative radiation therapy followed by surgical excision
c. Surgical excision
d. Chemotherapy with Adriamycin
e. Chemoradiation
KEY C
Explanation;
The primary treatment of meningioma is surgical excision with adjuvant radiation therapy if complete excision is not possible. Cerebral embolization has been used preoperatively to reduce blood loss and as a palliative option for patients who are poor surgical candidates, but is not a definitive therapeutic modality. Meningiomas are slow-growing, relatively benign tumors that arise from the arachnoid layer of the meninges. They occur predominantly in women, with a peak incidence at age of 45 years. They are treated primarily by surgical excision. Even after gross total resection, recurrence occurs in 11% to 15% of cases.

Module C. (Gastrointestinal Tract Diseases)

Learning Objectives;

By the end of this module/chapter, students of final year MBBS and 3rd year BDS should be able to explain dysphagia and its different causes, causes of acute and chronic abdomen, to describe acute appendicitis, acute cholecystitis, acute pancreatitis, Intestinal perforation, intestinal Obstruction, Ulcerative colitis, Crohn's disease, abdominal hernias ,Constipation, and colorectal Tumors.

Dysphagia / Esophageal Dysfunction

INTRODUCTION:

Dysphagia is defined as objective impairment or difficulty in swallowing, resulting in an abnormal delay in the transit of a liquid or solid bolus. The delay may be during the oropharyngeal or esophageal phase of swallowing.

CAUSES;

- ***A) BENIGN***
- **Primary** – achalasia, diffuse oesophageal spasm, nutcracker esophagus
- **Secondary** – GERD (most common), scleroderma, Zenker's Diverticulum, esophageal stricture etc.

B) MALIGNANT

- Squamous cell carcinoma
- Adenocarcinoma and
- mixed of both

Investigations;

- **Endoscopy** – Best initial test for **heartburn** (can visualize esophagitis, masses)
- **Foreign body** – Dx and Tx: endoscopy
- **Meat impaction** – Dx and Tx: endoscopy
- **Barium swallow** – best initial test for **dysphagia** or **odynophagia** (better at picking up masses
- **Perforation** – Dx: Gastrografin swallow

Achalasia;

1. Dysphagia (worse for liquids), regurgitation, weight loss, respiratory symptoms
2. Caused by lack of peristalsis and failure of LES to relax after food bolus
3. Secondary to destruction of inhibitory neuronal ganglion cells in muscle wall (autoimmune infectious, genetic)
4. Manometry – high/normal basal LES pressure, incomplete LES relaxation, and *poor* or *no* therapy with better long-term results compared to balloon dilatation)
5. Tx: laparoscopic Heller myotomy for good surgical candidates (considered definitive Myotomy of lower esophagus only (6 cm up esophagus, 2 cm onto stomach)
6. Also need partial Nissen fundoplication and complications can get esophageal CA late (squamous cell most common)

7. Balloon dilatation of LES → effective in 80% *however* high incidence of repeat procedures *Trypanosoma cruzi* can produce similar symptoms (Chagas' disease).

Gastroesophageal Reflux Disease (GERD);

- Normal anatomic protection from GERD – need LES competence (most common defect in GERD), normal esophageal body, normal gastric reservoir GERD caused by ↑ acid exposure to esophagus from loss of gastroesophageal barrier down, with tight clothing, or bending over
- **Symptoms:** heartburn (burning retrosternal chest pain) 30–60 minutes after meals; worse lying
- Dysphagia/odynophagia/weight loss/anemia – need to worry about esophageal tumors Make sure patient does not have another cause for pain (check for unusual symptoms): Can also have asthma symptoms (cough), choking, aspiration (Dx: upper endoscopy)
- Bloating – suggests aerophagia and delayed gastric emptying (Dx: gastric emptying
- study)
- Epigastric pain – suggests peptic ulcer, gastric tumor (Dx: upper endoscopy)
- • Weight loss, avoid instigating foods and elevate head of bed Most treated empirically with PPI (omeprazole, 99% effective) (usually start with EGD) If long-standing, consider upper endoscopy to check for Barrett's esophagus. motility disorder; resting LES < 6 mm Hg suggests GERD) Dx: 24-hour pH probe (*best test*), endoscopy, histology, Manometry
- **Surgical indications**: failure of medical Tx, avoidance of lifetime meds, young patients, refractory complications (e.g. bleeding, esophagitis, stricture, ulcer), respiratory symptoms (e.g. abdomen (restores normal GE junction; need **≥ 2 cm** of esophagus in abdomen), cough, asthma, aspiration, hoarseness, congestion)
- Treatment: **Nissen fundoplication** → divide **short gastrics**, mobilize and pull **esophagus** into **approximate crura** (permanent suture), 270- (partial) or 360-degree **gastric fundus** wrap (creates anti-reflux valve; completely mobilize fundus, **2 cm** floppy wrap over large bougie) Phrenoesophageal membrane is an extension of the **transversalis fascia.**
- Key manoeuvre for **dissection** is finding the **right crura.**
- Key manoeuvre for **wrap** is identification of the **left crura.**
- **Complications** – injury to spleen, diaphragm, esophagus, or capnothorax (CO_2 PTX)
- **Belsey** – approach is through the chest
- **Collis gastroplasty** – when not enough esophagus exists to pull down into abdomen, can staple along stomach cardia and create a "new" esophagus (neo-esophagus)
- Most common cause of dysphagia following Nissen – ***wrap is too tight*** (generally resolves Postop Tx: on its own; give clears for 1st week; can dilate after 1 week)

Barrett's Esophagus;

- **Squamous** changes to **columnar** epithelium (**metaplasia**; raised, pink lesion)
- Occurs with long-standing exposure to **gastric reflux** (is acquired)
- **Intestinal type** columnar metaplasia is the only type predisposed to esophageal CA.
- Pathology shows **goblet cells**.
- CA risk is increased 50 times compared to general population (adenocarcinoma; relative risk [RR] 50)
- **Barrett's** surveillance:
  - EGD **annually** for **2 years** (4 quadrant Bx's at 1-cm intervals for entire length of involved
  - Needs to be confirmed by **2 experienced pathologists**
  - If EGD **negative** for dysplasia for **2 years**, get EGD with biopsies **every 3 years**.
  - **Low-grade dysplasia** (LGD)
  - Segment and Biopsy of any suspicious areas)
  - If repeat biopsy again shows **LGD** – Tx: **endoscopic resection** *or* **continued annual**
  - **Repeat EGD** with Biopsies in 3–6 months.
  - Needs to be confirmed by **2 experienced pathologists**
  - **High-grade dysplasia** (HGD) – considered carcinoma in situ **surveillance**

Bx stands for Biopsy

- Needs to be confirmed by **2 experienced pathologists High-grade dysplasia** (HGD) – considered carcinoma in situ **surveillance**
- Tx: **endoscopic mucosal resection** (need mucosa and submucosa)
- Cell types other than Barrett's (e.g. squamous cell carcinoma in situ) – follow above as well Tx will decrease esophagitis and further metaplasia **Uncomplicated Barrett's** (i.e. no dysplasia) can be treated like GERD (i.e. PPI or Nissen) –
- Need EGD surveillance for lifetime, even after Nissen
- *Barrett's CA risk is not reversed with PPI or fundoplication.*

Esophageal Cancer;

- ✓ **Adenocarcinoma** – usually in **lower 1/3** of esophagus; **liver** metastases most common
- ✓ **Squamous cell carcinoma** – usually in **upper 2/3** of esophagus; **lung** metastases MC
- ✓ **Cervical esophageal CA** (for tumors up to **5 cm** below cricopharyngeus muscle) – all get definitive chemo-XRT (*not surgery*); consider surgery only for non-complete responders to **5 cm** below EGJ)
- ✓ **Nodal disease outside area of resection** (i.e. supraclavicular or celiac nodes – considered Most important prognostic factor in patient devoid of systemic metastases – **nodal spread Esophagogastric junction (EGJ) CA** – treated like thoracic **esophageal CA** (for tumors up **Thoracic esophageal CA** M1 disease) – contraindication to esophagectomy
- ✓ **High-grade dysplasia**, **carcinoma in situ**, and select **T1a tumors** (invades lamina propria or muscularis mucosa only, < 2 cm, well moderately differentiated, and no nodal metastases). Tx: **endoscopic resection**
- ✓ **T1b** (invades submucosa) or greater – **esophagectomy** if resectable
- ✓ **Neoadjuvant chemo-XRT** (**cisplatin** and **5FU** *or* **carboplatin** and **Taxol**)
- ✓ **Improves survival** for resectable tumors
- ✓ Can **downstage tumors** and make them **resectable**
- ✓ Indicated for ≥ **T2** (invades muscularis propria or more) or **positive periesophageal nodes**
- ✓ **Adjuvant chemo** also **improves survival.**
- ✓ Esophagectomy – 5% mortality from surgery; curative in 20%
- ✓ No difference in long-term survival between approaches
- ✓ Need 6–8 cm margins
- ✓ Right gastroepiploic artery – primary blood supply to stomach after replacing esophagus (have to divide left gastric and short gastrics)
- ✓ Transhiatal approach – abdominal and neck incisions; bluntly dissect intrathoracic esophagus
- ✓ Ivor Lewis – abdominal incision and right thoracotomy → exposes all of the intrathoracic esophagus and intrathoracic anastomosis.
- ✓ May have lower morbidity from esophageal leaks with cervical anastomosis
- ✓ May miss some lymph nodes; may be difficult for large tumors intrathoracic esophagus; intrathoracic anastomosis
- ✓ 3-Hole esophagectomy – abdominal, thoracic, and cervical incisions
- ✓ Need pyloromyotomy with these procedures
- ✓ Colonic interposition – may be choice in young patients when you want to preserve gastric function; 3 anastomoses required; blood supply depends on colon marginal vessels; also good if patient had previous gastric resection
- ✓ After esophagectomy → need contrast study on postop day 7 to rule out leak
- ✓ Postoperative strictures – most can be dilated

- ✓ Need for pre-op enteral nutrition (e.g. severe dysphagia or malnutrition and undergoing
- ✓ Neoadjuvant Tx) – place laparoscopic J tube (*avoid* PEG tube in stomach conduit)
- ✓ Chylothorax – white to clear fluid; high in lymphocytes and TAGs
- ✓ Thoracic duct ligation (right side, low in the mediastinum) if drainage is > 2 L/day
- ✓ Tx: drainage, NPO, TPN, short- or medium-chain fatty acids (*avoid* long-chain); conservative Tx for 1–3 weeks or is refractory to medical Tx palliation
- ✓ Malignant fistulas – most die within 3 months due to aspiration
- ✓ Rx – esophageal stent for Adjuvant chemo-XRT – indicated for ≥ T2 or positive nodes
- ✓ Unresectable tumors – get definitive chemo-XRT (stands for external beam radiotherapy)
- ✓ Must remember short cut;

- Rx stands for Treatment
- Ix stands for investigations
- Dx stands for diagnosis
- Bx stands for biopsy
- XRT stands for external beam radiotherapy

Obstructive Jaundice:

- CASE CAPSULE

A 68-year-old male patient presents with epigastric discomfort, anorexia and weight loss of six months duration. Initially these complaints were dismissed by his doctor. Later he noticed yellow discoloration of urine and conjunctiva for the last two months. The jaundice is painless and progressive. There is no history of waxing and waning of symptoms. Now he complains of generalized itching for the last 1 month. He passes clay-coloured stools for the last two months. He is a recently detected diabetic. He is a heavy smoker for the last 50 years. On examination he is ill built and cachexic. The sclera is yellow orange in colour (deeply jaundiced). Scratch marks are seen in the abdomen and chest. Abdominal examination revealed a globular mass below the costal margin in the midclavicular line impinging upon the examining hand on inspiration of about 10 × 4cm size. The mass is visible and moving up and down with respiration. This mass is better seen than felt and better palpated by superficial palpation than deep palpation. The liver is palpable about 4cm below the costal margin. It is firm in consistency, the edges are sharp and the surface is smooth. There is no other palpable mass in the abdomen. There is no free fluid. Digital rectal examination is normal. There is a hard mobile lymph node in the left supraclavicular area between the two heads of sternomastoid muscle.

Q. What is the definition of jaundice?

- Jaundice is yellow staining of body tissues produced by an excess of circulating bilirubin. Normal serum concentration is **5-19 mmol/L** (**0.2-1.2 mg/dL**) Jaundice is detected clinically when the level rises above **40 mmol/L** (**2.5 mg/ dL**).

Q. What are your points in favour of obstructive jaundice?

- It is a painless progressive jaundice
- Presence of itching and scratch marks
- Presence of palpable gallbladder
- Loss of weight.

Q. Can you differentiate the types clinically by the colour of jaundice?

- **Lemon yellow** – haemolytic jaundice
- **Orange** – hepatocellular jaundice
- **Deep and greenish** – obstructive jaundice
- What is Courvoisier's law?
- "When the gallbladder is palpable and the patient is jaundiced, the obstruction of bile duct causing the jaundice is unlikely to be a stone because previous inflammation will have made the gallbladder thick and non-distensible".
- Q. Clinically what are the other differentiating features of various jaundice?

Disease	Symptoms	Pain	Jaundice
Hemolytic	General malaise, loss of weight	No pain	Slow onset and jaundice persists
Infective Hepatitis	Loss of appetite, nausea, malaise	Dull ache	Gradual onset and disappearance
Gallstone	Episodes of flatulent dyspepsia	Intermittent severe pain	Sudden onset, fades slowly in days
Carcinoma of Head of Pancreas	Loss of weight, loss of appetite, itching	Backache	Progressive jaundice

Q. What are the causes for each type of jaundice?

- Causes for pre-hepatic, hepatic and post hepatic jaundice

Pre-hepatic (Hemolytic) Jaundice	Hepatic Jaundice	Post hepatic(Obstructive Jaundice)
Hereditary spherocytosis Hereditary non-spherocytic Anemia Sickle cell disease Thalassemia Acquired haemolytic anemia Hypersplenism Crigler–Najjar syndrome* Gilbert's disease	Hepatocellular – Acute viral hepatitis, alcoholic cirrhosis Dubin Johnson syndrome** Cholestatic – Toxic drugs, Cholestatic jaundice of pregnancy, postoperative Cholestatic jaundice, Biliary cirrhosis	In the lumen – • Gallstone • Parasites (hydatid, liver fluke roundworms • Foreign body – broken T tube • Haemobilia In the wall – • Benign stricture • Malignant stricture • Congenital atresia • Traumatic strictures • Choledochal cyst • Caroli's disease • Tumors of bile duct • Klatskin's tumor • Sclerosing cholangitis Outside the wall – • Carcinoma head of pancreas • Periampullary carcinoma • Porta hepatis metastasis • Pancreatitis • Chronic duodenal diverticulum • Pseudocyst of pancreas • Metastatic carcinoma

INVESTIGATIONS FOR OBSTRUCTIVE JAUNDICE;

- CBC
- Liver Function Test(LFTS)
- Ultrasound Abdomen: It will show Gallstones/CBD stones, Any pathology in abdominal wall or viscera
- MRCP (Magnetic resonance cholangio pancreatography) Best or gold standard investigation for Distal CBD stone where Ultrasound abdomen cannot comment on CBD stone or some hepatobiliary lesion due to Gut lying over it or any gas shadow.

MRCP is good non-invasive investigations if dilated proximal biliary or pancreatic duct channels without any evidence of lesion in hepatobiliary tract on Ultrasound.

- Triphasic CT SCAN of Abdomen; It is indicated in case of suspected malignant lesion in hepatobiliary channel on Ultrasound abdomen or MRCP and in dilated proximal biliary or pancreatic duct due to that lesion to know about the extent of the lesion and lymph node or vessels involvement or metastasis to liver or stomach.
- ERCP (endoscopic retrograde cholangio pancreatography); It is indicated when there is obstructive jaundice due to CBD stone of small size less than 1.5cm because it is diagnostic as well as therapeutic. It is also indicated in case of post cholecystectomy cystic duct leak or very high bilirubin/ obstructive jaundice level due to malignant lesion in hepatobiliary tract to insert the stent and relieve jaundice.
- ERCP can help in taking biopsy or brush cytology from the lesion in hepatopancreatobiliary tract.
- Endoscopic Ultrasound; It can take biopsy and tells about local staging and vessels involvement by the tumor in Hepatopancreatobiliary tract.

Management of Obstructive Jaundice:

- Management depends upon the cause of obstructive jaundice.
- If obstructive jaundice is because of small CBD stone of less than 1.5cm size then ERCP is the best option for it. If the CBD stone is primary which is in rare cases then no further management is needed, but if this CBD stone is secondary (slipped from Gallbladder into the CBD) then after ERCP, Laparoscopic cholecystectomy after 6 weeks should be performed because in 6 weeks inflammation subsides.
- If patient presents with symptomatic gallstones or asymptomatic gallstones in diabetic patient having no obstructive jaundice and the patient also has small CBD stone meanwhile on Ultrasound abdomen, then 1st do Laparoscopic cholecystectomy followed by ERCP after 6 weeks for CBD stone

- If patient has history of gallstones and obstructive jaundice due to large CBD stone of more than 1.5cm size or multiple stones in CBD or deranged LFTS(liver function test) or Palpable stone in the CBD then the best option is Laparoscopic Cholecystectomy plus Laparoscopic Choledechotomy(CBD exploration) if expertise are available otherwise Laparoscopic cholecystectomy plus open Choledechotomy is another option or Open cholecystectomy plus open choledechotomy is another option and then keep T-tube in CBD, do T-tube cholangiogram after 10-14 days, if no defect seen in distal CBD on T-tube cholengiogram then remove the T-tube. If defect present then left the T-tube as such for more 6weeks, after the tract maturation, stone can be removed either by ERCP or pass the choledechoscope on the same mature tract made by T-tube and remove the stone by dormia basket so called Burhenne method (The Burhenne method of removing retained bile duct stones through the T-tube track has proved successful and is now the method of choice for removing stones retained following bile duct exploration (Burhenne, 1980).

- If Obstructive jaundice is due to CBD stricture as in case of post cholecystectomy CBD injury, then Roux en Y Choledochojejunostomy can be performed if proximal CBD stricture or Choledochoduodenostomy if distal CBD stricture is present on MRCP.
- If Obstructive jaundice is due to CBD worms' infestation then CBD exploration can be performed either laparoscopically or open choledechotomy and CBD repair over the T-tube to keep CBD patent and give time for repair to heal.
- If Obstructive Jaundice is due to mass or lesion which may be benign or malignant in Hepatopancreatobiliary tract then three types of investigations should be performed 1st, before going into management.
- 1) Investigations for Diagnosis of that lesion which will be confirmed by biopsy from the lesion either via ERCP or Endoscopic Ultrasound. It must be remembered that biopsy should not be performed percutaneously as the tumor will spread to the peritoneal and abdominal skin and the stage 2 or 3 tumor will be converted to stage before.

2) Investigations for Staging;

- After confirmation of diagnosis of the lesion, if turns out to be malignant (cancer lesion), then staging investigations should be performed. It includes CT CAP (chest, abdomen and pelvis) with IV and sometime oral contrast if gut involve or gut obstruction as in case of Ca head of pancreas or Periampullary cancer in which case 2nd part of the duodenum can be involved. If patient cannot afford CT CAP then can advise digital Chest x-ray for lung mets, LFTS and Ultrasound abdomen for Liver Mets.
- Endoscopic Ultrasound for local staging.

3) Investigations for patient fitness;

- After staging investigations, if the tumor is operable or resectable as in case if there is no involvement of vessels like portal vein, MA (Superior mesenteric artery), SMV(Superior mesenteric vein),absence of hepatic, lungs, peritoneal and omental mets, ascites, no para aortic lymph node involvement, less than 5cm tumor, no rectal blumer shelf, and no supraclavicular lymph nodes on examination then investigations for fitness of the patient before surgery or tumor resection should be performed. It includes CBC, HBSag, Anti HCV Ab, HIV, serum Albumin, LFTS, RFTS, RBS, PT/INR, APTT, CA19-9(Carbohydrate antigen), CEA (Carcinoembryonic Antigen) both are tumor markers for colorectal cancers or Hepatopancreatobiliary (HPB) cancers.
- Surgical Treatment for Operable or Resectable Tumor;

- If the malignant lesion is either operable or resectable as mentioned before then Whipple Procedure or more recently Pylorus Preserving Pancreaticoduodenectomy (PPPD) should be performed if the tumor is present in Head of pancreas or Periampullary cancer of Pancreas followed by chemo radiotherapy.
- If Klatskin's Tumor(Hilar Cholangiocarcinoma),then resection of the extrahepatic bile duct from the duodenum to above the level of the hepatic confluence, cholecystectomy, portal lymphadenectomy and biliary-enteric anastomosis(Roux en Y Hepaticojejunostomy) followed by chemo radiotherapy.

If Tumor is non-operable or irresectable then Palliative treatment like Duodenal stenting for relieving of gut obstruction or Bypass surgery like gastrojejunostomy,

CBD stenting via ERCP for relieving of jaundice, and chemo radiotherapy are different palliative options.

Causes of Acute and Chronic Abdomen.

A) Causes of Acute Abdomen are;
- ✓ Acute Appendicitis
- ✓ Acute Cholecystitis
- ✓ Acute Pancreatitis
- ✓ Intestinal Perforation
- ✓ Intestinal Obstruction
- ✓ Ruptured ectopic Pregnancy
- ✓ Acute renal colic
- ✓ Acute Pyelonephritis etc.

B) Causes of Chronic Abdomen are;
- ✓ Ulcerative Colitis
- ✓ Crohn's Disease
- ✓ Abdominal wall Hernias
- ✓ Constipation
- ✓ Visceral masses either benign or malignant
- ✓ Intestinal TB
- ✓ Colorectal Tumors etc.

Some of the important Causes of Acute Abdomen are explained;

Acute Appendicitis;

Definition;

Acute appendicitis is an acute inflammation of the vermiform appendix, most likely due to obstruction of the lumen of the appendix (by fecalith, normal stool, infective agents, or lymphoid hyperplasia)

Clinical Presentation:

Mnemonics; MANTRELS

- Migration of pain to the right iliac fossa
- Anorexia [urinalysis to look for acetone as an indication of anorexia; add urine dipstick for ketonuria >2+]
- Nausea/Vomiting
- Tenderness in the right iliac fossa
- Rebound pain [Can be replaced with other indirect signs such as the Rovsing sign; Dunphy's sign; or percussion tenderness]
- Elevated temperature (fever) [> 37.3 C]
- Leukocytosis
- Shift of leukocytes to the left

The Alvarado (MANTRELS) Score.	
Symptoms	Score
Migratory RIF pain Anorexia Nausea and vomiting	1 1 1
Signs	
Tenderness (RIF) Rebound tenderness Elevated temperature	2 1 1
Laboratory	
Leukocytosis	2
Shift to left	1
Total	10

RIF, right iliac fossa.

Some Typical Signs to elicit the pain in case of Acute Appendicitis;

1) Pointing Sign:

- McBurney's point refers to the point on the lower right quadrant of the abdomen at which tenderness is maximal in cases of acute appendicitis.

1) Rovsing's

A positive Rovsing's sign is characterized by right lower abdominal pain upon palpation of the left side of the lower abdomen.

2) **Psoas Sign**
Psoas sign: Pain on passive extension of the right thigh. It is present when the inflamed appendix is retrocecal and overlying the right psoas muscle.
3) **Obturator sign;**
Obturator sign: Pain on passive internal rotation of the hip when the right knee is flexed. It is present when the inflamed appendix is in contact with the obturator internus muscle

INVESTIGATIONS for Diagnosis of Acute Appendicitis:

- CBC
- Ultrasound Abdomen
- CT Scan Abdomen and Pelvis(Best and Gold standard Investigation for confirmation of diagnosis)
- Urine R/E

TREATMENT for Acute Appendicitis:

Definitive Treatment for Acute Appendicitis is surgery either Open appendectomy with Gridiron incision or Lanz incision. Another option is Laparoscopic Appendectomy (Best treatment nowadays) with three port sites 10mm umbilical camera port and two laterally placed small 5mm ports incisions.

For Appendicular Mass, a more conservative approach can be used with admission of the patient in surgical unit, pass Iv line, give Iv Antibiotics, Iv pain killer, maintain intake output record and vitals record 4 hourly, pass NG tube and Urinary catheter if needed, all above conservative treatment collectively called Ochsner–Sherren regimen. Appendicular mass should be assessed with size by daily marking with pencil or measuring the size with measuring tape, pulse record and pain. If size of the appendicular mass, pulse and pain increases then early surgical intervention should be indicated.

Acute Cholecystitis

Definition:

Acute inflammation (swelling) of the gall bladder is called Acute Cholecystitis.

Types of Acute Cholecystitis;

There are two types depends upon the causative factors.

- A) Acute Calculous Cholecystitis which is caused by Cholesterol stones, pigmented stones or mixed stones in GB.
- C) Acute Acalculous Cholecystitis which occurs in those patients who are critically ill, burns patients, severely injured patients due to trauma, patients admitted in ICU etc.

Clinical Presentation;

- ✓ Pain in Right Hypochondrium(RHC)
- ✓ Tenderness in RHC(Murphy's sign positive)
- ✓ Fever
- ✓ Raised TLC(Total Leukocyte count) or WBC

How to Diagnose?

- Diagnosis is mostly clinical but Some Imaging Investigations like Ultrasound Abdomen which shows Inflammation of Gall Bladder, stone in Gallbladder or some other pathology in the Gallbladder like polyp, benign or malignant masses.
- Laboratory investigations like Complete blood count (CBC) which shows raised TLC/WBC.
- *Investigation of choice in Acute Cholecystitis is HIDA SCAN*

Tokyo Consensus Guidelines diagnostic criteria for acute cholecystitis;

1. A Local signs of inflammation, etc.
   1) Murphy's sign
   2) Right upper quadrant pain/tenderness/mass
2. B Systemic signs of inflammation, etc. 1) Fever 2) Elevated CRP
   3) Elevated WBC count
3. **C Imaging findings**
   Imaging findings characteristic of acute cholecystitis: Suspected diagnosis: 1 item in A + 1 item in B Definite diagnosis: 1 item in A + 1 item in B + C

Differential Diagnosis of Acute Cholecystitis;

- *A) Common;*
  - Appendicitis
  - Perforated peptic ulcer
  - Acute pancreatitis
- *B) Uncommon;*
  - Acute pyelonephritis
  - Myocardial infarction

- Pneumonia – right lower lobe

Treatment of Acute Calculous Cholecystitis;

A) Medical or Conservative Treatment;

- Admit the Patient in Surgical Unit on Call
- Pass Iv line
- Keep Nil by Mouth
- Iv antibiotics 2nd or 3rd Generation Cephalosporin like Cefuroxime or Ceftriaxone respectively or 3rd Generation Fluoroquinolones like Ciprofloxacin
- Iv Analgesics Tramal or Toradol
- Iv Fluid like R/L.
- Subsequent management. When the temperature, pulse and other physical signs show that the inflammation is subsiding, oral fluids are reinstated, followed by a regular diet.

Surgical Treatment for Acute Calculous Cholecystitis;

✓ After conservative Management Definitive treatment is Laparoscopic or open Cholecystectomy within 7days in same admission or after 6weeks

Acalculous cholecystitis;

✓ Acute and chronic inflammation of the gallbladder can occur in the absence of stones and give rise to a clinical picture similar to that of calculous cholecystitis.

✓ Acute acalculous cholecystitis is particularly seen in critically ill patients and those recovering from major surgery, trauma and burns. The diagnosis is often missed and the mortality rate is high.

✓ The treatment is cholecystectomy for patients who are able to tolerate surgery. In selected patients, non-surgical treatment (such as antibiotics or percutaneous cholecystostomy) may be an effective alternative to surgery.

Gallbladder Stone (Cholelithiasis);

Definition;

- Stone in the Gallbladder is called Cholelithiasis. It may be symptomatic gallstone or asymptomatic gallstone.
- Long standing gallstone in the gallbladder causes swelling/inflammation of GB that continues over time so called Chronic Cholecystitis.

Types of Gallbladder stones;

- Cholesterol stones, Pigment stones (brown/black) and mixed stones.
- Gallstones are asymptomatic in the majority of cases (>80%). Approximately 1–2% per year will develop symptoms requiring surgery, making cholecystectomy one of the most common operations performed.

Clinical Presentation;

✓ Gallbladder stones mostly detected incidentally during imaging for other pathology
✓ If Symptomatic then following symptoms exist;

- Pain in RHC or epigastric region which may radiate to back region, This may be described as colicky but the typical biliary 'colic' more often is dull, continuous and severe, lasting for several minutes or even hours, with associated nausea and vomiting. Frequently, pain starts during the night and wakes the patient; minor episodes may occur intermittently during the day. The development of acute cholecystitis is marked by fever.
- Dyspepsia, flatulence, food intolerance, particularly to fats, and some alteration in bowel frequency.

Effects and Complications of Gallbladder Stones;

Biliary colic

- Acute cholecystitis
- Chronic cholecystitis
- Empyema of the gallbladder
- Mucocele of the gallbladder
- Perforation of the gallbladder

Biliary obstruction (jaundice)

- Acute cholangitis
- Acute pancreatitis
- Intestinal obstruction (gallstone ileus)

How to diagnose Cholelithiasis;

- Ultrasound Abdomen is the 1st choice for imaging
- USG is performed to confirm the diagnosis.
  If jaundice with deranged ALP and enzyme levels is present,
- MRCP should be performed to exclude choledocholithiasis(stone in CBD)
- If there is any concern regarding the diagnosis or the presence of complications such as perforation, CT should also be performed.

Treatment of Cholelithiasis;

Asymptomatic gallstones do not need intervention, however prophylactic cholecystectomy may be performed for asymptomatic cholelithiasis in the following situations:

- Large (>3 cm) gallstones;
- Choledocholithiasis;
- Chronic haemolytic conditions (sickle cell disease, hereditary spherocytosis);
- Gallbladder polyps >1 cm in diameter;
- Suspicion/risk of malignancy (anomalous pancreatic ductal drainage);
- Calcification of the wall (porcelain gallbladder);
- Some ethnic groups or subjects living in areas with a high *Prevalence of gallbladder cancer* associated with gallstones (some parts of northern India, Native Americans, Mexican Americans, Colombia, Chile, Bolivia);
- Transplant patients (during transplantation);
- Bariatric surgery.

Treatment for Symptomatic Gallstones;

For patients with symptomatic gallstones, cholecystectomy is the treatment of choice if there are no medical contraindications

Acute Pancreatitis:

Definition;

Acute pancreatitis is a serious condition where the pancreas becomes inflamed over a short period of time. The pancreas is a small organ located behind the stomach and is retroperitoneal structure

Clinical Presentation;

- **Pain:** Pain is the cardinal symptom. It characteristically develops quickly, reaching maximum intensity within minutes rather than hours and persists for hours or even days. The pain is frequently severe, constant and refractory to the usual doses of analgesics. Pain is usually experienced first in the epigastrium but may be localised to either upper quadrant or felt diffusely throughout the abdomen. There is radiation to the back in about 50% of patients, and some patients may gain relief by sitting or leaning forwards.
- Nausea, repeated vomiting and hiccups are usually marked
- **On Examination**: The appearance may be that of a patient who is well or, at the other extreme, one who is gravely ill with profound shock, toxicity and confusion.
- Tachypnea is common, tachycardia is usual and hypotension may be present.
- The body temperature is often normal or even subnormal, but frequently rises as inflammation develops.
- Mild jaundice can be caused by biliary obstruction in gallstone pancreatitis, and an acute swinging pyrexia suggests cholangitis.

- Bleeding into the fascial planes can produce bluish discoloration of the flanks (Grey Turner's sign) or umbilicus (Cullen's sign).
- Subcutaneous fat necrosis may produce small, red, tender nodules on the skin of the legs.
- A pleural effusion is present in 10–20% of patients.

Differential Diagnosis;

A: COMMON

- Perforated peptic ulcer
- Biliary colic or acute cholecystitis

B: UNCOMMON

- Myocardial infarction
- Pneumonia or pleuritic pain.
- In fact, acute pancreatitis can mimic most causes of the acute abdomen

Causes;

The mnemonic, "GET SMASHED," is very helpful in recalling the most common causes of acute pancreatitis. It represents Gallstones, Ethanol, Trauma, Steroids, Mumps, Autoimmune disease, Scorpion sting, Hypercalcemia, Hypertriglyceridemia, ERCP and some Drugs. Gallstones are the most common cause of acute pancreatitis in our country while ethanol in western countries.

Investigations:

- Typically, the diagnosis is made on the basis of the clinical presentation and an elevated serum amylase level
- A serum amylase level three times above normal is indicative of the disease.
- A normal serum amylase level does not exclude acute pancreatitis, particularly if there is delay in presentation.
- The serum lipase level provides a more sensitive and specific test than amylase.
- If there is doubt, and other causes of acute abdomen have to be excluded, contrast-enhanced CT scan of the Abdomen with pancreatic protocol is the best single imaging investigation.
- Cross-sectional MRI can yield similar information to that obtained by CT.
- EUS and MRCP can help in detecting stones in the common bile duct and directly assessing the pancreatic parenchyma but are not widely available.
- ERCP allows the identification and removal of stones in the common bile duct in gallstone pancreatitis.
- In patients with severe acute gallstone pancreatitis and signs of ongoing biliary obstruction and cholangitis, an urgent ERCP should be sought.

Assessment of Severity;

- The Ranson and Glasgow scoring systems are specific for acute pancreatitis, and a score of 3 or more at 48 hours indicates a severe attack.
- Several other systems that are used in intensive care units can also be applied,
- These include the APACHE, SAPS, SOFA, MODS and modified Marshall scoring systems (the latter has the advantage of simplicity). Regardless of the system used, persisting organ failure indicates a severe attack.

- A serum C-reactive protein level >150 mg/L at 48 hours after the onset of symptoms is also an indicator of severity.

Atlanta classification of acute pancreatitis (1992) recommends that patients with acute pancreatitis be stratified into three groups:

1. Mild acute pancreatitis:
   → No organ failure;
   → No local or systemic complications.
2. Moderately severe acute pancreatitis:
   Organ failure that resolves within 48 hours (transient organ failure); and/or
   Local or systemic complications without persistent or- organ failure.
3. Severe acute pancreatitis:
   1. Persistent organ failure (>48 hours);
   2. Single organ failure;

3. ● multiple organ failure

The Ranson and Glasgow scoring systems to predict the severity of acute pancreatitis: in both systems, disease is classified as severe when three or more factors are present

Ranson score On admission
Age >55 years White blood cell count >16 × 109/L Blood glucose >11 mmol/L (>200 mg/dL) LDH >350 units/L AST >250 units/L
Within 48 hours
Haematocrit fall of 10% or greater Blood urea nitrogen rise >5 mg/dL (1.8 mmol/L) despite fluids
Arterial oxygen saturation (PaO2) <8 kPa (60 mmHg)
Serum calcium <8 mg/dL (2.0 mmol/L)
Base deficit >4 mmol/L
Fluid sequestration >6 litres

Glasgow score Within 48 hours
Age >55 years White blood cell count >15 × 109/L Blood glucose >10 mmol/L (no history of diabetes) LDH >600 units/L or AST >200 units/L Serum urea >16 mmol/L (no response to intravenous fluids) Arterial oxygen saturation (PaO2) <8 kPa (60 mmHg) Serum calcium <2.0 mmol/L Serum albumin <32 g/L

Complications of acute pancreatitis:

- ✓ Systemic ;

(*More common in the first week*) **Cardiovascular:** Shock, Arrhythmias **Pulmonary :** ARDS Renal failure **Haematological:** DIC, Metabolic
Hypocalcaemia
Hyperglycaemia
Hyperlipidaemia
Gastrointestinal
Ileus
Neurological
Visual disturbances
Confusion, irritability
Encephalopathy
Miscellaneous
Subcutaneous fat necrosis
Arthralgia

a) Local Complications:

- ✓ *Usually develop after the first week*)
- ✓ Peripancreatic fluid collection
- ✓ Sterile pancreatic necrosis
- ✓ Infected pancreatic necrosis
- ✓ Pancreatic abscess
- ✓ Pseudocyst
- ✓ Pancreatic ascites

Pleural effusion
Portal/splenic vein thrombosis Pseudoaneurysm

Medical/Conservative Treatment;

- Admit the patient in ward, HDU, ICU after severity assessment
- Pass iv line
- Pass NG tube if vomiting
- Intake/output record
- Keep the patient NBM
- IV Fluids
- IV Analgesics
- IV prophylactic antibiotics (Cefuroxime or Imipenem) or Ciprofloxacin with Metronidazole
- If gallstones are the cause of an attack of predicted or proven severe pancreatitis, or if the patient has jaundice, cholangitis or a dilated common bile duct, ERCP should be carried out within 72 hours of the onset of symptoms as sphincterotomy and clearance of the bile duct can reduce the incidence of infective complications. In patients with cholangitis, sphincterotomy should be carried out or a biliary stent placed to drain the duct; however, ERCP is an invasive procedure and carries a small risk of worsening the pancreatitis.

Surgical Treatment options;

- Open Surgical Drainage
- Pancreatic Necrosectomy
- Distal pancreatectomy

4) INTESTINAL PERFORATION;

TWO most common causes of intestinal perforations are;

a) Peptic ulcer perforation
b) Enteric Perforation

a) Peptic Ulcer Perforation:

- ✓ The common complications of peptic ulcer are perforation, bleeding and Pyloric stenosis.
- ✓ Perforated peptic ulcer;

- ✓ Presentation of the patient is acute abdomen, sudden onset of severe pain in abdomen, past history of peptic ulcer disease or NSAIDS, stress life, smoking or H-pylori infection.
- ✓ On Abdominal examination; the abdomen is very tender, hard board like rigidity of the abdomen and scaphoid abdomen, usually thin and lean emaciated toxic look patient.
- ✓ Investigation of choice is X-ray erect Chest with Both Hemidiaphragm which shows Gas shadow under the Right dome of Hemidiaphragm. CT Abdomen with contrast can be done if in doubt.
- ✓ Treatment of Perforated peptic ulcer is 1st admit the patient in surgical unit, pass iv line, NG tube, keep the patient NBM, pass urinary catheter, IV fluid, I/V Antibiotics, I/V PPI, No NSAIDS, Only Tramal/Gravinate which is centrally acting painkiller, vital record, intake output record, stabilize the patient for surgery.
- ✓ After stabilization of the patient, shift the patient to O.T for Exploratory Laparotomy(Wash the abdomen inside thoroughly with 5-6L warm Normal Saline and repair the perforation with Absorbable Vicryl 2/0 or 3/0 suture and Fix the Omental patch over the already Sutured perforation, so called Modified Graham's Patch Omentopexy. Keep the abdominal drain inside in pelvic cavity or Sub hepatic space, close the abdomen with Non-absorbable Proline 1 suture and shift the patient to ward after recovery. Remember if gastric ulcer then must take biopsy from the ulcer to know about malignancy of stomach ulcer.
- ✓ After discharge following advices should be given to the patient that try to avoid spicy, fast/junk food, use PPI for one month, also Avoid NSAIDs, use Central acting painkiller like Tramal for pain and remove the stitches after 10-14 days.

b) Enteric Perforation:

Typhoid fever is caused by *Salmonella enterica* and presents with fever and abdominal pain after an incubation period of 10–20 days. Over the next week, the patient can develop distension, diarrhea, splenomegaly and characteristic 'rose spots' on the abdomen caused by a vasculitis. Typhoid is a systemic infection and diagnosis of typhoid is confirmed by culture of blood or stool. Treatment is by antibiotics, usually chloramphenicol. A number of surgical complications can result, including paralytic ileus, intestinal hemorrhage, free ileal perforation and cholecystitis.

Perforation of a typhoid ulcer characteristically occurs during the third week of the illness, although it is sometimes the first clinical sign of the disease. The ulcer is parallel to the long axis of the gut and is usually situated in the distal ileum. Perforation requires surgery to wash out and close the ulcer and intestinal resection is usually avoided. In unstable patients, notably with evidence of septic shock, the bowel should be exteriorized and the perforation closed after recovery. Paratyphoid infection (with *Salmonella* Paratyphi A) resembles typhoid fever and is treated in a similar manner

Intestinal Obstruction:

Causes of Intestinal Obstruction;

- ✓ Adhesions 40% most common cause of intestinal obstruction
- ✓ Carcinoma 15%
- ✓ Inflammatory TB etc. 15%
- ✓ Obstructed Hernia 12%
- ✓ Faecal Impaction 8%
- ✓ Pseudo Obstruction 5%
- ✓ Miscellaneous 5%

INVESTIGATIONS;

X-ray Abdomen Supine which shows three or more than three air fluid level
Ultrasound Abdomen which will shows dilated gaseous gut loops with moderate free fluid in pelvic cavity and may show the pathology causing obstruction
CT Scan Abdomen and Pelvis will confirm the Diagnosis in vitally stable patient.

CLINICAL PRESENTATION;

Remember four cardinal signs symptoms of obstruction;

1) Vomiting
2) Abdominal pain
3) Abdominal Distension
4) Constipation

TREATMENT;

- If a patient presents with acute intestinal obstruction, then after diagnosis admit the patient in surgical unit.
- Pass IV line
- Keep the patient Nil by Mouth NBM
- NG tube
- Urinary catheter
- IV antibiotics
- IV fluids
- IV PPI
- IV pain killer like Toradol not Tramal because Tramal reduces the gut motility
- Maintain intake output record and 4-6 hourly vitals monitoring
- If patient have no previous record of abdominal surgery (Virgin Abdomen), and patient's obstruction does not relieve, then Exploratory Laparotomy should be performed within 24 hours (The sun should not rise again).
- But if Patient have previous record of abdominal surgery, then wait for 72 hours for surgery as conservative treatment can be given for 3-7 days in this case specially when obstruction caused by adhesions or paralytic ileus respectively.
- In case of sigmoid volvulus, there will be Omega sign or Coffee bean sign on X-ray Abdomen supine, while in case of Intussusception (most common cause of obstruction in children), there will be Doughnut Sign on Ultrasound abdomen.

- In case of Intestinal obstruction, during Exploratory Laparotomy, either Resection of the gut and anastomosis is performed or Resection and then stoma formation (bringing the part of gut outside the abdomen just above the skin) can be performed depends upon the conditions of the patients, gut, intra-abdominal contamination, blood loss, vital stability etc.

b) Causes of Chronic Abdomen;
- ✓ Ulcerative Colitis and Crohn's Disease
- ✓ Both Collectively Called Inflammatory Bowel Disease (IBD)

Distinguishing Ulcerative Colitis (UC) and Crohn's disease (CD).			
Macroscopic			
Serial #	Feature	Ulcerative Colitis (UC)	Crohn's disease (CD).
1	**Distribution**	Colon/rectum	Anywhere in the gastrointestinal tract
2	**Rectum**	Always involved	Often spared
3	**Perianal disease**	Rare	Common
4	**Fistula formation**	Rare	Common
5	**Stricture**	Rare	Common
Microscopic			
Serial #	Feature	Ulcerative Colitis (UC)	Crohn's disease (CD).
1	**Layers involved**	Mucosa/sub mucosa	Full thickness
2	**Granulomas**	No	Common
3	**Fissuring**	No	Common
4	**Crypt abscesses**	Common	Rare

Inflammatory bowel disease

CLINICAL MANIFESTATIONS;

The main symptoms in UC are, rectal bleeding, tenesmus and mucous discharge. The disease often remains confined to the rectum, usually with a benign course. Colitis is almost always associated with bloody diarrhea and urgency. Severe and/or extensive colitis may result in anaemia, hypoproteinaemia and electrolyte disturbances. Pain is unusual. Children with poorly controlled colitis may have impaired growth. The more extensive the disease, the more likely extra intestinal manifestations are to occur. Extensive colitis is also associated with systemic illness, characterized by malaise, loss of appetite and fever.

The clinical presentation depends on the pattern of disease. Occasionally, CD presents acutely with ileal inflammation and symptoms and signs resembling those of acute appendicitis or, much less commonly, free perforation of the small intestine resulting in a local or diffuse peritonitis. CD may present with acute severe colitis but this is considerably less common than in UC.

Small bowel CD often presents with bouts of abdominal pain and mild diarrhea. A tender mass may be palpable in the right iliac fossa. Intermittent fever, anemia and weight loss are common. After months of repeated attacks characterized by acute inflammation, the affected area of intestine stenosis with fibrosis, causing chronic obstructive symptoms. Children developing the illness before puberty may have retarded growth and sexual development. As CD progresses, transmural fissuring, intra-abdominal abscesses and fistulae may develop.

INVESTIGATIONS FOR UC and CD;

Imaging FOR CD

High-resolution ultrasound in expert hands can demonstrate inflamed and thickened bowel loops as well as fluid collections and abscesses – the string sign of Kantor
CT scans with oral contrast are widely used in the investigation of abdominal symptoms and can demonstrate fistulae, intra-abdominal abscesses and bowel thickening or dilatation. Magnetic resonance imaging (MRI) is useful in assessing complex perianal disease and has been shown to be an excellent method for investigating the small bowel

Endoscopy FOR CD Confirm Diagnosis;

Colonoscopic examination may be normal or show patchy inflammation. Characteristically, there are areas of normal mucosa in between areas of inflammation that are irregular and ulcerated, with a mucopurulent exudate. The earliest findings are often aphthous ulcers surrounded by a rim of erythematous mucosa. These become larger and deeper with increasing severity of disease. There may be stricturing, and it is important to exclude malignancy at these sites by multiple and often repeated mucosal biopsies.

INVESTIGATIONS FOR UC;

Endoscopy and biopsy

Rigid/flexible sigmoidoscopy can detect proctitis in the clinic; the mucosa is hyperaemic, bleeds on touch and there may be a purulent exudate. Where there has been remission and relapse, there may be regenerative mucosal nodules or pseudopolyps. Later, tiny ulcers may be seen that appear to coalesce. Colonoscopy with biopsy has a key role in diagnosis and management

Radiology

A plain abdominal film may indicate the severity of disease in the acute setting and is particularly valuable in demonstrating the development of toxic mega colon. Barium enema has been replaced by CT, although a contrast study will show a featureless colon. CT findings in pancolitis may show significant thickening of the colonic wall, as well as inflammatory stranding in the colonic mesentery

Bacteriology

A stool specimen should be sent for microbiological analysis when UC is suspected in order to exclude infective colitis, notably *Campylobacter*, which may be very difficult to distinguish from acute severe UC.

TREATMENT FOR UC and CD;

A) Medical Treatment;

- ***Steroids***

Corticosteroids are widely used to treat acute fares of CD. They induce remission in 70–80% of cases of moderate to severe disease. Steroid enemas may be used in the rectum,

- ***Amino salicylates***
- Colonic symptoms can be treated by 5-ASA agents in a similar manner to those in UC. These agents have limited efficacy in small bowel CD.
- ***Antibiotics***
- Metronidazole and ciprofloxacin may be used, particularly for periods of a few weeks at a time, especially in perianal disease.
- ***Immunomodulatory agents***
- Azathioprine is used for its additive and steroid-sparing effects and currently represents standard maintenance therapy.

B) Surgical Rx:

If above medical treatment fail, or there is obstruction or perforation or toxic mega colon, then surgery is indicated.

Abdominal Wall Hernias;

Abdominal Hernia;

Definition:

A hernia is an abnormal protrusion of an organ or tissue through an opening in the layer that normally confines it.

Types of Abdominal Hernia;

A) Ventral Hernias which Includes;

Primary ventral hernias:

- Umbilical
- Epigastric
- Spigelian
- Lumbar
- Traumatic

Secondary Ventral Hernia;

- Incisional
- Parastomal

B) Inguinal Hernia

C) Femoral Hernia

Types of hernia by complexity

- ✓ Occult – not detectable clinically
- ✓ Reducible – a swelling that appears and disappears
- ✓ Irreducible – a swelling that cannot be replaced in the abdomen, at risk of complications
- ✓ Incarcerated – irreducible, trapped, risk of strangulation
- ✓ Strangulated – acutely painful swelling with tissue ischaemia:

Requires emergency surgery

Infarcted – when contents of the hernia have become gangrenous: high mortality

Causes of hernia

- ✓ Anatomical weakness
- ✓ Developmental failures
- ✓ Genetic weakness of collagen
- ✓ Sharp and blunt trauma
- ✓ Weakness due to ageing and pregnancy
- ✓ Primary neurological and muscle diseases
- ✓ Risk Factors for Hernia are, Constipation, Chronic Cough, Urinary Straining, Labours

How to Diagnose a Case of Hernia?

Clinical history and diagnosis in hernia

Patients are usually aware of a lump on the abdominal wall under the skin. Self-diagnosis is common. The hernia is usually painless but patients may complain of an aching or heavy feeling. Sharp, intermittent pains suggest pinching of tissue at the hernia neck. Severe pain should alert the surgeon to a high risk of strangulation

Check

- ✓ Reducibility
- ✓ Cough impulse
- ✓ Tenderness
- ✓ Overlying skin colour changes
- ✓ Multiple defects/contralateral side
- ✓ Signs of previous repair
- ✓ Scrotal content for groin hernia
- ✓ Associated Pathology

On Examination:

- A swelling with a cough impulse is not necessarily a hernia
- A swelling with no cough impulse may still be a hernia but consider other diagnose

Once the clinician is satisfied that a swelling is indeed a hernia, it is important to know if this is a primary hernia, a recurrent hernia or an incisional hernia after previous surgery. Recurrent and incisional hernias are more difficult to treat and may require a different surgical approach.

Investigations for Hernia:

For most hernias, the diagnosis is made on clinical examination. However, the patient may have symptoms suggesting a hernia but no hernia is found, or the patient may have a swelling suggestive of hernia but with clinical uncertainty.

- ✓ Plain radiograph – of little value
- ✓ Ultrasound scan – low cost, operator dependent
- ✓ CT scan – ventral and incisional hernia
- ✓ MRI – good in sportsman's groin with pain
- ✓ Laparoscopy – useful to identify occult defects but not interstitial hernias

Hernia Management and Surgical Principles:

Management:

- ✓ Not all hernias require surgical repair
- ✓ Small hernias can be more dangerous than large
- ✓ Pain, tenderness, skin changes and difficulty reducing imply high risk of strangulation
- ✓ Femoral hernia should always be repaired

Surgical approaches to hernia

In general, modern surgical repairs follow these principles:

- ✓ Reduction of the hernia contents into the abdominal cavity with excision of any non-viable tissue and bowel repair if necessary.
- ✓ Excision and closure of the peritoneal sac if present (though small sacs may be reduced intact).
- ✓ Closure of the hernia defect if possible.
- ✓ Reinforcement of the abdominal wall with mesh (though non-mesh repairs are an option).
- ✓ If necessary, excise redundant skin to improve cosmetic outcome.

Epigastric Hernia;

Definition:

Epigastric hernia

These hernias arise through the midline raphe (linea Alba) anywhere between the xiphoid process and the umbilicus.

Characteristics:

They begin with a transverse split in the midline raphe so the defect is elliptical and usually less than 1 cm in diameter. The hernia commonly contains only extraperitoneal fat, which gradually enlarges, spreading in the subcutaneous plane to resemble the shape of a mushroom. When very large they may contain a peritoneal sac but rarely any bowel. More than one hernia may be present. Indeed, the most common cause of 'recurrence' is failure to identify a second defect at the time of original repair.

Clinical features

The patients are often fit, healthy men, but they are also seen in older, overweight men and women especially after multiple pregnancies. The hernia can be very painful even when the swelling is small owing to the fatty contents becoming nipped sufficiently to produce partial strangulation. It may be locally tender. It is unlikely to be reducible because of the narrow neck and may resemble a Lipoma. A cough impulse may or may not be felt.

Investigations:

Mostly Clinical Diagnosis but US abdomen will show the size of the defect and contents of the sac.

Treatment

Very small epigastric hernias have been known to disappear spontaneously, probably because of infarction of the fat. Small- to moderate-sized hernias without a peritoneal sac are not inherently dangerous and surgery should be offered only if the hernia is sufficiently symptomatic. Hernias containing bowel should always be repaired.

Surgical Treatment Options:

Depends upon the size of the defect, if up to 1cm then open repair with Non-absorbable suture with figure of eight, if defect size is 1-2cm then Mayo repair and if larger then 2 cm then either open mesh repair(ONLAY,SUBLAY,INLAY AND UNDERLAY Mesh repair) or Laparoscopic mesh repair(IPOM=INTRAPERITONEAL ONLAY MESH Repair)

Incisional Hernia;

Definition:
These arise through a defect in the musculofascial layers of the abdominal wall at the site of a postoperative scar. Thus, they may appear anywhere where a laparotomy has been made.

Causes:
Incisional hernias have been reported in 10–50% of laparotomy incisions and 1–5% of laparoscopic port-site incisions. Factors predisposing to their development include patient factors (genetic collagen disorders, obesity, general poor healing due to malnutrition, immunosuppression or steroid therapy, chronic cough, cancer), wound factors (poor quality tissues, wound tension, wound infection) and surgical factors (inappropriate suture material, poor closure technique)

Clinical features
Incisional hernias commonly appear as a localised swelling involving part of a surgical scar but may present as a diffuse bulging of the whole length of the incision. Alternatively there may be several discrete hernias along the length of the incision, but even with apparently singular hernias unsuspected defects are frequently found at operation.

Investigation and Treatment;
Mostly clinical but US abdomen and CT scan abdomen

Treatment;
For small incisional hernia and asymptomatic hernia, conservative approach like treat the cause and abdominal belt but for large symptomatic incisional hernia, Surgical repair with Mesh Placement either open or Laparoscopic procedure.

Open repair
The previous incision is opened along its full length to reveal any clinically unsuspected defects. The hernial sac, its neck and the margins of the defect are fully exposed. The sac can be opened, contents reduced, local adhesions divided and any redundant sac excised to allow safe fascial closure.

Inguinal hernia;
- Types – indirect (lateral, or oblique) or direct (medial)
- Origin – congenital or acquired
- Anatomy – inguinal canal
- Diagnosis – usually clinical but radiological in special circumstances (US, CT, MRI)
- Surgery – open or minimally invasive (laparoscopic/robot assisted

Operations for inguinal hernia
- Herniotomy
- Open suture repair
- Bassini repair]Shouldice
- Desarda Maloney darn
- Open fat mesh repair
- Lichtenstein (Open complex mesh repair – not recommended

- Mesh plugs
- Hernia systems)
- Open preperitoneal repair
- Transinguinal, Stoppa repair
- Laparoscopic/robot-assisted repair TEP (Total extraperitoneal)
- TAPP (Trans abdominal Preperitoneal)

Constipation;

This may be classified as absolute (i.e. neither faeces nor flatus is passed) or relative (where only flatus is passed). Absolute constipation is a cardinal feature of complete intestinal obstruction. Some patients may pass flatus or feaces after the onset of obstruction as a result of the evacuation of the distal bowel contents. The administration of enemas should be avoided in cases of suspected obstruction. This merely stimulates evacuation of bowel contents distal to the obstruction and confuses the clinical picture.
The rule that absolute constipation (also called Obstipation) is present in intestinal obstruction does not apply in:

- ✓ Richter's hernia
- ✓ Gallstone ileus
- ✓ Mesenteric vascular occlusion
- ✓ Functional obstruction associated with pelvic abscess
- ✓ All cases of partial obstruction (in which diarrhea may occur

Colon and Rectum Cancers;

Colon Cancers;

Malignant: colorectal carcinoma;

Epidemiology

In the UK, colorectal cancer is the second most common cause of cancer death. Approximately 42 000 patients are diagnosed with colorectal cancer every year in the UK. Approximately one-third of these tumours are in the rectum and two-thirds in the colon. The burden of disease is greater in men than in women (56% versus 44%). Colorectal cancer occurs less frequently in resource-poor than in resource-rich countries.

Etiology

Most colorectal cancers are thought to develop from adenomatous polyps through a sequence of genetic mutations influenced by environmental factors. Mutations of the *APC* gene occur in two-thirds of colonic adenomas and are thought to develop early in the carcinogenesis pathway. *K-ras* mutations result in activation of cell signaling pathways and are more common in larger lesions, suggesting that that they are later events in mutagenesis. The *p53* gene is frequently mutated in carcinomas but not in adenomas and therefore thought to be a marker of invasion.

Spread

Colonic cancer can spread locally, via the lymphatics, bloodstream (haematogenous) or across the peritoneal cavity (transcoelomic spread). Direct spread may be longitudinal or radial. Radial spread may be retroperitoneal into the ureter, duodenum and posterior abdominal wall muscles or intraperitoneal into adjacent organs or the anterior abdominal wall.

Staging colorectal cancer;

Dukes' staging for colorectal cancer

- A: Invasion of but not breaching the muscularis propria
- B: Breaching the muscularis propria but not involving lymph nodes
- C: Lymph nodes involved

Dukes himself never described a stage D, but this is often used to describe metastatic disease

TNM classification for colorectal cancer;

- Note the prefix y refers to neo-adjuvant radio- or chemotherapy, p refers to pathological confirmation of stage; Union for International Cancer Control, 8th edition)

T

T1 Tumour invades into submucosa
T2 Tumour invades into muscularis propria
T3 Tumour invades into non-peritonealized pericolic tissues or subserosa
T4a Tumour breaches visceral peritoneum
T4b Tumour directly invades another organ/structure Nodal stage
N0 No nodes involved
N1 1–3 nodes involved (N1a, 1 regional lymph node involved; N1b, 2 or 3 regional lymph nodes involved; N1c, satellite extra nodal tumour deposits)

N2 4 or more nodes involved (N2a, 4–6 regional lymph nodes involved; N2b, 7 or more regional lymph nodes involved)
Metastases
M0 No metastases
M1 Metastases (M1a, metastasis confined to 1 organ; M1b, metastasis to more than 1 organ; M1c, metastasis to the peritoneum)

Investigation of colorectal cancer;

A) Investigations for Diagnosis;

Endoscopy

For symptomatic patients with rectal bleeding, direct referral from primary care for a flexible sigmoidoscopy is increasingly used.
Colonoscopy with biopsy is the investigation of choice if colorectal cancer is suspected

B) Investigations for Staging;

In case of Rectum Cancer, MRI pelvis is the investigation for local staging, while CT scan chest and abdomen with oral and IV contrast for distant staging
While in case of only Colon cancer, CT scan CAP (chest, abdomen and pelvis) with oral and IV contrast for distant staging

2) Investigations for patient fitness;

- CBC
- LFTS
- RFTS
- Serum Albumin
- PT/INR
- APTT
- HBS Ag, Anti-HCV Ab, HIV
- Serum Electrolytes
- ECG/CHEST XRAY if above 40 years old
- Random Blood Sugar, and Tumor markers before surgery in this case CEA.

CLINICAL PRESENTATION;

Right sided colon cancer present with Anaemia, right iliac fossa mass, weight loss, loss of appetite, abdominal pain while left sided colon mass presents with Obstruction, weight loss, loss of appetite.
Carcinoma of Rectum presents with bleeding per rectum, Tenesmus, Altered Bowel habits and early morning bloody diarrhea.

Treatment of Colon Cancer;

Treatment depends upon Stage of the Tumor.
In stage 1 and Stage 2 colon cancer, only surgery is indicated. No chemo radiotherapy before or after surgery.
In stage 3 tumor of the colon, after surgical resection of the tumor, then give Adjuvant chemotherapy regime FOLFOX or FOLFIRI(Adjuvant chemotherapy based on 5-fuorouracil (5-FU) and folinic acid (leucovorin) usually in combination with oxaliplatin (FolFox) is used on an individual basis for stage III disease)

In Stage 4 Tumor which is metastatic tumor, most common mets to liver followed by lungs, if single or two mets, then can be removed surgically during the resection of the primary colonic tumor.
Which part of the Gut should be resected depends upon the location of the tumor;
If tumor present in caecum, ascending colon, then Right Hemicolectomy with 10-15cm resection of ileum with removal of 10-12 lymph nodes and high vascular ligation of right colic and ileocolic arteries and sometime right branch of middle colic artery if tumor located at hepatic flexure of colon.
If Tumor located in mid transverse colon or at splenic flexure then Extended Right Hemicolectomy with high ligation of above mentioned vessels plus left branch of middle colic artery as well.
If Tumor is located in Descending colon/left colon, then do Left Hemicolectomy.
If tumor is located in Sigmoid colon, then do Sigmoid resection with proximal and distal margin of the tumor should be more than 5cm.

Rectal Tumor/Cancer;

In case of rectal cancer, TNM staging, Investigations, Spread of tumor are same except the treatment is different from colonic cancer.
Remember in case of rectal cancer, the surgical management of the Tumor depends on the stage of the tumor and the location of the tumor from the anal verge.

If tumor is located more than 5cm from the anal verge, then Anterior resection should be performed with proximal margin from the tumor more than 5cm should be resected while distal margin can be taken more than 1cm with sparing of anal Sphincters, with TME(Total mesorectal excision) and then anastomosis of anal canal with colon.

But if Tumor of the rectum is located less than 5cm from anal verge, then anal sphincters cannot be spared therefore APR (Abdominoperineal resection) should be performed with permanent Stoma on left side of the abdomen. Patient will live with this stoma lifelong.

In case of Stage 1 tumor of the rectum, just do surgery either anterior resection or APR depends upon then location of the tumor from anal verge.

In case of Stage 2, 3 and stage 4 rectal cancer/tumor, 1st give short course of chemo radiotherapy (Neoadjuvant chemotherapy before surgery), downstage the tumor, then restage the tumor, then do tumor resection and then Chemotherapy.

Multiple Choice Questions (MCQs)

MCQ#1:

A 45-year-old man presents with a long history of heartburn, especially at night. He uses three pillows to sleep and has medicated him- self with a variety of antacids over the past 15 years. Recently he has been complaining of dysphagia that he localized to the precordial area. Which is the most likely diagnosis?

(A) Adenocarcinoma of the esophagus
(B) Angina pectoris
(C) Benign peptic stricture of the esophagus
(D) Achalasia of the esophagus
(E) Lower esophageal ring (Schatzki's ring

KEY C

Explanation;

Benign peptic strictures of the esophagus are submucosal fibrotic rings that narrow the lumen and obstruct the passage of food. They present with dysphagia. They tend to be between 1 and 4 cm in length. GERD is the most common cause. Other associated motility disorders often occur. Heartburn may improve because of the obstruction to refluxed bile.

MCQ#2:

A 28-year-old man is admitted to the emergency department complaining of pain in the umbilical region that moves to the right iliac fossa. Which is a corroborative sign of acute appendicitis?

A) Referred pain in the right side with pressure on the left (Rovsing) sign
B) Increase of pain with testicular elevation
C) Relief of pain in lower abdomen with extension of thigh
D) Relief of pain in lower abdomen with internal rotation of right thigh
E) Hyper anesthesia in the right lower abdomen

KEY A

Explanation;

Rousing's sign is corroborative of acute appendicitis. The other signs are corroborative of appendicitis. Hyperesthesia is a useful sign provided that it is performed objectively. The area of hyperesthesia is a triangular area (base placed upward) in the right lower abdomen.

MCQ#3:
A 38-year-old man with a history of fever associated with abdominal pain of 3-week duration presents now with a sudden onset of abdominal pain and copious vomiting. Plain abdominal x-rays reveal air under a diaphragm. A CT scan shows mesenteric lymphadenopathy and splenomegaly is found. Laparotomy is performed and 3 feet of ileum resected. The luminal aspect of the resected bowel shows marked ulceration of Peyer's patches. What is the most likely diagnosis?
A) Typhoid enteritis
B) Tuberculosis enteritis
C) Crohn's disease
D) Primary peritonitis
E) Ulcerative colitis
KEY A
Explanation;
Typhoid fever typically presents with initial symptoms. Small intestine complications are related to involvement of Peyer's patches of the small intestine, which result in bleeding and/or perforation in the second and third week after symptoms are noted.

MCQ#4:
A 68-year-old man presents with crampy abdominal pain and distention with vomiting. Findings on physical examination are positive for healed abdominal scars. X-rays reveal multiple gas fluid levels. The WBC count is 12,000. What is the most likely diagnosis?
A) Small-bowel intestinal obstruction due to adhesions
B) Hernia
C) Appendicitis
D) Inflammatory bowel disease
E) Gallstones and ascites
KEY A
Explanation;
The presence of distended loops of bowel indicate bowel obstruction. The clinical features favor mechanical obstruction rather than paralytic ileus due to infection. Obstruction due to adhesions is more common than obstruction due to hernia.

MCQ#5:
A 25-year-old man has recurrent, indolent fistula in ano. He also complains of weight loss, recur- rent attacks of diarrhea with blood mixed in the stool, and tenesmus. Proctoscopy revealed a healthy, normal-appearing rectum. What is the most likely diagnosis?
A) Crohn's colitis
B) Ulcerative colitis
C) Amoebic colitis
D) Ischemic colitis
E) Colitis associated with acquired immunodeficiency syndrome (AIDS)
KEY A

Explanation;
Recurrent fistulas in ano are a feature of Crohn's colitis. The absence in the rectum eliminates the possibility of ulcerative colitis. Amebic colitis presents with recurrent episodes of diarrhea with bleeding. Ischemic colitis also presents with diarrhea

MCQ#7:
A 70-year-old man presents with pallor and breathlessness on exertion. He does not complain of abdominal pain. He has microcytic, hypochromic anemia. What is the most probable cause?
(A) Diverticulosis of the colon
(B) Peptic ulcer disease
(C) Crohn's disease
(D) Ulcerative colitis
(E) Carcinoma of the right colon
KEY E
Explanation;
Insidious development of a microcytic, hypochromic anemia is an important clue for the diagnosis of carcinoma of the right colon. Guaiac-positive stool with or without a palpable mass in the RLQ should raise the possibility. All the other possibilities listed may also cause lower GI bleeding but are characteristically associated with abdominal pain (peptic ulcer disease, Crohn's disease, ulcerative coli- tis). Bleeding in sigmoid diverticulosis usually is bright red and painless.

MCQ#8:
A 66-year-old man with obstructive jaundice is found on ERCP to have Periampullary carcinoma. He is otherwise in excellent physical shape and there is no evidence of metastasis. What is the most appropriate treatment?
(A) Radical excision (Whipple procedure) where possible
(B) Local excision and radiotherapy
(C) External radiotherapy
(D) Internal radiation seeds via catheter
(E) Stent and chemotherapy
KEY A
Explanation;
Carcinoma of the head of the pancreas is treated with radical excision of the head of the pancreas along with the duodenum. Continuity of the biliary and GI tract is established by performing Hepaticojejunostomy, pancreaticojejunostomy, and gastrojejunostomy. The 5-year survival rate is higher for periampullary carcinoma (30%) than that for pancreatic head lesions (10%). Most centres do not give irradiation routinely before or after surgery, because pancreatic cancers do not respond well to radiotherapy. Endoscopically placed stents alone are used only in palliative circumstances in patients with limited life expectancy.

MCQ#9:
A 42-year-old woman with a history of chronic alcoholism is admitted to the hospital because of acute pancreatitis. The bilirubin and amylase levels are in the normal range. An ultrasound reveals cholelithiasis. The symptoms abate on the fifth day after admission. What should she be advised?
(A) To start on a low-fat diet.
(B) To increase the fat content of her diet.
(C) To undergo immediate cholecystectomy.
(D) To undergo cholecystectomy during the same hospital stay as well as an assessment of her bile ducts.
(E) That she will be discharged and now should undergo elective cholecystectomy after 3 months.
KEY: D
Explanation;
Patients who develop acute pancreatitis as a result of cholelithiasis should have gallbladder surgery performed during the same hospital stay to avoid recurrence. An assessment of the bile ducts should be performed either preoperatively or intraoperatively after the resolution of the pancreatitis. Elective cholecystectomy should be avoided during the actual phase of pancreatitis.

MCQ#10:
A 50-year-old man presents with a complaint of a 1-cm moderately painful, tender mass situated one-third of the way between the xiphisternum and the umbilicus. What is the most likely diagnosis?
(A) Fibro sarcoma of the abdominal wall
(B) Omphalocele
(C) Spigelian hernia
(D) Fat necrosis
(E) Epigastric hernia
KEY E
Explanation;
Epigastric hernia is a defect in the linea alba between the umbilicus and the xiphisternum. It usually contains preperitoneal fat rather than omentum or bowel. It may cause pain and is commonly encountered in older patients. Sometimes it is located on either side of the midline. Spigelian hernia occurs lateral to the linea semilunaris.

MCQ#11:
A 70-year-old cigarette smoker presents with a right inguinal mass that has enlarged and has caused discomfort in recent months. He complains of recent difficulty with micturition and nocturia. The swelling, which does not extend to the scrotum, reduces when resting. What is the likely diagnosis?
(A) Direct inguinal hernia
(B) Strangulated indirect inguinal hernia
(C) Hydrocele
(D) Aneurysm of the femoral artery

(E) Cyst of the cord
KEY A
Explanation;
Direct hernias are more common in older patients. There is an increased incidence in patients with a chronic cough and prostatic obstruction. They are rarely encountered in children and women. This type of hernia does not extend to the scrotum and rarely undergoes strangulation.

MCQ#12:
A 35-year-old man presents with right upper quadrant pain, fever, jaundice, and shaking chills. Ultrasound of the abdomen demonstrates gallstones, normal gallbladder wall thickness, and common bile duct of 1.0 cm. The patient is admitted to the hospital and given IV fluids and antibiotics. He continues to be febrile with increasing WBCs. Which of the following is the most appropriate next step in this patient's management?
a. Endoscopic retrograde cholangiopancreatography (ERCP)
b. Placement of a cholecystostomy tube
c. Laparoscopic cholecystectomy
d. Open cholecystectomy
e. Emergent operation and decompression of the common bile duct with a T tube
KEY: A
Explanation;
Cholangitis is suggested by the presence of the Charcot triad: fever, jaundice, and pain in the right upper quadrant. In patients with suppurative cholangitis who fail to respond to intravenous antibiotics and fluid resuscitation, the non-operative approach is the preferred intervention via either percutaneous or endoscopic drainage of the obstructed common bile duct. If endoscopic retrograde cholangiopancreatography (ERCP) or percutaneous transhepatic biliary drainage (PTBD) fails, surgery is indicated. This is usually best accomplished by surgical placement of a T tube into the duct. Cholecystostomy will be effective only if there is free flow of bile into the gallbladder via the cystic duct and in general should not be depended on to secure drainage of the common bile duct. A cholecystectomy would not provide drainage of the obstructed common bile duct.

MCQ#13:
A 45-year-old man complains of burning epigastric pain that wakes him up at night. The pain is relieved by eating or using over-the- counter antacids and H2 blockers. Diagnosis is best confirmed by which of the following?
(A) Urea breathe test
(B) Serum gastrin levels
(C) Barium meal examination
(D) Upper endoscopy
(E) Upper endoscopy and biopsy
KEY E
Explanation;
Duodenal ulcer is best diagnosed by upper endoscopy and biopsy. Findings of gastritis and the presence of *H.pylori* are indications to prescribe appropriate therapy. This

typically includes a PPI and two antibiotics (one regimen includes amoxicillin and clarithromycin). Although the urea breath test is the most sensitive and specific test used to detect *H. pylori*, it is not readily available in all settings.

MCQ#14:
A frail elderly patient is found to have an anterior perforation of a duodenal ulcer. He has a recent history of nonsteroidal anti-inflammatory drug (NSAID) use and no previous history of peptic ulcer disease. A large amount of bilious fluid is found in the abdomen. What should be the next step?
(A) Lavage of the peritoneal cavity alone
(B) Lavage and omental patch closure of the ulcer
(C) Total gastrectomy
(D) Lavage, vagotomy, and gastroenterostomy
(E) Laser of the ulcer
KEY B
Explanation;

- Although surgery is generally recommended for perforation, conservative measures can be considered in select cases. A patient who has a benign clinical presentation or one who is improving, might be considered for treatment with antibiotics and nasogastric decompression.
- Patients who have an acute abdomen and are hemodynamically unstable should not be observed. Board-like rigidity of the abdomen occur as a result of chemical peritonitis. These patients should have fluid and electrolyte repletion, and antibiotics followed by surgery.

Choice of the operative procedure should be guided by the information obtained during the history, the presence of comorbid disease, and hemodynamic stability during the operation. An omental (Graham) patch will seal the ulcer, but it will not prevent recurrence