General Surgery
Part 2 Review

By : Dr. Haider Abdulridha Baqer

"Salivary Glands"

Salivary Glands Anatomy

1. Two Parotid & Submandibular & Sublingual Glands.
2. About 800 Minor Salivary Glands.
3. Sublingual Glands Present in Anterior Part Of Mouth's Floor.
4. Submandibular Glands Consist Of Large Superficial & Smaller Deep Part.
5. Submandibular Glands Related To:
   - ▪Lingual & Hypoglossal Nerve.
   - ▪Marginal Mandibular Branch Of Facial N.
   - ▪Anterior Facial Vein & Facial Artery.
6. Parotid Glands Consist Of Superficial (80%) & Deep (20%) Parts Separated By The Facial Nerve.
7. Parotid Glands Related To: Facial Nerve Trunk (5 Branches), Terminal Branch Of External Carotid Artery (Divide into Maxillary & Superficial Temporal A).
   - ▪Retromandibular Vein, IntraParotid LN

Salivary Gland Cysts

- Cysts Arise From Accumulation Of Salivary Gland Secretions (Mucous) Due To Obstruction Of The Salivary Drainage.
- Most Cysts Are Extravasation (Mucous Extrusion into The Surrounding Gland Capsule).

A. Retention Cysts

1. Cyst Arise From Minor Salivary Glands.
2. Causes Of Retention Cysts:
   - ▪Trauma To Glandular Parenchyma Or Drainage System, PeriDuctal Scars.
   - ▪Salivary Gland Stones (Sialolithiasis).
   - ▪Pressure From Surrounding Structures
3. Present As ➞ Translucent Painless Swelling On The Lower Lip Or The Floor Of The Mouth.
4. Mx Of Retention Cysts: Mostly Resolve Spontaneously, Surgical Excision.

"Salivary Glands"

B. Ranula (Little Frog)

1. Cysts Arise From Sublingual Glands.
2. Causes Of Ranula: Main Duct Rupture, Obstructed Acini Rupture.
3. Present As: Soft Flactuant Painless Transilluminated Bluish Swelling in The Anterior Floor Of The Mouth, Resemble The Belly (Air Sac) Of The Frog.

- ➢ Can Penetrates into The Mylohyoid Muscle To The Neck Then Present As Dumbbell Shape Submental Swelling (Plunging Ranula).
- ➢ Contain Thick Sticky Saliva.
- ➢ DDX ➞ Lymphangioma.
- ❑ Mx Of Ranula:
- ✓ Sublingual Gland Excision ➞ Best Choice To Prevent Recurrence.
- ✓ Incision & Drainage (Low Success Rate).
- ✓ Local Injection Of Ok-432 (To Produce Fibrosis) Or Botox (Good Success Rate).

Salivary Gland Stones (Sialolithiasis)

Sites Of Salivary Gland Stones

- ❑ 1.Submandibular Gland (80-85%)
- ➢ Most Commonly Affected Due To Its Viscous Secretions & Ascending Course Of The Duct (Predispose To Mucus Stagnation).
- ➢ Most Submandibular Stones Are ➞ Radio-Opaque (80% Visible On X-ray).
- ➢ Stones Of Submandibular Gland Mostly in ➞ Proximal Location.
- ❑ 2.Parotid Gland (20%)
- ➢ 2nd Most Common.
- ➢ Most Parotid Gland Stones Are ➞ Radio-Lucent (Not Visible On X-ray).
- ➢ Stones Of Parotid Gland Mostly in ➞ Distal Location.

"Salivary Glands"

Clinical Features & Dx Of Stones

1. Acute Painful Gland Swelling: Precipitated By Food (Eating Or Smelling), Resolved Spontaneously in 1-2h After Meal (Meal-Time Syndrome), Intermittent Pain During Partial Obstruction (Stone Dislodgement).
2. Asymmetrical Gland Enlargement & Tenderness.
3. Palpable Stones If Large & Proximal.
4. 2nd Bacterial Infection, Abscess Formation.

Dx Of Stones

- ❑ X-ray ➞ Detect 80% Of The Stones.
- ❑ CT/US/MRI ➞ Detect Radiolucent Stones.
- ❑ Sialography (Gold Standard) ➞ Dye Injection into The Gland's Duct.

Mx Of Stones

1. Small Stones (<5mm) ➞ Removed By Sialendoscopy.
2. Large Stones (>5mm) ➞ Removed By Surgical Duct Slitting, (ESWL) ➞ Induce Stones Fragmentation Then Can Removed By Sialendoscopy.
3. Gland Excision (Last one If Others Failed).

Salivary Gland Tumor's

- ❖ Rare & Mostly Present in 4th Decade Of Life (30-39 Years), Mostly Benign & Affect The Parotid Gland (>80%).
- ❖ Most Minor Salivary Glands Are Malignant (>50% Malignancy Risk) ➞ Present At Upper Lip / Palate / RetroMolar.
- ❖ MC Benign Tumor ➞ Pleomorphic Adenoma (Mostly Affect Parotid Gland).
- ❖ MC Malignant Tumor ➞ MucoEpiDermoid Ca

"Salivary Glands"

Risk Factors For Tumors

1. Radiation Exposure.
2. Smoking (Warthin's Tumor).
3. Viral Infection (Mumps/EBV) & Recurrent inflammation.
4. Environmental & Industrial Exposure (Rubber/Nickel/Hair Dyes/Silica Duct/ Cooking Kerosene)
5. Pickled Vegetables & Vitamin A Deficiency.

Types Of Salivary Gland Tumors

- **1. Pleomorphic Adenoma:**
  - Most Common Benign Salivary Tumor.
  - More in Women At 3rd-6th Decade Of Life (Average 45 Years).
  - Mostly Affect Parotid Gland (>80%) .
- **2. Warthin's Tumor (AdenoLymphoma):**
  - 2nd MC Benign Salivary Tumor (5-15%).
  - More in Elderly Men At 6th Decade Of Life.
  - Exclusively Occurs in Parotid Gland (More At The Inferior Pole) & Can Present Bilaterally.
  - Related To Smoking & Radiation Exposure.
  - Associated With Other Salivary Tumors (Pleomorphic Adenoma & Salivary Duct Carcinoma).
- **3. Adenoid Cystic Carcinoma:**
  - More in Submandibular Gland.
  - High Risk Of PeriNeural Invasion.
  - High Risk Of Recurrence.

- **4. Acinic Cell Carcinoma.**
- **5. Carcinoma Ex Pleomorphic Adenoma** ➞ Arise From Primary Or Recurrent Pleomorphic Adenoma.
- **6. Salivary Duct Carcinoma (High Grade Ductal Carcinoma)** ➞ +Ve Androgen & HER2 Receptors.

"Salivary Glands"

7. MucoEpiDermoid Carcinoma:

- MC Malignant Salivary Gland Tumors.
- Mostly Affect Children & Young Adults At 2nd Decade Of Life.
- Related To Radiation & Chemotherapy in Childhood.
- Affect Major & Minor Salivary Glands (Mostly Affect Parotid Gland).
- High Grade Tumor is Locally Aggressive & Affects Bone & Skin.
- Distant Metastases To The Lung.

1. US:
   - Benign Features → Well-Lobulated HypoEchoic Lesions With Calcifications.
   - Malignant Features → Irregular Shape HypoEchoic Heterogeneous Mass With Blurred Margins

Clinical Features Of Salivary Tumors

1. Benign Features: Painless Well-Defined Solitary Smooth Mobile Mass, Gradually & Slowly Increase in Size Over Time.
2. Malignant Features: Painful, Rapid Increase in Size, Fixed & Hard-Firm Consistency, Facial Numbness, Skin Ulcerations, LN Enlargement, Jaw Movement Restriction, Metastatic Features.

Dx Of Salivary Tumors

1. CT → Differentiate Tumors From Inflammatory Conditions.
2. MRI → Differentiate Benign From Malignant Tumors.
3. PET → Detect Distant Metastases.
4. FNAC Or Core Biopsy → Confirm Dx.

"Salivary Glands"

Mx Of Salivary Tumors

1. Gland Excision Only ➞ For Benign Tumors.
2. Gland Excision Then Chemotherapy ➞ For Malignant Tumors.

Complications Of Gland Excision

1. **Frey's Syndrome (Gustatory Sweating):**
   - Most Common Complication After ParotideCtomy.
   - Due To Abnormal Regeneration Of The Postganglionic Parasympathetic Fibers into The Vessels & Sweat Glands Of The Skin Overlying Parotid Gland.
   - Results in Skin Sweating & Flushing During Eating (Abnormal Stimulation).
2. **Nerve Injury** (Facial / Lingual / Hypoglossal / Mandibular).
3. **Skin Numbness.**
4. **Facial Disfigurement.**
5. **Hematoma Formation.**
6. **Wound Infection.**
7. **Sialocele** (Subcutaneous Cavity Filled With Saliva).

Cervical lymphadenopathy

▪ Cervical lymphadenopathy refers to the swelling of lymph nodes located in the neck.
▪ When the lymph nodes accumulate excessive amounts of lymphocytes, they can increase in size and become swollen.
▪ Depending on the underlying cause, enlarged cervical lymph nodes may be painless or painful to touch, tender, firm or rubbery in consistency, and mobile or fixed to the underlying tissue.

Important point

- Cervical lymphadenopathy can often be confused with cervical lymphadenitis, Although cervical lymphadenitis does usually present with cervical lymphadenopathy, cervical lymphadenitis refers to a direct infection of the cervical lymph nodes, often resulting from bacterial or viral infection.

Causes of Cervical Lymphadenitis

- Mycobacterium tuberculosis
- Atypical mycobacteria
- Cat scratch disease, which is caused by the bacterium Bartonella henselae

Symptoms of Swollen Cervical Lymph Nodes

1. Enlargement of the cervical lymph nodes. The enlarged nodes can be felt as small, hard, and painless lumps beneath the skin. cervical lymphadenopathy can also present with other symptoms such as:
2. Fever
3. Fatigue
4. Night sweats
5. Weight loss
6. Sore throat
7. Skin rashes
8. Joint pain

Cervical lymphadenopathy

Causes of Generalized cervical lymphadenopathy

1) Chronic infections, acquired immunodeficiency syndrome, infectious mononucleosis, and pulmonary tuberculosis.
2) Hodgkin's and Non-Hodgkin's lymphoma, acute lymphoblastic and myeloblastic leukemia.
3) Autoimmune disorders : SLE , rheumatoid arthritis
4) Miscellaneous conditions.
Sarcoidosis, Kawasaki disease.
5) Storage disorders : Gaucher's disease, Niemann–Pick disease, and amyloidosis.

Causes Localized cervical lymphadenopathy

1. Inflammatory processes in the neck or nearby areas such throat infection, the common cold, dental decay, ear infection, bronchitis, conjunctivitis, and infections of the salivary glands are all causative factors.
2. Cancers of the head and neck regions

Diagnosis

- Detailed history and physical examination
- US , MRI , CT
- CBC : Leukocytosis
- Flexible broncoscopy , OGD
- lymph nodes can be biopsied by :

1. Fine needle aspiration (FNA).
2. Core needle biopsy.
3. Excisional biopsy.

Treatment

- Tx needed if it has been present for a prolonged duration, or if there is any concern about an underlying malignancy.
- In cases due to an infection, antibiotics or antiviral medications may be prescribed.
- In cases where the lymph node enlargement is due to an inflammatory condition, corticosteroids
- In cancer, treatment may involve neck surgery, chemotherapy, radiation therapy, or a combination of these treatments.

Cervical tuberculous lymphadenitis

Causative organism: Mycobacterium tuberculosis (not M. bovis).

❖ **Sites** :

– Common in neck lymph nodes.

– Common in upper deep cervical (jugulodigastric—54%) lymph nodes.

– Next common is posterior triangle lymph nodes. (22%).

– Disease can also occur in other LNs like, axillary LNs, para-aortic LNs

❖ Disease may be associated with HIV infection, lymphomas.

❖ Stages of tuberculous lymphadenitis

1. Stage of infection, and lymphadenitis
2. Stage of periadenitis with matting
3. Stage of caseating necrosis and cold abscess
4. Stage of formation of collar stud abscess
5. Stage of formation of sinus which discharges yellowish caseating material

Clinical Features

- Swelling in the neck, which is firm, matted.
- Cold abscess is soft, smooth, non-tender, fluctuant, without involvement of the skin. It is not warm.
- As a result of increased pressure, cold abscess ruptures out of the deep fascia to form collar-stud abscess which is adherent to the overlying skin.
- Once collar-stud abscess bursts open, discharging sinus is formed.
- Tonsils may be studded with tubercles
- Associated pulmonary tuberculosis should also be looked for.
- Cervical spine is examined for tuberculosis

Cervical tuberculous lymphadenitis

Investigations

1. Haematocrit, ESR.
2. FNAC of lymph node and smear for AFB and culture.
3. HIV test (ELISA and western blot).
4. Open biopsy when FNAC is inconclusive.
5. Chest X-ray to look for pulmonary tuberculosis.
6. Polymerase chain reaction (PCR) is very useful

Gross Pathology : Firm, matted, lymph node, with cut section showing yellowish caseating material.

Microscopic : Epithelioid cells with caseating material are seen along with Langhan's type of giant cells.

Treatment

– Anti-tubercular drugs (usually for 6-9 months).
– Aspiration
– Incision and drainage
– Surgical removal
– Surgical removal of lymph nodes are indicated when:
1. There is no local response to drugs or
2. When sinus persists.
– Excision of the sinus track is often essential when sinus develops.

Cold abscess:

– Deep to deep fascia
– No evidence of signs of inflammation
– Not warm, non-tender, smooth, soft and fluctuant, non-transilluminating
– Not adherent to skin (skin is free); no redness
– Contains cheesy caseating material
– It is seen in caseating tuberculous lymphadenitis due to caseation necrosis
– It may form collar stud abscess and later sinus
– FNAC, AFB, culture are useful investigations

Treatment

- Anti-tuberculous drugs
- 'Zig - zag' aspiration by wide bore needle in nondependent area to prevent sinus formation
- Drainage using nondependent incision; later closure of the wound without placing a drain

Cystic Hygroma and Branchial cyst

- It is a sac formed from sequestrated part of jugular lymph sac of fetus.

Pathology

– It Consists of Multiple Intercommunicating Cystic Lymph Space.
– It is lined by Endothelium.
– It contains Lymph.

Clinical picture

– Age: Since Birth or Shortly after.
A. Common at lower part of side of neck superficial to sternomastoid & extends to post. Triangle.
B. The next common site is Axilla alone or with Neck.
C. The less common Cheek, Lip (Macrocheilia) and Tongue (Macroglossia).
Characters : Irregular shape, large in size. ill-defined edge. Translucent, Lax, Cystic & Compressible, but Non- pulsating mass.

Treatment of Cystic Hygroma

1. Excision as early as possible… or
2. Injection of boiling water of sclerosing material / weekly lead to Fibrosis, or
3. If infected give A.B. end by Fibrosis.

Branchial Cyst

Clinical Picture

- Present Congenitally , but may present at childhood or later at age of 20 years. At the Upper part of side of neck just below the angle of mandible deep to anterior border of upper 1/3 of sternomastoid

– Moderate in size about 5 cm, Globular, Smooth, Well defined, Tense cystic & Opaque.
– On contracting Sternomastoid, it bulges out.

Pathology:

– Lined by Squamous epithelium and Surrounded by Lymphoid tissues.
– Contains mucus rich in Cholesterol crystals.

Treatment

Complete excision through a transverse incision.

Day Case Surgery

- Day surgery is defined as the admission and discharge of a patient for a specific procedure within the 12-hour working day.
- Where a patient requires an overnight admission, then the term '23 hour stay' should be used.
- "True day surgery" : to operations requiring full theatre facilities and/or general anaesthesia, excluding outpatient or endoscopic cases.

Other Definition

- Outpatient surgery : not admitted to a ward facility
- Procedure room surgery : surgery not requiring full sterile theatre facilities
- Day or same-day surgery : admitted and discharged within the 12-hour day
- Overnight stay : 23-hour admission with early morning discharge
- Short-stay surgery : admission of up to 72 hours

SELECTION CRITERIA

1. Surgical

- Low risk of significant postoperative complications (e.g. bleeding, airway issues).
- Patient should be able to eat, drink, mobilise, and have pain managed with oral analgesics (possibly with local infiltration or nerve block).
- Example procedures:

A. Laparoscopic cholecystectomy (75%)
B. Vaginal hysterectomy (60%)
C. Arthroscopy (99%)
D. Ureteroscopy for calculus (70%)

2. Medical

- Suitability judged on comorbidities and functional status, not age or BMI alone.
- Exclusions: unstable ASA 3, ASA 4–5, or poorly controlled medical conditions.
- Specific conditions:

1. Diabetes: Well-controlled (HbA1c less than 8.5%)
2. Epilepsy: Well-controlled cases accepted
3. Obesity: Acceptable if managed by experienced teams; use short-acting agents; assess with STOP-BANG for sleep apnoea.

Day Case Surgery

SELECTION CRITERIA

3. Social

- Adequate home environment (heating, toilet, phone access).
- Residence within 1 hour of a hospital.
- Responsible adult to stay for 24 hours post-anaesthetic (unless local "home alone"

Delivery of Day Surgery

Facilities

- Ideally performed in a dedicated day surgery unit with separate admission, operating,
and discharge areas.
- Benefits : fewer cancellations, higher patient satisfaction, protection from inpatient/COVID pressures.

Preoperative Assessment

- Nurse-led, with anaesthetist input as needed.
- Emphasise patient education and social preparation.

Admission & Theatre List Planning

- Normal fasting rules.
- Encourage patients to walk to theatre.
- Schedule longer recovery cases first (e.g. tonsillectomy, high BMI patients).

Anaesthesia & Surgery

- Use short-acting agents and multimodal analgesia.
- Avoid long-acting opioids (e.g. IV morphine).
- Minimise drains; ensure clear postoperative instructions are documented.

Emergency Day Surgery

Some emergency cases can also be managed as day cases:

- Suitable examples (BADS):
- ERPC (95%)
- Perianal abscess drainage (95%)
- Zygomatic fracture reduction (60%)
- Tendon repair (95%)
- Contraindications: sepsis, unstable diabetes, need for parenteral analgesia, inability to
mobilise

Day Case Surgery

Discharge criteria

1. Vital signs stable for at least 1 hour
2. Correct orientation as to time, place and person
3. Adequate pain control with supply of oral analgesia
4. Understands how to use oral analgesia supplied
5. Ability to dress and walk where appropriate
6. Minimal nausea, vomiting or dizziness
7. Has taken oral fluids
8. Minimal bleeding or wound drainage
9. Has passed urine (if appropriate)
10. Has a responsible adult to take them home
11. Written and verbal instructions given about postoperative care
12. Knows when to come back for follow-up (if appropriate)
13. Emergency contact number supplied

Advantages

- For patients : Recovery in home comfort, less disruption to daily life, and reduced risk of hospital-acquired infection.
- For hospitals : Increases bed availability, improves efficiency and patient satisfaction.

Perioperative management of the high-risk surgical patient

CLASSIFICATION OF RISK

-It can be classified into patient and surgical factors.

Patient factors:

- ❖Severe cardiac disease ((IHD), (MI), cardiac failure).
- ❖Severe respiratory disease ((COPD), respiratory failure).
- ❖Aged >70 years with limited physiological reserve in one or more vital organs.
- ❖Metabolic disease (renal failure, poorly controlled diabetes).
- ❖Morbid obesity.
- ❖Late stage vascular disease.
- ❖Poor nutrition

Surgical factors:

- ❖Prolonged duration of surgery (>1.5 hours).
- ❖Extensive surgery (e.g. oesophagectomy, gastrectomy).
- ❖Type of surgery (thoracic, abdominal, vascular).
- ❖Emergency surgery (e.g. perforated viscus, gangrenous bowel, gastrointestinal bleeding).
- ❖Acute massive blood loss (>2.5 litres).
- ❖Septicaemia (positive blood cultures or septic focus).
- ❖Severe multiple trauma: >3 organs or >2 systems or 2 body cavities open

GENERAL PRINCIPLES OF MANAGEMENT

-The key management is the identification of risk, the accurate estimation of that risk and the work done to minimise it.

It can be done by:

improving by optimising their medical therapy.

- •Patient may need to admit to a high dependency unit (HDU) or intensive treatment unit (ITU) preoperatively.
- •Intraoperative considerations.
- •Consider specific strategies e.g. goal directed therapy (GDT).
- •Consider admission to a critical care facility postoperatively.

Optimise medical management and intraoperative considerations

-**Simple measures:** such as stopping smoking, reducing alcohol intake, losing weight, improving nutrition and/or haemoglobin levels

.-**Other measurements:** complex investigations, review of medication or even consideration of further surgery.

Perioperative management of the high-risk surgical patient

Ischaemic heart disease:

-Minimising pain and provide a good degree of cardiac stability, it should be used to minimise myocardial ischaemia

.-Avoid tachycardia, systolic hypertension and diastolic hypotension.

-Blood loss must be accurately monitored and haemoglobin level maintained.

-Oxygen supplementation is advisable for 3–4 days postoperatively.

-Perioperative B-blockade should be considered.

-Elective postoperative critical care admission should be considered

Cardiac failure

-Drugs used in chronic heart failure like B-blockers, ACE inhibitors should be continued.

-Ensure minimal myocardial depression and change in afterload during surgery.

-Arrhythmias particularly (AF) should be controlled and correcting any electrolyte imbalance.

Respiratory failure

-It is defined as a PaO2 kPa in air, PaO2/FiO2 or inability to extubate a patient 48 hrs. after surgery and the mortality is 27–40%

.-Bronchodilator, steroids therapy will be required in those with reversible obstructive airway disease and preoperative pulmonary function test should be done to assess functional status.

-Nutritional status should be optimised and albumin levels corrected.

-Physiotherapy for postural drainage and deep breathing exercises should be considered pre- & postoperatively.

-Regional techniques of anaesthesia should be considered where possible in these patients.

-Given good quality pain relief & use non-invasive ventilation strategies

Postoperative care

Postoperative care

-The aim is to provide the patient with as quick, painless and safe recovery from surgery as possible.

The immediate postoperative period:

*recovery room:

❑All anaesthetised patients should be recovered in a recovery room.

❑All vital parameters should be monitored and documented.

❑Treat pain and nausea/vomiting.

❑Watch for complications

-The patient can be discharged from the recovery room when they fulfil the following criteria:

- Patient is fully conscious.
- Respiration and oxygenation are satisfactory.
- Patient is normothermic, not in pain nor nauseous.
- Cardiovascular parameters are stable.
- Oxygen, fluids and analgesics have been prescribed.
- There are no concerns related to the surgical procedure.

SYSTEM-SPECIFIC POSTOPERATIVE COMPLICATIONS:

Respiratory complications:

-Early respiratory complications are hypoxaemia, hypercapnia and aspiration.

-Late complications are pneumonia and pulmonary embolism.

-Obese, smokers and those with chronic lung conditions are more likely to have respiratory complications.

*Postoperative hypoxia or hypoxaemia:-

It is defined as an oxygen saturation of less than 90%.

-It may present as shortness of breath or agitation or as upper airway obstruction or cyanosis or as a combination of any of the above

Postoperative care

-Causes of postoperative hypoxia:

- Upper airway obstruction due to the residual effect of general anaesthesia, secretions or wound haematoma after neck surgery.
- Laryngeal oedema from traumatic tracheal intubation, recurrent laryngeal nerve palsy and tracheal collapse after thyroid surgery.
- Hypoventilation related to anaesthesia or surgery.
- Atelectasis and pneumonia after upper abdominal & thoracic surgery.
- Pulmonary oedema of cardiac origin or related to fluid overload.
- Pulmonary embolism: sudden onset of chest pain and dyspnoea. If large embolism, there will be systemic hypotension, pulmonary hypertension and an elevated central venous pressure (CVP).

The treatment of postoperative hypoxia:

-It should be urgently and if the patient is breathing spontaneously, administer oxygen at 15 L/min, using a non-rebreathing mask.

-A head tilt, chin lift or jaw thrust should relieve obstruction related to reduced muscle tone.

-Suctioning of any blood or secretions and insertion of an oro pharyngeal airway may be needed.

-Anaesthetist should be informed as tracheal intubation and manual ventilation may also be needed.

-Neck wound haematoma can become a life-threatening emergency and must be evacuated immediately under local or general anaesthesia

-In case of pulmonary oedema, diuretics should be started and a cardiology opinion should be arranged.

-Antibiotics, chest physiotherapy and bronchodilators will be needed to treat pneumonia.

Postoperative care

Cardiovascular complications

-Hypotension in the immediate postoperative period may be due to inadequate fluid replacement, vasodilatation from subarachnoid & epidural anaesthesia or rewarming of the patient.

-Other causes of hypotension such as surgical bleeding, sepsis, arrhythmias, myocardial infarction, cardiac failure, tension pneumothorax, pulmonary embolism, pericardial tamponade and anaphylaxis.

-Patients with hypotension are likely to have cold clammy extremities, tachycardia, low urine output ≤0.5 mL/kg/hr. and low CVP.

-Hypovolaemia should be corrected with intravenous crystalloid or colloid infusions

Myocardial ischaemia and infarction:

-Patient may present with retrosternal pain radiating into the neck, jaw or arms and may also have nausea, dyspnoea or syncope.

-On the ECG: there is a ST-elevation in two continuous leads or new left bundle branch block (LBBB).

-Serum troponin levels will be high in both types of MI (myocardial ischaemia and myocardial infarction).

The treatment:

-Start with oxygen, glyceryl trinitrate (GTN), morphine, aspirin and involve a cardiologist.

-Beta-blockers and/or calcium antagonists to reduce further episodes of ischaemia.

-Cardiologists may start coronary reperfusion therapy for STEMI in the form of primary percutaneous coronary intervention or thrombolysis

Postoperative care

Arrhythmias:

-Arrhythmia can cause hypotension and ischaemia in postoperative period so that patients need continuously monitoring.

-Tachycardia (sinus or supraventricular) may be caused by anxiety, pain, MI, hypovolaemia, sepsis or hypoxia in the postoperative period.

-Sinus bradycardia may be normal in athletes but it may also be associated with hypoxia, preoperative beta-blockers, digoxin and increased intracranial pressure.

Treatment:

-Correcting underlying causes including acid-base and electrolyte imbalance, hypoxia and hypercapnia.

-In case of tachycardia, control the heart rate with beta-blockers, amiodarone or cardioversion.

-In case of bradycardia, If the heart rate is 40 bpm or less, glycopyrrolate 0.2–0.4 mg or atropine 0.6 mg should be given intravenously and the patient reviewed.

Surgical Nutrition

Physiological consideration:

- Normal person needs 30 Kcal/kg
- For average adult body weight (70 kg) average 2100 Kcal/day.

The energy given by each type of food:

- 1 gm carbohydrate → 4 Kcal
- 1 gm protein → 4 Kcal
- 1 gm fat → 9 Kcal

In health adult, the normal dietary intake of protein is 80-120 g per day (equivalent to 12-20 g nitrogen).

Approximately 2 g of nitrogen are lost in faeces and 10-18 g in urine each day. mainly in the form of urea.

So, the ratio of the different items in a well-balanced diet:

Carbohydrate 50%
Fat 35%
Protein 15%

Maintaining a healthy nutritional status requires the following daily balanced supplementation:

	Per Kg	For 70 Kg person
Water (ml)	35	2450
Carbohydrate (gm)	2	140
Fat (gm)	3	210
Protein (gm)	0.7	50
Nitrogen (gm)	0.7	7
Na+ (mmoL)	1	70
K+ (mmoL)	1	70

Proteins are better assessed by its nitrogen contents. So, if the Intake of nitrogen exceeds its amount in urine (positive nitrogen balance) anabolic state. If the reverse (negative nitrogen balance)= catabolic state.

Malnutrition in Surgical Patient

Incidence:

About 30% of patients with GIT diseases.
It reaches 60% in those with prolonged hospital stay.

Aetiology:

A. Starvation (input):

1. Social causes, as poverty & neglected elderly
2. Less of appetite by chroatc diseases
3. Dysphagia.
4. Repeated vomiting.
5. Malabsorption syndrome in short gut syndrome, Crohn's & ulcerative colitis. Chronie pancreatitis
6. Post-operative restriction of oral intake (e.g. paralytic fleus).

B. Hypercatabolism (↑ output):

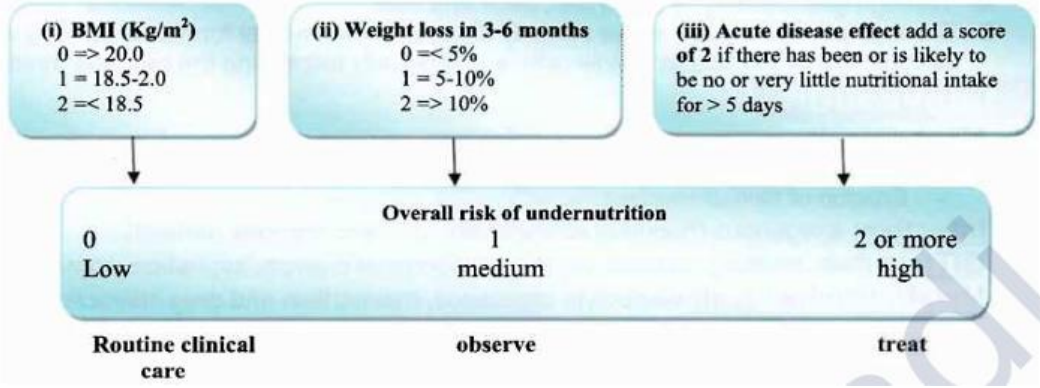
1. Major trauma and bums.
2. Major surgical operations
3. Severe acute pancreatitis.
4. Major sepsis e. g. septicaemia

Effects on the outcome of surgery:

1. Impairment of wound healing, e.g. burst abdomens
2. Immunosuppression with susceptibility to infection.
3. Delay physical recovery & hospital stay.
4. Decreased tolerance to radiotherapy and chemotherapy.

↑ Operative mortality & morbidity when >20% of the body weight is lost.

The MUST tool: the British association of parenteral and enteral nutrition Introduced Mal-nutrition Universal Screening Tool (MUST):



Malnutrition in Surgical Patient

Diagnosis:

A. Anthropometric measures:

1. Recent un-intentional weight loss > 10%.
2. Body weight is < 80% of the ideal for height.
3. Muscle mass: Mid-arm muscle circumference < 80% of the average.
4. Triceps skin fold thickness.

B. Laboratory:

1. Serum albumin < 3.5 gm/L.
2. Determine nitrogen balance (whether +ve/-ve).

➤ Input-output→ +ve nitrogen balance (anabolism).

→-ve nitrogen balance (catabolism).

3. TLC < 1.200 x 109/L.
4. Impaired hypersensitivity reaction.

Types of Surgical nutrition

Types of Surgical nutrition:

A. Enteral nutrition.

B. Parenteral nutrition

Enteral nutrition:

Definition: Delivery of nutrients Into GIT

Indication

Patient in whom oral intake is inadequate or impossible, while having a functional accessible GIT as in:

1. Comatosed patients.
2. Severe dysphagia.
3. Head & neck surgery.
4. Critically ill patients.
5. Low output enterocutaneous fistulae (500 ml/day).

Roures of administration:

1. Sip feeding: whole food by mouth (fluid formula)

2 Tube feeding techniques

Nasogastric tube (NGT) Ryle's tube

Gastronomy: if NGI feeding is not possible e g upper GIT obstruction

Jejunostomy: if the stomach is diseased.

Administration formula:

A- Through gastrostomy; liquid diet, juice and milk.

B- Through jejunostomy; either partially digested or elemental formulae, starting with isotonic sterile formula at a slow rate, and gradually increasing the rate and tonicity.

Types of Surgical nutrition

Complications:

1) Mechanical:Malposition, displacement, blockage, breakage or leakage of the tube. Erosion of skin or mucosa.
2) Infective: exogenous (handling contamination) or endogenous (patient).
3) GIT complications: diarrhoea, bloating, nausea, vomiting, abdominal cramps, aspiration, constipation.
4) Metabolic/chemical: electrolyte imbalance, malnutrition and drug interactions.

Tube Care:

a) Flushed with water at least twice per day.
b) If obstructed with solidified diet instillation of chemotrypsin inside the tube may salvage a partially obstructed tube.

Total Parenteral Nutrition (TPN):

➤ **Definition:** Provision of all nutritional requirements through intravenous route without use of GIT.

Indications:

The principle indication for TPN is found in seriously ill patients suffering from protein calorie malnutrition where the use of GIT for feeding is not possible as follow:

1- GIT is blocked e.g. stricture, neoplasm or extrinsic mass
2- GIT is short e.g. short gut syndrome.
3- GIT is fistulated e.g. enterocutaneous fistula.
4- GIT is inflamed e.g. inflammatory bowel disease.
5- GIT can not cope e.g. severe trauma or hyper-catabolic state.
6- Radiation enteritis
7- Moderate in severe pancreatitis.
8- Paralytic ileus.

Types of Surgical nutrition

Route of administration:

Central: catheter inserted via subclavian or internal or external jugular vein.

Peripheral: (appropriate for short term feeding up to 2 weeks);

Peripherally ;inserted central venous catheter (PICC) line

Conventional ;short cannula in the wrist vein (isotonic fluid)

Calculation of the requirements:

➤ Normal person needs 30 Kcal\ Kg body weight. 2100 Kcal/day.

➤ Surgical patient need 40 Kcal/Kg body weight.

Following surgery, overall energy expendiye may rise by 50% due to increased thermogenesis, fever and BMR

➤ **The energy given by each type of food:**

1gm CHO→4 Kcal

1gm protein → 4 Kcal

1gm fat → 9 Kcal

Calorie (CHO+ fat): nitrogen = 200 Kcal: 1 gm

So, the ratio of the different items in a well-balanced diet:

carbohydrate → 50%

Fat →35%

Protein →15%

The requirement is given In 2-4 liter of fluids.

Types of Surgical nutrition

Types of solutions used

1. CHO Glucose 50% + insulin.
2. Fat Intralipidl 10% & 20%.
3. Protein Vamine or Totamine.

➤ Other elements which has to be added:

1. K, Mg and Cl
2. Trace elenents.
3. Water-soluble vitamins and fat-soluble vitamins

The fluids are mixed together in a mixer bag & given over 24 hours in CVP.

Lipids can be given through a peripheral vein because it is isotonic

Important notes about TPN

Intralipid: Fat emulsion produced from soya oil.

It is isotonic, Given in peripheral vein, Not to mix it in the same mixture bag, Given twice weekly.

CHO:

Raise the dose every 3_4 days, regards to ↑insulin output gradualy

Complications:

A. Nutritional and metabolic complications resulting in overfeeding. underfeeding or specific nutrient imbalance as hyponatremia, hypokalaemia or hyperosmolar dehydration. Hyperglycaemia is a common incident.

B. Catheter complications:

1. Misplacement of the catheter.
2. Insertion of a catheter tip in the pleural cavity leading to hemothorax or pneumothorax. Chest x-ray should always be done after insertion of a catheter.
3. Injury to arteries or to nerves of brachial plexus (rare in experienced hands).
4. Air embolism
5. Venous thrombosis.
6. A common serious complication is the central venous catheter infection &septic thrombophlebitis septicaemia death,

Types of Surgical nutrition

whenever the patient develops unexplained fever the persists for more than 24 hours the venous catheter should be removed and sent for bacteriological and fungal cultures.

C. Failure of blood barrier, the absence of enteral feeding leading to atrophy of Intestinal mucosa. This allows for translocation of bacteria from the lumen to the blood stream leading to septicemia in the critically ill patients.

Home Parenteral Nutrition:

Intravenous nutrition at home is usually reserved for patients who had massive small intestinal resection (short bowel $).

1. Permanent silastic central venous catheter, tunnelled & cuffed is placed for long-term use
2. Parenteral alimentation is usually given at night over 12 hours with the aid of mechanical pump.

Monitoring of the patients:

Daily: urine output, Blood (Urea, Electrolyte, Glucose).
Twice weekly: Ca. Phosphorous, Albumin, CBC
Weekly: LFT, Plasma lipids, Magnesium.
Monthly: Folate, Iron, Zinc, PT

Metabolic response to starvation:

1. Low plasma insulin.
2. High plasma glucagon.
3. Hepatic glycogenolysis.
4. Protein catabolism.
5. Hepatic gluconeogenesis.
6. Lipolysis: mobilization of fat stores.
7. Adaptive ketogenesis.
8. Reduction in resting energy expenditure

Fluid

Chemical terms:

1-Osmosis: is movement of solvents (fluid where particles dissolve) from an area of low concentration to area of high concentration across semi-permeable membrane.

2-Osmotic pressure: is the pressure that drives the process of osmosis.

3-Osmolarity: is the number of particles in mOsm per one liter.

4-Osmolality: is the number of particles in mOsm per one kilogram..

Note: all particles have pressure however only large particles that do not pass through the membrane either due to its weight, charge or gate will produce effective osmotic pressure (oncotic pressure) while small ones have no effective osmotic pressure Tonicity: is effective osmotic gradient

Note: In tonicity we measure only the large particles that do not pass the membrane as it produce osmosis.

IV fluids types according to constituents

1-Crystalloid: electrolyte containing fluid
2-colloid: large particles containing fluid.
3-Dextrose water: electrolyte free fluid (it is considered as crystalloid by a mistake)
4-Blood (it was considered as colloid) but contain cells

Crystalloid vs. Colloid

	Crystalloids	Colloids
Advantage	• Cheap • Accessible	• Longer half life • Smaller volume required to expand intravascular volume
Disadvantage	• Short half life • Larger volume required for resuscitation	•Expensive • Risk of allergic reaction

How fluid affect body compartment?

Isotonic fluid:

It expand extracellular compartment (both interstitium and intravascular compartments act as single compartment) with the same amount given and as osmolarity is same no fluid shift thus it is best fluid for resuscitation and to replace acute deficit.

*In acute loss firstly the body starts to loss fluid from extracellular compartment then from intracellular compartment

Hypotonic fluid :

As the osmolarity of extracellular compartment decrease the fluid will move into intracellular compartment, It replace fluid to both intra and extra cellular compartments thus it is best type of fluid for maintenance. Usually our daily body loss occur from the extra cellular compartment and as osmolarity increase this loss will be replaced by fluid from the intracellular compartment until osmolarity raise in both compartments activating the hypothalamus which activate pituitary for ADH secretion and also for thirst sensation

Hypertonic fluid:

As the osmolarity of extracellular compartment increase the fluid will move into extracellular compartment. It is used in increased intracranial pressure caused by brain cellular edema. However it is also used in increase intracranial pressure caused by brain mass in critical cases will awaiting for surgery to prevent impending herniation

In resuscitation fluid should be isotonic (number of anion= number of cation)because we are giving large amount of fluid in short period.

-Using hypotonic fluid to shift intracellularly causing cell swelling and rupture of RBC.
-Using hypertonic fluid cause the cell to shrinkage

Ringer lactate theoretically is better than normal saline as it contain all electrolyte and buffer however practically they are interchangeable except when using large amounts of fluid

Fluid

-When we use large amounts of fluid for example in sepsis and burn ringer lactate is preferred as normal saline can cause non anion gap metabolic acidosis (hyperchlorimeic metabolic acidosis) HCo3 is excreted due to excess chloride. However in small amount no problem

.-In specific conditions ex DKA give normal saline. Ringer lactate could be given in renal failure although it have potassium.

-Lactate is changed into bicarbonate in liver. So In liver injury be careful giving ringer lactate. Also in hypothrmia where liver function is impaired

R/L vs N/S?

Fluids are prescribed for three reasons
Resuscitation of deficit
Maintenance
Replacement ongoing loss
correct fluid prescription varies depending on the individual patient

ressustation:

Bolus of isotonic fluid.(R/L or N/S) Requirement: Adult: 1-2L/Kg Pediatric: 20ml/Kg

Maintenance

Daily Requirements
Current NICE guidelines suggest the following:
Water: 25 mL/kg/day
Na+: 1.0 mmol/kg/day
K+: 1.0 mmol/kg/day
Glucose: 50g/day

Fluid

Fluid Prescribing

Maintenance Fluids

these do not have to be replaced exactly but should be targeted, to permit ease of prescribing

As an example,

70kg healthy male

fluids over 24 hours 1750mL of water (70kg x 25mL/kg/day) let us say 2000 ml

70mmol of Na- (70kg x 1.0mmol/kg/day)

70mmol of K. (70kg x 1.0mmol/kg/day)

50g (50g/day) of glucose

maintenance regimen is as follows:

First bag: 500mL of 0.9% saline with 20mmol/L K to be run over 8 hours This provides all of their Na, ~1/3 of their K., and a quarter of their water

Second bag: 1L of 5% dextrose with 20mmol/L K to run over 8 hours This provides a further 1/3 of their K., and half of their water, as well as 50gm glucose

Third bag: 500mL of 5% dextrose with 20mmol/L K to run over 8 hours

This provides the remaining 1/3 of their K., and a quarter of their water, as well as 25 gm glucose

Replacing Ongoing Losses

Subjective assessment of excess loss in the 4 secretions also take inconsideration;

3rd space loss e.g bowel wall, retroperitoneum in pancreatitis

Common scenarios

Dehydration (high urea:creatinine ratio and high PCV)

vomiting (low K+, low Cl-, and alkalosis)

diarrhoea (low K+ and acidosis)

Ongoing Monitoring

Clinical response

Fluid chart

Oral fluid intake amend fluid prescription

Daily weight

Blood test U&Es

Pediatric trauma

Introduction:

Trauma is the leading cause of death in children over 1 year old, and blunt trauma is the most common mechanism. Prompt, guideline-driven management by a trauma team reduces complications and saves lives

The primary survey:

Injured children are assessed using the Advanced Trauma Life Support (ATLS) structured ABCDE approach:

control of catastrophic bleeding with pressure,
Airway with C-spine control,
Breathing with oxygen,
Circulation with further control of haemorrhage,
Disability,
Exposure and Environment.

The following should be considered;

A .overextension of the neck can cause airway obstruction; a neutral position is used for infants and a 'sniffing the morning air' position for older children.

B . hypoxia is usually the cause of cardiac arrest in children; if easily reversed, the cardiac rhythm return.

C . hypotension occurs comparatively late after 20% of the circulating volume is lost.

D . an age-dependent modified Glasgow Coma Scale (GCS) is used.

E . small children lose heat rapidly, with hypothermia exacerbating any coagulopathy.

✓ If their weight in kilograms is unknown, it can be estimated from 2 × (age in years + 4).

✓ In cardiac arrest, the four Hs and four Ts are considered: Hypoxia, Hypovolaemia, Hypothermia/Hyperthermia, Hyperkalaemia/ hypokalaemia, Tension pneumothorax, cardiac Tamponade, Toxins, Thrombus

Pediatric trauma

Specific considerations:

Head: In a neonate, the fontanelle may not have closed, leading to a bony space that could be confused with a fracture. A bulging fontanelle may suggest raised intracranial pressure, whereas a sunken fontanelle is seen in hypovolemia.

Chest: A child's rib cage is very compliant and ribs may bend and recover rather than break, leading to lung contusions or mediastinal injuries without fractures. If diagnosed clinically, a tension pneumothorax need not be confirmed with a chest radiograph before needle thoracocentesis and placing a chest drain. Although uncommon, cardiac tamponade should be considered and requires an emergency subxiphoid needle pericardiocentesis; a limited echocardiogram may confirm the diagnosis

Abdomen: The liver and spleen in children are less well protected by the rib cage than they are in adults and are at greater risk of injury from blunt trauma. Signs may be subtle, and tenderness should be investigated with CT imaging.

Extremities: in comparison with adults, children's bones are more compliant and they may bend or fracture in one cortex. Children's bones also remodel as they grow; therefore, the position of an angulated distal limb fracture may be accepted in a child as compared to adult. The growth plates in children are not yet fused and a fracture involving the growth plate can limit future limb growth, and these fractures should be referred to a pediatric orthopedic surgeon

Pediatric trauma

Secondary survey

The secondary survey is performed after resuscitation and stabilization. The history is reviewed and a complete clinical examination is performed to assess for other injuries.

Note; The choice of imaging depends on the mechanism of injury and the findings on examination.

Plain radiograph: CXR is mandated in major trauma. The cervical spine is rarely injured, but if the injury mechanism leads to suspicion of cervical damage, then a cervical spine X-ray is requested.

Lateral and antero posterior images must include the base of the skull and the C7–T1 junction.

P elvic X-ray is requested if a pelvic fracture is suspected.

Suspected limb fractures initially undergo anteroposterior and lateral radiographs with CT reserved for those that are complex.

CT scans: Indications of CT brain:

1. If the GCS is 14 at the initial assessment (CT should be done within one hour from injury) or if the GCS is15 after the injury (done within two hours),
2. Evidence of tense fontanelle,
3. suspicion of an open or depressed skull fracture or a basal skull fracture,
4. abnormal pupillary response,
5. abnormal posturing,
6. focal neurological defect,
7. three or more vomiting episodes,
8. witnessed loss of consciousness for >5 minutes or amnesia >5 minutes.

Indications of CT chest:

1. Penetrating chest injury,
2. Significant deceleration injury.

However, most blunt chest injuries are detected on a chest radiograph; if the mediastinal shadow is normal, a chest CT is not usually required.

Pediatric trauma

Indications of CT abdomen and pelvis:

1. Abdominal wall bruising,
2. Abdominal tenderness,
3. Abdominal distension,
4. Signs of peritonitis,
5. Blood per rectum or blood in the nasogastric tube.

Some relative indications include;

1. Aspartate aminotransferase >200 U/L,
2. Amylase >100 U/L,
3. Microhematuria >5 erythrocytes/high-power field.

Patterns of injury:

There are some well-recognised patterns of injury in children.

Lap belt: If a child experiences a forced flexion over a lap belt in a car accident, the small bowel or its mesentery or the abdominal portion of urinary bladder may get compressed against the spine. Lumbar fractures may also be seen. In small children, the pancreas can be compressed by a lap belt.

Handlebar injury: A child who falls onto the end of a bicycle handlebar may crush the pancreas, duodenum, small intestine or its mesentery against the spine. A duodenal hematoma may cause an obstruction, the pancreas may be injured or divided and contused intestine may perforate after a delay of a few days, so a period of observation is required.

Straddle injury: A child typically falls onto the side of a bath or a toy, causing a perineal injury that may involve the urethra or vagina

Definitive management:

1.Chest:

_ A small pneumothorax detected on a chest radiograph may be observed rather than drained.

_Lung contusions require analgesia and chest physiotherapy to prevent secondary infection.

_Penetrating lung injuries may be assessed at either thoracoscopy or thoracotomy and the underlying lung injury sealed with fibrin glue or by applying a stapler; segmentectomy or lobectomy are rarely required

2. Abdomen:

Intraperitoneal air mandates a laparoscopy or laparotomy.

_Penetrating wounds that have not entered the abdominal cavity should be cleaned and closed.

In the hemodynamically stable child, most solid organ injuries can be managed without an operation, but if unstable despite appropriate transfusion, or only transiently responding, interventional radiology and embolization or a laparotomy should be considered.

Following an abdominal solid organ injury, bed rest advised until pain free, with mobilization after a minimum of 1 night for grade I and II injuries and after a minimum of 2 nights for grade III injuries. High-impact activities and contact sports should be limited for grade IV and V injuries for 6 wks.

Delayed hemorrhage can arise spontaneously several days after an injury and is thought to occur due to hematoma breaks down.

There is a risk of splenic pseudoaneurysm after splenic trauma, which is unrelated to the severity of the injury and a follow-up ultrasound is recommended.

Pancreatic trauma may lead to a pancreatic pseudocyst, which requires endoscopic drainage into the stomach.

For distal lacerations in the pancreatic tail, some surgeons prefer an early distal pancreatectomy rather than non-operative management. Proximal pancreatic duct injuries in older children can be stented.

Pediatric trauma

Splenic injury scale:

Grade	Injury type	Description of injury
I	Haematoma	Subcapsular, <10% surface area
II	Laceration	Capsular tear, <1 cm parenchymal depth
	Haematoma	Subcapsular, 10–50% surface area, intraparenchymal, <5 cm in diameter
III	Laceration	Capsular tear, 1–3 cm parenchymal depth not involving a trabecular vessel
	Haematoma	Subcapsular, >50% surface area or expanding; ruptured subcapsular or parenchymal haematoma, intraparenchymal haematoma ≥5 cm or expanding
IV	Laceration	>3 cm parenchymal depth or involving a trabecular vessel
	Laceration	Laceration involving segmental or hilar vessels producing major devascularisation (>25%)
V	Laceration	Completely shattered spleen
	Vascular	Devascularised by a hilar injury

Liver injury scale:

Grade	Injury type	Description of injury
I	Haematoma	Subcapsular, <10% surface area
	Laceration	Capsular tear, <1 cm parenchymal depth
II	Haematoma	Subcapsular, 10–50% surface area, intraparenchymal, <10 cm in diameter
III	Haematoma	Subcapsular, >50% surface area or expanding; ruptured subcapsular or parenchymal haematoma; intraparenchymal haematoma ≥10 cm or expanding
	Laceration	>3 cm parenchymal depth or involving a trabecular vessel
IV	Laceration	Parenchymal disruption involving 25–75% of hepatic lobe or 1–3 Couinaud segments in a single lobe
V	Laceration	Parenchymal disruption involving >75% of hepatic lobe or >3 Couinaud segments within a single lobe
	Vascular	Juxtahepatic venous injuries
VI	Vascular	Hepatic avulsion

"HYPERTROPHIC PYLORIC STENOSIS"

- The condition is caused by hypertrophy of the smooth circular muscle layer of the pyloric muscle, obstructing the gastric outlet.
- It occurs at a rate of 1_4 / 1,000 live births.
- 4 : 1 male-to-female.

Clinical features:

- The classic presentation of HPS is nonbilious, forceful vomiting in a full-term neonate who is between 2_8 weeks old.
- Exam: Palpable pylorus mass in 70–90%.

Etiology

- The cause of HPS is unknown.
- Genetic and environmental factors appear to play a large role in the pathophysiology.
- Environmental factors associated with HPS include feeding(bottle), exposure to erythromycin, pesticides.

Risk factors:

1. Family history.
2. Gender(MALE).
3. Younger maternal age.
4. A first born infant.

Diagnosis

- Ultrasound (gold standard technique). The diagnostic criteria for pyloric stenosis is a muscle thickness ≥4 mm and a pyloric channel length ≥16 mm.

Treatment

- ✓ Resuscitation followed by pyloromyotomy.
- ✓ The metabolic derangement
  Hypochloremic,
  Hypokalemic,
  Hyponatremic,
  Metabolic alkalosis.

"DUODENAL ATRESIA"

- Occurs in 1 / 5000.

Etiology

- Intrinsic: (is most common) believed to be caused by a failure of recanalization of the fetal duodenum resulting in complete obstruction.
- The extrinsic form of duodenal obstruction is due to defects in the development of neighboring structures.

Associated anomalies

- VACTRAL:

1. Vertebral.
2. Anorectal.
3. Cardiac.
4. Tracheoesophageal.
5. Renal.
6. Atresia of duodenum.
7. Limb.

Clinical features:

- The classic presentation is that of bilious emesis within the first hours of life in an otherwise stable neonate.
- In neonates with duodenal atresia, the abdomen is scaphoid.

Diagnosis

- prenatal ultrasound.
- The diagnostic radiographic presentation of duodenal atresia on Plain abdominal x-ray with no distal bowel gas.

Treatment

- Appropriate resuscitation is required with correction of fluid and electrolyte abnormalities, evaluation, then duodenoduodenostomy.

"Malrotation"

Midgut maturation involves 4 stages:

1. Herniation.
2. Rotation.
3. Retraction.
4. Fixation.

Clinical features:

- The incidence of malrotation has been estimated at 1 in 6000 live births.
- Classic malrotation with midgut volvulus is often discovered in a previously healthy term neonate.
- Sudden onset of bilious vomiting in a previously healthy term neonate is the cardinal sign , and malrotation with volvulus must be the presumed diagnosis until proven otherwise.

Diagnosis

- Physical examination findings will vary. Initially, the patient have a scaphoid abdomen.
- Upper gastrointestinal contrast study remains the gold standard, the contrast study may show the 'coil spring' or 'corkscrew' configuration with incomplete obstruction.
- the "beak" appearance in the duodenum with complete Obstruction.

Treatment

- ✓ Patients with suspected or confirmed midgut volvulus They should be aggressively resuscitated and taken to the operating room for immediate exploration.

"Pediatric surgery"

Jejunoileal atresia

Clinical presentation:

- Bilious emesis, abdominal distention and mostly gray plugs of mucus passed via the rectum.

Diagnosis

- X-ray: few(3-5) gas-filled and fluid-filled loops of small bowel, but the remainder of the abdomen is gasless.

Treatment

- Resection of atretic segment, with primary end-to-end anastomosis or resection with stoma.

Hirschsprung disease (HD)

- Known as congenital megacolon is a developmental disorder that is characterized by the absence of ganglion cells in the myenteric and submucosal plexuses of the distal intestine.

Etiology

- The neural crest cells never reach the distal intestine, The neural crest cells reach their destination, but fail to survive or differentiate into ganglion cells.
- 85% short segment involvement (rectosigmoid).
- Long segment(10-15%).

Zones:

- It has got 3 zones:

1. Aganglionic zone: distal immobile spastic segment.
2. Transitional zone: proximal middle, about 1-5cm length with less number of ganglion.
3. Hypertrophied dilated segment: More proximal, normal ganglionic area.

"Pediatric surgery"

Hirschsprung disease (HD)

Clinical features:

- Most affected patients present during the neonatal period with abdominal distension, bilious vomiting.
- Delayed passage of meconium beyond the first 24 hours is present in app. 90%.

Diagnosis

- Plain erect X-ray of Abdomen.
- Rectal biopsy: Gold standard.
- Anorectal manometry.
- Barium Enema: The pathognomonic finding of HD is a transition zone between the normal and aganglionic bowel.

Treatment

- ✓ Pull-through Procedure, the surgical management for HD are to remove the a ganglionic bowel and bringing the normally innervated bowel down to anus.

Anorectal Malformations

- occurs in 1 every 4000_5000 newborns.
- Male predominance.
- 2nd child with ARM 1%.

Classification

Males:

1. Rectoperineal fistula.
2. Rectourethral fistula (MC 80%).
3. Rectobladder neck fistula.
4. Imperforate anus without fistula.
5. Rectal atresia/rectal stenosis.

Female:

1. Rectoperineal fistula.
2. Rectovestibular fistula(80%).
3. Cloaca.
4. Imperforate anus without fistula.
5. Rectal atresia/rectal stenosis.
6. Rectovaginal fistula .

"Pediatric surgery"

Anorectal Malformations

Associated anomalies

- ❑ **VACTRAL:**

1. **V**ertebral.
2. **A**norectal.
3. **C**ardiac.
4. **T**racheoesophageal.
5. **R**enal.
6. **A**tresia of duodenum.
7. **L**imb.

Management

1. N.P.O. and NG tube.
2. fluid and electrolytes resuscitation.
3. Antibiotics, Search for VACTRAL
4. X ray should be done after 24 hours, air swallowing reach distal large bowel after 16 hours.
5. Surgical: varies according to the defect.

Gastroschisis and Omphalocele

- ❖ Gastroschisis occurs in 1 in 4,000 live births.
- ❖ Omphalocele occurs in 1 in 5,000 live births.

Etiology

- ❑ develops due to a failure of the viscera to return to the abdominal cavity through abdominal ring (STAGE 3 MIDGUT DEVELOPMENT).

Management

I. Appropriate IV access and fluid resuscitation.
II. NG decompression and Warming (incubator).
III. The bowel should be wrapped in warm saline-soaked gauze .
IV. The neonate should be positioned on the right side to prevent kinking of the mesentery with resultant bowel ischemia.
V. Surgical Management: Primary Closure, Staged Closure and Scarifcation treatment (Omphalocele).

"Pediatric surgery"

Gastroschisis and Omphalocele

Characteristic	Omphalocele	Gastroschisis
Herniated viscera	Bowel ± other	Bowel only
Sac	Present	Absent
Associated anomalies	Common (50%)	Uncommon <10%
Location of defect	Umbilicus	Right of umbilicus
Mode of delivery	Vaginal / cesarean	Vaginal
Surgical Tx	Nonurgent	Urgent
Prognostic factors	Associated anomalies	Condition of bowel

UMBILICAL HERNIA

- ❖ the fascial defect is present at birth .
- ❖ Incidence: Premature and low birth weight, trisomy conditions , and congenital hypothyroidism.
- ❑ Diagnosis: Exam.

Management

- ✓ umbilical hernias will close spontaneously.
- ✓ It seems very safe to observe the hernia until ages 5 to 7 years to allow closure to occur.

"Pediatric surgery"

Meconium ileus

- ❖ Extremely viscid, protein-rich, inspissated meconium causing an intraluminal obstruction in the distal ileum.
- ❖ Normal meconium is composed of: Water (>75%), Intestinal epithelial cells, Amniotic fluid, Mucus, Lanugo, Bile

Causes

1. Cystic fibrosis.
2. Pancreatic aplasia.
3. Colonic aganglionosis.

Clinical Presentation

- ➢ Greenish vomiting, Abdominal distension, Failure to pass meconium.
- ➢ Abdominal distension, palpable bowel loops, may have visible peristaltic waves.

Diagnosis

- ❑ Abdominal X- ray: Dilated ileum and Absence of air fluid level.
- ❑ Contrast enema: Dilated proximal ileum, Microlcolon.

Treatment

- ✓ Simple Meconium Ileus: The majority of newborns with MI can be managed nonoperatively, By isotonic watersoluble contrast enema.
- ✓ In complicated MI operative management is almost always required.

Intussusception

- ❖ Intussusception is the most frequent cause of bowel obstruction in infants and toddlers.
- ❖ It is an acquired invagination of the proximal bowel (intussusceptum) into the distal bowel (intussuscipiens).

"Pediatric surgery"

- **Primary Intussusception:**
  - The vast majority (90%) of cases do not have a lead point and are classified as primary or idiopathic intussusceptions.
  - The cause is generally attributed to hypertrophied Peyer patches within the bowel wall (URTI or gastroenteritis).
- **Secondary Intussusception:**
  - An intussusception may have an identifiable lesion that serves as a lead point (10%), Most common lead point is a Meckel diverticulum followed by polyps and duplications.

- Male predominance(2/3).
- The highest incidence occurs in infants between ages 4 and 9 months.
- Intussusception age group 3 m_ 3 Y.
- Anatomical location: ILEOCOLIC (MC), ILEO-ILEOCOLIC (2nd MC), ENTEROENTERIC.

CLINICAL PRESENTATION:

- The classic presentation(classic traid) is an infant or a young child with:

1. Intermittent, crampy abdominal pain.
2. Currant jelly' stools.
3. palpable mass on physical examination.

RADIOLOGY

1. Ultrasonography (Screening tool).
2. Abdominal Radiography.
3. CT and MRI.

TREATMENT

- ✓ NONOPERATIVE MANAGEMENT: An air or contrast enema is first-line treatment.
- ✓ Contraindications: Include intestinal perforation, peritonitis, persistent hypotension, Successful reduction (to 95%).
- ✓ OPERATIVE MANAGEMENT: when non-operative reduction is unsuccessful, the presence of a lead point, same CI of enema

"Meckel diverticulum"

- Is a remnant of the embryologic vitelline (omphalomesenteric) duct that connects the fetal gut with the yolk sac and normally involutes between the fifth and seventh weeks of gestation.
- The 'rule of 2s' regarding the diverticulum:
- Occurs in 2% of the population, A 2:1 male: female, Usually discovered by 2 yrs.
- Located 2 feet (60 cm) from the ileocecal valve, Commonly 2 cm in diameter and 2 inches (5 cm) long.
- Can contain two types of heterotopic mucosa Gastric is the most common type of heterotopic mucosa, followed by pancreatic.
- The two most common presentation intestinal painless bleeding (1st), intestinal obstruction (2nd).

CLINICAL PRESENTATION

- The three most common presentations in children:

1. Intestinal bleeding (1st).
2. Intestinal obstruction (2nd).
3. Diverticular inflammation(3rd).

- Episodic painless rectal bleeding in a young child is the classic presentation of a bleeding Meckel diverticulum.
- The preferred radiologic test is the technetium-99 radionuclide study ('Meckel scan').

TREATMENT

- ✓ for a symptomatic Meckel diverticulum consists of resection using either an open or laparoscopic approach.
- ✓ Asymptomatic incidentally found diverticulum remains controversial.

"Pediatric surgery"

Biliary Atresia

- ❖ Obstructive condition of the bile ducts causing neonatal jaundice.
- ➢ The cardinal signs and symptoms of biliary atresia are jaundice(direct), more than 20% TSB, clay-colored stools and hepatomegaly.
- ❑ Diagnosis: ultrasound.
- ✓ TX: Kasai procedure (portoenterostomy).

Choledochal Cyst

- ❖ Is a congenital dilatation of the biliary tract, The dilatation can be found along any portion of the biliary tract.
- ❖ abdominal mass and or jaundice is a common finding in an infant with CC, whereas abdominal pain is more often seen in older children.
- ❖ DX: US, MRCP.
- ❖ MX: primary excision of the cyst.

Esophageal atresia (EA) and tracheoesophageal fistula (TEF)

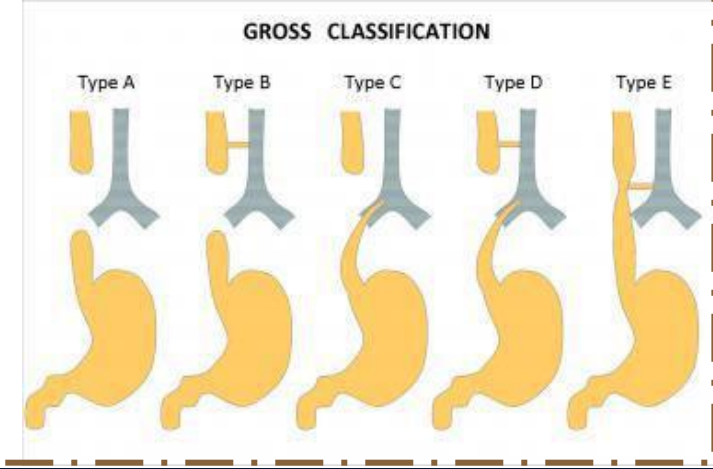
- ❖ The birth incidence of EA/TEF varies between 1 in 2500_3000 live births.
- ❖ Associated malformations (VACTARL).
- ❖ Incomplete fusion of the tracheoesophageal folds results in a defective tracheoesophageal septum.

Diagnosis

- ❑ excessive salivation, frothy secretion from mouth, and chocking.
- ❑ X-ray of chest and abdomen

TREATMENT

- ✓ Resuscitate and Stabilization
- ✓ SURGERY.



"Foreign body (FB)"

- The vast majority of ingestions in children are accidental.
- 80%- 90% of FBs in the GIT are passed spontaneously without complications.
- **The common sites of FB impaction:**

1. The esophagus is the narrowest portion of the alimentary tract and is thus a common site for FB impaction.
2. Pylorus.
3. C shape of duodenum.
4. Iliocecal valve.

- The vast majority of ingestions occur in the 6 months _3 years age.
- Battery FB in the esophagus need urgent intervention, while it confirmed distal to the esophagus mostly need observation.

- **Esophageal batteries lead to tissue injury through:**

1. Pressure necrosis.
2. Release of a low voltage electric current.
3. Leakage of an alkali solution, which causes a liquefaction necrosis.

- Large foreign bodies (>6 cm in length) are unlikely to pass through the duodenum and the ileocecal valve.
- Sharp or pointed foreign bodies (such as safety pins, nails, hair-pins, screws) sharp or pointed FBs can cause perforation in 15%- 35% of patients.

"Foreign body (FB)"

Management

- ✓ Hx taking and physical exam are the basic components of an initial assessment.
- ✓ Useful aspects of the history-ta king include symptoms, type of foreign body, timing of presentation, and associated conditions.
- ✓ The initial presentation can vary from the child being completely asymptomatic to a variety of symptoms
- ✓ Radiopaque objects can be detected on the AP and lateral radiographs, while radiolucent objects may require a gastrografin UGIT contrast study or esophagoscopy.

- ❑ Indication of form body removal:

1. Any esophageal F.B.
2. GIT foreign bodies with complication (obstruction, perforation, fistulation).
3. Magnets (esophagus or stomach, multiple magnets may appear to be attached at a single point) .
4. Bezoars.

- ❑ bezoar is a tight collection of undigested material that may often present as a gastric outlet or intestinal obstruction.
- ❑ Diagnosis: confirmed on plain radiographs, upper GIT studies, or endoscopy.
- ❑ Medical management, endoscopic removal ,or operation is necessary.
- ❑ Phytobezoars are made up of undigested vegetable matter.
- ❑ Trichobezoars: made up of swallowed hair.
- ❑ A lacto-bezoar: aggregation of undigested milk.

"Pediatric Tumor"

- The most common abdominal tumor in infants and children:
1. Neuroblastoma (most common).
2. Renal tumors.

- The differential diagnosis for a malignant abdominal mass in a child:
1. Neuroblastoma
2. WT.
3. Hepatoblastoma.
4. Rhabdomyosarcoma.
5. Lymphoma.

WILMS TUMOR

- Also referred to as nephroblastoma or renal embryoma
- WT is the most frequent tumor of the kidney in infants and children.
- One case per 10,000 infants.
- Most children presenting between the ages of 1 and 4 years.

- Pathology: WTs are currently divided into those with 'favorable' histology (90%) and those with 'unfavorable' histology.

Clinical Presentation, DX, TX:

- WT is often noted during a bath or by doctor at a routine visit as painless abdominal mass.
- Examination:- the mass mostly not cross the midline.
- This is in marked contrast to neuroblastoma, which is frequently presents with painful abdominal mass.
- Radiographic imaging is confirm a renal origin to the mass.
- WT arise from within the kidney and distort its internal configuration.
- ✓ The treatment for WT includes operation, chemotherapy, and in some cases, radiation therapy (RT).

"Pediatric Tumor"

Neuroblastoma

- is the most common solid extra cranial malignancy of childhood and the most common malignant tumor in infants.
- Neuroblastoma is an embryonal tumor of the sympathetic nervous system.
- Pts with neuroblastoma usually present with signs and symptoms that reflect the primary site and extent of disease.
- As 75% of neuroblastoma occurs in the abdominal cavity, an abdominal mass detected on physical examination is a common clinical feature, as is the complaint of abdominal pain.
- The mass cross the middline.
- Neuroblastoma is characterized by secretion of catecholamine products, which can be detected in the urine of more than 90% of patients with neuroblastoma.

Hepatic tumors

- The most common malignant hepatic neoplasms are metastatic lesions.
- Infantile hepatic hemangioma (IHH) is the MC benign solid hepatic tumor in children
- The MC primary liver tumors occurring in the first two years of life:

1. Hepatoblastoma.
2. Infantile hepatic hemangioma.

TERATOMAS

- are generally divided into gonadal and extragonadal types which is the MC being sacrococcygeal teratomas (SCT).
- Teratomas are having three embryonic layers (endoderm, mesoderm, ectoderm).
- Sacrococcygeal Teratoma (SCTs) account for 40–60% of teratomas.
- ✓ En bloc excision, including the coccyx, is preferable.

"Testis and Scrotum"

- The term *acute scrotum is defined as acute scrotal pain* with or without swelling and erythema.
- Differential Diagnoses of the Acute Scrotum:

1. Torsion of the testis.
2. Torsion of the appendix testis / epididymis.
3. Epididymitis / orchitis.
4. Hernia / hydrocele.
5. Trauma / sexual abuse.
6. Tumor.
7. Idiopathic scrotal edema (dermatitis, insect bite).
8. Cellulitis.
9. Vasculitis (Henoch–Schnlein purpura).

Testicular Torsion

- Torsion of the testis results from twisting of the spermatic cord which compromises the testicular vasculature and results in infarction.
- There appears to be a 4-8-hours window before significant damage occurs once torsion develops.
- Two types of torsion occur: intravaginal and extravaginal, Intravaginal torsion is more common in children and adolescents (compared to neonates).
- Testicular torsion typically occurs before age 3 years or after puberty.
- Patients present with the sudden onset of severe, unilateral pain in the testis, lower thigh, or lower abdomen, often associated with nausea and vomiting.

"Testis and Scrotum"

Testicular Torsion

- Physical examination may reveal an enlarged testis that is retracted up toward the inguinal region with a transverse orientation.
- The cremasteric reflex is often absent with testicular torsion.
- The diagnosis of testicular torsion is usually clinically apparent and managed by immediate scrotal exploration.

inguinal hernia

- An inguinal hernia in a child usually refers to an indirect inguinal hernia.
- It is failure of the PPV to close that results in an indirect inguinal hernia.
- DX: is clinical and rests squarely on the history and physical examination.
- Pediatric indirect inguinal hernias usually repaired through an inguinal herniatomy.

UNDESCENDED TESTES

- Any deviation from the normal process can result in a cryptorchid or undescended testis.
- classification divides testes into palpable and nonpalpable.

Diagnosis

- A careful history and physical examination is thus paramount.

Treatment

- ✓ *Timing of intervention*.....after age of 6 months.
- ✓ UDT appears to be associated with a two- to eightfold increased risk of malignancy.
- ✓ Risk of torsion and infertility

Thank You