



India Connecting Continents (ICC)

Study materials for FMGE

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SURGERY

HEMORRHAGE

(Bleeding)

* It can be classified as :

- ① External - visible
- Internal - invisible

↓
Also called as concealed bleeding

- ② Arterial - like a jet & pulsate
 & each pulsation

[& : which, & : with]

Venous - continuous bleed
Capillary - generalized oozing of blood.

MCA

■ Venous hemorrhage is the most difficult hemorrhage to control.
 (because less muscle, difficult to get contract)

- ③ A. Primary - during operation due to direct injury to the blood vessel.

B. Reactionary - bleeding & occur within 4-24 hrs of operation (4-6 hrs)

- (i) Slipping of ligature
- (ii) Dislodgement of clot
- (iii) Cessation of reflex vasospasm (rise in BP)

C. Secondary - occurs (7-14d) 7-14 days after surgery

MCA

■ Secondary hemorrhage is due to sloughing off the wall of blood vessel due to infection.

* Secondary hemorrhage is MC seen in hemorrhoidectomy.

* Methods to control hemorrhage:

- Best - Direct pressure (with palm)
- 2nd - Position
- Clamps, artery forceps
- Sutures
- Substances: Gel foams, surgical, spongostan

↓
(generally used to arrest capillary hemorrhage)

↓
(promotes platelet aggregation at the bleeding site)

* Methods to measure the amount of blood loss.

MCA

a) Clot in a clenched fist : 500 ml.

b) Gravimetric / Swab weighing method.

- Minor operation less than 1 to 1 1/2 hrs
 ↓
 x x 1

(cholecystectomy, appendicectomy, hernioplasty)

- Moderate operation duration 2-3 hrs
 ↓

x x 1.5

(Modified radical mastectomy for breast cancer)

- Major duration operation
more than 3-4 hrs

↓

$\alpha \times 2$

(Abdomino perineal resection,
Whipple's)

APR → Carcinoma of anal
canal / lower 1/3 rectum

Whipple's → Pancreatic cancer.

$\alpha = \text{Wet weight} - \text{Dry wt}$

$\alpha \text{ gms} \approx \alpha \text{ ml of blood loss.}$

(c) Colorimetric method:

It is estimation of
blood loss by hemoglobin (Hb)
estimation.

Pre operative Hb - Post opr. Hb
= $\alpha \text{ gm \%}$.

1 gm % = 1 unit of blood.

1 unit of blood = 450 ml of blood
(World wide)

(India → 350 ml

Kerala → 250 ml)

* Blood loss in closed fractures:

a) Tibia = 500 - 1500 ml (1000)

b) Pelvis = 500 - 2000 ml (1500)

c) Femur = 500 - 2000 ml (2000)

Blood donation

* If once blood is donated,
again we can donate after
3 months. (turn over of RBC)

* Size of needle used for
drawing blood during blood
donation is 16 G (G - gauge)

↓

from median cubital vein

* If small needle size → cells
get squeezed & long time taken.

* BP cuff is tied at the
donating arm to occlude
the veins.

* Pressure in BP cuff during
blood donation = diastolic
pressure of donor = 70-80 mmHg

* Anticoagulants used are

a) CPD - Citrate phosphate
dextrose.

Shelf life: 21 days

b) CPD - A: Citrate PD4
dextrose & acetate

Shelf life: 28-35 days

* Pressing sponge^{ball} in hand during
donation to increase blood flow

* Storage temperature of blood
 $4^\circ\text{C} \pm 2^\circ\text{C}$ (2-6°C)

* Collected blood → swings in a
plate → to get mixed & anticoagulated

* Life span of blood components:

- (a) RBC - Normal : 120 days
 - Transfused RBC : 50-60 days
 - Stored blood : 24-72 ^{hours} ~~days~~

- (b) Platelets - stored blood : 24 hrs
 - Sometimes 5-6 days

(c) WBC / clotting factors are destroyed quickly in stored blood.

* Fractions of blood :

- 1) RBC concentrate / packed red cells.
- 2) Platelet concentrate
- 3) Cryoprecipitate - special clotting factor preparatⁿ specially for specific clotting factor deficiency
eg: Haemophilia (factor VIII, factor IX)
- 4) Fresh frozen plasma - rich source of clotting factors.

↓
Given along with blood in massive blood loss cases (RTA)

↓
Temperature of storage is

↳ -42°C

Blood transfusion

- * should take care about grouping, cross matching
- * Warming of blood prior to transfusion (to prevent hypothermia)

↓ (warm blanket)
wrap in blanket for 1/2 hr.

↓
In India - keeping it close to attender's body

↓
^{MCO} It should not be warmed for more than 2 hrs.

(↑ bacterial action)
(septicemia occurs)

↓
due to risk of bacterial infection in the recipient.

- * In BT set (blood transfusion set) there are air chambers - to prevent air → act as embolus if get in to vessels.

- * Also filters

- * Size of filter used in BT set is 40 microns. (MCO)

- * Filters to prevent entry of macromolecules (clots)

Complications of BT

1) Simple pyrexial reaction → fever in recipient → due to pyrogens in the donor apparatus (blood bag & tube)

↓
glass bottles → silica → lot of pyrogens → so replaced with plastic bags

↓
MCC Simple pyrexial reaction is the MC transfusion reaction in recipient.

2) ABO incompatibility: mismatched blood transfusion → leads to Ag-Ab reaction → formation of large clumps in the circulation → blocks the glomerulus → renal failure.

MC: Most common

↓
MCC MCC of mismatched blood transfusion is clerical error

↓
to prevent it now blood is taken in labelled vials.

MCC: Most common cause

↓
MCC MC symptom of mismatched BT is sensation of heat & pain along the veins

↓
MCC MC sign of mismatched BT is oliguria > hemoglobinuria

• Normal urine output is :

1.5 - 2 L/day

30 - 50 ml/hr

0.5 - 1 ml/kg/hr

• Oliguria < 400 ml/day

• Anuria - Absence of passage of urine > 12 hrs

* Signs of mismatched BT in an unconscious/anaesthetized patient

1) Generalized oozing of blood from the wound.

2) Tachycardia (less volume ^{so} ↑HR)

3) Hypotension

* Signs of mismatched BT in a conscious patient

- Rigors

- Lumbar pain (renal failure)

- Tachycardia

- Hypotension

* Rx for mismatched BT

- 1st step is stop the transfusion immediately.

- Diuretics

- Collect patients blood sample & donor blood sample for grouping & crossing matching

- Sometimes dialysis

- Rarely renal transplant

- 3) Air embolism
- 4) Thrombophlebitis (inflammation of superficial veins)
- 5) Coagulation failure \rightarrow DIC (disseminated intravascular coagulopathy)

Massive blood transfusion

- * It is replacement of whole blood volume within 24 hrs. (5-6 L or 11-12 units)
- * Or if replacement of more than half the blood volume within few hours.
- * Complications of massive BT:
 - 1) Congestive heart failure due to volume overload (in elderly & in anemic people)
 - 2) Hyperkalemia due to lysis of RBC in stored blood which release K^+
 - 3) Hypocalcemia, hypomagnesemia, hypophosphatemia, (coagulant binds with it)
 - 4) Hypothermia
 - 5) Thrombocytopenia
 - 6) Coagulation failure \rightarrow DIC
 - 7) Initially acidosis (M.Ac) (stored blood pH is 6.3) eventually metabolic alkalosis (M.Alk)

• Normal pH of blood
7.37 - 7.44

- * Anticoagulants \rightarrow metabolized by liver \rightarrow releases HCO_3^- \rightarrow leads to metabolic alkalosis eventually.
- * Vomiting \rightarrow acids out \rightarrow so in body metabolic alkalosis \rightarrow alkaline urine.
- * Diarrhoea \rightarrow mucus from goblet cells \rightarrow mucus rich in HCO_3^- \rightarrow so alkali out \rightarrow metabolic acidosis.
- * Diarrhoea occurs in inflammation affecting ileum, colon ... (eg: Ulcerative colitis, Crohn's ileitis)
- * In infantile hypertrophic pyloric stenosis \rightarrow narrowing of pylorus \rightarrow vomiting \rightarrow initially metabolic alkalosis \rightarrow gradually more H_2O loss \rightarrow so aldosterone release \rightarrow H_2O absorption, Na^+ absorption \rightarrow K^+ & H^+ excreted out \rightarrow leads to metabolic acidosis \rightarrow paradoxical metabolic acidosis

WOUND

* Different classifications:

① Rank & Wakefield

- Tidy
- Untidy

- ### ②
- Abrasion
 - Bruise (injury to venule)
 - Hematoma (» to artery)
 - Puncture
 - Laceration
 - Avulsion / degloving injury
 - Crush injury
 - Chronic ulcers
 - Pressure sores

③ Classification of surgical wounds

- Class I / II / III / IV

* Tidy wounds → clean, no evidence of infection, made by sharp cuts, usually heal by primary intention (1° healing)

* Untidy wounds →

- Roadside accident wounds
- Contaminated
- Require thorough cleaning with normal saline / hydrogen peroxide / povidone iodine.
- Usually heal by 2° intention (2° healing)

* Abrasion → superficial epidermal injury.

- Does not require any active surgical intervention
- Heals leaving a scar within 2 wks by exposure only.

* Bruise → due to leakage of blood beneath the skin, usually due to rupture of a venule.

* Hematoma → collection of blood usually due to injury to a small artery.

* Puncture wound → due to nail or any sharp penetrating object injury.

* Laceration → usually associated with skin loss.

- Incised like lacerated wound is commonly seen in scalp.

* Avulsion / degloving:

- Avulsion of skin / skin + subcutaneous fat / skin + subcut. F + deep fascia from underlying structure

MCQ • MC seen is avulsion of skin, subcut. fat from the underlying deep fascia

* Crush injury → pressure injury to the structures within a closed compartment.

- Risk of compartment syndrome.

- Cardinal features of compartment syndrome → pain on passive stretching of the affected muscle. (passive - done by doctor) (to release pressure)

MCQ • Rx → Urgent fasciotomy

(Pain on active exercise indicates arterial insufficiency)

* Chronic ulcers.

- Usually with long standing debilitating diseases like diabetes mellitus, CDM, chronic venous insufficiency associated & varicose veins
- MC site of venous ulcer - around medial malleolus (Gaiter's area - area b/w two malleoli)

* Pressure sores:

- Seen in bed ridden patients at the pressure points
- MC site - Sacrum
- Also in heel, scapular region

Classification of surgical wounds

1) Class I

- * Clean
- * No evidence of infection
- * No use of antibiotics
- * Eg: Hernia operation (Hernioplasty - I & II)

2) Class II

- Clean - contaminated
- Minimal infection
- Seen in opening of a hollow viscus without significant spillage.
- Antibiotics are required
- eg: Elective GI surgeries
Cholecystectomy

3) Class III

- * Contaminated
- * Significant infection
- * Opening of hollow viscus with significant spillage
- * Both prophylactic as well as therapeutic antibiotics are required.
- * eg: Emergency GI surgery like Sx for acute intestinal obstruction. (Sx: surgery)
- Acute appendicitis

4) Class IV






- Dirty
- Gross infection
- Pus drainage Sx
- Both prophylactic as well as therapeutic antibiotics
- eg: Incision & drainage of abscess.

⇒ Elective surgeries - Class II.
⇒ Emergency Sx - Class III.

Ulcers

* Breach in the continuity of epithelium or mucous membrane.

* Edges of an ulcer

- MCA
-  → Sloping edge
(in healing ulcer)
 -  → Undermined
(in tuberculosis)
 -  → Punched out (MCA)
(in syphilis)
 -  → Raised and everted
(in squamous cell carcinoma)
 -  → Rolled out & beaded
(in basal cell carcinoma)

Wound healing

* It can occur by:

• Primary intention

- Wound edges are close to each other
- Wound is clean

• Secondary intention

- Wound edges are far from each other
- Usually contaminated or dirty.
- Management of dirty wounds:

↓

(until we see fresh bleeding) thorough cleaning, then debridement of dead & devitalised tissues

↓

↓

that is called as pseudotumor approach of wound excision.

- Secondary healing takes place by formation of granulation tissue.

- Features of healthy granulation tissue:

- ⇒ Red / pink in colour
- ⇒ Velvety in appearance
- ⇒ Bleeds on touch
- ⇒ Does not contain slough or necrotic material
- ⇒ Not raised from the surrounding skin surface

- Overgrowth of granulation tissue is called as

↓

Hyper granulation tissue / Proud flesh.

- Rx: Chopping of proud flesh by
- ⇒ Chemical cauterization
 - CuSO_4 , povidone I_2
 - ⇒ Electro cauterization
 - ✓ Diathermy
 - ✓ Surgical excision

* Outcome of wound healing is formation of scar.

Scar

- * Composed of mature collagen & fibroblast.
- * Relatively acellular & avascular
- * Delayed wound healing → bad scar formation.
- * Adverse scars:
 - MC: Hypertrophic scar
 - Then keloid
- * Reasons for bad scar:
 - Patient: Anemia, uremia, jaundice, DM, deficiency of Vit C, Zn, hypoproteinemia, Ehler Danlos syndrome.
 - Surgeon: Tension in wound, Improper alignment.

- * ~~Over growth~~ of Keloid & hypertrophic scar is composed of abundant collagen & fibroblast.
- * Rx of hypertrophic scar ~~mainly~~ aims at applying moisturizing cream.
- * Sometimes use coconut oil instead of cream.
- * Keloid → mostly seen in areas where less soft tissue → after Rx ↑ chance of reoccurrence → so cobalt beads are used in the area it present → to prevent reoccurrence.

*

Features	Hypertrophic scar	Keloid
• Definition	→ Composed of dense collagen & fibroblast • Confined <u>̄</u> in wound <u>limits</u>	→ • Composed of dense collagen & fibroblast. • Extend beyond wound limit in a claw like manner.
• Age	→ Children	→ • 10-30 yrs
• Sex	→ Equal in ♂ & ♀	→ • MC in females (♀)
• MC site	→ <u>Sternum</u> , tip of shoulder, tip of nose, ear lobule.	→ • <u>Sternum</u> , tip of shoulder, nose, ear lobule.
• Rx	→ Spontaneous resolution Fair & Lovely (moisturizer) No active intervention Pressure garments.	→ • No spontaneous resol ⁿ Intra keloidal injection of <u>Triamcinolone</u> . Best Rx → Surgical excision & interstitial radio therapy.

MCS Timing of prophylactic antibiotic

* Ideal time is of giving the prophylactic antibiotic before operation is at the time of induction of anaesthesia.

* Or 25 minutes prior to making the incision.

* Or just before operation.

⇒ Best method for pre-operative skin preparation: Use of hair clippers just before operation.

(no shaving nowadays)

↓
That too done outside the operation theatre.

⇒ Hair removal also done just before operation → because there is chance of forming abrasions → blood from it comes out → blood is a good culture media for bacteria → so ↑ risk of infection.

⇒ Antibiotics when given, after 25 min it has maximum activity → so at the time of incision, maximum protection.

BURNS

- * MC in day to day practise is → Scalds (by hot liquids)
- * MC in hospital practice is → Thermal or flame burns.
- * Types of burns:
 - 1) Scalds
 - 2) Thermal / Flame
 - 3) Electrical
 - 4) Chemical
 - 5) Radiation
 - 6) Cold - Frost bite

Electrical burns

* 2 types:

1) Low tension - injury by current < 1000 volts

- Mechanism → direct irritation of the local ~~nerves~~ nerves
Also interfere E

MCA (Q) rhythm of SA node
(Pacemaker of heart)

- So ECG monitoring is required.

2) High tension - injury by current > 1000 volts

- Mechanism → direct myocardial damage

Chemical burns

- * Alkalies are more dangerous than acids.
- * Because alkali is hygroscopic → absorbs H_2O from cell → so depth of penetration is more
- * Throwing of H_2SO_4 over the face is called as vitriolage.

Radiation

- * Slow process (eg: Uranium in Ukraine)

Cold burns

- * Injury to exposed areas in extremely low temperature conditions.
- * Gradual warming is done at 42°C (MCA)
- * Surgical interventions should be delayed until appear clear line of demarcation appear b/w viable & nonviable part

- Pugilistic attitude / Boxer's attitude is seen in burns
- Joule burn → Electrocutation
- Filigree burn → are seen in lightning burns.
- Boxer's ear → also known as Cauliflower ear → it is post traumatic ear
- Boxer's hematoma → Subdural hematoma.

* It is delayed because cold temperature slows the denaturation of proteins.

Pathophysiology of thermal burns

(1) Hypoxia

- ⇒ Due to injury to airway
- Upper airway (MC is flame)
 - Lower airway (MC is steam)

⇒ Inhalational injury due to inhalation of soot particles settled down in alveoli, leads to chemical alveolitis (soot → in flame burns)

Chemical alveolitis → Alveolar edema

⇒ Toxins released:

- MC → CO, it has > 200 times affinity than O₂ to bind to Hb.
- CO → leads to anaerobic respiration → metabolic acidosis (↑ lactic & pyruvic acid)
- 2nd MC → HCN → interfere with mitochondrial respiration → M. acidosis

(HCN: Hydrogen cyanide)

⇒ Eschar over chest wall:

Seen in deep burns, skin becomes leathery → eschar over chest wall interferes with rib movement.

Rx. → Escharotomy.

(2) Hypovolemia:

- MC
- Most crucial period is the first 36 hrs after burns.
 - Here intravascular fluid leaks into the extravascular space.

(3) Sepsis:

- MC
- Immunity is depressed in burn patients
 - Loss of skin (Natural host barrier) → microorganisms invade into body tissue.
 - MC source of infection in burn patients is the burn wound infection.
 - Other sources → intravenous line / Foley's catheter / Tracheostomy tube.
 - MC causative organism is Pseudomonas, also Staphylococcus aureus
 - MC viral infection is Herpes simplex.

- MCC of immediate death in a burn patient → Hypoxia
- MCC of early death → Hypovolemia
- MCC of late death → Sepsis

Assessment of damage in burn patients

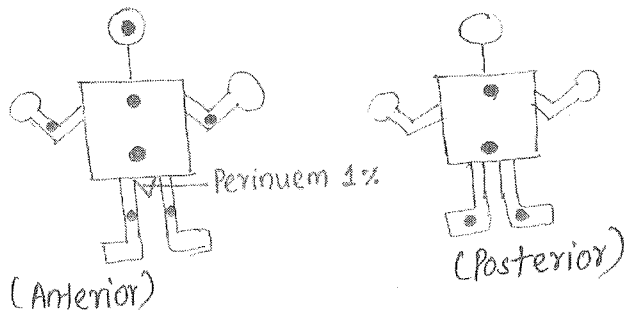
- 1) Inhalational injury.
- 2) % of burns.
- 3) Depth of burns.

* In inhalational injury → signing of nasal hairs, burns to lips, oral cavity, face, neck.

↓
Secure airway as early as possible.

* % → TBSA (Total body surface area burn in %)

(a) Wallace rule of 9:



- ⇒ Burns in head & neck - 9%
- ⇒ Complete upper limb - 9% (one)

- ⇒ Anterior portion of the chest → 9%
- ⇒ Posterior chest → 9%
- ⇒ Anterior part of abdomen → 9%
- ⇒ Posterior abdomen → 9%
- ⇒ Anterior lower limb (one) → 9%
- ⇒ Posterior one lower limb → 9%
- ⇒ Perineum → 1%

⇒ First degree burns are not included in calculating the % of burns.

(b) Palm rule:

Palmar surface of the hand → as 1%

(c) Lund & Browder charts:

- Head & Neck burns in case of infants is taken as 18% → then reduce 1% every year up to 10 yrs age → so in 10 yrs child it becomes 9%.
- Lower limb burn in an adult → 18%
- Front of one lower limb in adult → 9%
- In infants add 0.5% up to 9 years age for one complete lower limb
- Front of one lower limb of infant → 7%

- One lower limb burn in infant $\rightarrow 14\%$
- Add 0.5% each yr up to 9 yrs
(14, 14.5, 15, 15.5 ... 17.5, 18)

\Rightarrow In children: (for all age)

- * Chest $\rightarrow 18\%$
- * Abdomen $\rightarrow 18\%$
- * Upper limb $\rightarrow 6\%$

[Palm rule \rightarrow used in case of patchy distribution of burns all over the body \rightarrow cut a piece of paper in size of palm & including fingers \rightarrow put it in areas of burn \rightarrow and calculate each paper size as 1%]

\Rightarrow If right/left side of chest or abdomen is mentioned in que, then it comes
child $\rightarrow 18/2 = 9\%$
adult $\rightarrow 9/2 = 4.5\%$

- * Depth of burns depends on
 - Temperature of source
 - Duration of contact.

\Rightarrow Blister \rightarrow damage to epidermis & sup. dermis \rightarrow fluid from intravascular escapes to extravascular \rightarrow it get accumulated b/w E & sup. \odot .

Features	1° burn	2° burn	3°/4° burn
• Part involved	Epidermis	Epidermis + Superficial dermis	3° \rightarrow E + complete dermis 4° \rightarrow E + D + underlying tissue (subcut fat / fascia/muscle)
• Capillary filling	+	-	-
• Sensation	+	+	-
• Blister formation	-	+++ Blister fluid is protein.	-
• Colour	Red	Pink	• White / black leathery. • Eschar is common
• Rx.	Exposure	Dressing	Surgery
• Healing	Within 2 wks	3 wks (earlier if was > 3 wks)	Depends on Sx.

<ul style="list-style-type: none"> • Scar • Also called as • Skin grafting 	<p>No scar</p> <ul style="list-style-type: none"> - Superficial burns * Partial thickness burns. <p>⊖</p>	<p>Hypertrophic scar is common.</p> <ul style="list-style-type: none"> - Deep partial thickness burns <p>⊖</p>	<p>Depends on surgical intervention</p> <ul style="list-style-type: none"> - Full thickness burns. - MC done.
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Management of burn

Pre-hospital

- * Ensure rescuer safety first
- * Stop, Drop, Cool.
 - Stop: Switch off mains in electrical flame / electrical burns
 - Drop: Turn burning surface up
 - Cool: Done with water at room temperature
 - Ice should not be used → it causes hypothermia & asso. ↑ risk of infection due to ischemia.
 - Beneficial up to 1 hr of burn
 - Maximum effect is for 10 minutes.

- * In temperate climate, cooling should not be done below 15°C
- * If both anterior & posterior surface is burned → more burned area comes up while drop.

Hospital

- * Has two parts
 - Life saving management
 - Specific management.
- * Life saving
 - Basic resuscitation → ABC
 - Airway:
 - Early recognition of airway burns is important
 - Because symptoms & signs of laryngeal edema appear late.
 - Endo tracheal intubation is preferred in suspected airway burns.

Basic resuscitation:

- A → Airway
- B → Breathing
- C → Circulation
- D → Disability
- E → Exposure
- F → Fluids & fractures

→ Other options for restoration of airway:

- 1) Tracheostomy
- 2) Cricothyroidotomy
- 3) Needle cricothyroidotomy

• Breathing:

- Humidified O_2
- Ventilatory support

• Circulation:

- Most crucial period is first 36 hours.

- $>10\%$ burn in ~~adult~~ child
- $\$$
- $>15\%$ burns in adult



should be given i.v fluids

MCA - 1° burns are not included in calculating % of burn

MCA - Initial fluid of choice for resuscitation in burn patients is



Ringer Lactate (RL)
[Crystalloid solution]

⇒ Parkland's formula:

$$4 \times \% \text{ burns} \times \text{wt in kg} = x \text{ ml of RL given in 1st 24 hrs.}$$

$x/2$ → to be given in 1st 8 hrs

$x/2$ → in next 16 hrs.

* Additional fluid for nutrition is given in children in the form of Dextrose-saline (DNS)



- 100 ml/kg for 1st 10 kgs body weight

- 50 ml/kg for next 10 kgs body weight.

- 20 ml/kg for next each kgs body weight.

eg: for a 22 kg child 5 yr old

- 1st 10 kgs → $100 \times 10 = 1000$
- next 10 kgs → $50 \times 10 = 500$
- next 2 kg → $20 \times 2 = 40$

∴ Total = 1540 ml (nutritional DNS)

Resuscitation = $4 \times 50 \times 22 = 4400 \text{ ml}$ (50% burn)

∴ Total fluid given in 24 hrs = $4400 + 1540 = 5940 \text{ ml}$

- 1st 8 hrs → $\frac{4400}{2} = 2200 \text{ ml}$ resuscitation

- Total nutritional fluid in 24 hrs = 1540 ml

∴ 1st 8 hr nutritⁿ = $\frac{1540}{24} \times 8 = 513.3 \text{ ml}$

∴ Total fluid in 8th hrs = $2200 + 513.3 \text{ ml} = 2713.3 \text{ ml}$

⇒ Monitoring of fluid resuscitation is best done by urine output.
 (1.5 L/day or 30-50 ml/hr or 0.5-1 ml/kg/hr)

⇒ Additional fluid for nutrition i.e., DNS along with RL is given only in children.

(1) A 5 yr old child comes to casualty with 50% burns over body (22 kg). Calculate total fluid for 24 hrs

$$RL = 4 \times \% \text{ burn} \times \text{weight}$$

$$= 4 \times 50 \times 22$$

$$= \underline{4400 \text{ ml}}$$

$$DNS = (10 \times 100) + (10 \times 50) + (2 \times 20)$$

$$= \underline{1540 \text{ ml}}$$

So total fluid given in 24 hrs

$$= 4400 + 1540$$

$$= \underline{5940 \text{ ml}}$$

(2) In the above que, find the amount of fluid to be given in first 8 hrs.

RL - 24 hrs → 4400 ml

$$1^{\text{st}} \text{ 8 hrs} \rightarrow \frac{4400}{2}$$

$$= \underline{2200 \text{ ml}}$$

DNS - 24 hrs → 1540 ml.

$$8 \text{ hrs} \rightarrow \frac{1540}{24}$$

$$\therefore 8 \text{ hrs} \rightarrow \frac{1540}{24} \times 8$$

$$= \underline{513.3 \text{ ml}}$$

So total fluid for 8 hrs

$$= 2200 + 513.3$$

$$= \underline{2713.3 \text{ ml}}$$

(3) A 40 yr, 70 kg man comes to casualty with burns over his head & neck and anterior surface of chest and abdomen. The burned area is having blisters in some part which appears pink in colour & very painful. Calculate the amount of fluid to be given in first 8 hrs.

$$RL = 4 \times \% \text{ burns} \times \text{weight}$$

(24 hrs)

% burn → 9 + 9 + 9

$$= 27\%$$

$$\therefore RL = 4 \times 27 \times 70$$

$$= \underline{7560 \text{ ml}}$$

$$1^{\text{st}} \text{ 8 hrs} \rightarrow \frac{7560}{2}$$

$$= \underline{3780 \text{ ml}}$$

(Since adult no need of DNS along RL)

(4) In the above question, calculate the amount of fluid to be given till 20th hr

Total RL = 7560 ml.

$$1^{\text{st}} \text{ 8 hrs} = \frac{7560}{2}$$

$$= \underline{3780 \text{ ml}}$$

So another half - 3780 ml is to be given from rest of 16 hrs.

$$9^{\text{th}} + 10^{\text{th}} + 11^{\text{th}} + \dots + 24^{\text{th}} \text{ hr} = 3780 \text{ ml}$$

$$\text{i.e., in } 9^{\text{th}} \text{ hr} \rightarrow \frac{3780}{16} \\ = \underline{\underline{236.25 \text{ ml}}}$$

$$\text{So in } 20^{\text{th}} \text{ hr} = 236.25 \times 12 \text{ (20-8)}$$

$$\text{or} \\ \frac{3780}{16} \times 12 \\ = \underline{\underline{2835 \text{ ml}}}$$

\therefore Total amount of fluid to be given till 20^{th} hr

$$= 3780 + 2835 \\ = \underline{\underline{6615 \text{ ml}}}$$

(5) A 7 yr old child is presented with redness over the right upper limb which is painful but without blisters or any other eschar (white/black leathery appearance). Calculate the amount of fluid to be given for him (Weight - 35 kg)

Since this is a case of first degree burn, we won't include it in calculating the % of burn. So no need of fluid resuscitation.

(6) A 15 yr old girl is presented with severe burns over the right anterior surface of abdomen caused from hot oil spillage. Also the right lower limb area is involved. The burned area appears pink with blister formation and painful. Calculate the amount of fluid to be given till first 16 hours.

$$\% \text{ burns} \rightarrow 9/2 + 9 \\ = 4.5 + 9 \\ = \underline{\underline{13.5\%}}$$

More than 15% burns in adult are given i.v fluids.

Conservative treatment only.

(7) A 50 yr old man is taken to casualty from a fire accident site. There is severe burns over his head & neck, chest, abdomen, right upper limb and right lower limb. Burned area have blisters in some parts and some appear area ^{have} appears white/black leathery appearance. The patient is unconscious. Calculate the total amount of fluid to be given in 24 hrs. (Weight - 80 kg)

$$\% \text{ burns} = 9 + 9 + 9 + 9 + 9 \\ = \underline{45\%}$$

$$\text{RL} = 4 \times 45 \times 80 \\ = \underline{14400 \text{ ml}}$$

(8) In the above que. ^{calculate} amount of fluid to be given till ~~12th hour~~ first 12 hrs.

$$\text{RL } 24 \text{ hrs} \rightarrow 14400 \\ \text{1st } 8 \text{ hrs} \rightarrow \frac{14400}{2} \\ = \underline{7200 \text{ ml}}$$

Rest 7200 for next 16 hrs.

$$\therefore 12 \text{ hr} \rightarrow \frac{7200}{16} \times (12-8) \\ = \frac{7200 \times 4}{16} \\ = \underline{1800 \text{ ml}}$$

$$\therefore \text{Total fluid till 12 hrs} \\ = 7200 + 1800 \\ = \underline{9000 \text{ ml}}$$

(9) A 3 year old child is presented with burns over his chest and abdomen ^{perineum} with blisters and he is crying so much due to pain. Calculate the ~~amount~~ total amount of fluid to be given. (Weight - 15)

$$\% \text{ burns} = 18 + 18 + 1 \\ = \underline{37\%}$$

$$\text{RL} = 4 \times 37 \times 15 \\ = \underline{2220 \text{ ml}}$$

$$\text{DNS} = (10 \times 100) + (5 \times 50) \\ = 1000 + 250 \\ = \underline{1250 \text{ ml}}$$

$$\therefore \text{Total fluid} = 2220 + 1250 \\ = \underline{3470 \text{ ml}}$$

(10) If in the above que. if his right upper limb is involved, calculate the total amount of fluid

$$\% \text{ burns} = 18 + 18 + 1 + 6 \\ = \underline{43\%}$$

$$\text{RL} = 4 \times 43 \times 15 \\ = \underline{2580 \text{ ml}}$$

$$\text{DNS} = (10 \times 100) + (5 \times 50) \\ = \underline{1250 \text{ ml}}$$

$$\text{Total fluid} = 2580 + 1250 \\ = \underline{3830 \text{ ml}}$$

Burn wound management

* 1° → • No Rx.

- Exposure (MCR)
- Healing in 2 wks
- No scar

* 2° → • Deep partial thickness burns

- Dressing is required to delay the onset of contamination of burn wound
- We use:

a) Silver Sulphadiazine

- MC ointment used to dress a burn wound
- Concentration of 1%
- Effective against Pseudomonas, Methicillin resistant Staph. aureus.

b) Silver Nitrate solution

- Very effective against Pseudomonas
- Disadvantage is it causes black staining of the dressing.

c) Mafenide Acetate cream

- In a conc. of 5%
- Only ointment which can penetrate the eschar (dead Epi+Der)
- Disadv → painful & Metabolic acidosis

Not available in India.

d) Subeschar clysis:

It is injection of an antibiotic beneath the eschar.

- Indication → if concⁿ of microorganism $> 10^2 - 10^4$ per gram of tissue

* For 3° & 4° burns

- Skin is dead
- Rx OC is surgery
- Sx Rx OC is skin grafting
- Escharotomy should be done for eschar over the extremities / chest wall.

Skin grafting (Important topic)

- * Autograft → Same person
- * Iso graft → Identical twins
- * Allograft → Same species
- * Xenograft → Different species

• Contraindications of skin grafting

- 1) Bare bone
- 2) Bare cartilage
- 3) Bare tendon
- 4) Infection with the β -hemolytic streptococci (eat up skin graft)

Features	Partial thickness skin graft	Full thickness skin graft
• Also called as	Split SG Thiersch SG	Wolfe SG
• Composition	Epidermis + superficial dermis	Epidermis + complete dermis
• MC donor site	Anteromedial thigh > Anterolateral thigh	Post auricular/ Supraclavicular area
• Donor site cover	Dressing placed for <u>14 days</u> (MCR)	Sutures to close the donor site
• Area which can be covered	Larger (Mesher is used to expand the graft)	Smaller
• Graft contraction	More	Less
• Cosmetic outcome	Poor	Better (preferred for better cosmetic outcome in cosmetic areas of body)

⇒ Knife used for skin graft

↳ Humby's knife

- For full thickness grafts → Dermatome

⇒ Blade used for
- Wolfe's blade

⇒ Skin graft survive initial 48 hours by plasma imbibition of nutrients from underlying surface.

⇒ From 3rd day onwards - Angiogenesis & Neovascularization start in SG (skin graft)

⇒ SG settle in recipient site in 5 days. (MCR)

⇒ In burn patients → we use crystalloid instead of colloids → colloids are proteins → they cause intravascular fluid to come to extravascular compartment → aggravates fluid loss → so colloids are not used (hyperosmolar → drags fluid outside vessels)

Nutrition

- * Enteral nutrition is preferred
- * Unless contraindicated (in paralytic ileus)
- * No role of prophylactic antibiotics
only documented infection should be treated w/ antibiotic
- * Physiotherapy → should be started on day 1 except in case of skin grafting (here after 5 days)
- * If physiotherapy is not done → can lead to development of contractures (stiff collagen deposits at the joints site) → makes the joint difficult to move after healing.
- * Enteral nutrition is always preferred than parenteral → due to risk of disuse atrophy ~~hypertrophy~~ of intestinal smooth muscles.

TRAUMA

Disaster Management:

National Disaster Management Authority Guidelines (New Delhi)

1st → START - Simple Triage And Rapid Treatment

- by paramedical staff
- at disaster site

Next → ESI - Emergency Severity Index

- by doctors
- in the hospital

by TRISS - Trauma Injury Severity Score

↓
comprises age of patient + ISS + RTS

ISS - Injury Severity Score (fractures)
(Anatomical scoring)

RTS - Revised Trauma Score
(Physiological scoring)

RTS = SBP + RR + GCS

SBP: Systolic Blood Pressure

RR: Respiratory Rate

GCS: Glasgow coma scale

Glasgow Coma Scale

	(Max)	(Min)
Eye	4	1
Verbal	5	1
Motor	6	1
<hr/>	<hr/>	<hr/>
Total	15	3

* On the basis of GCS score

→ Mild head injury
14-15

→ Moderate head injury
8-13

→ Severe head injury
<8

* Eye opening:

- Spontaneous (E 4)
- To voice command (3)
- To pain (2)
- No response (1)

* Verbal orientation

- Oriented (5)
- Confused (4)
- Inappropriate words (3)
- Incomprehensible sounds (2)
- No response (1)

Brain injury

* CSF (shock absorber) & skull bones prevent brain injuries.

* 2 types of brain injury

1) Coup

2) Counter coup.

* Coup → at the site of impact

* Countercoup → injury remote from the site of impact.

* Primary brain injury:

- Direct injury to brain parenchyma

- a) Diffuse axonal injury

- b) Cerebral concussion

- c) Cerebral concussion with laceration.

- Amnesia in cerebral concussion

- Focal neurological deficit in CC with laceration.

(Loss of brain tissue, so that part function lost)

* Secondary brain injury:

It includes

- Intracerebral hematomas

- Extradural hematoma

- Subdural hematoma

- Subarachnoid hemorrhage

- Cerebral herniation

* MC brain injury after head trauma is subdural hematoma / Boxer's hematoma

Extradural hematoma

* Collection of blood outside the duramatter & beneath the periosteum.

* MC site is temporoparietal region

* MCC is injury to middle meningeal vessels (Artery > Vein)

* Lucid interval is seen. It is a transient period of consciousness after trauma, where in patient carries out normal routine activities.

^{MCC} * CT scan → Hyperdense convex.
(In subdural hematoma, in CT scan → Hyperdense concave)

In CT → Fresh bleeds are always hyperdense (appears white)

CT → Hyper / hypo density

MRI → Hyper / hypo intensity

- Extradural → Hyperdense convex

- Subdural → Hyperdense concave

- Extradural : outside duramatter

- Subdural : ~~is~~ Beneath duramatter

Subdural hematoma

* MC intracranial mass lesion resulting from head trauma

- Acute (0-3 days)
- Subacute (4-21 days)
- Chronic (>21 days)

Management of head injuries

Aim

- To reduce intracranial pressure < 20 mmHg (ICP)
- Increase cerebral perfusion pressure > 65 mmHg (CPP)

Rx

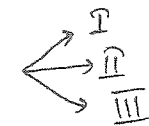
- Hyperventilation (to wash out CO₂) (drowsy patient)
- Mannitol
- Diuretics
- Ventriculostomy (CSF drains)
- Decompressive craniotomy.
- Frontal / Temporal lobe lobectomy

* Lumbar puncture is best avoided as it carries a risk of cerebral herniation.

Facial & Neck Trauma

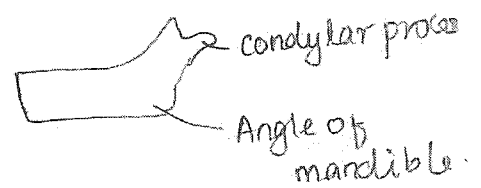
Facial Trauma

1) Upper face

• Lefort # 

2) Lower face

• Mandibular #



* MC # at angle of mandible

* Condylar process # also is common.

* Most dangerous →
Butterfly # of mandible
(at the symphysis mandib)

↓
Here is the insertion of
Genioglossus muscle.
(safety muscle of tongue)

↓
so in # it dislodged

↓
Tongue may fall back &
close / block airway.

* Investigation of choice (IOC)
Orthopantomogram
(OPG) (x-ray)

* Rx :

a) Dentate patient → Interdental wiring.

b) Edentulous patient →
Open reduction and the
fixation c̄ plates & screws

Neck trauma

Blunt Trauma

- * Cervical vertebral # → Neck stabilisation by using a cervical collar (Philadelphia collar) is the first step.
- * Soft tissue in the neck usually escapes injuries in blunt trauma (protected by head & trunk)

Penetrating Trauma

- * Divide the neck in to 3 zones
- * Zone I : sternal notch to cricoid cartilage
- * Zone II : Cricoid cartilage to angle of mandible.
- * Zone III : Angle of mandible to base of skull.

* Hemodynamically unstable neck trauma patient

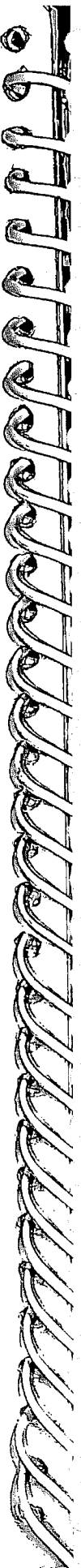
↓
Injury to Zone II require immediate operative exploration

* Hemodynamically stable patient with neck trauma

↓
Injury to Zone III, Zone I require investigation

POC → Angiography

↓
According to that may or may not require exploration.



CHEST TRAUMA

- * MC part injured → Ribs (4th - 9th)
 - * Left side rib # is MC than right side. (majority right handed)
 - * Rib # → injury to pleura, lungs, blood vessels.
 - * Collection of air in pleural cavity → Pneumothorax.
 - * Collection of blood in the pleural cavity → Hemothorax
 - * Collection of both air & blood in pleural cavity → Hemopneumothorax.
 - * Any collection in the pleural space → leads to lung collapse → also mediastinal shift to opposite side → leads to breathing difficulties such as respiratory discomfort & respiratory distress
 - * Respiratory distress → emergency → needs immediate intervention → actually a case of tension pneumothorax
- ↓
- Immed. Rx: Wide bore needle in 2nd intercostal space in the midclavicular line.

* Respiratory discomfort.

↓
Evaluation & Rx is required

↓
Evaluation = Clinical examination
- Percussion & Auscultation

↓
Percussion is done with middle finger on middle finger, movement at wrist joint.

- Dull note - fluid
- Resonant / Tympanic note → air.

↓
On Auscultation, diminished breath sound suggest lung collapse

↓
I/Oc: Chest X-ray
(AP view)

Anteroposterior view is preferred in trauma. But routine chest x-ray are posteroanterior view (PA view)

- Hazziness, hyperdensity, Ground glass appearance - fluid
- Hyperlucency - air

↓
Rx: Aim is to restore normal breathing

↓
Expansion of lung

↓
by drain pleural collection + Breathing exercises.

For drainage, Rx OC is -
Intercostal tube drain in the
5th intercostal space (4th ICS) just
anterior to mid-axillary line in
all cases of Pneumothorax / Hemo-
thorax / Hemopneumothorax.

↓
Intercostal tube is connected to
an underwater seal.
+ Breathing exercises

Indications of thoracotomy

- 1) > 1500 ml of blood drained
through intercostal tube at
one instance.
- 2) > 200 ml/hr for 3 or > 3
consecutive hours is drained
through intercostal tube.
- 3) Esophageal rupture
- 4) Tracheobronchial rupture.

⇒ Stove in chest: Inward indentation
of chest wall.

⇒ Sucking wound of thorax:
Communicating wound,
pleural cavity communicating \bar{c}
external environment. It usually
occurs due to penetrating
trauma.

↓
Rx: Special valvular dressing
or
Dressing + Intercostal
tube drainage

• Valvular dressing → allows
unidirectional flow of air from
inside to outside only.

⇒ Flail chest: (Important)

* Fracture of 3 or > 3
consecutive ribs at 2
or > 2 places.

* Flail segment shows
paradoxical respiration

* Rx. is

- Pain management
- IPPV (Intermittent
positive pressure
ventilation)

⇒ Best method of pain management
with rib #

- Epidural analgesia
- 2nd: Liquid nitrogen
at -42°C in the
intercostal nerves
(Cryoanalgesia)

⇒ liquid N_2 at -42°C is also
called as cryoanalgesia.

Note:

- PCA - Patient Control Analgesia
through epidural catheter
- Catheter is connected to a pressor
→ whenever the patient feels pain
→ press the button → releases
Morphine → pain relief.

Abdominal Trauma (Important)

MCE

* MC organ injured in blunt AT:
Spleen > Liver

MCE

* MC organ injured in penetrating AT
Small intestine > Liver
(6m)

MCE

* MC organ injured in blast injuries
(are air filled cavities, from
top to bottom)

Tympanic membrane > Trachea >
Lungs > Intestine

MCE

* MC organ injured in seat belt
injury / trauma:

Mesentery
(it is duodenojejunal flexure)

Blunt abdominal trauma

Hemodynamically

Stable

(Pulse < 100 b/min
sys. BP > 100 mmHg)

Unstable

(Pulse > 100 b/min
sys BP < 100 mmHg)

⇒ FAST: Focused Assessment by
Sonography in Trauma.

⇒ CECT: Contrast Enhanced
CT scan.

• Stable patient

↓
Admission in to hospital

↓
FAST

↓
CECT abdomen (Best Invⁿ)

↓
Non operative Rx.

(However if any vascular leak
is noted on CT-angiography
then Angioembolisation is
preferred.)

⇒ In FAST → standard 4 probes

a) Right hypochondrium
Liver & Rt. kidney

b) Left hypochondrium
Spleen, Lt. kidney

c) ~~Epig~~ Epigastrium
Pericardial fluid


d) Pelvis
Any free fluid in abd.

⇒ Extended FAST (e-FAST)

Extra probe in the
bilateral thoracic region to
check for pleural effusion.

• Hemodynamically unstable

↓
1st step is basic resuscitation
IV fluids - Most imp part

↓
Immediate laparotomy
by midline incision 
(equal exposure on both sides,
easy extension to one side,
fast access into peritoneal
cavity. Cut skin, subcut.)

Note: FAST can be done if
available in emergency room
at the time of basic
resuscitation.

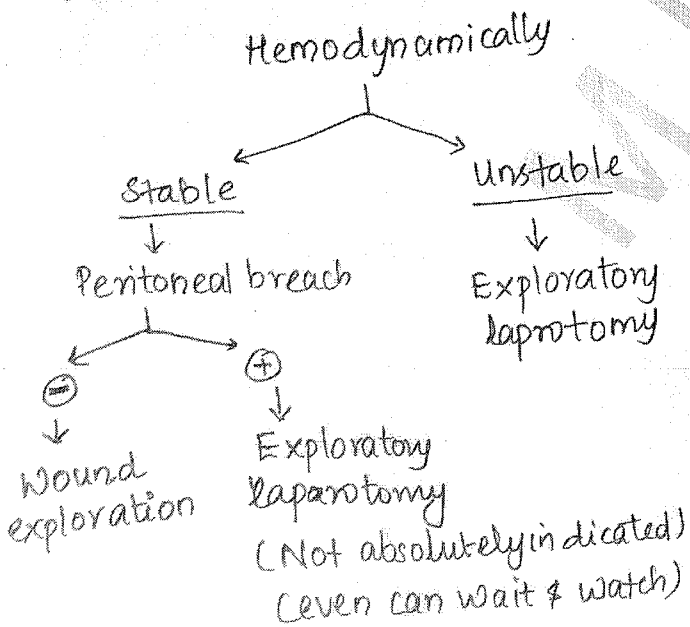
Retroperitoneal Trauma

- 1) Zone I - Centromedial RP
(major vessels)
- 2) Zone II - Lateral RP.
(Lumbar / Renal)
- 3) Zone III - Pelvic RP.

* Rx. of retroperitoneal trauma:

Zones	Blunt	Penetrating
I	Explore	Explore
II	Observe	Obs./Exp.
III	Observe	Obs/Exp.

Penetrating AT



Que: A 40 yr old man is taken to the casualty from an accident site. The bystanders commented that he falls with his chest hitting the ground. Now he is under severe respiratory distress. What is the immediate Rx. given to the patient?

- a) Ventilatory support
- b) Resuscitation with ambu
- ✓ c) Needle thoracocentesis in 2nd ICS in midclavicular line
- d) Endotracheal intubation

Que: In the above case which is the most important clinical examⁿ to be done.

- a) Inspection
- b) Palpation
- ✓ c) Percussion
- d) Auscultation

Que: If on percussion a dull note is heard at the right side of chest at about 6th ICS, what would be the IOC in the case:

- ✓ a) Chest x-ray (AP view)
- b) CT
- c) MRI
- d) USG
- e) Chest x-ray (PA view)

Que: On chest x-ray hazziness / ground glass appearance is seen. So, ^{what} would be the most likely diagnosis:

- a) Tension pneumothorax
- b) Pneumothorax
- ✓ c) Hemothorax
- d) Pneumohemothorax.

Que: What would be the RxOC for Hemothorax.

- a) IC drain in 5th ICS anterior to midaxillary line
- b) Thoracotomy
- c) IC drain in 2nd ICS anterior to midaxillary line
- ✓ d) IC drain + Breathing exercise.

(Read full options, then mark best possible answer)

Que: A patient 35 year old female met with RTA is brought to casualty. No significant bleeding is found on investigation other than some abrasions. The BP of the patient is 110/70 mmHg and pulse rate is 80 b/min. What would be the first IOC to this patient?

- a) No Rx required
- b) CECT
- c) MRI
- ✓ d) FAST

Que: In the above case what would be the best IOC

- a) Chest x-ray
- ✓ b) CECT
- c) MRI
- d) FAST

Que: After investigation, the patient is kept for observation. After 2 hrs, patient starts to feel some discomfort. BP is now 90/60 mmHg and pulse rate is 125 b/minutes. What would be RxOC now?

- a) CECT
- b) MRI
- c) FAST
- ✓ d) Immediate laparotomy

ARTERIAL DISORDERS

- Gradual arterial obstruction
- Sudden arterial obstruction.

* MCC of gradual arterial obs.

- Atherosclerosis
- Buerger's disease (2nd)

* MCC of sudden arterial obs.
Embolism

Gradual A.O

1) Intermittent claudication - (MCC)
Cramp like pain, felt in calf, on walking a certain distance

- Distance walked is called as the claudication distance.
- Usually felt in lower limbs
- Rarely in upper limbs. (Writer's spasm)

Boyd's Grading → for intermittent claudication

- ↓
- Grade I: Pain on walking & improve on further walking
 - Grade II: Pain on walking & continue to walk & pain
 - Grade III: Pain on walking a certain distance, cannot walk any further, has to take rest.
 - Grade IV: Rest pain

2) Rest pain:

(MCC)
Pain in the foot at rest due to ↓ blood supply to the nerves of skin of dorsum of foot.

- It is crying of dying nerve

3) Coldness, Numbness, Paraesthesia

↓
indicates moderate to severe ischemia.

4) Plegangrene:

Rest pain, colour changes, hyperesthesia, with or without skin ulceration.

5) Critical limb ischemia:

Rest pain + skin ulceration

6) Gangrene.

Step wise clinical approach

* Clinical examination → palpation of the pulses.

1) Pulse - Lower limb

(a) Femoral - 2cm beneath mid inguinal point

(b) Popliteal - prone position, knee flexed at 45°, lower part of popliteal fossa, press 3 fingers against fibial tuberosity

MCC

- Most difficult pulse to feel in lower limb → Popliteal pulse, due to no bony prominence & it is deep

(c) Anterior tibial pulse - Next to hallucis longus tendon at the ankle anteriorly.

(d) Posterior tibial pulse - Felt b/w medial malleolus and the Achille's tendon.

MCO
(e) Dorsalis pedis pulse - felt in the proximal part of first (1st) metatarsal space.

(proximal part, becoz in distal part it is not present, it will go towards sole)

Always compare the pulses with the other limb pulses.

* Nature of pulse:

a) Distal to obstruction
- Low volume (feeble)
- Normal due to collaterals

b) Proximal to obstruction
- High volume
- Normal in case of the mild obstruction.

(2) Disappearing pulse:

On initial examination, pulse may be normal due to collaterals

↓
On exercise pulse disappears due to presence of collaterals insufficient to meet need.

↓
On rest pulse reappears.

3) Harvey's sign:

Sign of delayed venous refilling → suggestive of the arterial insufficiency

4) Auscultation:

"Bruit" heard over blood vessel indicates turbulence → suggestive of obstruction or stenosis.

* IOC → Colour doppler.

• (Non-invasive)

• Also calculate ankle brachial pressure index

↓
$$\frac{\text{Systolic pressure at Ankle}}{\text{Systolic pressure at Arm}}$$

Imp.

* Ankle Brachial Pressure Index: (ABPI)

1.1 ± 0.1 → Normal

0.6 ± 0.2 → Intermittent claudication.

0.3 ± 0.1 → Rest pain

≤ 0.3 → Critical limb ischemia.

0.1 → Ulceration and gangrene.

* Angiography:

- Not IOC because it is invasive (can dislodge clot → emboli)

- MC → Femoral artery → Radial artery > Brachial artery

- Technique: Seldinger technique

Rx

* Aim is to restore distal supply of blood.

* Rx options:

1) Life style modifications

2) Drugs

3) Angioplasty

4) Surgical intervention:

- Bypass Sx

- Lumbar sympathectomy

- Amputation.

* Life style modification:

• Quit smoking

(Buerger's disease — "Cigarettes or legs")

• ↓ weight

• Brisk walk for 40 min in morning and 40 mins in evening.

(brisk - fast not running)

• Spontaneous improvement in 6 months due to formation of good collaterals.

MCO

* Drugs:

- Vasodilators (Oxyphenhyline)

- Antiplatelets (Aspirin - long term use, Clopidogrel - for short term use of 6-10 months)

- Statins

* Angioplasty:

• PTA (Percutaneous Transluminal Angioplasty)

• PTCA (Percutaneous Transluminal Coronary Angioplasty)

• Vascular catheter used in the angioplasty is vascular Sx FOGARTY CATHETER

• Types:

- Ballon Angioplasty

- Metallic stent Angioplasty

- Drug eluted stent (Drug - Sirolimus)

- Biodegradable & bioabsorbable stent.

* Surgery:

a) Bypass Sx → formation of collateral / bypass channel using bypass graft

- Autologous bypass graft

↓

• Great saphenous vein

• LIMA / RIMA (Lt & Rt internal mammary arteries)

- Synthetic graft:

Textile

(Better one)

↓
made of Dacron

↓
- woven (better)

- knitted

Non-textile

↓
made of PTFE

PTFE : Poly Tetra Fluro Ethylene.

- ⇒ Woven Dacron graft is better than knitted Dacron graft.
- ⇒ Synthetic graft
 - Carbon coating is done to make graft negatively charged to avoid aggregation of platelets & fibrins.
 - Gelatin impregnation of the graft make the graft leak proof.
- ⇒ MC early cause of graft failure is faulty technique.
- ⇒ MC late cause of graft failure
Graft occlusion
- ⇒ MC infection in bypass graft
Staph. aureus.
- ⇒ Suprainguinal obstruction
Dacron graft
- ⇒ Inguinal level obstruction
PTA
- ⇒ Infrainguinal obstruction
Great saphenous vein graft
- ⇒ MC peripheral bypass Sx done:
Femoro popliteal bypass
(Fem Pop bypass)

b) Lumbar Sympathectomy:

- * Removal of L₁, L₂, L₃, L₄ lumbar ganglia
- * Migration of blood from the calf towards the foot.
- * So beneficial in rest pain.
- * But absolutely contraindicated in intermittent claudication.
- * If bilateral lumbar sympathectomy has to be done, then we preserve 1st L₁ ganglion on one side.
- * Removal of L₁ ganglion on both sides can lead to
LERICHE syndrome
Pain in buttocks & thighs associated with impotence.

c) Amputation:

- offers best pain relief

Buerger's disease

- * Called as thromboangitis obliterans.
- * It is thrombosis & thrombophlebitis of small to medium sized vessels associated with Raynaud's phenomenon.
- * Seen in smokers
- * 95% are males.
- * Usually < 45 yrs of age
- * Usually affects lowerlimbs

* OLIN's criteria:

- Smokers / history of tobacco use
- 95% males
- Distal ischemic symptoms and signs.
- Exclusion of proximal any other disease → DM/Atherosclerosis, Autoimmune disease.
- Characteristic Angiography appearance -

CORK SCREW appearance of the femoral artery.

- * Always involve arteries & veins
- * Can involve the nerve
- * But never involve the lymphatics
- * On biopsy of vessel → Internal elastic lamina is preserved (But destroyed always in atherosclerosis)

* Rx.:

- 1) Life style modification
- 2) Drugs
- 3) Lumbar sympathectomy
- 4) Amputation.

Note

- * Cork screw appearance on barium swallow → Diffuse oesophageal spasm

Raynaud's disease

- * Spasm of arterioles on cold exposure.
- * Common in young females
- * Upper limbs
- * Pulse is normal
- * Raynaud's phenomenon → characteristic sequence of colour changes white, blue, red. (W → B → R)

* Rx:

- 1) Life style modification
- 2) Drugs (CCBs, Nitrates)
- 3) Rarely cervical sympathectomy

- * In life style modification:
 - Avoid cold exposure.
 - Wear warm clothings.

Sudden Arterial Obstruction

- * Seen in Embolism - sudden obstruction of an artery by a substance which is foreign to the bloodstream.

* Characteristic 5 P's:

- Pain
- Pallor
- Pulselessness
- Paraesthesia
- Poikilothermia

- * Emergency → risk of early gangrene

- * IOC: Colour Doppler.

Rx

- Immediate Rx → Low molecular wt Heparin.

- Prevents extension or migration of thrombus
- Maintain patency of surrounding blood vessel.

- Definitive Rx. (dissolve embolus)

(1) Thrombolysis

Standard thrombolytic agent:
TPA - Tissue plasminogen Activator

Also Streptokinase & Urokinase

(2) Thrombectomy / Embolectomy (Using Fogarty catheter)

Arterio venous fistula (AV fistula)

- * Abnormal communication b/w artery and vein.
- * MCC → Penetrating trauma
- * Sometimes
 - Congenital
 - Infections
 - Iatrogenic (for dialysis, created in forearm; called as CIMINO fistula)
- * Abnormal amount of blood move from artery to veins → abnormal dilatation & tortuosity of veins.

* In growing children, AV fistula in limbs can lead to overgrowth of limbs

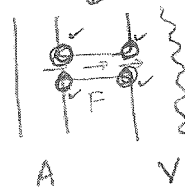
* Branham's sign / Nicoladoni's sign
If pressure is applied over an artery proximal to fistula → reversal of changes observed in AV fistula.

* IOC: Colour doppler

* Rx:

① Angioembolisation
(Therapeutic embolisation)

② Surgery - Quadruple Ligation of AV fistula
(Hunterian ligation)



VENOUS DISORDERS

Venous anatomy of lower limbs:

- * Deep venous system
 - Femoral vein, popliteal vein, Tibial veins.
- * Superficial venous system:
 - Great saphenous vein, Short saphenous vein.

- * Perforating veins → are the communicating veins

↓

3 above ankle	Cockett
2 ab below knee	Boyd
1 mid thigh	Dodd



- * Valves allow the blood to move from superficial VS to deep VS.

- * 2 junctions: (Guarded by valves)
 - Saphenofemoral (GSV → FV) *(medially)*
 - Saphenopopliteal (SSV → PV) *(laterally)*

- MCA*
 - * MC valvular incompetence → Saphenofemoral incompetence.

- * 2 pumps in the lower limb
 - Foot pump (foot muscles)
 - Calf pump (Soleal pump) calf muscles.

Basic pathology

- * Varicose veins → abnormal, dilated, tortuous veins

- * MC in lower limbs
- * MC in females

- * Risk factors:

- Prolonged standing (Traffic policeman / Rickshaw puller)

- Pregnancy (baby obstruct inferior vena cava)

- Pelvic tumour

- Progesterone

- Deep vein thrombosis (MC site → calf veins)

- Genetic predisposition

- * Pathogenesis: Ampulatory Venous Hypertension.

- Normal individuals on walking, muscles contract → pressure in deep VS increases → blood in DVS goes upwards → blood does not pool from DVS into SVS because of valves in the communication → on walking blood flows from SVS towards DVS → so pressure in SVS falls during walking.

* In valvular incompetence → on walking muscles contract → pressure in DVS increase → blood in DVS moves from DVS to SVS because of valvular incompetence in the communication → blood flows from DVS to SVS → pressure in SVS increase during walking → called as ambulatory venous hypertension. (↑ pressure in the SVS)

* MC clinical presentation of varicose veins → Aching discomfort in calf and heel.

* Complications:

- 1) Bleeding
- 2) Lipodermatosclerosis
- 3) Venous ulcer

* Lipodermatosclerosis is brownish black appearance of skin MC seen around medial malleolus.

* MC site of venous ulcer → (pressure necrosis to surrounding tissues)
Around the medial malleolus

↓
Gaiter's area (area b/w two malleoli)

* Rx → Rx of varicose veins
↓
(of venous ulcer)

* In case of deep vein thrombosis → Rx. of venous ulcer

↓

4 layer bandage to exert uniform compression and distribute the pressure elsewhere.

* Step wise clinical approach

• Clinical examination:

→ Tourniquet Test (for the saphenofemoral & saphenopopliteal incompetence)

→ Sequential Tourniquet Test (Identification of the perforators)

→ Fegan's Test (Identification of the perforators)

• IOC : Duplex Imaging
(Grey scale B scan ultrasound + Doppler effect)

Note

• Perthe's test → for deep vein thrombosis (DVT)

• Adson's test → Cervical rib/Thoracic outlet syndrome

• Rx:

* Early stage → Conservative

- Avoid prolonged standing
- Limb elevation
- Elastic compression stockings

* Advanced stage

- Destruction of superficial dilated super tortuous veins

↓

1) Injection sclerotherapy

- Sclerosing agent of choice
Polidocanol (Askerol)

2) Laser ablation of GSV

3) Radio-frequency ablation of the GSV

4) Surgical removal of GSV

- Sx Rx is Trendelenburg operation (Flush ligation of GSV with FV (at saphenofemoral junction))
+ stripping of GSV

±
Ligation of perforators in case of perforator incompetence

MCC

• SEPS

- Openal Open operation
- Cockett & Dodd operation

(SEPS: Sub-fascial Endoscopic Perforator surgery)

LYMPHATIC DISORDERS

■ Lymphedema:

Abnormal accumulation of fluid in the interstitial space

* Approximately > 4.5 L of fluid accumulation in the lower limb results in lymph edema of lower limb.

* 2 types:

(1) Congenital lymph edema:

- Probably due to the hypoplasia of lymphatic channels

(2) Acquired lymphedema

- MC

- MCC is Filariasis

* Congenital L-E

• < 2 yrs → Lymph edema congenita

• 2-35 yrs → Lymphedema praecox (MC)
MILROY'S disease

• > 35 yrs → Lymphedema tarda

* Rx :

- Conservative treatment
- Rx. of disease associated
- Avoid prolonged standing
- Limb elevation
- Elastic compression stockings
- Pneumatic compression devices.
- Sx → rarely done.
(becoz of lympho-venous shunts)

MIST

THYROID GLAND

- * Normal weight : 25 gms (20-35)
- * Two lobes joined by isthmus
- * Isthmus → in front of 2nd, 3rd & 4th tracheal rings

MCA

- * Supplied by 2 arteries:
 - 1) Superior thyroid artery
 - 2) Inferior thyroid artery

- * 3 veins draining
 - 1) Superior thyroid vein
 - 2) Middle thyroid vein
 - 3) Inferior thyroid vein.

- * Lymph node draining
 - Delphic LN (Level VI LN)
 - or Pretracheal LN.

MCA

- * Parathyroid gland is mainly supplied by inf. Thyroid artery.
(PTG posteriorly in TG)

Embryology

- * Thyroglossal bud descend from the foramen caecum (junction of ant. 2/3 & post 1/3 of tongue) down in to the neck exactly in the midline then unite with the two ultimo branchial bodies in the lower part of the neck.

- * This forms the two lobes of the thyroid gland

- * All these occurs in early intrauterine life.

Physiology

- * Thyroid hormones - T₃ & T₄
 - T₃ : Tri iodo tyrosine
 - T₄ : Tetra iodo tyrosine

- * 4 stages in the synthesis of thyroid hormone (TOBC)

a) T : Trapping of iodide (I⁻) from diet by follicle

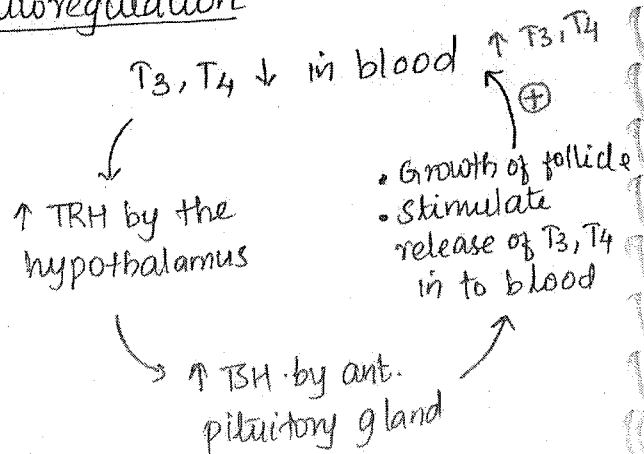
b) O : Oxidation of I⁻ → I

c) B : Binding of I₂ + Tyrosine = Mono iodo tyrosine

d) C : Coupling of

- Mono + Mono = Di
- Di + Mono = Tri IT
- Di + Di = Tetra IT

Autoregulation



TRH : Thyroid Releasing Hormone

TSH : Thyroid Stimulating Hormone.

Congenital anomalies

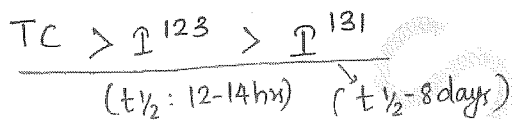
1) Lingual thyroid - Presence of thyroid tissue on the tongue

mca

- MC site is foramen caecum
- Difficulty in speech, breathing and swallowing.
- Radio isotope scan is performed prior to Rx. of lingual thyroid.

- Technicium ($t_{1/2}$ - 6 hrs) is (TC)

mca



- If isotope scan confirms the presence of normal functioning thyroid tissue in the neck

↓
then lingual thyroid can be destroyed by

- (MCA) ✓ a) Drugs - Thyroxine
b) Radio isotope - I^{131}
c) Surgical excision

(Thyroxine \rightarrow \uparrow $T_3, T_4 \rightarrow$ \downarrow TRH \rightarrow \downarrow TSH \rightarrow \downarrow growth of follicle \rightarrow reduces swelling)

• ~~Other drugs used are~~

2) Median ectopic thyroid:

Ectopic thyroid tissue in midline of upper neck

3) Lateral aberrant thyroid:

Presence of thyroid tissue laterally in neck

↓
It is not an ectopic tissue usually, rather it should be considered as metastasis in a cervical lymph node from papillary thyroid cancer

4) Struma ovarii - Part of ovarian teratoma

↓
can be associated with hyperthyroidism.

5) Thyroglossal cyst - Accumulation of secretions anywhere in the patent thyroglossal tract

- MC found exactly in the midline
- MC - Subhyoid (beneath the hyoid bone)
- MC seen in children.
- Pathologically it consists of cholesterol crystals.

MCA

(Branchial cyst & Hydrocele fluid also contain cholesterol crystals)

- MC c/f - Neck midline swelling which moves with deglutition (swallowing). Also moves with protrusion of tongue

- Complications are:
 - = Stasis of secretion \rightarrow infection \rightarrow abscess formation (pus)
 - = Papillary thyroid cancer

- Abscess can either rupture spontaneously or incised by doctor
 - \downarrow
 - establish a communication b/w skin and thyroglossal tract
 - \downarrow
 - Thyroglossal fistula

- Thyroglossal fistula is never congenital, always acquired.

- Rx. Sistrunk's operation
 - \downarrow
 - Removal of thyroglossal fistula/cyst + Removal of entire thyroglossal tract up to foramen caecum on tongue along with some muscles (Fistula \rightarrow Cyst)

MCC

GOITRE

- * Enlargement of thyroid gland
- * MCC - I_2 deficiency
- * Types:
 - 1) Diffuse
 - 2) Simple nodule
 - 3) Multi nodule

- * Diffuse goitre \rightarrow reversible by giving I_2 / thyroxine

- * But simple / multi nodular goitre \rightarrow irreversible (necrosis occurs)

Nodular goitre

- * Asymptomatic
- * Sometimes symptoms - pressure symptom \rightarrow dyspnea, dysphagia



- * Complications:



- Secondary thyrotoxicosis
- Follicular thyroid cancer



- * Rx.: If patient is symptomatic / complications / cosmetic reasons / patient's wish


\downarrow
Surgery is preferred.

- * Surgical options are:

a)  \rightarrow  Hemithyroidectomy

 \rightarrow  Subtotal thyroidectomy

 \rightarrow  Near total thyroidectomy

 \rightarrow - Total thyroidectomy

- In subtotal → Preserve 4 gms of thyroid tissue on each side. So total 8 gms is preserved
- In near total → Preserve some thyroid tissue on one side (5 gm approximately)

- * I_2 deficiency → persists so long → undergo necrosis → necrotic tissues joins → forms nodule.
- * RxOC for solitary thyroid nodule
Hemithyroidectomy
(Removal of one lobe + Isthmus)

Retrosternal goitre

Enlargement of the thyroid gland behind sternum



- * MC - Enlargement from lower pole of the thyroid gland.
- * Rarely - Ectopic thyroid tissue.
- * Pressure ~~syndro~~ symptoms → Dyspnea & Dysphagia
- * Also dilated, engorged neck & facial veins
- * Characteristic feature - Stridor (due to compression of airway)
- * Clinical test - Pemberton's test (flushing of face on raising both the hands above the head multiple times)

- * RxOC → Surgery.
- * Removed by cervical (neck) approach usually.
- * Rarely sternotomy may be required

Hypothyroidism

- * ↓ T_3, T_4 levels in blood
- * MCC - Hashimoto's thyroiditis (worldwide)
- * Also I_2 deficiency - India
- * Drugs / Radioisotope iodine ablation / Sx removal of thyroid gland → ↓ T_3, T_4
- * Other causes - Genetic causes like defective hormone synthesis (Dyshomogenogenesis)

↓ Pendred syndrome

(Hypothyroidism associated with sensorineural deafness + bony labyrinth abnormality)

- * Cretinism in children
- * Symptoms of hypothyroidism
 - Cold intolerance
 - Weight gain
 - Constipation
 - Menstrual disturbances
 - Carpal tunnel syndrome (median nerve)
 - Lethargy

Note

- Tarsal tunnel syndrome, compression of → Post. tibial nerve
- Cubital tunnel → Ulnar nerve at the elbow
- Guyon canal syndrome → Ulnar nerve at wrist

* Signs of hypothyroidism:

- Bradycardia
- Bradykinesia
- Dry skin & hair
- Periorbital puffiness
- Delayed relaxation of ankle jerk reflex

(characteristic sign of the hypothyroidism)

- Hoarseness of voice.

• Myxedema

- * Advanced form of hypothyroidism + supraclavicular puffiness + Malar flush + Yellow ~~tint~~ tinge to the skin.

• Myxedema coma

- * Advanced form of myxedema
- * Hypothyroidism + Altered sensorium + Hypothermia (temp. can drop up to 30°C)

Note

- * Pretibial myxedema - Not associated with hypothyroidism

↓
associated with Graves' disease (hyperthyroidism)

↓
due to deposition of mucin & mucopolysaccharides within the subcutaneous tissue beneath the skin over the shin. Can also be seen in feet, hand.

■ Rx of hypothyroidism

- * DOC - Levothyroxine (T₄)

(long acting, single daily dose)

- start \bar{c} 100 μ g/day → can ↑ up to 200 μ g/day.

- * In cardiac patients, start \bar{c} 50 μ g/day then gradually ↑.

- * Other drug → T₃

(short acting, thrice daily dose)
- But fast acting, so preferred if rapid control of the hypothyroidism is required.

- 20 μ g thrice a day.

Hyperthyroidism

* ↑ T₃, T₄ in blood.

* Causes: Types:

- 1) Diffuse toxic goitre
- 2) Toxic nodule
- 3) Toxic multinodular goitre

(toxic - ↑ T₃, T₄)

MCQ 4) Jod Basedow's thyrotoxicosis
(Iodine induced hyperthyroidism
in endemic areas)

MCQ 5) Thyrotoxicosis factitia
(Thyroxine induced hyper-
thyroidism) (faulty prescription)

6) Hyperthyroidism associated
with thyroiditis.

a) Early stages of
Hashimoto's thyroiditis

b) Early stages of
De Quervain's thyroiditis

7) Neonatal thyrotoxicosis:

Diffuse toxic goitre

- * Called as Grave's disease
- * 8 times MC in females
- * Thyroid stimulating antibodies (TSH receptor Ab) are formed
→ enlargement of all follicles,
leading to → diffuse goitre +
release of T₃, T₄ in to blood →
hyperthyroidism.

* Eye signs are more common
in Grave's disease.

Toxic nodule & Toxic multinodular goitre

- * Due to over activity of peripheral
nodular tissue → ↑ T₃, T₄ synthesis
- * Central necrotic tissue → forms nodule
- * ↑ T₃, T₄ syn → hyperthyroidism.

Neonatal thyrotoxicosis

* Due to maternal thyroid stimulating
Ab → cross placenta → entered
in to babies circulation → (neonate is
0-28 days)

- MCQ
- * So it does not require any Rx.
 - * Get excreted in urine.

Hashimoto's thyroiditis

* Inflammation & production of Ab
against follicle → destruction of
follicle → release of stored T₃, T₄ initial
→ hyperthyroidism early → later hypot

De Quervain's thyroiditis

* Viral infection → damages follicles →
release of stored T₃, T₄

Note:

- * Reidel's (fibrosing) thyroiditis
is associated w̄ collagen vascular
diseases like idiopathic retroperitoneal
fibrosis which is called as Ormond's
disease (MC structure involved is
ureter), mediastinal fibrosis.
- * It is not asso. w̄ hyperthyroidism

Symptoms

- * ↑ Basal metabolic rate
- * ~~Rx~~ Tiredness (d/t ↑ work)
- * Heat intolerance
- * Weight loss despite of ↑ appetite
(characteristic symptom)
- * Diarrhea.

Signs

- * Various eye signs → Exophthalmos
(protrusion of eyeball due to deposition of mucin & mucopolysaccharide \bar{c} in retroorbital tissue)
(retro → behind)
- * Tachycardia (fast HR persists during sleep → characteristic sign)
- * Palpitation
- * Tremors
- * Pretibial myxedema.
- * Plummer's nail (thinning of the hyponychium)

Rx. of hyperthyroidism

- 1) Drugs - Carbimazole / Methimazole
 - 2) Radio iodine ablation (I^{131})
 - 3) Surgery
- * Antithyroidal drug of choice in pregnancy → Propyl thiouracil
 - * Surgical aspect of thyroid gland
 - 1) Pre operative precautions
 - 2) Intra operative precaution

* Pre operative precautions:

= Mandatory to make the patient euthyroid before operation to avoid risk of thyroid storm / thyrotoxic crisis.

a) Iodides - given up to morning of operation

b) Carbimazole - given up to evening before operation.

c) β -blockers - given for 7 days after surgery

- inhibit $T_4 \rightarrow T_3$ conversion
- no role in interfering synthesis of thyroid hormones.

(peripheral conversion of $T_4 \rightarrow T_3$ is inhibited)

* Intra operative precautions:

- Ligation of sup. thyroid artery
 - Ant. & post. branches of STA are ligated as close to the gland as possible to avoid injury to external branch of sup. laryngeal nerve.
- Ligation of inf. thyroid artery
 - capsular branches of ITA are ligated away from the gland to avoid injury to recurrent laryngeal nerve
- Preserve blood supply to parathyroid gland (branch of inf. TA)

Post operative complications:

(1) Hemorrhage:

= MC type is reactionary hemorrhage
(4-24 hrs after Sx)

= MCC: Slipping of ligature
from post. branch of the
superior thyroid artery.

↓
Bleeding → clot,
compression of trachea

↓
Respiratory distress

↓
Immediate Rx.: Open skin
suture / staples immediately

(2) Respiratory distress:

= Hemorrhage

= Tracheomalacia

= Bilateral RLN paralysis

= Hypocalcemia (late cause,
2nd - 5th post. operative day)

(3) Injury to nerves

= MC nerve injured: RLN

= SLN can also be injured.

(4) Hypothyroidism:

• Incidence is 20-45%

(5) Hypoparathyroidism

• Incidence is 0.5%

• MCC - Ischemia to parathyroid
gland due to ligation
of blood supply to the
parathyroid gland.

• Sometimes accidental removal
of parathyroid gland.

• Parathyroid is re-implanted into
→ forearm, arm or the
sternocleidomastoid muscle

BREAST

Anatomy

* Rests on pectoralis fascia

* Lie in b/w 2 layers of
superficial fascia

* Extent of breast: (MCC)

⇒ Anatomical extent

• Vertically → 2nd rib
to 6th ribs below

• Horizontally → lateral
border of sternum to
ant. axillary line.

⇒ Surgical extent:

• Vertically → clavicle
to 7th, 8th rib below

• Horizontally →
Midline to edge
of latissimus dorsi
muscle.

* Part of breast extend in to
axilla → Axillary tail of Spence



- * Areola at the centre
- * Enlarged sebaceous glands in the areola during pregnancy & lactation → Montgomery tubercles
- * Breast → divided into 4 quadrants → Upper inner, upper outer, lower inner, lower outer.
- * Most important quadrant is Upper Outer quadrant as it is the MC site of breast cancer.
- * Numerous lobules inside breast → lactiferous ducts from it → unite to form main lactiferous duct.
- * Dilated part of lactiferous duct is Ampulla.
- * Supporting tissue / connective tissue to support lobules & lactiferous duct → Stroma.
- * So breast has
 - Lobules
 - Ducts
 - Stroma

* Stroma has got ligaments connecting pectoralis fascia below to the skin above

↓
 Suspensory ligaments /
 Astley's ligaments /
 Cooper's ligament.

Blood supply of breast

- * Major → Lateral thoracic vessel (artery & vein)
- * Also from internal mammary vessels (artery & vein) → it mainly supplies posterior part of breast.
- * Also from intercostal vessels



- ⇒ Malignancy arising in epithelium & mucosa → Carcinoma
- ⇒ Malignancy arising in connective tissue / stroma → Sarcoma.
- ⇒ In breast, duct & lobules: Carcinoma
- ⇒ In breast, stroma: Sarcoma
- ⇒ In breast, MC - ductal carcinoma

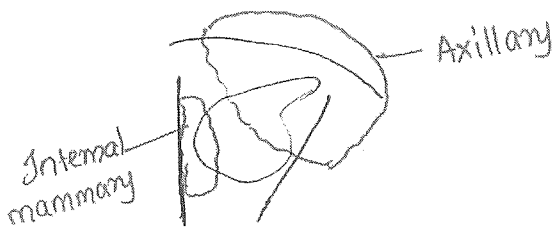
Lymphatic drainage

* Levels I, II, III based on the pectoralis minor muscle.

* 3 levels

* 2 groups:

- Axillary group (receives 80% of lymph)
- Internal mammary group (receives lymph from posterior part of breast)



* Axillary group:

- 30 LN in axilla
- 3 levels
- 5 subgroups

* Structures from external to internal:

Skin → sup. layer of sup fascia
 → breast → deep layer of ~~dee~~ sup fascia → pectoralis fascia
 → pectoralis major

* Level I: LN lies below & lateral to pectoralis minor muscle.

↓
 divided into 3 subgroups

- (a) Anterior subgroup - LN lies along lateral thoracic vessel
- (b) Posterior subgroup - LN lies along subscapular vessel.
- (c) Lateral subgroup - LN lies along axillary vein

* Level II: At the level of pectoralis minor muscle.

- (d) Central subgroup - Interpectoral LN / Rotter's LN
 (btw pectoralis major & P. minor)

* Level III: LN lies above & medial to pectoralis minor

(e) Apical subgroup - Receives efferents of all other Axillary subgroups of LN

↓
 Sends its efferent to * the supraclavicular LN

Physiology

Hormonal changes

* If hormonal level ↑ / sensitivity of receptors in the breast tissue become abnormal

↓
 can be related to hyperplasia of cells in lobules, ducts & stroma

* ↑ estrogen & ↑ in progesterone → hyperplasia of breast → when ↓ E & P → involution of breast back to normal.

* Estrogen & progesterone receptors are present in breast (if sensitivity of this receptor increases → can lead to hyperplasia)

Que: There is NO MEDIAL subgroup

Congenital Anomalies

* Amazia → Absence of breast associated

^{MCC}
* Poland's syndrome → Absence of breast associated with absence of sternal part of pectoralis major muscle. MC in males

* Athelia → Absence of nipple.

* Polymazia → Multiple breast

- MC site is Axilla
- 2nd - Groin area
- 3rd - Mediastenum

(along the milk line)

* Polythelia → Multiple nipple
Axilla > Groin > Mediastenum.

* Breast pain → Mastalgia

* Mastalgia can be

Cyclical

Non-cyclical

- Hormonal etiology
- Cyclical pain asso. w/ different phases of menstrual cycle
- Initial Rx: Conservative
 - Oil of evening Primrose
 - Breast support

- Non-hormonal etiology
 - Simple mastitis
 - Myositis
 - Costochondritis

if fails: Danazol & Bromocriptine

if it fails then Tamoxifen (Anti-estrogen)

* Costochondritis of 2nd costal cartilage → Teitzel's disease

* Rx. of non cyclical mastalgia

- Breast support
- Anti-inflammatory NSAID
- Injection of local anesthetic agent can be given at the trigger spot.

Discharge from nipple

* MC discharge → Milk

* MC pathological discharge → Serous

* MCC of pathological " → Duct ectasia

(dilatation)

* MCC of green discharge → Duct ectasia

* MCC of blood discharge → Duct papilloma.

* Bilateral discharge is usually benign

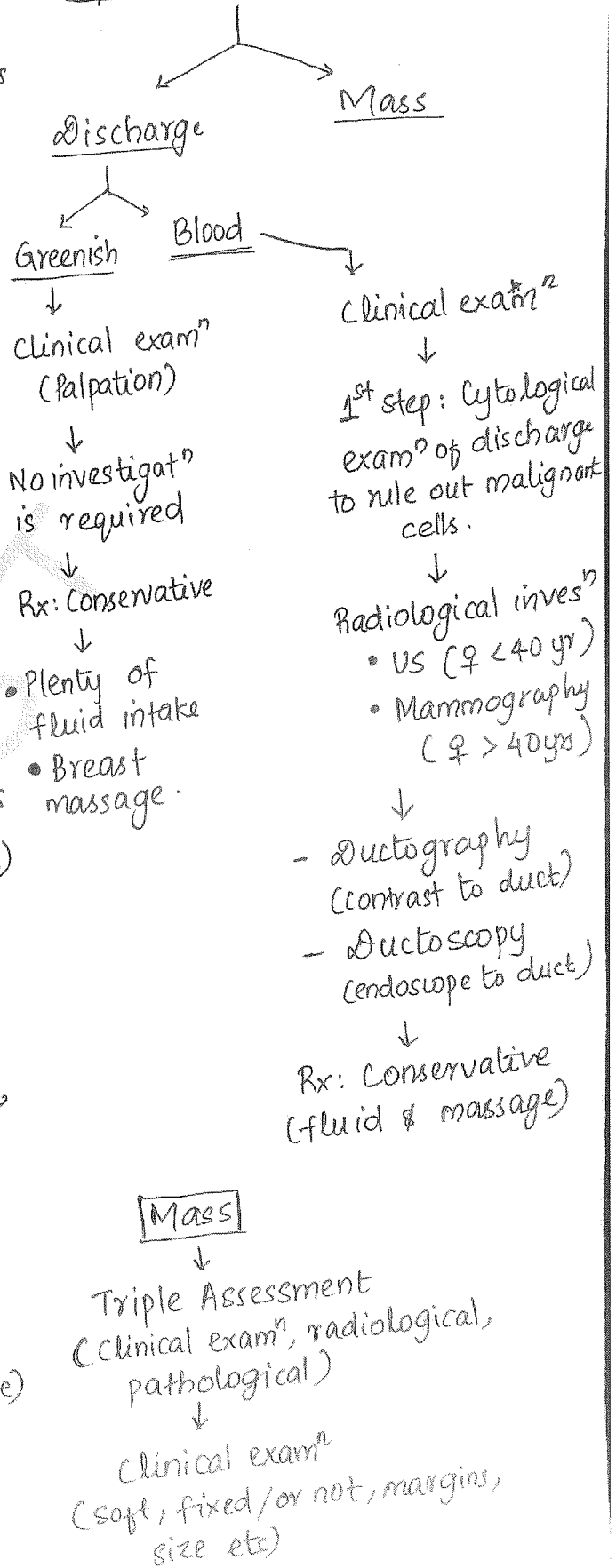
* Unilateral discharge can be malignant.

Duct Ectasia

(Periductal mastitis)

- * Abnormal dilatation of lactiferous ducts
- * MC seen just beneath the areola
- * ~~Dilatation~~ → proximal
- * Block → ~~prox~~ proximal part dilated → distal part normal / collapsed.
- * Dehydration → thickening of fluid → blocks the duct → stasis of fluid → infection
- * It is due to clogged secretions anywhere within the lactiferous ducts
- * commonly asso. \bar{c} dehydration → common in smokers & Alcoholics
- * Causes nipple retraction (inwards)
- * Slit like retraction of nipple in duct ectasia (circumferential retraction of nipple is seen in carcinoma of duct)
- * stasis of secretion → infection → subareolar abscess
- * Chronic subareolar abscess is called as ZUSKA'S disease.
- * MC clinical presentation is greenish discharge from the nipple, ~~&~~ rarely blood discharge subareolar mass

* Stepwise clinical approach



↓
Radiological evaluation
(USG / mammo)

↓
Pathological diagnosis
(FNAC / Biopsy)
↓
(best)

↓
If it is Duct ectasia then
Rx: Conservative

↓
if unresolved
↓
(usually multiple
lactiferous ducts
are involved)

opening of ducts by Sx
- Microdochotomy

↓
if it fails or unresolved
↓
removal of duct

- Hadfield's operation
(excision / removal of multiple
lactiferous ducts)

- Microdochectomy
(removal of single lactiferous duct)

• Breast feeding is not possible
after Hadfield's operation.

Duct Papilloma



- * Exophytic growth from lactiferous duct.
- * Usually involves single lactiferous duct.
- * MC c/p → Blood discharge from the nipple.
- * It is premalignant so can lead to cancer.
- * Single papilloma without atypia has less risk of cancer.
- * But multiple papilloma with atypia has high risk of cancer.
- * Rx OC: Microdochectomy

Inflammatory conditions

Mondor's disease

- * Thrombophlebitis of superficial veins of the breast skin of breast and chest wall.

Mastitis

- * Inflammation of breast
- * Commonly seen during lactation and pregnancy.
- * MC causative agent: Staph. aureus from baby's mouth during lactation.
- * MC c/p → Swelling, redness & pain in the breast.

* Rx: Supportive + Adequate antibiotics
Breast support, Anti-inflammatory

* If unsuccessful can progress to breast abscess.

* Early stage of breast abscess →

- fluctuation is not seen
- Rx: Repeated needle aspiration under adequate antibiotic cover.

* Late stage of breast abscess →

- fluctuation is present
- Rx: Incision & Drainage.
- Most cosmetic incision is Periareolar (circum areolar) breast incision
- Best incision is: Radial incision (less damage to ducts)

Benign breast disorders

* MC benign breast disease:

Fibrocystic disease of breast

* MC benign tumor of breast:

Fibroadenoma of breast

* Aberration in normal development and involution (ANDI classification) is the reason for these disorders.

* Estrogen / Progesterone ↑ → hyperplasia of cells (lobules, ducts, stroma)

* ↓ E/P → involution of hyperplastic cells

* ANDI → Benign breast disorder, rarely malignancy.

Sequence of ↑ risk of cancer:
(normal → ~~hyper~~ controlled hyperplasia
→ atypical HP → carcinoma in situ
→ microinvasion → invasive Ca)

Dupond & Page classification of changes inside the breast

* Non-proliferative (70%)

- Relative risk of cancer = 1
- eg: Simple adenosis, Duct ectasia, Breast cyst

* Proliferative without atypia (26%)

- RR of Ca: 1-2
- eg: Duct papilloma, Sclerosing adenosis.

* Proliferative with atypia (4%)

- RR of Ca: 4-5
- eg: Atypical ductal hyperplasia, Atypical lobular hyperplasia

Fibroadenoma

* Breast mouse

* MC benign breast tumor

* Hyperplasia of single lobule

* It can occur in fully developed breast only

* MC seen in ♀ 15-25 yrs

* Usually small (2-3 cm in size)

mca

* Sometimes >5cm, called as Giant fibroadenoma.

* MC C/F → Breast lump, freely mobile inside the breast, smooth, firm, not fixed, not asso. LN enlargement.

* Step wise clinical approach:

Clinical examination

↓

US / mammo

↓

FNAC / Biopsy

mca

* POC is FNAC

* Best investigation is biopsy

* Popcorn calcification on mammography → Fibroadenoma

* Popcorn calcification on Chest X-ray → Pulmonary Hamartoma

* Egg shell calcification on mammography → Benign breast diseases - Traumatic fat necrosis.

* Egg shell calcification on Chest X-ray → Silicosis & Sarcoidosis

* Irregular, branching, spiculated, microcalcification on mammography
Carcinoma of breast

* 10% of fibroadenoma can regress in 1 year.

* 10% are bilateral

* 10% are multiple.

* Rx: Wait up to 30 yrs of age for spontaneous regression

↓

if persists - Enucleation → Excision
(excision is done when lump is fused with capsule. In enucleation no fusion b/w lump & capsule, simply lump is removed)

Cystosarcoma phylloides

* Serocystic disease of Brodie/
Phylloides tumor.

* Leaf like appearance

* Stromal hyperplasia

* MC → >40y ♀

* MC C/F: Diffuse breast mass

* Can become malignant

* If malignant → sarcomatous tumor

↓

(they do not spread via lymphatics)

* So LN dissection is not required

* Rx: Simple wide excision

↓

if si malignant, massive, recurrent - Simple mastectomy.

Carcinoma Breast

- * MC cancer in females worldwide.
- * MC cancer in females in urban India.
- * MC cancer in females in rural India → cervical cancer.

MCQ
* MC Ca in females in India is Breast Ca.

* ♂: ♀ = 1:200

* Risk factors

- 1) Familial inheritances
- 2) Genetic inheritance

MCQ

BRCA 1 & BRCA 2 → ♀ breast cancer

BRCA 2 → ♂ breast Ca.

* Hormonal exposure

- Menopause worldwide - 51 yrs
 - " India → 47 yrs
 - Menarche in India → 11-13 yrs.
 - Early menarche & late menopause
- 3) Early menarche
 - 4) Late menopause
 - 5) Nulliparous
 - 6) Females taking hormone replacement therapy

7) Postmenopausal ♀ → ~~obese~~
Obese ♀ → ↑ conversion of steroids to estradiol in body.

MCQ 8) Oral contraceptive pills

Long term use of OCPs with high estrogen content → ↑ risk of breast Ca.

9) Alcohol

10) Less phytoestrogens in diet.

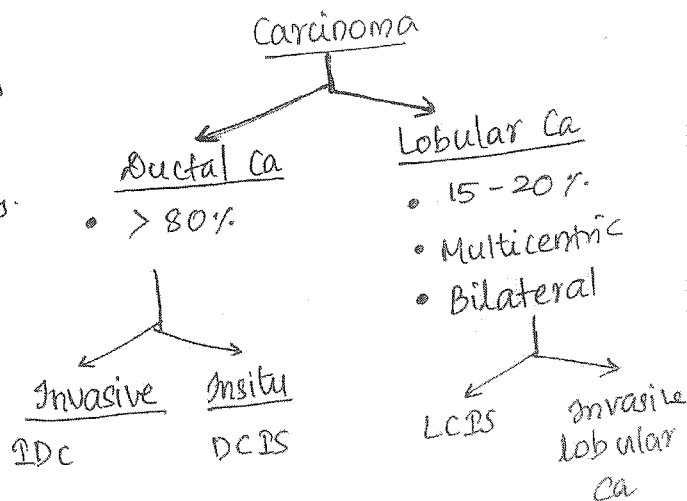
Protective factors

- 1) Late menarche
- 2) Early menopause
- 3) Prolonged breast feeding
- 4) First child at an early age.

BRCA 1 → 17q chromosome
BRCA 2 → 13q "

Pathology

- * Carcinoma → Epithelium of duct/lobule
- * Sarcoma → Connective tissue - stroma



MCQ

⇒ MC type is Invasive ductal Ca

MCQ

⇒ Bilateral → Lobular Ca.

(IDC → Invasive ductal Ca)

DCIS → Ductal Ca insitu

LCIS → Lobular Ca insitu

Pathological subtypes

1) DCIS (Ductal Ca insitu)

- Comedo
- Noncomedo
- Intermediate

2) Invasive ductal Ca

- Tubular (Best prognosis) ^{MCA}
- Colloid
- Papillary
- Medullary
- Inflammatory (Least prognosis)

↑ Prognosis order

3) Invasive lobular Ca

- classical
- Pleomorphic (Poor prognosis)

Pathological Grading

* Pathological grading of breast Ca

Bloom Richardson Grading

- * " Prostate Ca → Gleason's grading
- Gleason's score: 2-10

* Bloom Richardson grading is based on

- Tubule formation.
- Mitotic rate.
- Pleomorphism.

* Classified Breast Ca based on above

↳ to

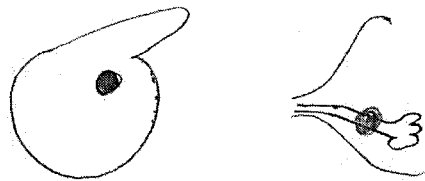
- Well differentiated (best prognosis)
- Moderately differentiated
- Poorly differentiated (Poor prognosis)

* MC in upper outer quadrant

C/F

* MC → Breast lump

MC in upper outer quadrant.



* Circumferential retraction of nipple (Slit like retraction → Duct ectasia)

* Blood discharge from nipple.

* If Ca involving suspensory ligament / Astley's ligament / Cooper's ligament → skin in that area can pulled in → cancer is involved the ligament not invades the skin.

* ^{MCA} Indrawing / dimpling of skin is not due to skin involvement by cancer, but due to involvement of suspensory ligament / Astley's / Cooper's - L. by cancer cells.

* Peau de Orange appearance / Orange peel appearance. (pits in skin)

↓
due to involvement of skin lymphatic by cancer cells

↓
blockade of subdermal lymphatics by cancer cells

↓
it indicates skin involvement by cancer cells.



↓
can also be seen in chronic abscess

- * Cancer en Cuirasse appearance.
 - Leathery appearance like an armour's coat of chest wall.
 - Due to recurrence after mastectomy for lobular breast Ca.

Note

- Skin involvement ⇒ T4b stage in the breast cancer
- Skin involvement present in
 - a) Peau de Orange
 - b) Cancer en Cuirasse
 - c) skin ulceration
 - d) satellite nodules
 - e) Inflammatory ~~nodule~~ Ca (T4d)

- *
 - * Lymphedema of arm
 - due to blockade / destruction of Axillary LN either by cancer or by radiotherapy or surgery.

mca - Most severe lymph edema of arm is seen if radiotherapy is given to axilla after modified radical mastectomy

- MC complication of lymph edema of arm is Lymphangiosarcoma.

mca (Que: Lymphangiosarcoma is a complication of lymphedema not lymphangioma)

Paget's disease of Breast

- * Eczema like condition where nipple is eroded & eventually eroded
- * Manifestation of underlying ductal breast cancer.
- * Not associated with lobular breast cancer.
- * Due to intraductal spread of Ca cells to the nipple.
- * It is ER / ~~PR~~ PR negative (ER - Estrogen receptors, PR - Progesterone receptors) (So no need of hormonal therapy)
- * Characterised by presence of Paget's cells (Adenocarcinoma cells)
- * These cells express carcino embryonic antigen (CEA)
- * So stain +ve with PAS
- * Doc → Exfoliative cytology, Scraping biopsy.
- * Rx → Simple mastectomy.

⇒ Carcinoma spread by blood & lymphatics

⇒ Sarcoma spread ~~by~~ not by lymphatics.

↓
Mainly local spread

↓
Rarely blood spread.

Spread of breast Ca

- * Local
 - Skin
 - Pectoralis fascia → P. major to P. minor
 - Chest wall (ribs & intercostal muscles)

- * Lymphatics
 - Axillary LN
 - Internal mammary LN (post. part)

- * Blood
 - Bones - Lumbar vertebra, (Dorsal lumbar vertebra) Femur, Thoracic V.
 - Viscera → Liver, Lung, Brain

- * Bony metastasis in breast Ca are usually osteoclastic, but can be osteoblastic also.

- * Prostate Ca bony metastasis are usually osteoblastic.

Step wise clinical approach

* Triple Assessment

- Clinical examⁿ
- Radiological evaluation (US / Mammography)
On mammography we get irregular microcalcification
- Pathological diagnosis
FNAC / Biopsy.

* Triple Assessment has a +ve predictive value of 99.9%

Note:

- Fine needle aspiration cytology is done using (a fine needle) 22-26 G (MC 24 G)
- Fine needle non aspiration cytology (FNNA) is done for vascular swelling, tense glandular tissue like thyroid gland.
- Biopsy can be
 - i) Needle biopsy (core needle biopsy)
 - ii) Incisional biopsy
 - iii) Excisional biopsy (lumpectomy)
- IOC of superficial swelling in body
FNAC
- Best IOC → Excisional biopsy (remove the lump & study)

* Adeno-Ca of breast

↓
Staging Investigation

* MRI: Staging IOC (can distinguish scar from recurrence)

* BONE SCAN

* PET SCAN - Positron Emission Tomography

↓
Isotope used: ¹⁸F FDG

* 18 FDG → Fluoro deoxy glucose

$T_{1/2}$: 110-120 mins

* TNM staging of breast Ca

TNM staging

- $T_1 < 2$ cm
- $T_2 \rightarrow 2-5$ cm
- $T_3 \rightarrow > 5$ cm
- $T_4 \rightarrow$ any size but
 - Chest wall - T_{4a}
 - Skin - T_{4b}
 - Both - T_{4c}
 - Inflammatory Ca - T_{4d}

⇒ T_1 is subdivided as :

- $T_{1\text{micro}} \rightarrow < 0.1$ cm
- $T_{1a} \rightarrow 0.1-0.5$ cm
- $T_{1b} \rightarrow 0.5-1$ cm
- $T_{1c} \rightarrow 1-2$ cm

⇒ LN staging is done for LN on same side having cancer (ipsilateral)

⇒ If LN involved in contralateral side (opposite) → indicates metastasis (M)

- $N_1 \rightarrow$ Ipsilateral mobile axillary LN
- $N_{2a} \rightarrow$ Ipsilateral fixed axillary LN
- $N_{2b} \rightarrow$ Ipsilateral internal mammary LN.

HTh → Hormone therapy

TTh → Targeted therapy

• $N_{3a} \rightarrow$ Ipsilateral apical + axillary LN.

• $N_{3b} \rightarrow$ Ipsilateral axillary + int. mammary LN

• $N_{3c} \rightarrow$ Ipsilateral supraclavicular LN.

⇒ Contralateral LN involvement is M_1 (metastasis)

⇒ Distant metastasis - M_2

Based on all these breast Ca is classified in to :

* Early breast Ca

- T_1 or T_2 / N_0 or N_1 / M_0
- Surgery (Breast conservation Sx / MRM - Modified radical mastectomy)
- ± Radiotherapy / ± ChemT / ± HTh / ± TTh

* Locally advanced

- T_3 or T_4 / N_2 or N_3 / M_0
- Neoadjuvant CTx (before Sx) → MRM → Adjuvant CTx (after Sx)
- ± RTh / ± HTh / ± TTh.

* Metastatic

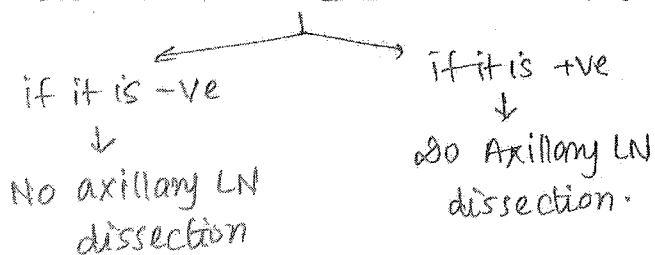
- Any T / any N / M_1
- Palliative care → Simple mastectomy

Surgical Rx of breast Ca

- 1) Breast conservative Sx (BCS)
- 2) Modified Radical mastectomy (MRM)
- 3) Simple Mastectomy
- 4) Radical mastectomy / Halsted Halsted mastectomy.

BCS

- * Breast conservative surgery
- * Removal of the lump with 1cm margin
- * It can be
 - Lumpectomy
 - Quadrantectomy
- * It is always supplemented by adjuvant radiotherapy (to destroy Ca cell if left out)
- * QUART → Quadrantectomy + Axillary dissection of LN + RT (radiotherapy)
- * In BCS, if lymphnode involvement is not present pre-operatively then ~~do~~ should do sentinel LN biopsy.



Note:

- ⊗ Sentinel LN is the first LN draining the tumor bearing area.
- ⊗ First done in 1978 for the Cabana LN in Penile cancer.
- ⊗ Can be done for malignant melanoma, GI cancers, Vulval cancers.
- ⊗ Methylene blue, Sulphur colloid & radiolabelled albumin can be used for identification of Sentinel LN.

* C/I of BCS:

- 1) Pregnancy
- 2) Previously irradiated site
- 3) Collagen vascular diseases
- 4) Multicentric tumors (at multiple sites in breast) (lobular Ca)
- 5) High tumor breast ratio.

* Not a C/I for BCS

- 1) Familial history (+)
- 2) B/L (bilateral) breast cancer
- 3) Heavily LN +ve patients.

Modified Radical Mastectomy

* Removal of breast along with nipple areolar complex + removal of fat, fascia & LN of axilla.

* Types: (Based on Pectoralis minor)

- Auchincloss MRM (PM retracted)

- Schanlon MRM (insertion of PM is divided)

- Patey's MRM (PM removed)

^{MCA} * MC is Auchincloss MRM (to remove LN)

^{MCA} * MC breast Ca - surgery is

Modified Radical mastectomy

* Structure ~~removed~~: preserved in MRM are:

- 1) Thoracodorsal nerves & vessels
- 2) Median & Lateral pectoral nerve
- 3) Nerve to Serratus anterior
- 4) Axillary vein.

* Complications of MRM.

- MC early complication is bleeding
- MC late complication is

Lymph edema of arm ←

- If not mentioned early / late, then
- seroma formation (accumulation of serous fluid beneath skin)
- Flap necrosis
- Injury to intercostobrachial nerve can lead to numbness on the medial aspect of arm.

(Neoadjuvant therapy → shrinks the tumor before surgery → makes margin clear)

Radical mastectomy

* Halsted mastectomy.

* MRM + Removal of P. major & P. minor muscle

Simple mastectomy

* Removal of entire breast

Chemotherapy

- * Indicated in heavily LN +ve patient
- * Poor grade of cancer.
- * Now chemotherapy of choice: ACT (Adriamycin, Cyclophosphamide, Taxanes)

Radiotherapy

- * Indicated in patients with +ve resection margins
- * Heavily LN +ve patients.

Hormonal therapy

- * Indicated in all patients with +ve hormone receptors (ER / PR +ve)
- * HT of choice in premenopausal ♀ Tamoxifen (Anti-estrogen) (20 mg x OD → 10 yrs)

* Hormonal therapy of choice in postmenopausal ♀ is:

Anastrozoles.

* Bilateral (B/L) oophorectomy (B/L oophorectomy) can also be done in premenopausal females.

Targeted therapy

* In Her-2-neu gene positive patients → use receptor modulators

Trastuzumab.

Prognosis in breast Ca

* Depends on LN status followed by size of tumor → then grade

* Most imp. is LN status

* Also depends on ER/PR status & Her-2-neu gene.

(ER/PR → +ve → good prognosis → can give hormonal therapy)

(But Her-2-neu gene → +ve → bad prognosis → as it is a mutated gene)

* Prognosis of metastatic breast Ca depends on ER/PR status

* Prognostic Index → NPI.

Nottingham Prognostic Index

Biomarkers of breast Ca

* PCNA (Proliferative Cell Nuclear Antigen)

Ki-67, Br-Udr

* Indicator of Apoptosis

Bcl₂, Bax; Bcl₂ (ratio)

* Indicator of angiogenesis

VEGF (Vascular endothelial growth factor)

* Tumor suppressor genes:

BRCA-1, 2, P53

* Growth factors:

EGF, Her 2 neu gene (epidermal growth factor)

⇒ Overexpression of all biomarkers carries poor prognosis except

Bax.

UROLOGY

- * Peritoneum - Cavity in front
- Extraperitoneum - Cavity on sides
- Retroperitoneum - cavity behind peritoneum

* Kidneys, ureter → upper urinary tract

* Urinary bladder, Urethra → lower UT

Kidneys & Ureter

Embryology

During 5-7 wks of intra-uterine life, mesonephric buds form near the sacrum in the retroperitoneum which gradually ascend upwards.

* Dilated portion of the bud forms - pelvicalyceal system



* Stalk forms - Ureter.

* Renal parenchyma develops from the metanephrons

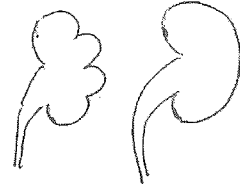
* Lined by transitional epithelium

* MC Cancer → Transitional cell carcinoma

* But distal urethra lined by squamous epithelium.

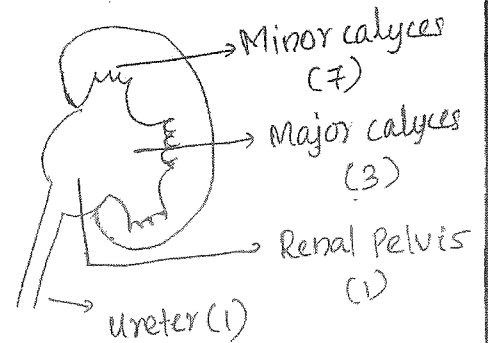
(^{natural openings} sphincters ~~are~~ all over body lined by squamous epithelium)

* During intrauterine life, multiple lobulations in the foetal kidney which disappear in adult life.



* If persistence of fetal kidney lobulations in adult life → Ormedary hump.

Basic Anatomy



- * Renal pelvis is funnel shaped
- * Capacity of renal pelvis is 7 ml
- * One renal artery, one renal vein for one kidney.

* Length of ureter → 25 cm

* ~~Len Diameter of ure~~

* Diameter of ureter: 6-8 cm

* Anatomical constrictions - 3

* Surgical narrowings in ureter - 5

1) PUJ (Pelvicureteric junction)

2) At pelvic brim (pelvic inlet)

- 3) Crossing by vas deferens
- 4) Intramural ureter (inside muscle of bladder - detrusor)
- 5) Ureteric orifice.

MCA

- Sometimes can develop symptoms
Swelling, pain (in lower abdomen)

- Complications: (no ascend to lumbar)
 - 1) Infections
 - 2) Pyonephrosis
 - 3) Stones - Nephrolithiasis

Congenital Anomalies:

1) Absent kidney

- 1:1000 (incidence)
- Due to renal agenesis

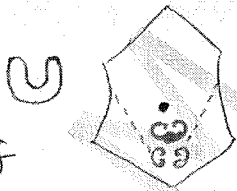
2) Ectopic kidney

- 1:400
- Kidney fails to ascend
- MC site is Pelvis of body
i.e., in retroperitoneum near the sacrum
- MC on left side.

MCA

3) Horse shoe kidney

- 1:900
- It is a pair of ectopic kidney
- It is due to fusion of the medial subdivision of lower pole of 2 kidneys in front of L₃-L₄ vertebra. (L₄ > L₃)



MCA

MCA - Level of isthmus (fusion)

L₃-L₄

- Usually asymptomatic

MCA

- Step wise clinical approach.

⇒ Elective (OPD)

↓
Uncomplicated, 3 yr old baby,

Abd swelling, pain

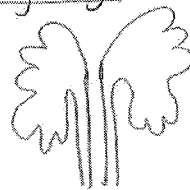
↓
Clinical Examination

↓
1st investigation in all cases with abdominal swelling is USG (ultrasound Abd)

↓
IOC: CECT Abdomen

↓
IVP can also be done in these cases → in horse kidney block in block in ureter → urine can't come down, so ↑ pressure in pelvis → minor calyces become club shaped

↓
k/a Flower vase ureter / Rovsing's sign / Hand joining sign



M → II

Note

- IVP → Intravenous pyelography / Intravenous urography
- Retrograde pyelography
- Antegrade pyelography
- Cystogram → Urinary Bladder
- Retrograde Urethrogram → Urethra
- Micturating cystourethrogram

Kidney & Ureters

* MCO

It is IOC for

- ✓ 1) Vesicoureteric reflux
- ✓ 2) Posterior urethral valves

Flower vase ureter

↓
 Rx: Asymptomatic → No Rx.
 If symptomatic - Simple conservative Rx. done

Complication → UTI → Antibiotic
 Stone → Removal of stone

⇒ If baby comes to emergency.

↓
 (pus) Pyonephrosis (high grade fever)
 Severe infection

↓
 Aggressive Ab
 + Drainage of pus

MCO

- * Division of isthmus is not RxC in ~~horse~~ horseshoe kidney
- * But it can be done in abdominal emergencies like rupture of abdominal aortic aneurysm.
- * Solid organs in body (spleen, liver, kidney) where parenchyma → not incised due to profuse bleeding until it is mandatory to do → so only no division of isthmus in horse shoe kidney.

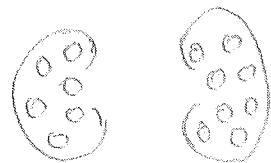
Polycystic Kidney disease

- * Congenital - Adult PCKD → Autosomal dominant - Common
- * Infantile PCKD → Autosomal recessive → rare → ↑ mortality

Congenital APCKD

- * Manifest > 30yr
- * Always B/L (Bilateral)
- * Associated with multiple cyst → MC in liver / pancreas / Spleen / Ovaries.

- * Can also be associated with:
 - Berry Aneurysm: (Circle of Willis)
 - Mitral valve prolapse



* C/P:

- Swelling B/L lumbar pain
- Hematuria
- HTN - 75%
- Uremia

Clinical approach

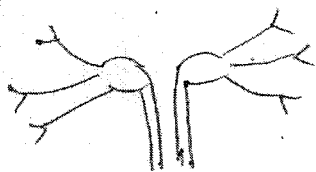
⇒ Clinical examination - Palpation

⇒ 1st investigation: US abd.
(USG can differentiate fluids)

⇒ IOC: CECT abd

⇒ IVP → Compressed renal calyces

↓
"Spider leg appearance"



⇒ Rx: Eventually renal transplant

- Derroofing of cyst
- Removal of renal capsule

"Rovsing's operation"

(Rovsing's sign is seen in horse shoe kidney & acute appendicitis)

⇒ During renal transplant

- (L) kidney is preferred from donor due to long (L) RV

• Transplanted kidney is placed in iliac fossa.

• Orthotopic transplant

Transplanted organ is placed in the same anatomical location
eg: Liver (Cirrhosis, carcinoma)

• Heterotopic transplant

Transplanted organ placed in different ana. place.
eg: Kidney

• Auxillary transplant:

When transplanted organ is placed beside the diseased organ.

eg: Liver in fulminant hepatic failure ↓
due to drug toxicities like Acetaminophen.

Congenital anomaly of renal vasculature

Super numerary renal arteries



- Double renal artery - MC (L) side
- Lower pole (one artery to it)
- Never be ligated or divided
- End artery ← (because)

(Renal artery, appendicular artery)

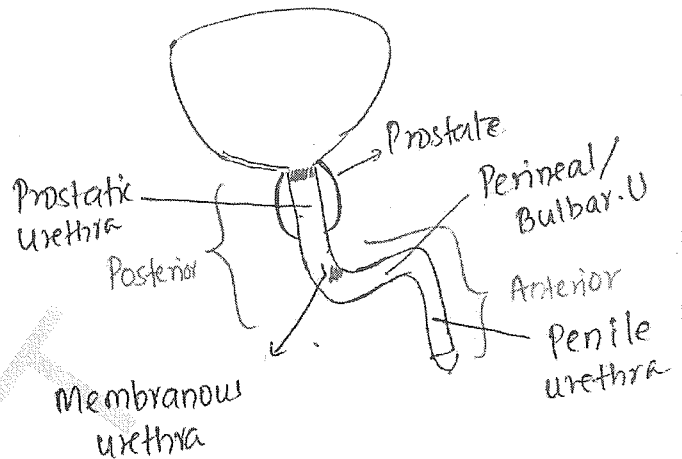
* End artery → part of organ supplied by only that vessel → so any damage to it can damage the part it supplies (necrosis)

* Narrowest part in ♂ Membranous urethra (< External urethral meatus)
* Widest part of ♂ urethra Prostatic urethra.

Congenital anomalies of upper renal tract

- 1) Duplication of renal pelvis
- 2) Duplication of ureter

* drooping lily sign → seen in duplication of R. pelvis.
(Renal pelvis > Ureter)



* Duplication of ureter:

- Usually → both ureters joins → opens via single ureteric opening in the urinary bladder
- Sometimes → both ureters do not join, upper ureter passes distally and open more medially than its counterpart

* 4 parts:
- Prostatic urethra
- Membranous urethra
- Perineal / Bulbar urethra
- Penile urethra.

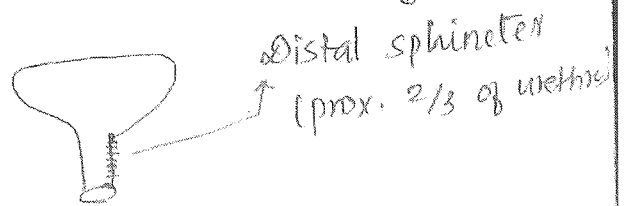
* Two sphincters:
• Internal sphincter
• External sphincter

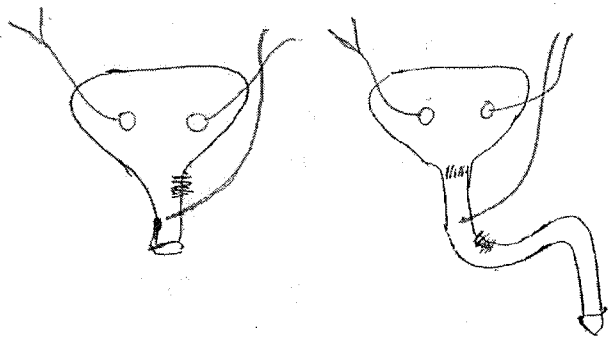
Kla Meyer Weigert law

Anatomy of Urethra

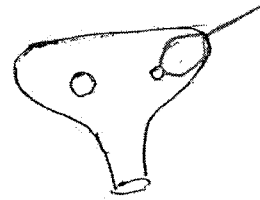
- * Length of ♀ urethra: 4 cm
- * " ♂ urethra: 20 cm
- * Diameter of ♀ → 6 mm
- * " ♂ → 6-8 mm

* In females → only 1 sphincter





- * When urine comes from above
 - resistance due to constriction
 - dilatation of ureter in wall of urethra → SD intramural



- MCO
- * MC site of ectopic ~~urethra~~ ureter
 - ♀ → distal to distal sphincter
 - ♂ → Prostatic urethra

- * In cystoscopy → translucent cyst bulging and collapsing in to the urinary bladder
 - (area proximal to bulged area part contracts & urine is pushed out → so dilated area collapses → but again fills as urine comes)

- * MC sign of ectopic ureter in ♀
 - dribbling incontinence.

- * MC sign of ectopic ureter in ♂
 - UTI (some urine retains there before micturition)

(⊕ UTI more common in ♀ due to short urethra)

- * In IVP → Cobra head / Adder head appearance

- * IOC : IVP

- * RxOC → ureteric re-implantation in to the urinary bladder.



- * (seen in ureterocele not urethrocele)

3) Ureterocele :

- * Partial atresia of ureteric orifice
- * MC in ♀
- * Usually B/L
- * In childhood / Adolescence
- * Intramural dilatation of ureter
- * Presents \bar{c} UTI

(intramural - within bladder muscle)

- * RxOC :

Endoscopic longitudinal diathermy incision of atretic ureteric orifice

- * MC complication of this Sx
 - VUR (Vesico ureteric reflex)

* IOC for VUR:

Micturating cystourethrogram

Urolithiasis

* Risk factors:

- Altered urinary solutes →
↓ urinary citrates (Ⓝ citrates prevents deposition of Ca. oxalate)
- Dehydration
- Infection - Inadequate drainage
- Deficiency of Vit A
- Prolonged immobilization
- Hyperparathyroidism, hyperuricosuria
- Randall's plaque

⇒ Cranberry juice prevents UTI → makes mucosa slippery & don't allow bacteria to stay.

* Types:

- 1) Primary → sterile → Usually kidney stone
- 2) Secondary → Infected → Usually UB stone

* Composition:

1) Ca oxalate stones → Ca. ox. mono-hydrate (hard)
→ Ca. ox. dihydrate (MC)

- Spiculated
- Hematuria

• MC stone asso. \bar{E} hematuria
Calcium oxalate stones
(since spiculated)

2) Triple phosphate stones:

- Ca, NH_4 , Mg PO_4
- Forms alkaline urine
[Ⓝ Urine pH: 6-8 slightly acidic]
- UTI (recurrent UTI)
- Also k/a Struvite stones
- Remains silent
- Most dangerous
- Keeps on enlarging, not spiculated
- Stone in the shape of pelviccalyceal system

Staghorn stone

3) Uric acid stones:

- Smooth, round or oval
- Radiolucent (not visible on x-ray)
- Other radiolucent stones

PG LUX

P - Parotid duct stone

G - Gall stone

L - Lysine

U - Uric acid

X - Xanthine

} Urinary stone

(MC stone in salivary system
- Submandibular stones)

(Gall stone → Cholesterol not Ca^{2+})

Urinary stone disease

4) Cystine stones

- Seen in cystinuria
- Very hard
- Difficult to be broken by ESWL (Extra corporeal shock wave lithotripsy)

5) Indinavir stones:

- Neither visible on x-ray, nor visible on CT scan.
- ~~MC kidney~~

⇒ MC kidney stone: Ca. oxalate dihydrate

⇒ MC UB stone in child: Triple PO_4

⇒ MC UB stone in adult: Uric acid

⇒ UB stones 10x MC in boys

⇒ MC UB stones overall: Triple PO_4

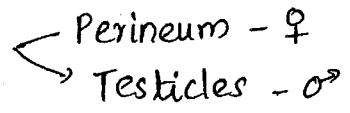
⇒ MC stone in recurrent UTI: Triple PO_4

⇒ Hardest stone: Cystine stone

(1) * MC C/F - Pain

* Kidney stone - Fixed lumbar pain

* Upper 1/3 ureter → Lumbar pain radiate to



* Pelvic brim → LP radiate to inner thigh.

* Mid 1/3 ureter → LP radiate to iliac fossa

* Intramural ureter → strangury (Painful desire to pass urine)

* Bladder stone → Suprapubic pain

* Bladder neck / urethra - ~~no~~ Suprapubic pain referred to tip of penis.

(2) Frequency of micturition
Earliest C/F.

(3) Hematuria

(4) Interruption of urinary stream
Large vesical calculus

(Bladder neck stone > Bladder stone)

* Clinical approach →

1st: Basic resuscitation

↓
Pain relief - 1st Med -

↓ Diclofenac

clinical examination

↓
1st Invⁿ - Plain X-ray KUB ^{Kidney Urinary Bladder}

80-90% radio opaque

(Triple PO₄ - Most radio opaque)

Best Invⁿ ⇒ Non contrast
(IOC) CT scan

* Elective R_x → R_xOC: ESWL

* R_xOC in

• Kid/upp 1/3, mid 1/3 ureteric stone
ESWL

• Lower 1/3 ureter stone

→ URS - Ureteroscopic retrieval
of stone

↓

Dormia Basket

(Remove CBD stones)

→ Urinary bladder stone

Litholapaxy - Lithotrite

→ Urethral stones

Push in to UB → Litho-
lapaxy MCA

• Kid/upper 1/3 ureteric stone >2cm

PCNL

(Percutaneous Nephrolithotomy)

* Emergency R_x for obstruction

(a) Upper urinary tract

1st → Endourinary stenting
- DJ stent (Double J)

If endourinary stenting
is not possible

2nd → PCN (Percutaneous
Nephrostomy)

(b) Low urinary tract

1st → Foley's catheterisation

(If not possible ↓

2nd → Suprapubic cystostomy
- "Supracath"

Note

• For emergency biliary obstruction,
we will do endobiliary
stenting by ERCP.

⇒ ESWL: Extracorporeal shock
wave lithotripsy

↓

Shock waves are fired directly
on to the stones, fragmented
stones align in the ureter as
Steinstrasse phenomenon

↓
if no distal obstruction, fragmented stones pass spontaneously in urine

↓
MC complication: Bleeding > Infection

↓
Absolute c/I of ESWL:

- Pregnancy / Bleeding diathesis / distal obstruction

↓
Relative c/I of ESWL

- > 2cm stone / cystine stone / stone in the inf. calyx

* To break the stone

- Holmium laser
- CO₂ gas

* Xenon light source is better

Urinary Tuberculosis

- * Renal TB - Hematogenous infection
 - Usually 1 kidney is affected
 - Earliest change is: Papillary ulcer
 - Pyonephrosis
 - Parenchymal abscess

Pyonephrosis + Parenchymal abscess

↓
Putty kidney
↓

↓
Cement kidney

↓
Autonephrectomy

Note

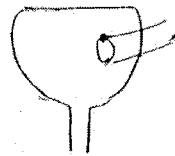
- Autosplenectomy is a feature of Sick cell anemia.
- Autopancreatectomy
Acute necrotising pancreatitis

* Ureteric TB - Rare, strictures

* Bladder TB - Earliest change - Seen around ureteric orifice.

* Narrow contracted UB

Thimble bladder



* Have constitutional symptoms of TB

* Earliest / MC c/I is - Frequency of micturition

* Hematuria

* Clinical ~~appearance~~ approach
Urinary examination

- Early morning midstream
3 consecutive urine sample examination.

↓
Sterile Acidic Pyuria.

* IOC : CECT abd.

* In IVP

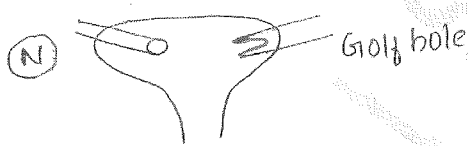
a) Renal TB -

- Earliest IVP finding
- Moth Eaten calyces/
Indistinct calyces.

- Cement kidney
Pseudo calculi appearance

b) Bladder TB -

- MCA
- ✓ - Golf hole ureteric orifice
 - ✓ - Thimble bladder.



c) Thimble bladder:

Cystectomy (removal of bladder)
↓

MCA then creation of new bladder using Jeum.

OR

Alternative, Urinary diversion can be done by

- Jeal conduit
- Colonic conduit
- Uterusigmoidostomy
(But risk of Colon Ca so not used)

⇒ Any surgical option is done 3-6 wks after ~~ATT~~ starting ATT

* Rx : ATT (Anti-tubercular therapy)

- Surgical options

a) PUJ stenosis -

Anderson Hynes Pyeloplasty

b) Ureteric stricture -

i) Upper / Mid $\frac{1}{3}$ ureter
Ureteroplasty

(ii) Lower $\frac{1}{3}$ ureter
Boari's operation

MCA
↓
Reconstruction of lower ureter using urinary bladder flap

Tumors

* Wilm's tumor - Nephroblastoma

* Mixed tumor containing both → Epithelial
→ connective tissue elements

* Inactivation of WT₁:
WAGR syndrome / Denys
Drash syndrome

* " WT₂ :
Beckwith Weidman syndrome

* Pathology - Upper pole usually

* C/P - < 3 yrs

* MC C/P → Abdominal mass.

→ Pyrexia

→ Hematuria

→ HTN

→ Anorexia, weight loss

* 1st Investigation: US abd

* IOC: CECT abd.

* Rx: Sx, CTh, RTh.

Stage I, II → Sx, CTh

III, IV → Sx, CTh, RTh

* Sx → Radical Nephrectomy.

* Prognosis depends on

- Age ⇒ Earlier, better

- Histological type

↓

• Cystic type of WT → Best

• Rhabdoid type of WT → Worst

(WT - Wilms' tumor)

Adult Kidney Cancer

* or Adeno carcinoma of kidney /

Renal cell carcinoma

* Hypernephroma / Giravitz tumor

* MC site → PCT epithelium

* MC patho. subtype

Clear cell type

* Risk factor - Smoking,

MCA - Aniline, Naphthylamine dyes

- Chemical stains

- Contrast

- Obesity

- Long term of drugs
like Phenacetin

- Long standing renal calculus
disease.

- Syndrome - Von Hippel

Lindau syndrome

* Pathology: At upper pole

- Histological Mainz classification

• Clear cell - MC asso. \bar{c}
deletion of 3p

• Chromophilic - asso \bar{c}
Trisomy 7/17 chromosomes

• Chromophobic - asso. \bar{c}
loss of multiple chromosomes
1, 2, 6, 10, 13, 17, 21

* C/P:

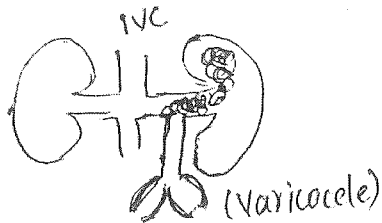
- MC is Painless hematuria
(MC C/P of UB cancer too)

- Pain

- Mass in the abdomen

- HTN (20%)

- Anorexia, weight loss
- Fever
- Varicocele (left sided varicocele in left renal carcinoma)



Paraneoplastic syndromes:

- ↑ ESR
- Polycythemia
- Amyloidosis
- Stauffer syndrome - Non metastatic hepatic dysfunction

* MC site of distant metastasis
Lungs > Bone.

* Cl. examⁿ → Elderly patient, painless hematuria

1st → Urine cytological evaluation to rule out malignant cells.

↓

If ⊕ then do

↓

Cystoscopy

↓ ⊖

US abdomen

↓

↓

• IOC: CECT abd.

↓

- IOC for vascular spread is MRI
- IOC for bony spread Bone scan.

* Rx

Sx only curative option

CTx

RTx

Sx

a) T < 4cm - Partial nephrectomy

b) > 4cm - Radical nephrectomy

Recent advances → RCC is immunogenic tumor

- Immunotherapy ± BCG
- Vaccine trial is on.

Urinary Bladder

* Anatomy → Extra peritoneal organ

→ In overdistended UB - Fundus / dome of UB become intraperitoneal

→ Vas deferens, seminal vesicle & ureter lie on the post. surface.

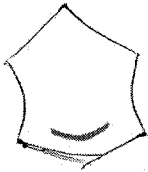
→ Trigone - Δ area b/w two ureteric openings & bladder neck.

+ Microscopic anatomy → Transitional epithelium / Lamina propria / Submucosa / Detrusor muscle / Adventitia

* For UB operation → Ant. approach is preferred.

Pfannenstiel incision

(2 finger breadth above pubic symphysis)

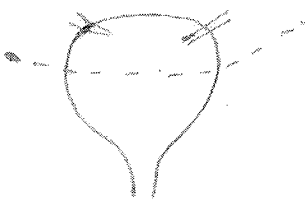


1) Trauma to lower urinary tract

1) Bladder rupture → Intra-peritoneal (20%)
→ Extra-peritoneal (80%)

2) Urethral rupture → Post. → Membranous
Ant. - Perineal (MC) (Bulbar)

Intra-peritoneal bladder rupture



* Trauma to overdistended UB

* Oprⁿ - Lower abd operation - LSCS herniotomies.

* Beer drinking

* Sudden severe agonising pain in the hypogastrium associated with syncope.

* Bed side test - Peritoneal tap

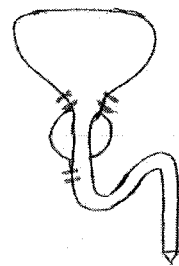
* Doc: Cystogram

* Rx:

Lower midline laparotomy with peritoneal lavage with repair of bladder. Also bladder drainage with Foley's catheter (7-10 days)

Extraperitoneal bladder rupture &

Rupture of post. (membranous) urethra



* MCC - Fracture pelvis (RTA)

* Most dangerous pelvic # asso. w this injury is

Butterfly # of pelvis



* Tear drop UB → Extra peritoneal bladder rupture



* MC site of membranous urethral rupture → Near apex of prostate.

* In case of membranous urethral rupture → On DRE (Digital Rectal Exam?) →

High Lying Prostate
(or flying prostate)

* Triad for memb. urethral rupture

- Inability to pass urine or Retention of urine
- Pelvis hematoma
- Blood @ ext. urethral meatus

* IOC → Bl. rupture → Cystogram

Urethral rup → Retrograde urethrogram

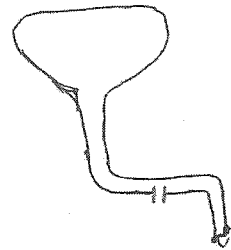
* RxC: Suprapubic cystoscopy

Instrument → ~~Supr~~ Cystocath
Supracath

(Foley's catheter is C/D)

Rupture of Ant (Perineal/Bulbar) urethra

- * MC urethral rupture
- * ~~Loose~~ Loose manhole covers, bicycle accidents or any perineal trauma.



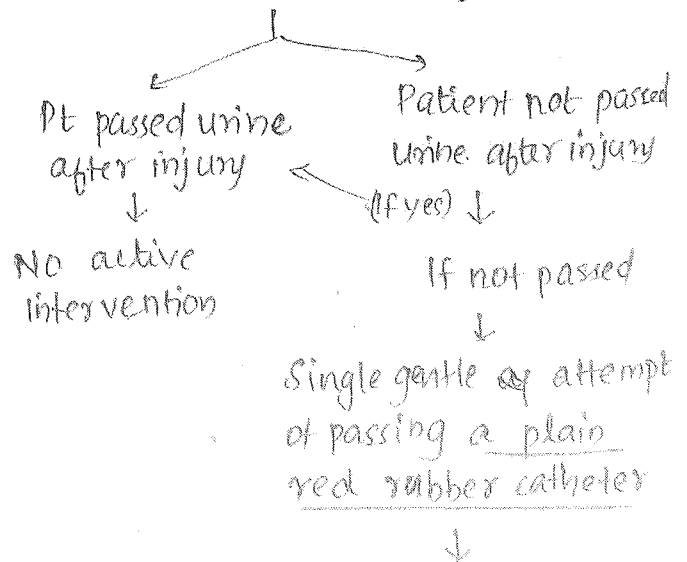
* Triad of Ant. urethral rupture

- Retention of urine
- Perineal hematoma
- Blood @ tip of EUM

* IOC: Retrograde urethrogram

* RxC: Suprapubic cystoscopy

* Clinical approach in suspected urethral injury.



Note: self retaining catheters

- Foley's
- Malecot's
- Gibbon's

Plain red rubber catheter

If catheter goes in to UB

Fix it

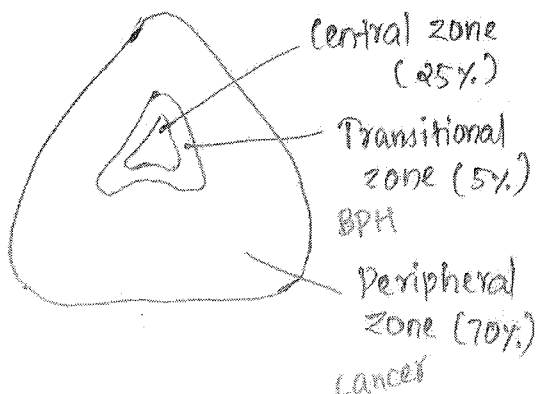
If any resistance is encountered

Do not force

Supra pubic cystoscopy

Prostate gland

- * Weight : 20 gms (18 gms)
- * Fibromuscular gland, lies just beneath the bladder neck.
- * 5 anatomical lobes - Ant / Post / Median / 2 lateral.
- * 3 Mc Neal zones



* BPH → Enlargement of median & lateral (M > L) lobes.

* Cancer → Mainly in posterior lobe of prostate.

* Skene's tubules → homologue of prostate in ♀

Benign Prostatic Hyperplasia (BPH)

* Most imp. factor -

↑ Testosterone $\xrightarrow{5\alpha \text{ reductase}}$ 1,5 DHT

DHT : Dihydro testosterone

* This increased conversion occurs in prostatic epithelium, perigenital skin by ↑↑ 5α-reductase.

Pathology

1) Prostatic urethra

compression → Lengthening

2) Urinary bladder - Sagging of post. UB wall, back pressure changes.

* Lower urinary tract symptoms:

a) storage ⇒ Frequency of micturition - MC, earliest C/E.

- Nocturia
- Urgency

- Urge incontinence
- Retention of urine

- It is a serine protease
- Liquefaction of semen
- ↑ in prostatic patho. only

b) Voiding: Hesitancy (delay in initiation of urination), Poor flow

★
MCA

Ⓝ PSA = 0-4 ng/ml

↓
Most troublesome symp.

- Intermittency
- Dribbling of urine

* PSA > 10 ng/ml → Suspicious of cancer

> 20 ng/ml → Indication for bone scan

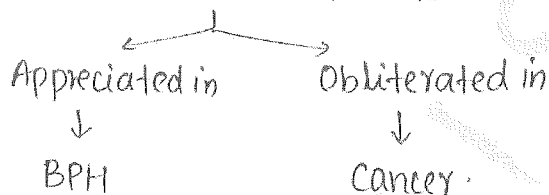
> 35 ng/ml → Advanced Prostatic cancer

* Clinical examination:

DRE / Per rectal examination

DRE:

* On DRE, median sulcus is



* Indwelling Foley's catheter can lead to false high value of serum PSA.

* Urodynamic studies:

a) Cystometry - Measure of extensor function → due to SM, Neurological disorders.

b) Uroflowmetry:

Measure the urine flow.

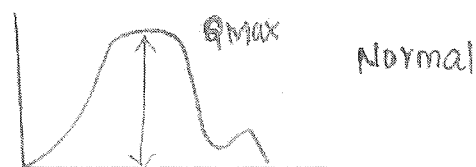
* Doc: US abdomen (KUBP)

* (KUBP → Kidney, UB, Prostate)
(Not rectal US)

† on US abd → Can measure

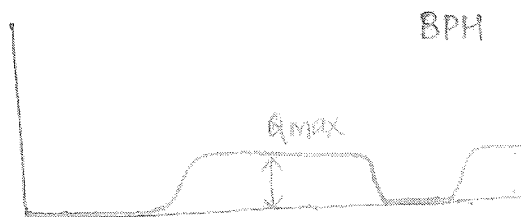
- Volume of prostate ≈ wt in gms
- PVR - Post voidal residue.

PVR > 100 ml → Significant



* Serum PSA (Prostate specific Ag)

→ Secreted by prostatic epithelium only



- * $Q_{max} \rightarrow$ Max. voided vol in 1 sec
- > 25 ml/sec \rightarrow (N) in ♀
- > 15 ml/sec \rightarrow (N) in ♂
- < 10 ml/sec \rightarrow Frank obstruction.

* Rx : Mild symptom
 \downarrow
 Medical Rx.

If severe symptom \rightarrow Sx Rx

* Medical Rx OC \Rightarrow Tamsulosin

* Sx Rx OC \Rightarrow TURP

TURP (Trans urethral resection of prostate)

* ~~Tamsulosin~~ Medical Rx

a) • selective α_{1a} blocker

- Relax bladder neck & prost. urethra

- Improves urine flow

- Tamsulosin,
Alfuzosin.

b) 5α reductase inhibitor

\downarrow

$\downarrow\downarrow$ size of prostate gland

\downarrow

Finasteride, Dutasteride.

* Indications of Sx in BPH

- Retention of urine



- Severe symptoms

- Hemorrhage

- B/L Hydronephrosis /

\uparrow blood urea / PVR > 100 ml

* - Recurrent UTI (Most imp. indi. for Sx)
 - Stones / Diverticulum.

* Sudden decompression of venous plexus on surface of urinary bladder can occur after Foley's catheterisation in chronic retention of urine & can lead to gross hematuria.

* Thus slow, gradual decompression of UB should be done in chronic urinary retention.

* Sx OC \rightarrow TURP (Gold standard Rx)

* MC laser used: Holmium laser

* Procedure \rightarrow HOLEP

(Holmium laser evaporation of prostate.)

* Open Sx \rightarrow Transvesical prostatectomy.

* Complications of prostatic Sx

- Hemorrhage
- Retrograde ejaculation (65%)
 - Due to damage to the internal sphincter.
- Incontinence of urine (due to damage to both int. & ext. urethral sphincter)
- Urethral stricture
- Infection
- CCF - due to vol. overload (longestive cardiac failure)
- TUR syndrome - water intoxication syndrome (due to dilutional hyponatremia)

↓
occurs if water is used as irrigation fluid.

↓
No water in TURP

↓
So can use Normal Saline

But it can interfere \bar{c} diathermy. Thus not used

↓
In dextrose 5% - Risk of infection (Not used)

↓
Irrigation fluid of choice is

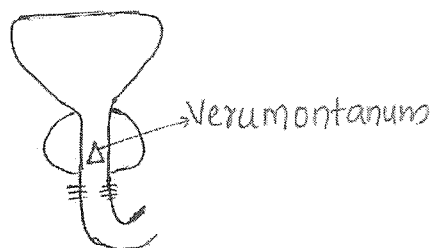
Glycine 1.5%

* In a \textcircled{N} person \rightarrow during ejaculation \rightarrow int. sphincter closes & ext. S relaxes.

↓

In case of damage to int. sphincter \rightarrow retrograde ejaculation.

* Ejaculatory duct opens to the prostatic urethra.



* Verumontanum act as a guide for distal resection in TURP.

* Prostate cancer is the MC cancer in elderly male arises in the peripheral zone & leads to enlargement of post. lobe.

* Prostate cancer spread upwards and laterally.

* MC clinical presentation is low back ache.

* Spread - 3 routes

- 1) Local
- 2) Lymphatic
- 3) Blood

* In local spread \rightarrow involvement of seminal vesicle occurs early

while the involvement of ext. sphincter is late.

* In clinical approach for prostate cancer, if patient presents with low back ache

↓

1st investigation → Plain X-ray of lumbosacral spine

↓

In suspicious prostate cancer,

IOC: Prostatic biopsy →

- TRUS guided.

6-10 biopsies have to be taken

kla Sextant biopsy

↓

Histopatholo. examⁿ → AdenoCa

Patho. grading: Gleason's grading

↓

Gleason score ranges from 2-10
(pathological grading for Breast Cancer → Bloom Richardson grading)

Spread

* Through lymphatics → 1st LN involved → Obturator LN

* Blood → MC: Bones → Lumbar vertebra through Bateson's plexus (Vertebral plexus) of veins.

(All others → Osteodastic)

* Bony metastasis are usually osteoblastic.

* Cancers which spread to bones → Prostate / Breast / Kidney / Bronchus / Thyroid.

* Staging IOC → TRUS (Trans rectal USG)

* Best staging Invⁿ → MRI + Endorectal coil spectroscopy.

* IOC for bony metastasis Bone scan.

* IOC for distant metastasis PET scan (18-FDG)

↓
t_{1/2}: 110-120 min

Staging

T_{1a} → <5% of resected TUR chips are +ve for Ca

T_{1b} → >5% of resected TUR chips are +ve for Ca

T_{1c} → Screening detected Prostate Ca.

(Screening IOC: DRE, Serum. PSA)

T₂ → Pr. Ca confined in Prostate gland.

T₃ → Pr. Ca extended beyond Prostate. (Seminal vesicle)

T₄ → Pr. Ca invaded adjacent organs excluding seminal vesicles.

Rx

* Sx, LTh, RTh, HTh
✓ x x ✓

* Chemo resistant tumor → but Suramin has 40% response.

* T_{1a} → Observation ± TRUS / serum PSA
(Tumor marker: Serum PSA)

* T_{1b}, T_{1c}, T₂ → Radical prostatectomy
↓
- Open
- Lap
- Robotic (1st robotic Sx done in India)

* ~~T₃~~ ~~T₄~~ T₃, T₄ → Advanced prostate cancer
↓
Needs hormonal or androgen ablation

Medical
↓
• Leuprolide
• Goserelin
• Cabergoline
• Degarelix

Surgical
↓
B/L Subcapsular Orchiectomy
not done for Penis Cancer - imp)

* Medical better than surgical castration

* Painful bony metastasis → Strontium 89 (Radiotherapy)
(Only for bony meta. not Ca, palliative Rx.)

Congenital anomalies of urethra

1) Post-urethral valves:

* Present just distal to the verumontanum

* Only in boys

* If the valves are complete → neonate → urinary retention → emergency → requires emergency Rx → Foley's catheterisation / suprapubic cystostomy.

* If incomplete valves → childhood → Rec. UTI → Evaluation / Management →

POC: MCU (Micturating cystourethrogram)

Rx: TURV (Transurethral Resection of valves) or Fulguration of valve (cautery burning)



Hypospadias

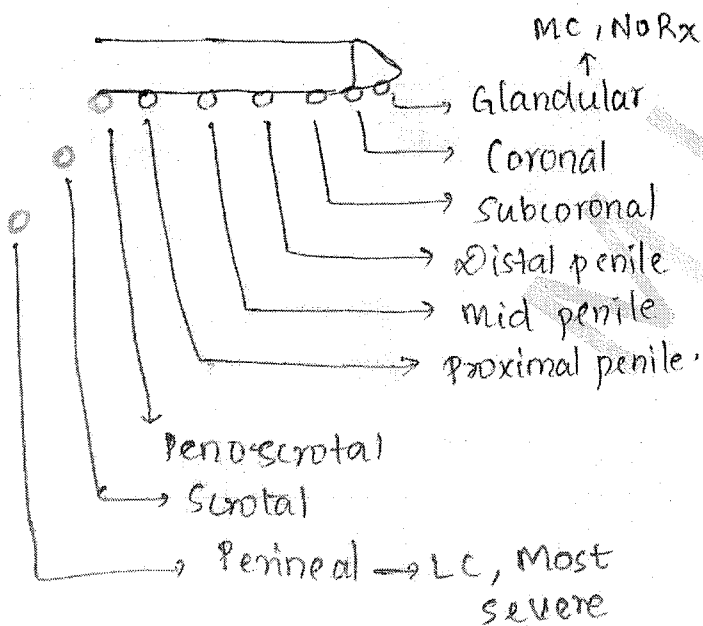
* When the ext. urethral opening is present on undersurface of penis

* Incidence : 1 in 200-300 male live births

* MC congenital malformation of male urethra.

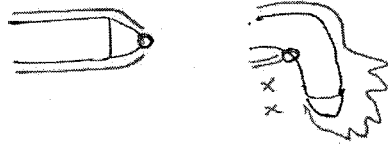
* 2nd MC congenital anomaly of male genitalia (MC: Undescended testis)

* Incidence of undescended testis in 3 in 100



* Chordee → Downward curvature of the penis (fibrous cord formed by urethra & corpora spongiosa distal to ectopic opening)

*



Hooded prepuce → Extra prepuce on the dorsum of the penis.

* Problems → Urination
Erection
Deposition of sperms.

* Clinical diagnosis

* Rx → Surgery

Chordee correction
+ Urethroplasty

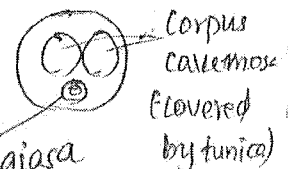
* Age for surgery : 10 months
(6-24 months)

* MC prepuce is used for the urethral reconstruction.

* Circumcision is C/D in the hypospadias.

* MC complication of Sx
Urethrocutaneous fistula

Note : (N) Penis



Corpora spongiosa (urethra in it)

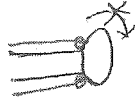
↓
Calams contain only this

Penis

Phimosis



Paraphimosis



* Inability to retract prepuce on to glans → Phimosis

* Inability to bring back retracted prepuce on to glans → Paraphimosis

* Phimosis: Up to 3 yrs of age it is physiological
- No Rx

* Pathological phimosis →
Mcc is infection -

↓
Balanoposthitis

(both glans & prepuce infection)

* Other cause - Balanitis xerotica obliterans

↓
Skin lesion associated with
Phimosis & premalignant.

* Most imp. risk of pathological phimosis is poor hygiene which can lead to penile cancer.

* Rx: Circumcision

* Circumcision is MC done for ritual & religious reasons

↓
MC done in Jews & Muslims.

* Paraphimosis →

Rx: Reduce glanular swelling

↓
Ice/MgSO₄ / Hyaluronidase injection.

↓
Manual reduction of prepuce.

• If the above is unsuccessful
↓

Dorsal slit operation
(small cut on ring & it will relax → back to (N) position)

• If that too fails then do Circumcision.

⇒ Fracture Penis

• Rupture of tunica of corpora cavernosa (covering of it)
(2 corpora cavernosa & 1 sponiosum in penis)

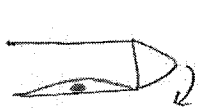
• Usually follows over enthusiastic sexual intercourse.

- * Rx: Incision + Evaluation of blood clot + Repair of the tunica.

Peyronie's disease:

- * Formation of hard fibrous plaque within one or both corpora cavernosa
- * H/O Trauma, Dupuytren's contracture.
- * Spontaneous resolution can occur in 3-5 ~~day~~ yrs.

MCC
* Flaccid penis is normal



Erect penis can bend towards site of plaque during erection.

- * Rx: - Reassurance
- Surgical → Nesbit's operation



Placing a non absorbable suture in opposite cavernosa.

- ESWL
- Plastic reconstruction

Priapism:

- Persistent
 - Painful
 - Pathological
- } Erection of penis.

- * Persistent pooling of blood inside cavernosa
- * MCC → Idiopathic
- * MCC in children - Sickle cell anemia
- Leukemia.

* Other causes

- Overuse of Sildenafil
- Over enthusiastic sexual intercourse
- Injection of Papaverine in corpora cavernosa
- Rarely < Malignancy
Spinal cord disease.

* MC C/A:

- Painful penile swelling (large)
- Risk → Impotency

* Rx

- Aspiration of blood from the corpora cavernosa
- Aspiration of blood + Inj. of Metaraminol in corpora cavernosa

- * Shunt Sx → Connect the cavernosa to the
 - ↓ (MC) (Winter/Ghorab S)
 - To glans → Glandular shunt
 - To spongiosa → Spongiosal shunt
 - To veins → Cavernous dorsal vein → Dorsal vein of penis
 - To cavernous saphenous vein → Saphenous vein shunt (Grayhack shunt)

- * White patch in oral cavity & having ^{no} any characteristics to pathologically → Leukoplakia
 - * Red plaque » → Erythroplakia
 - * Red velvety patch in penis → Erythroplasia
-
- * Bushke Lowenstein Tumor → low grade verrucous type of sq. cell Ca. of penis) Slow growing cancer

Penile cancer

- * MC → Squamous cell carcinoma
- * MC site → Glans / Prepuce / Both (Both > Glans)
- * MCC → Poor hygiene
- * Risk factors
 - Most important → Poor hygiene
 - Multiple sexual partners
 - HPV (Human Papillomavirus)
 - Smoking
 - Premalignant lesions - Leukoplakia, long standing genital warts, erythroplasia of Queyrat, Paget's disease of penis / Balanitis Xerotica Obliterans

* Patho → MC: Ulceroproliferative growth

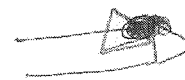
* MC C/F → Ulceroproliferative growth on glans or ~~penis~~ prepuce

- Foul smelling discharge.

* Clinical approach:

Clinical examination

↓
1st - Biopsy - Incisional wedge biopsy



(Some normal tissue & some cancerous tissue)

↓
staging Doc: MRI

Doc for distant metastasis
PET scan

Rx

* Sx, CTh, RTh
✓ x ✓

* Rx DC → RTh (beacoz to protect penis)

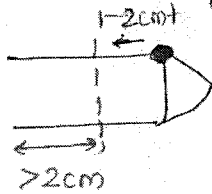
* Surgical options: margin of resection

(1) Partial Penectomy

(2) Total Penectomy

↓
2cm

* Partial Penectomy:



Length of preserved penile stump > 2cm.

* Total Penectomy: done if preserved penile stump is < 2cm

+
Perineal Urethrostomy

* In Penile cancer -

• 50-60% - Inguinal LN enlargement

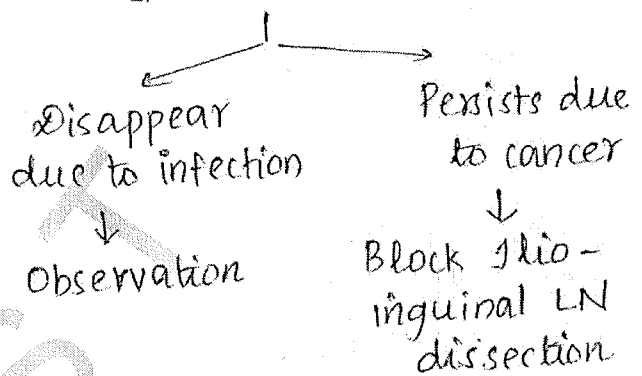
↓
50% - due to infection
50% - due to cancer

• death occur due to torrential hemorrhage

because of erosion of femoral or ext. iliac vessels by enlarged LN.

* Clinical approach for the enlarged LN in penile cancer

↓
3 wks antibiotics course before any surgery is attempted



Note:

* Foley's catheterisation done using 2% xylocaine

(1 gm/cm → 0² - 20 cm → 20 gm → 1 tube 30 gm so 2/3rd used)

directly apply with ointment tube.

* Syringe is not used for injecting this xylocaine to urethra.

Because can cause trauma → bleeding → healing → stricture

* m/c of stricture in urethra

(Wrong technique of Foley's catheter insertion)

* Urethral obstruction → urine can't flow out → retained within the urinary bladder → back pressure causes stretching of UB → leads to mucosal pouches, trabeculation & then diverticulum

- Detrusor muscle stretching
- BPH

Testis

* Covered by tunica vaginalis

- Visceral layer (continuously produces some fluid)
- Parietal layer (has LN drains this fluid)

* Acts as shock absorber.

* Fails to descend down → Undescended

* If moves up or down anywhere else - Ectopic testis

Undescended Testis (UDT)

* MC congenital anomaly of male genitalia

* incidence

- 3% in full term baby
- 30% in pre-term baby
- (R) 50%, (L) 30%
- B/L 20%

* 75% of UDT, descend down to the bottom of scrotum spontaneously \bar{c} in 9 months of life.

* So wait till 9 months

* Complication of UDT "ATESTIS"

↓

- Atrophy
- Trauma
- Epididymo orchitis
- Sterility
- Torsion
- Inguinal hernia - MC
- Seminoma

* Testis lies in scrotum outside abdomen → 2°C less temperature than inside abdomen.

* MCC of ~~Seminoma~~ test. Ca assoc. \bar{c} UDT - Seminoma

* MCC of Testicular cancer UDT

* MC occupational cancer in India skin cancer.

Features	UDT	Ectopic Testis
Definition	Testis arrested in the (N) path of descent	Testis deviate from (N) path of descent
MC site	Inguinal Canal	Superficial inguinal pouch (Denys Brown Pouch)
Testis Scrotum Spermatogenesis	Abnormal	Normal
2° sexual characteristics	(N)	(N)

Cryptorchidism

"Hidden" testis
(Neither see nor feel)

Retractile Testis

- * During excessive cry / in cremasteric reflex (scratch medial thigh) testis goes up
- * No Rx required.

UDT Clinical approach in UDT

↓
Clinical exam*: Palpation*
- Inguinal canal, Scrotum

↓
US abd including scrotum

- Best investigation is diagnostic laparoscopy.

↓
If testis in inguinal canal bring it down to scrotum.

* Rx DC → Orchidopexy

* Age of operation → 6th Oct, 2017
within 1 yr

> 9 months, < 12 months.

Testicular Torsion

(MCQ)

* MCC is Simple Inversion of Testis

- ↓
Due to sudden rise in the
- intra-abdominal pressure
 - due to sneezing/coughing/straining (constipation)

- Coitus
- Rarely sleep

* MC type → Intravaginal torsion

* Other cause: High investment of Tunica vaginalis covering the testis (no support)



↓
Extravaginal testis torsion

↓
Testis hanging like a clapper in a bell.

* Other cause → Separation of spermatic cord

Intravaginal torsion.

* MC age → 10-25 yrs of age

* c/f: Redness of scrotum,
Enlargement of scrotum,
Sudden severe pain in scrotum,
Low grade fever (pyrexia)
Mild ↑ in scrotal temperature

(Same can be seen in Epididymo-orchitis-infection)

[In torsion → it rotates → so blood vessels can get compressed → ischemia → necrosis if untreated]
Blood supply stops.

* Phren's test → Elevation of scrotum does not relieve pain in torsion.

⊖ ⇒ Torsion

⊕ ⇒ Epididymo orchitis

* Best investigation / POC

Immediate scrotal exploration

* color Doppler of scrotum is done if it is available then & there.

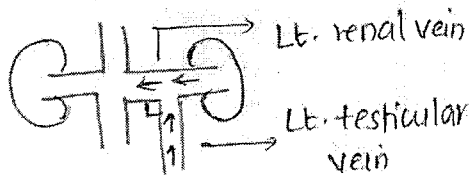
* Rx: Scrotal Exploration

a) T. viable → < 12-24 hrs →
(T-Testis) Dematation of testis +
Orchidopexy +
contralateral orchidopexy

b) If testis not viable →
Orchiectomy + Contralateral
Orchidopexy

Varicocele

- * Abnormal dilatation & tortuosity of Pampiniform plexus of veins around the testis
- * MC → Left side → 95%



[The blood flow from renal vein can exert backpressure on testicular vein → vessels dilates → become tortuous]

- * MCC → Idiopathic
→ (L) Renal cell carcinoma
- * MC C/Fs: Dragging sensation in the scrotum
- Sterility (↑ temp)

MCC
* Clinical examination ⇒
"Bag of worm" feel in scrotum

* Rx: ASS (Ascending Scrotal Sclerotherapy)
Sclerotherapy)

* Sclerosing agent used
Polidocanol

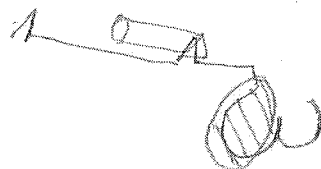
"Askerol" (Varicose veins)
(trade name) (also here)

- * Should inject it gently → (if forceful?)
goes to renal vein → renal failure
- * Alternative route of venous drainage → Cremasteric vein (will drain from testis)

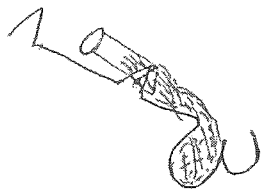
Hydrocele

- * Abnormal collection of fluid within the tunica of processus vaginalis around the testis
- * ↑ fluid productⁿ by visceral layer or ↓ absorption by parietal layer of tunica vaginalis
- * MCC → Piloriasis
- * Other causes:
 - Infection
 - Tumors (MC - Seminoma)

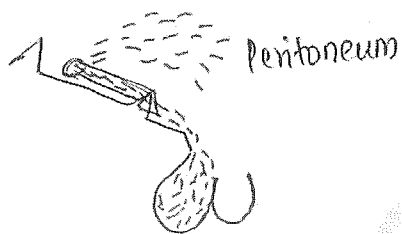
* Types of hydrocele:
- Vaginal hydrocele (MC)
(only in scrotum)



2) Infantile hydrocele
(to inguinal canal too)



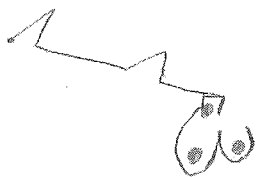
3) Congenital H (Communicating hydrocele & the peritoneal cavity)



↓
Whether congenital hydrocele / congenital hernia

↓
* MCO RxDC: Herniotomy

⇒ Encysted hydrocele of cord
→ 3 testicle appearance



⇒ Hydrocele in female →
hydrocele in canal of ~~the~~

Nuck → Round ligament of uterus

• In case of ~~congenital~~ hydrocele
→ can reach up to the top of swelling without any presence of any unusual substance.

• Whereas in case of congenital hernia → while going to the top of hydrocele can feel the parts on intestine there → due to this peritoneal fluid can come here & communication b/w peritoneal cavity and the hydrocele.

+ MC C/F → Scrotal enlargement

+ Clinical test to differentiate

a) Hydrocele from hernia

↓
Can reach up to top of swelling in hydrocele not in hernia.

b) Hydrocele from tumor

Trans illumination
(clear fluid can transmit the light - hydrocele)

⊕ → Hydrocele

Note

* Brilliantly Trans illuminant swelling

Cystic Hygroma

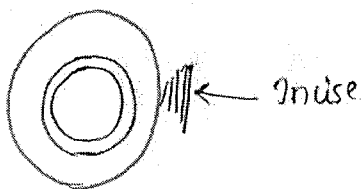
(in posterior Δ of neck)

* Also seen in

- Ranula (floor of mouth, sublingual gland)

- Meningocele

x-----x-----x



Rx DC

- Eversion of Sac (Jaboulay's operation)

- Other: Lord's operation
(Plication of thin walled sac in small to medium sized hydrocele)

* Rx DC for congenital hydrocele or congenital hernia

Herniotomy.

(Sx \rightarrow Age \rightarrow 3 yrs)

MCA

Note:

* Ranula is bluish translucent swelling in floor of mouth in relation to sublingual salivary gland.

* Mucous retention cyst resembles frog's belly.

x-----x-----x

Testicular tumors

* 99% testicular neoplasms
Malignant.

* MC cancer in Young σ

* It can be

\rightarrow Germ cell tumor (86%)

• Seminoma (40%) (S)

• Teratoma (32%) (T)

• S + T (14%)

\rightarrow Non germ cell tumor

• Interstitial cell tumor

- Sertoli cell T

- Leydig cell T

• Lymphomas

* MC testicular cancer in elderly male is

Lymphoma

(Young \rightarrow Testicular cancer)

* Earliest, ~~MC~~ C/F → Heaviness in the scrotum.

* MC C/F → Scrotal enlargement

* Testicular sensation is lost very early in testicular cancer.

* Vas deferens never thickened in testicular cancer.

* Secondary hydrocele is associated MC with Seminoma.

* ~~Epigastric~~ Epigastric lump in testicular cancer indicates: Pre/para aortic LN enlargement.

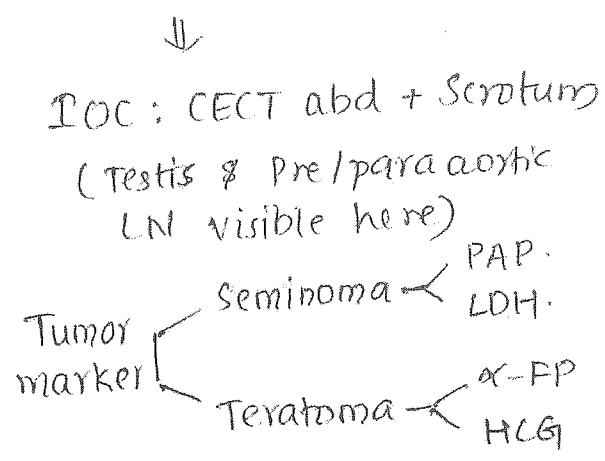
* MC metastasis → Lungs
(testicular vein → Lt renal vein → IVC → RA → RV → pulm. artery → Lungs)

* ~~Testis~~ Scrotal enlargement + Hemoptysis → Pulmonary metastasis

* Clinical approach:
↓
Clinical exm? - Palpation
- Transillumination test -ve

↓
Transscrotal biopsy is C/I
(can spill in to scrotum)

↓
cancer cell → US scrotum
↓



PAP: Placental Alkaline Phosphatase

↓
High inguinal orchidectomy
(send to pathologist → now confirm seminoma or teratoma)

Stages	seminoma	Teratoma
I - Testis/Scrotum	↓ Radiosensitive P. RTh	↓ Radio resistant Observed CT scan & TM
II - Pre/para aortic LN	RTh	Sx - RPLND
III - Distant metastasis	CTh	CTh

RPLND: Retroperitoneal LN Dissection
P: Prophylactic
TM: Tumor marker

* Prognosis of Seminoma is better than Teratoma

* Prognosis of seminoma is better than Teratoma.

HERNIA

* MC is inguinal hernia.
(inguinal canal - weak area)

* Hernia is abnormal protrusion of viscus or a part of viscus through a weakness/defect in the wall \bar{c} contains it.

* MC hernia (σ & η)
Indirect inguinal hernia

* MC in elderly male
Direct inguinal hernia

* Femoral hernia is 4 times MC in η .

* MC hernia to undergo strangulation
Femoral hernia.

Landmark to differentiate

1) Indirect & direct inguinal hernia
Inf. epigastric vessel

2) Inguinal & femoral hernia
Pubic tubercle (PT)

Features

Incidence

Age

Protrusion through

Relation of hernial sac to inf. epi gastric vessel (IEGV)

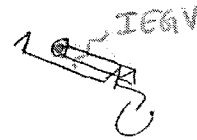
direction of protrusion

Extension into the scrotum

Indirect

Much MC

Young



Deep Ing. ring

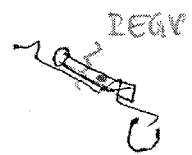
Lateral

downwards, forwards, medially

MC

Direct

Elderly



Hesselbach's Δ in fascia transversalis

Medial

Forwards

Rare

* I, AM \rightarrow Inguinal hernia - above & medial to PT

F, BL \rightarrow Femoral hernia - below & lateral to PT

3) Hernia from hydrocele

Can reach up to top of swelling in hydrocele but not in hernia.

4) Hydrocele from tumor
Transillumination

⊕ → In hydrocele, ⊖ → in tumor.

5) Epididymo orchitis from toxion
Phren's test

⊕ → E.O, ⊖ in toxion.

■ European Hernia Society classification

(1) P or R → Primary or Recurrent

(2) L, M or F →

Lateral: Indirect ing. H

Medial: Direct ing. H

Femoral: Femoral H

(3) 1, 2 or 3 →

1: One finger breadth defect
(= 1.5 cm - European finger)

2: Two finger breadth defect

3: Three finger breadth defect

■ Classical classification:

1) Reducible - MC, cough impulse ⊕

2) Irreducible - due to adhesions in
the scrotum

3) Obstructed - due to narrow neck
of hernial sac

4) Strangulated.

↳ due to decreased
blood supply to
hernial contents

* In emergency operations for
strangulated hernia, the hernial
sac is never opened at the neck.

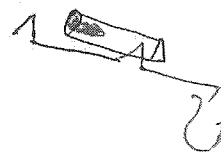
↓

It always opens at the
fundus.

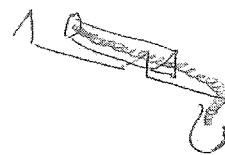
(to remove all dirty fluids in
the hernial sac. If opens neck →
that fluid can go to peritoneum)

■ Extend classification:

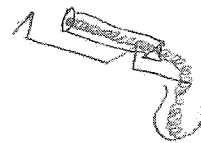
1) Bubonocoele (⊖ in inguinal
canal)



2) Funicular (top of scrotum)



3) Complete/scrotal (bottom of
scrotum)



■ Content Classification

1) Epiplocele (Omentocele)

- Omentum inside
- Doughy feel.

2) Enterocoele

- Intestine

3) Littre's hernia

- Meckel's diverticulum

4) Amyand's hernia

- Appendix

5) Maydl's hernia

- "W" loop of ~~hernia~~ ^{intestine} bowel

6) Richter's hernia

- Circumference of ~~hernia~~ ^{intestine}

7) Sliding hernia

- Organ forms one wall of hernial sac
- MC content → Sigmoid colon
- 2nd " → Caecum

8) Double / Pantaloon / Saddle / Romberg's / Cooper's hernia

Both direct as well as indirect hernia is present on the same side.

9) Gibbon's hernia:

Hernia + Hydrocele

Clinical Approach

* MC c/f : Inguinal / Inguinoscrotal swelling



1st : Clinical examination

Inspection - In standing posture

cough impulse ⊕ (contents comes out on coughing)

2nd : Clinical examination

- Supine position

- Reducibility

- cough impulse

- 3 Finger test : Zieman's Test

(3 fingers to block :-

deep ing. ring, Hesselbach's Δ & Femoral canal)

Rx.

* RxOC : Tension free Prolene mesh hernioplasty

(Polypropylene - Non absorbable)



kla Litchenstein operation

* Sx :

a) ~~Laparoscopic~~ Open Sx

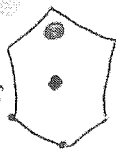
b) Laparoscopic:

TEP (Totally Extraperitoneal Repair)
TAPP - Trans Abdominal Preperitoneal repair

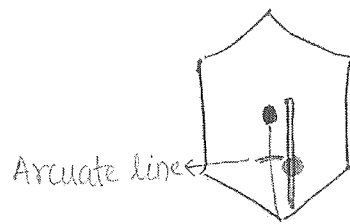
- TEP is better.
- * MC nerve injured in open hernia surgery is Ilio inguinal nerve
- * MC nerve injured in laparoscopic hernia Sx Genitofemoral nerve.
- * MC nerve injured in appendicectomy Ilio hypogastric nerve.

Epigastric hernia

- + Also k/a Fatty hernia of linea alba
- + Defect is in midline
- + Swelling is above umbilicus in the epigastrium.
- + Stimulate peptic ulcer disease
- + MC differential diagnosis is Lipoma (universal tumor)
- * Rx → Anatomical repair



Spigelian hernia



- + Protrusion through lateral border of rectus abdominis muscle.
- * At the level of arcuate line
- + Herniation occur b/w layers of anterior abdominal wall - Inter parietal hernia.
- * MC C/P → Pain ~~Swelling~~
- * Neck of hernia sac → Narrow → ↑ risk of strangulation.
- * IOC: MRI
- * Rx: Anatomical repair
(Below arcuate line, posterior rectus sheath is absent)
- * Also k/a interparietal hernia.

Features	<u>Exomphalos</u>	<u>Gastroschisis</u>
Ant. abdominal wall	Yes	Yes
Defect	In umbilicus	In right of umbilicus in ant. abdominal wall.
Defect size	$\geq 4\text{cm}$	$< 4\text{cm}$
Hernial sac	Present	Absent
Relation to umbilicus	Right/Left through the umbilicus	Right of the umbilicus
Association \bar{c} congenital anomalies	Yes	Rare (MC-is Intestinal Atresia)
Rx.	Anatomical repair	Mayo's operation.

GIT

Oesophagus

* Anatomy:

Length - 25 cm

Location - Post. mediastinum

Constriction - 3

1) Cricopharyngeal sphincter

(Narrowest part of GIT)

2) Arch of Aorta, division of bronchus (DOB)

3) Diaphragmatic opening.



Distance of these 3 constrictions from the upper incisor is

1) → 15 cm

2) → 25 cm

3) → 40 cm

Que: Distance b/w Arch of Aorta & diaphragmatic opening
 $40 - 25 = 15 \text{ cm}$

* In some people have 4 constriction

2nd → 2nd → Arch of Aorta (22-23 cm)

3rd → DOB (27 cm)

* Cricopharyngeal sphincter regulates the movement of food to GIT (won't come up)

(Hemobilia → blood in bile)

* Sphincters - 2

1) Cricopharyngeal sphincter

• Anatomical sphincter

• Narrowest part of GIT

2) Lower oesophageal sphincter

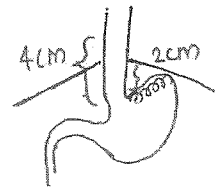
• Physiological sphincter

* LES

⊙ Length - 4 cm

⊙ Pressure → 12-25 mmHg

⊙ Intraabdominal esophagus - 2 cm



⊙ Gastroesophageal angle:

Angle of HIS

⊙ mucosal folds of Cardia of stomach

⊙ Crus of diaphragm

* Microscopic Anatomy:

• Mucosa - Stratified squamous
Non keratinized

(all natural openings)

• Submucosa - Neurovascular plexus
- Meissner's plexus is sparse

• Muscularis

MUS • Serosa absent, only adventitia

* Squamo-columnar junction →
Proximal to gastro-oesophageal
junction → k/a

Z line / Orna serrata /
Gastric Rosette

* pH → 5-7

MIS
* Pathological pH < 4

Congenital Anomalies

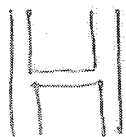
1) Oesophageal Atresia

- Absence of some part of oesophagus
- Due to post. deviation of tracheo-oesophageal septum



- Types → MC is upper oesophagus is blind, lower oesophagus is communicating w trachea (Tracheo-oesophageal fistula)

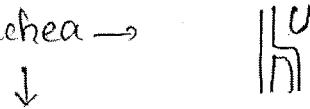
→ Isolated fistula - "H" type of fistula



• Associated congenital anomalies
"VACTERL"

- Vertebral
- Anorectal
- Cardiac (MC type)
- Transoesophageal fistula
- Renal
- Limb defects

* Lower oesophagus communicating to trachea →



Earliest sign in pregnancy is
Polyhydramnios

* C/F: At birth

- MC C/F → continuous pouring of saliva from baby's mouth
- Aspiration → Pulmonary complication
MC: Pneumonia
- Bed ~~to~~ side test - Failure to pass a nasogastric tube beyond 10 cm

• X-ray:

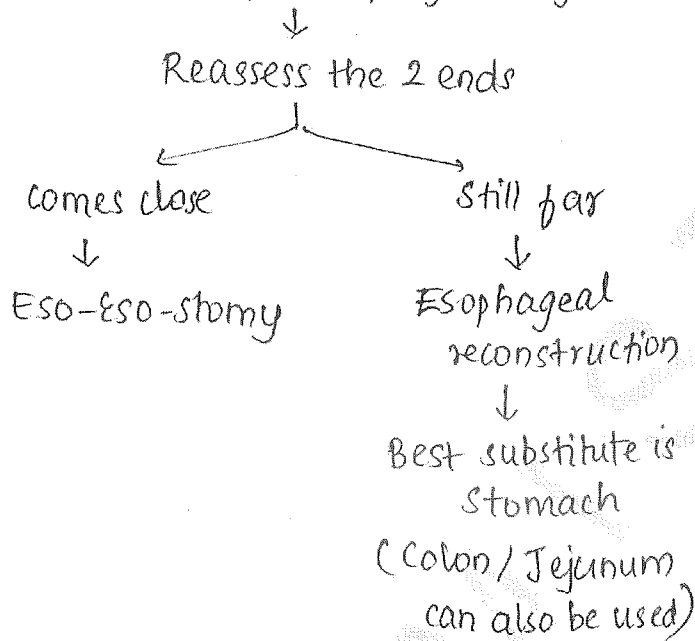
1) Coiling of NGT in the upper oesophagus

MIS 2) Distended stomach w gas

Rx

+ division of fistula +
Esophago esophago stomy

* If the 2 ends of oesophagus
are far from each other →
wait for 4-6 wks → allow the
2 ends of oesophagus to grow



(Intraosseous nutrition → iv canula
to tibial tuberosity → type of
parenteral nutrition)

* Preferred nutrition in the waiting
period → Enteral feeding jejunostomy.

2) Dysphagia Lusoria

* Compression of oesophagus by
aberrant blood vessels

MC

* Aberrant (R) subclavian artery

* Sometimes by double aortic
arch.

Esophageal Trauma

1) Foreign bodies

2) Eso. perforation { Traumatic (80%)
Spontaneous

3) Lye stricture - Ingestion of
caustics

(Alkali/Acid)

Foreign bodies

* MC site of impaction

Just above cricopharynx

* MC foreign bodies in oesophagus

Child → Coin

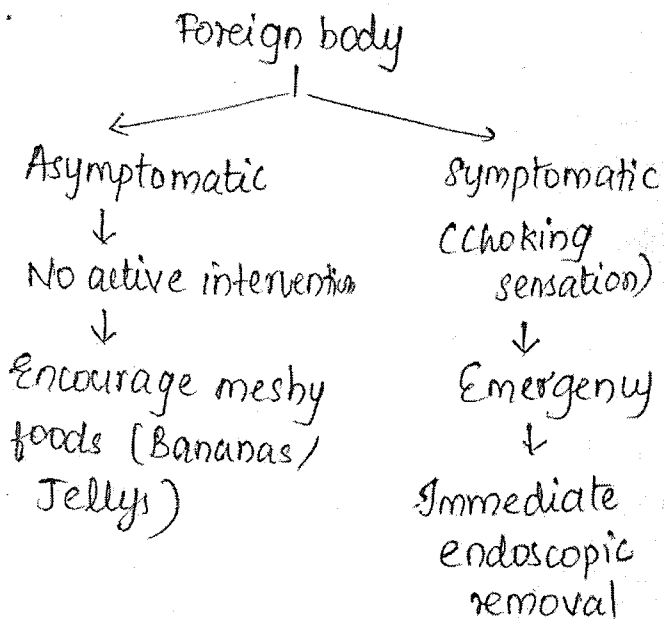
Adult → Impacted food
material

→ Fish bone

Elderly → dentures,

Loose teeth.

(Endoscopy → Only for luminal &
mucosal pathologies → not for
submucosa/muscularis pathology)



- Intra-gastric contents leak in to mediastinum under press → severe mediastinitis → septicemia.
- Forceful vomiting → eso. cannot tolerate barotrauma → eso. rupture → ⊕ lower. eso. posterolateral wall.
- MC C/F → Sudden severe chest pain radiating to ⊕ shoulder & ⊕ arm.

Oesophageal perforation

a) Traumatic → MC Oeso. perforation

- MCC: Instrumentation
- MC site: Near the cricopharynx
- Rigid > Flexible
- 1:4000 Endoscopies
- Rx → Non operative
i.e., conservative ↓
Leave a nasogastric tube for 5-7 days.

MCC

(Similar to MI, but in MI severe chest pain is 1st C/F but here first vomiting then severe chest pain)

- Other C/F
 - Subcutaneous Emphysema → Pathognomic
 - Mackler's triad
 - ⊙ Vomiting
 - ⊙ Chest pain
 - ⊙ Subcutaneous - emphysema.

b) Spontaneous E.P / Barotrauma / Boerhave syndrome:

- Spontaneous, transmural oesophageal perforation
- Elderly
- After heavy meals
- Forceful vomiting against a closed glottis.

• In clinical approach →

- Emergency - 1st: Basic resuscitation - i.v fluids, i.v antibiotics → rule out cardiac pathology

- Clinical examination →
Auscultation: Footsteps in the snow
↓
Kla Hamman's sign
Hamman's crunch
Mediastinal crunch.

- 1st investigation - Chest X-ray
- Pneumomediastinum
- IOC: CT Scan
- Contrast swallow → has risk of injury to mediastinal structures.
- Gastrografin contrast (H₂O soluble) is preferred over barium

• Rx: Thoracotomy + Mediastinal lavage

⊕

a) minimal contamination
↓ (< 4-6 hrs)
close the perforation

b) Gross contamination (> 4-6 hrs)
↓
then leave a drain

(If barotrauma not specified in que
then esp iatrogenic rupture →
Rx is conservative)

Achalasia Cardia

- * Spasm (motility disorder) of LES due to failure of relaxation of LES
- * Absence of ganglion cells in Myenteric (Auerbach) plexus
- * Absence of oesophageal peristalsis → pathognomic of Achalasia cardia.

* Spasm of LES → Proximal eso. dilatation (Mega esophagus) → stasis of food in mid 1/3 eso → Esophagitis (mid 1/3) eso → Squamous cell carcinoma in mid 1/3 esophagus.



Types

- * Primary → Exact cause
- * Secondary → Secondary to systemic diseases - Chagas' disease, DM, Cancer esophagus
- * Pseudo → Tumors around the esophagus

MCS

Mediastinal Tumors

Tumors of cardia of stomach

* clinical approach features:

- 25-40 yr old → dysphagia
- Dysphagia - MC / Cardinal symptom

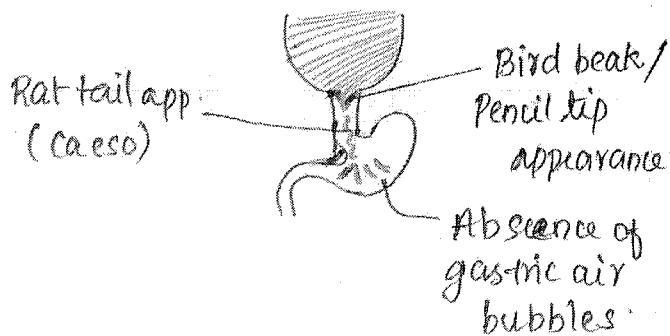
• Progressive for both solids & liquids.

MCA • Initially for liquids
↓ (spasm - solid b/c not goes down)

- All motility disorders →
Achalasia / Diffuse esoph spasm / Nutcracker esoph.
- Regurgitation
- Aspiration → Pulm. complication
- SCC → Mid 1/3 esoph
(Squamous cell carcinoma)

+ clinical approach: (LOPD)

- 1st Investigation - Barium swallow



- Standard investigation / IOC
Esophageal manometry
(for all motility disorders)

⊖ Intra esoph. pressure: 12-25 mmHg

Achalasia cardia: 25-100 mmHg

Nutcracker esophagus: 180-200 mmHg

⊖ Diffuse esoph. spasm: > 400 mmHg
(Barium swallow in DES →
cork screw appearance)

[Cork screw app. on angiography
→ Buerger's disease]

Rx:

* Medical Rx → CCB, Nitrates

* Pneumatic balloon dilatation
of LES (Risk - Eso. rupture)

* Rx OC: Surgery

↓

Sx OC: - Heller's myotomy.

(in stomach - seromyotomy, have
serosa. Here no serosa in Eso)

⊕
or Partial Antro Fundoplication
(to prevent the reflux)

⊖ Common bile duct: 7-5 cm

⊖ Endoscopy cant done after
2nd part of duodenum to
ileocaecal junction

⊖ In all other parts of
GIT can do endoscopy.

Stomach pH: 1.5 - 2 (or 2-3 sometimes)

* MC clinical presentation:
Heart burn (Retrosternal pain)
+
Epigastric pain
+
Regurgitation

GERD

* Gastro Esophageal Reflux Disease

* Pathology in lower oesophagus

* (N) till 4 times a day.

* Protective factors for GERD:

1) Integrity of lower oesophageal sphincter.

2) Good gastric emptying

3) Good esophageal peristalsis

TLOSRS → Transient lower oesophageal sphincter relaxations for 3-4 times in 24 hrs in (N) individuals
Maximum in the supine position.
(sleep)

* Risk factors for GERD:

1) MC → Smoking

2) Alcohol

3) Tea & Coffee

4) Spicy food

5) Hot liquids

6) Obesity

7) Drugs - CCBs, Nitrate

8) Progesterone

* Clinical approach:

↓
Lifestyle modification

x Smoking

x Alcohol

x Tea, Coffee

x Spicy food

x Hot liquids

↓ Weight

x sleep for 2-3 hrs after meal

- Elevate the head end of bed by 5-8 inches
(1 inch = 2.5 cm)

↓

Proton pump inhibitors (PPI)

Gold standard Rx.

(will ~~reduce~~ ~~the~~ ↑ pH to 5-7)

↓

if fails then

↓

If PPI fails



IOC for GERD: Ambulatory
24 hr esophageal pH recording



Drop in pH < 4 for > 4 times
in 24 hrs is suggestive of GERD

(Johnson Demeester score)



Sx RxOC: Nissen's Fundoplication
(Complete wrapping of fundus
of stomach around lower
oesophagus) (360° wrap)
sphincter

* Complications of GERD:

- MC → Esophagitis
- Esophageal stricture
- Esophageal shortening
- Barrett's oesophagus
- Sliding Hiatus hernia

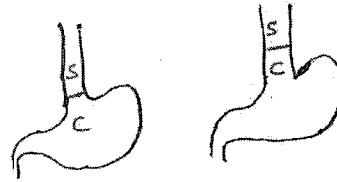
Barrett's Esophagus

* Columnar intestinal metaplasia
of squamous mucosa of lower
oesophagus.

* Hallmark - Goblet cells
(secretes mucus to protect from
acidic pH)

MC

* Squamo-columnar junction (SCJ)
moves upwards.



* Types:

- a) Cardiac metaplasia
Involvement of SCJ only
- b) Short segment Barrett's
Involvement of < 3 cm
of lower oesophagus.
- c) Long segment Barrett's
Involvement of > 3 cm
of lower esophagus.

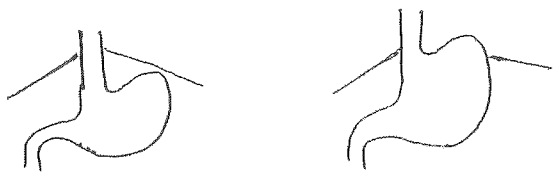
* ↑ risk of Adenocarcinoma

* IOC: Endoscopy + Biopsy

* RxOC: PPI's

- In severe dysplasia →
Sx resection of lower
eso. + gastric pull up
operation.

Sliding hiatus hernia (SHH)



Hiatus hernia

- First Inv.?
• IOC (Best Invⁿ)
- ← Chest x-ray →
← Barium meal (swallow) →

• Rx: Nissen's fundoplication

Features

Sliding H.H

Paraeso. HH
Rolling HH
Giant H.H



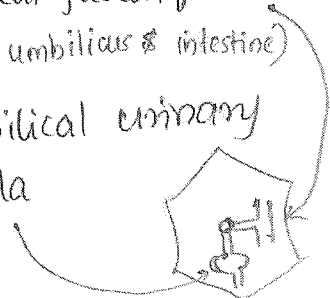
Diverticular diseases

* During intrauterine life → there is connection b/w umbilicus & intestine and also U to urinary bladder → usually obliterated before birth

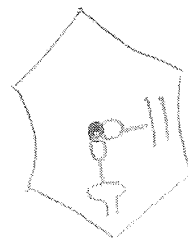
* If the connections persists → congenital diverticulum.

- Umbilical faecal fistula (b/w umbilicus & intestine)

- Umbilical urinary fistula



- Umbilical sinus



• Incidence Much MC

• Age 40yr

• Gastro-oesp. junction Thorax

• Assoc. \bar{E} reflex MC

• Risk of complication Less

50-60yr

Abdomen

Rare

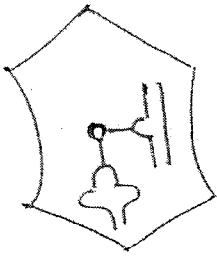
More

- Ischemia
- Strangulation
- Perforation

• MC C/F

← Chest pain →
Breathing difficulties
Post prandial fullness

Diverticula



congenital UB diverticula.

- Midline, anterosup, fundus, dome of UB
- Asso. \bar{c} AdenoCa of UB



_____ x _____ x _____

Congenital Diverticula	Acquired Diverticula
<ul style="list-style-type: none"> • Present since birth • True • All layers of organ • eg: Meckel's diverticula Congenital urinary bladder diverticula. 	<ul style="list-style-type: none"> • Elderly • False • Do not contain all layers Usually consist of mucosa & superficial submucosa. eg: Sigmoid colon diverticula Zenker's diverticula Acquired UB diverticula.

Zenker's diverticulum.

- * Cricopharyngeal Achalasia
- * Outpouching of posterior pharyngeal wall posteriorly above the cricopharyngeal sphincter, through Killian's dehiscence
- * False, Acquired, Pulsion type
- * Elderly
 - ↓ (blocks dilation in proximal part due to ↑ pressure)

- * Asso. \bar{c} cervical webs in 50%
- * MC C/F - Dysphagia
- * Earliest C/F - Regurgitation
- * Characteristic C/F

Halitosis (foul smelling breath due to stasis of food)

- * Defect in midline, but swelling usually on (L) side of midline (not midline due to vertebra)

* Boyle sign - Gurgling sound heard on reducing the swelling.

* MC complication:

Pulmonary abscess

* Doc / Best Invⁿ → Barium swallow

* Rx :- Diverticulopexy

- Diverticulo esophago^{stomy}~~stomy~~
k/a Dohlmans operation

(Linear stapler → large division > 4cm)

(made cavity large so that food bolus won't stay → no compression → no halitosis)

- ↓ mucosal protection factors
(Green leafy veg & fresh fruits
→ Vit A, Vit C, Zn, Se, Mo, Rb, β-carotenes)

- GERD

- Achalasia cardia

- Rarely Zenker's diverticulum

- Radiation

- Human papilloma virus

- Tylosis (thickening of skin) ← Palmaris
Plantaris

mca - Plummer Vinson syndrome (Paterson Brown Kelly syn)

[- Iron def. anemia (koilonychia)

- Glossitis

- Eso. webs (postcricoid - upp eso/cervical eso)

Esophageal carcinoma

* MC → Squ. cell Ca

* MC site of SCC → Upp 2/3 - Mid 1/3

* MC eso. Ca in Western: Adeno Ca

MC site: Lower 1/3

* Risk factor

- Smoking

- Alcohol

- Diet → ↑ smoked food, smoked fish,

↑ canned food →

N. Nitroso amines

* MC pathological subtype

Polypoidal, Best prognosis

* Worst prognosis

Fungating Eso Ca

* C/F: |po| ✓ |po| ✓

(No problem)



(no sensor)

(difficulty in swallowing)



- * Early → Asymptomatic
- * MC sym → dysphagia →
Progressive: both liquids/solid
- * Initially for solids
(Achalasia cardia - liquids)
- * Anorexia, weight loss
- * Hoarseness of voice due to involvement of recurrent laryngeal nerve by cancer.
- * Spread:

Local ⇒ Arises from mucosa
→ submucosa →
muscularis → then to
perioesophageal tissue
→ adjacent organ

Lymphatics: Regional LN
Satellite lymphatic
spread (to distant LN)

Blood: Liver & lungs

- * Clinical approach:

For all patient ē dysphagia
1st Invⁿ → Barium swallow



- ↓
- Filling defect
- Rat tail appearance
- Apple core appearance
(Ca colon) → MC

(Apple core app → seen in cancer of any tubular part of body except stomach.)

↓
Upper GI endoscopy + } IOC
Biopsy

↓
Staging IOC: CECT — Thorax
— Abd

↓
IOC for depth of tumor penetration: Endoscopic US /
Transluminal US.

↓
IOC for distant metastasis

PET scan
(18-FDG, 110-120 min t_{1/2})

↓
TNM staging

TNM staging of Eso. Ca

- T₁ → Involvement of submucosa
- T₂ → " muscle layer
- T₃ → " periesophageal tissue
- T₄ → " adjacent organs
- N₁ → " Regional LN
- M₁ → Distant metastasis

Rx

- * Sx → RxOC for mid/low 1/3 Eso. Ca
- * C Th
- * R Th → RxOC for upper 1/3 Eso. Ca
- * Sx offers best curative option
- * Sx RxOC → Total Esophagectomy
 ē Eso. reconstruction

Best substitute : Stomach.



- Ivor Lewis operation
- Transthoracic Esophagectomy
- Standard operation

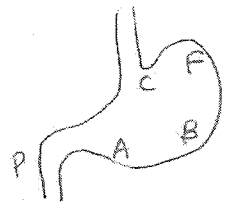
- * MC early complication of Sx
 Pulmonary due to anastomotic
 leak.

- * MC late complication is
 Esophageal stricture.

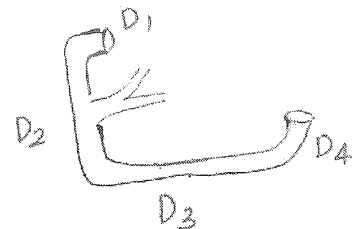
STOMACH

Anatomy

- * Cardia
- * Fundus
- * Body
- * Antrum
- * Pylorus (Ana. sphincter)



- * Duodenum → 4 parts



- * D₂, P₃ → Retroperitoneal
- * Both fused ē pancreas
- * Any problem in D₂ or pancreas
 head → since fused, have to
 remove both P & D → k/a
 Pancreaticoduodenectomy

- * Common bile duct & pancreatic
 duct → opens to D₂ →

Sphincter of Oddi

(4 sphincters)

* Parietal cells → fundus & body
→ produces HCl

* Parietal cell → stimulated by
Gastrin (from G cells) & vagus
(antrum →)

Congenital anomalies

Duodenal Atresia

* Some part of duodenum absent
due to failure of fusion of
fore gut & mid gut.

* MCC of intestinal obstruction in
a newborn:
Duodenal Atresia

(MCC Int. obstⁿ overall is
Post operative adhesions)

* MC GI anomaly associated with
Down's syndrome

Duodenal Atresia

* MC ClF: Bilious vomiting in
a few hrs of birth

* X-ray abd → Double Bubble sign
(also in Annular Pancreas)

↓
ring of pancreas tissue
around the duodenum

* Double bubble → due to presence
of pyloric sphincter in b/w
stomach & duodenum

Note

• Single bubble sign

Pyloric stenosis

• Double bubble sign

Duodenal Atresia, Annular
pancreas

• Triple bubble sign

Jejunal Atresia

• Multiple bubble sign

Ileal obstruction

* Rx OC: Duodeno-duodenostomy

* Rx OC for Annular pancreas: "

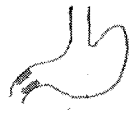
* Alternative option:

Duodeno-jejunostomy

Congenital / Infantile hypertrophic pyloric stenosis

* Hypertrophy of pyloric
musculature.

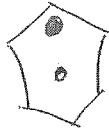
* Incidence - 3:1000 live births



* Usually 1st born male child is affected.

MCA
* MC → 3rd wk (2nd - 6th wk) of life

* Commonly present with epigastric lump.



↓
thickened/hypertrophied pyloric musculature

* Non bilious vomiting.

* Acid is losing → so metabolic alkalosis in baby.

(Any damage/irritation to intestine → mucus loss → HCO₃⁻ loss → metabolic acidosis)

* Hypochloremia

* Hyponatremia

* Urine initially is Alkaline but paradoxical aciduria

after 2-3 days of vomiting due to fluid loss → dehydration → ↑ aldosterone → ↑ Na⁺ & H₂O reabsorption → ↑ K⁺ & H⁺ excretion → ~~Aciduria~~

• Kaliuresis → Hypokalemia

• H⁺ loss → Paradoxical aciduria.

* Clinical approach:

Emergency - Basic resuscitation

↓
Rehydration, Electrolyte correction

↓
Clinical examⁿ: Palpitation

↓
1st Invⁿ: USG (IOC in hypertrophic pyloric stenosis)

↓
RxoC: Ramstedt's Seromyotomy (longitudinal incision cutting the serosa of pylorus)

Gastritis

* Acute Gastritis

* Chronic Gastritis

* Special Gastritis:

- ↓
- 1) Menetrier's ds - Premalignant
 - 2) Erosive G - NSAIDs
 - 3) AIDS G - Cryptosporidiosis
 - 4) Eosinophilic G - Allergen mediated
 - 5) Lymphocytic G - H. pylori
 - 6) Reflux G - after Gx Sx - Pylorus is damaged or removed → Alkaline G → Intestinal metaplasia.

* Chronic G
 ↳ Type A: Autoimmune
 ↳ Type B: H. pylori

Other substances which can be used for embolisation

- Gel foam
- Blood clot
- Human duramatter

Acute gastritis

- * MCC → NSAIDs
- * Alcohol (minute erosions in G. mucosa)
- * H. pylori
- * MC c/presentation → Hemetemesis

* Indication of Sx in hemetemesis
 ↓
 > 6 units of blood transfusion are required for stabilisation

Clinical approach:

Emergency → Admission - Basic resuscitation

↓
 i.v fluids is successful

* Indication of blood transfusion if > 30% blood loss

If bleeding continues

↓
 Upper GI endoscopy

↙ If bleeding vessel identified

↘ If blood vessel not identified

- Endoscopic sclerotherapy
- Endoscopic Adrenalin inj
- Endo. Diathermy
- Endo. clip ligation

↓
 Angiography

- Angio embolisation
- Therapeutic embolisation

↓
 MC substance used

⇒ "Coil" embolisation
 ↓

Note

- * MCC of hemetemesis
 - Peptic ulcer - Duodenal ulcer
 - Gastric erosions
 - Mallory Weiss tear
 - Esophageal varices

* MCC of bleeding per rectal Hemorrhoids (Piles)

* MCC of bleeding per rectum in a child

Juvenile polyp

* MCC of bleeding per rectum in an elderly

Colorectal cancer

Peptic ulcer
 ↳ Gastric ulcer
 ↳ Duodenal ulcer
 DU > GU

* Massive bleeding per rectum in elderly:

Diverticulosis of colon

* MCC of bleeding per rectum from (R) colon

Angiodysplasia of colon

Mallory Weiss tear

* Longitudinal gastric mucosal tear

* MC just beneath the gastro-oesophageal junction. i.e., the cardia of stomach.

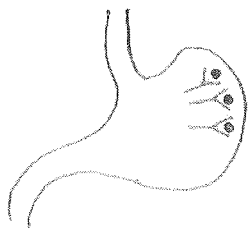
* 2nd MC site → Gastro-oesophageal junction.

* MCC - Alcoholics

* C/F - Hemetemesis

Chronic gastritis

* Type A → Autoimmune → Ab formed against parietal cells (HCl production, intrinsic factor secretion)



* ↓ HCl & ↓ IF (Pernicious anemia)
(Hypochlorhydria)

* Parietal cells → Stimulated by Gastrin & Vagus

* ↓ HCl → ↑ Gastrin → Hypergastrinemia → Microadenoma: Premalignant condition → can lead to gastric cancer

* MCC site of Gastric cancer in ^{PA} Fundus of stomach

(PA: Pernicious anemia)

* Type B gastritis → H. pylori

* H. pylori → urease production → NH₃ formation → alkalize → so can survive in acidic environment

* H. pylori can be associated with gastric pathology & duodenal pathology

a) Gastric pathology

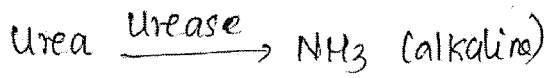
* Toxins by H. pylori → Cag A, Vac A, Proteases, Phospholipases

* Causes disruption of gastric acid mucosal barrier

* Acute G, Chr G, Pan G, Ga ulcer, Ga cancer.
(G - Gastritis)

b) Duodenal pathology:

* H. pylori produces Urease



↓
stimulates parietal cells
to produce ↑ HCl.

↓
Duodenitis &
Duodenal ulcer

* MC C/F → Epigastric pain

30y, ♂, OPD, epigastric pain

↓
Lifestyle modification.

↓
PPI's (21 days usually)

↓
If PPI fails then
upper GI endoscopy

+ Biopsy.

1) (Giemsa / Ethin Starrey/
Silver stains for H. pylori)

2) Rapid Urease test

↓
or instead of biopsy, can
do urea breath test

Rx

* H. pylori Eradication therapy

a) Triple drug therapy

2 Antibiotics + 1 PPI x 14 days

b) Quadruple therapy

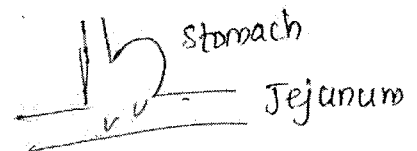
Add Bismuth subcitrate.

Peptic ulcer

* MC site: D₁ (duodenum)

* 2nd: stomach - close to the
incisura angularis.

* Also in lower end of esophagus,
stoma of Gastrojejunostomy (
ulcer - commonly in jejunal
side)



* Then in Meckel's diverticulum
due to heterotopic gastric
epithelium.

Risk factors

* Most important → H. pylori

* Smoking

* NSAIDs

* Spirit

* Spicy food

* Steroids

(Gastrinoma → ↑ Gastrin → ↑ HCl)

* Syndrome → Zollinger Ellison syndrome

* Stress ulcer

- Head injury
- "Cushings"
- Burns
- "Curlings"

Ulcer over skin in burn patient

venous ulcer → Marjolin's ulcer → squamous cell carcinoma

Burns:

- Gastric U → Curlings
- Skin U → Marjolin's

* During stress → vagal stimulation → ↑ HCl (head injury)

* In Curling's - burn → stomach is most sensitive to blood supply → during burn, ↓ blood to stomach (not only in burn, any situation ↓ blood to stomach) → ischemia of gastric mucosa → ulcer inside stomach.

(stealing of blood from stomach to periphery)

Features

- Incidence
- Age
- Socio economic status
- Size of ulcer
- Pathogenesis

• HCl

• MC C/F

• Pain to meals

• Appetite & weight

• Blood group association

• CL approach

Duodenal ulcer

Much MC

Younger

Rich

Smaller

↑↑ HCl

↑↑

— Epigastric pain —

Hunger pain (empty stomach)

↑↑

"Du O"

— Lifestyle modification —

↓ PPI's

Gastric ulcer

Elderly

Poor

Larger

Disruption of gastric acid mucosal barrier

Ⓝ / ↓ ↓

Occurs immediately after meals

↓ ↓

"Gi A"

* Gold standard Rx for Duo. ulcer
PPI

* Rx. for Gastric ulcers:

- Sucralfate (Ulcer protective)

* If H. pylori +ve → Eradication therapy

* Sx is usually not required

* Sx Rx OC for duodenal ulcer

↓
Highly selective vagotomy.

- Selective vagotomy

- Truncal vagotomy +

Drainage operation
↳ Pyloroplasty
↳ Gastro-jejunostomy

(compensate ↓ in motility)

* Sx Rx OC for recurrent Duo. ulcer

Truncal vagotomy + Antrectomy

(Antrum → G cells → Gastrin → stimulates parietal cells → ↑ HCl)

* 1881 → Bilroth

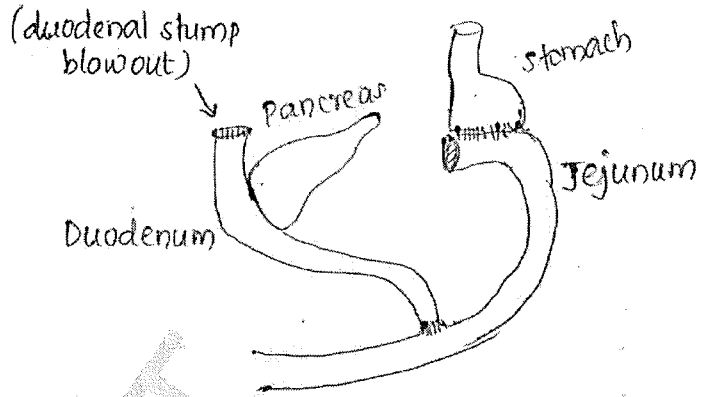
* Sx Rx OC for gastric ulcer:

Roux en Y Gastrojejunostomy

Peptic ulcer → Duodenal & Gastric
D > G.

Bilroth II - Gastrojejunal
Anastomosis (accident)

I → Gastro duodenal
Anastomosis. (Not successful)



complications of Sx:

1) Duodenal stump blow out
- 4th post. operative day

2) Dumping syndrome (Post
cibal syndrome)

(cibal - meal)

Early Dumping

↓
due to ↑ osmotic
load (rich
carbohydrate diet)

Late Dumping

↓
due to
reactive
hypoglycemia

- 3) Post vagotomy diarrhea
- 4) Nutritional deficiencies

MC → Iron

2nd → Vit B₁₂

Others → Ca, Phosphorus.

- 5) ↑ risk of gallstones formation
(vagus → motility of gall bladder → vagotomy → ↓ in motility → gall stones)

- 6) Gastric cancer.

* Immediately after meal → ↑ blood supply to GIT ^(to absorb nutrients?) when food reaches jejunum (because now food can't stay in stomach, no break down to small particles) → so patient feels epigastric pain, cold extremities, extreme fullness → early dumping syndrome.

* It remains for 30-40 min after meal → when nutrients are absorbed → pt becomes N.

* As all the food gets absorbed as soon as after food → but undigested food → ↑ insulin secretion by pancreas → hypoglycemia → fainting → late dumping syndrome.

* Rx for dumping syndrome
Small frequent meals.

Complications of Peptic ulcer

- 1) Bleeding
- 2) Perforation
- 3) Stenosis

* Bleeding → MC - Duodenal ulcer - Post surface.

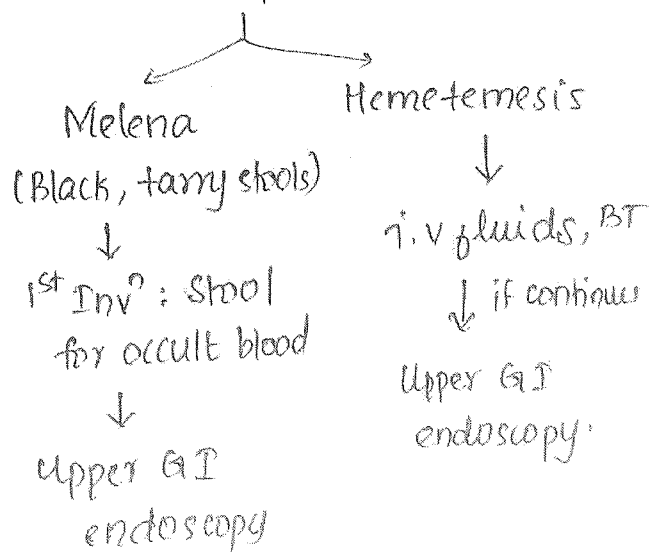
• More aggressive bleeding is observed in Gastric ulcer.

• ~~Due~~ → ~~Great duodenal art~~

• Duodenal ulcer:
Gastro duodenal artery

• Gastric ulcer:
Gastric artery

• clinical approach



(BT: Blood transfusion)

Perforation

* Anterior surface ulcers perforate

↓
Chemical peritonitis initially

↓
Diffuse abdominal pain associated with diffuse tenderness

[Tenderness → pain on pressing → due to inflammation in visceral peritoneum]

Rebound tenderness → pain on releasing pressure → due to inflam. in parietal peritoneum - no recoil on releasing pressure - pain]

↓
Diffuse guarding + Cardboard like rigidity.

* Clinical approach:

Basic resuscitation - i.v fluids

↓
Clinical examination

↓
1st Inv: X-ray (Chest X-ray)

(Gas in peritoneum → pneumo peritoneum → gas rises to (R) side below diaphragm)

↓
IOC: CT scan (Not endoscopy because may miss perforation in side walls)

Rx: Exploratory laparotomy + Peritoneal lavage

+
a) Minimal contamination (24-48 hrs) → closure of perforation & Omentum on perforation site - Omental patch (Graham's patch)

b) Gross contamination (> 2-3 days) - Leave the drains in peritoneal cavity

Stenosis:



Transverse healing
"Hourglass stomach"
(X)



Longitudinal healing
"Tea pot stomach"

Note:

- Category of blood loss: 5000ml
- Class I → < 15% (750 ml)
 - Class II → 15-30%
 - Class III → 30-40%
 - Class IV → > 40%

* If ulcer present on both anterior & posterior surface

↓
"Kissing ulcer"

Bezoar: Bag.

* Trichobezoar: Hairs inside stomach

- Commonly seen in young psychiatric females

* Phytobezoar: Plants (vegetable matter) inside stomach

* Lactatobezoar: Milk & milk products in stomach.

⇒ All these occur when motility of stomach decreases → products remain inside the stomach.
(Gastric stasis)

⇒ Phytobezoar & Lactatobezoar due to gastric stasis

⇒ Gastric stasis occurs due to

- Previous gastric Sx
- Prolonged immobilization
- ICU patients

* Dieulafoy's lesion:

↓
Due to gastric arteriolar malformation. Most difficult identifiable and treatable cause of GI bleeding.

IOC: Angiography

Rx OC: Angio embolisation.

Tumors

~~GIST~~

GIST

* Gastro Intestinal stromal tissue tumors

* Stroma: ~~Inter~~ supportive tissue → connective tissue, submucosa.

* MC site is Ileum > stomach

* It does not arise from the mucosa

* Arises from Interstitial cell (Pacemaker cell - Cajal)

* Associated with c-kit gene, over expression of CD 117

* Malignancy criteria:

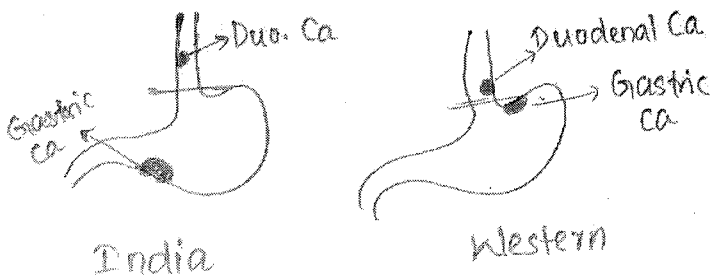
> 5 cm, > 50 mitosis per high power field.

- * IOC : CT scan
(Earlier - Endo USG)
- * If malignant → Sarcomatous
→ does not spread via lymphatics
- * Rx : Wide excision
- * If malignant / massive / recurrent
GIST → Rx : Simple Gastrectomy
(No need of LN dissection)

* Drug → Imatinib (Gleevec)
(life long)

Gastric cancer

- * MC type : Adeno carcinoma
- * MC site : Prepyloric region
(i.e., Antrum)
- * MC site in Western
Cardia of stomach



- * Risk factors
 - Most imp : H. pylori
 - Diet (↑ smoked food, canned food, ↓ mucosal protective factors)

- * - Autoimmune gastritis / Type A / Pernicious anemia
- Type B gastritis
- Menetrier's disease.
- Reflux gastritis - Previous
Gastritis / Alkaline gastritis /
Intestinal metaplasia

[Menetrier's disease → ↑ mucous
patn → ↑ HCO₃⁻ → ↑ HCl patn. to
neutralize it → ↑ K⁺]

- Gastric ulcer → on the
greater curvature.
- Gastric atrophy
- Adenomatous polyps
- Molecular / genetic factors
like mutation in APC
gene, inactivation of
p53 gene.

* Pathological ~~sub~~ subtype:

- MC → Superficial spreading
- Best prognosis
- Worst prognosis - Diffuse
(~~serous~~ Scirrhus type)
- ↓
- ✓ Leather bottle stomach /
✓ Linitis plastica

* ~~Early stage~~ Asymptomatic

* Early Gastric Cancer:
Involvement of mucosa,
submucosa \pm LN

* Advanced Gastric cancer:
Involvement of muscle,
 \pm LN

* > 65yr, 2 times more in σ

* Early Ga Ca \rightarrow Asymptomatic

* Advanced Ga. Ca can
present with

- Post prandial fullness
- Epigastric mass/lump
- Melena/Hematemesis
- Gastric outlet
obstruction

* MCA Enlarged \odot supra-
clavicular LN \rightarrow k/a
Virchow's node or
Troisier's sign.

* MCA - Enlarged ant. axillary
LN \rightarrow Irish node.

- Periumbilical tumor
deposits k/a SISTER
MARY JOSEPH nodule

- Trousseau's sign -
migratory thrombophlebitis
(MC in Pancreatic Ca)

Spread

* Locally \Rightarrow Mucosa \rightarrow submucosa
 \rightarrow muscle \rightarrow ~~per~~ Serosa \rightarrow
Pancreas - MC adjacent organ;
In proximal Ga Ca - Spleen

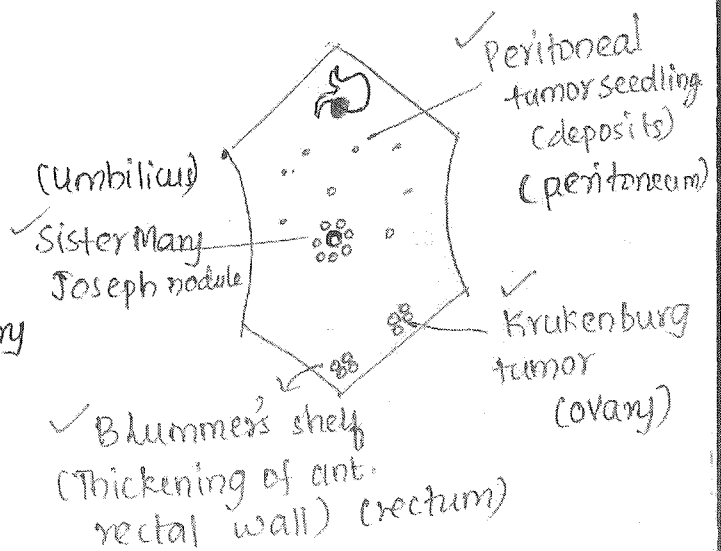
* Lymphatics \rightarrow Perigastric LN
 \downarrow

Coeliac LN
(Principal LN)

[Foregut \rightarrow coeliac trunk supplies \rightarrow
so coeliac LN. Midgut \rightarrow by
sup. mesenteric vessel \rightarrow sup. M LN.
Hindgut \rightarrow inf. M.V \rightarrow inf. M LN]

* Through blood \rightarrow Liver, Lungs

* Direct peritoneal spread
MCs k/a Transcoelomic spread



Clinical approach

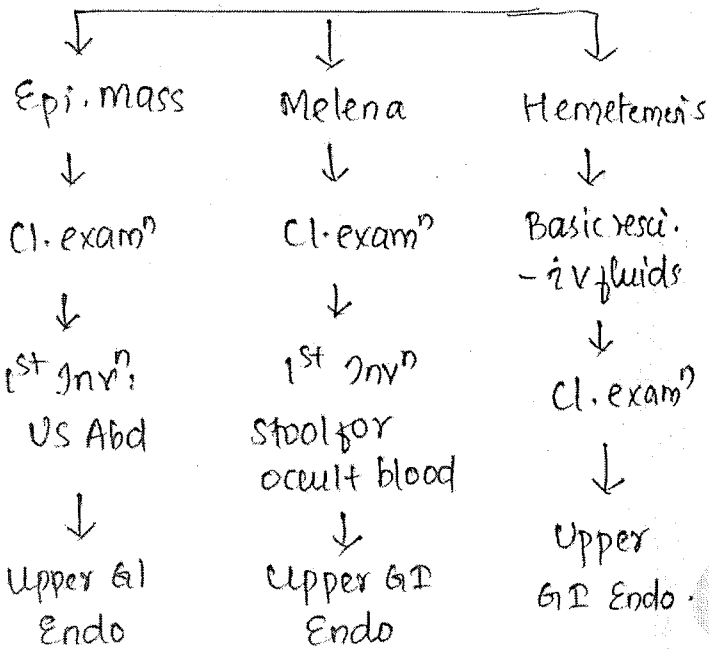
↓
Epigastric mass /
Melena / Hemetemesis

70yr, OPD
↗

* C Th → 5-FU (fluorouracil),
Cisplatin.

* Sx → Best curative option

* Sx options:



1) Early Ga Ca < 3 cm →
Endoscopic mucosal resection

2) Advanced Ga Ca :

a) Proximal Ga Ca -
Total gastrectomy +
spleenectomy

b) Distal Ga Ca -
Partial gastrectomy
or subtotal gastrectomy

(Margin of resection in the
stomach → 5 cm up & down)

* DOC : Upper GI Endo. + Biopsy

↓ (Adeno Ca)

Staging DOC : CECT Abd

(DOC for depth of tumor invasion

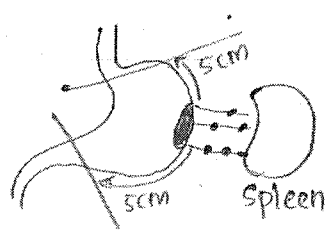
- Endoscopic US / Trans-luminal US)

↓

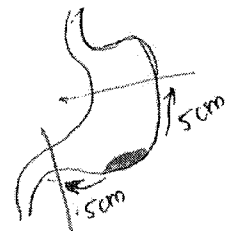
DOC for distant metastasis

- PET scan

⇒ Splenectomy is done for
adequate lymphatic clearance.



Proximal Ga Ca



Distal Ga Ca

* Rx : Sx ✓
C Th ✓
R Th x

Gastrinoma

* Zollinger Ellison syndrome

* Gastrinoma triangle / Δ le of Passaro



Boundaries:

MC Sup - Body of gall bladder
(earlier - Junction of cystic duct & common bile duct)

Inf - Junction of D₂ / D₃

Medial - Junction of head / neck of Pancreas

* MC arises from medial wall of D₂ - Brunner's gland

* Autosomal dominant

* Associated \bar{c} MEN I syndrome

* " Non β Islet cell tumor of Pancreas

* $\uparrow\uparrow$ HCl secretion \rightarrow Severe GI ulceration \rightarrow Abd. pain

* Biochemical test:

1) Secretin infusion test \rightarrow Rise in serum gastrin levels
> 110 pg/ml : Suggestive of Gastrinoma

2) Serum Gastrin levels

< $\begin{cases} > 200 \text{ pg/ml} \rightarrow \text{Suggestive} \\ > 1000 \text{ pg/ml} \rightarrow \text{Diagnostic} \end{cases}$

3) Basal acid output level

> 15 meq/hr \rightarrow Suggestive

4) Pentagastrin test

No marked response in HCl secretion.

* Radiological Invⁿ:

• IOC \rightarrow CT scan

• ~~Octreo scan~~ Octreoscan / SRS scan (Somatostatin receptor scintigraphy scan)

• Endoscopic USG

* Rx:

- Aggressive PPIs

- If massive \rightarrow removal of the tumor.

\Rightarrow In pentagastrin test \rightarrow exogenous Gastrin is injected \rightarrow \uparrow HCl \rightarrow but here parietal cells continuously stimulated by endogenous ^{high} gastrin so no ~~rise~~ response to exogenous gastrin \rightarrow thus no HCl secretion

LIVER

Anatomy

- * Weight of liver → 1500 gm
- Spleen → 150 gm (75-250g)
- Pancreas → 85 gm

* Falciform ligament → divides liver into 2 anatomical lobes.

* Cantlie's line divides liver into 2 surgical lobes.

* It extends from gallbladder bed below to middle hepatic vein above. (before it was Inf. vena cava instead of MHV)

* Segments in liver = 8
 k/a Couinad's segments

* Blood supply:

 80% → Portal vein

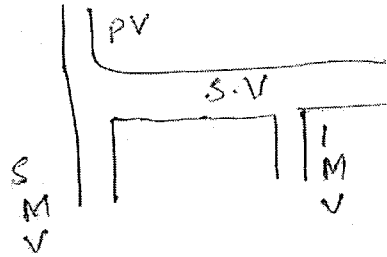
 20% → Hepatic artery

* Liver surrounded by Glisson's capsule.

* R, L, middle hepatic vein → opens to IVC

* Portal vein → union of splenic vein & sup. mesenteric vein

* Inf. mesenteric vein → opens in splenic vein



* Common bile duct (CBD)

- Supra duodenal
- Retro duodenal
- Intra duodenal
- Intro duodenal

Biliary Anatomy

* Gall bladder - Pear shaped, capacity: 25-30 ml

* Function:

- Storage of bile
- Concentration of bile by 3-5 times.

* Cystic duct

 Length = 3 cm

 Diameter = 1-3 mm

* CBD → L = 7.5 cm

 Dia = 6-8 mm

congenital anomalies

Biliary Atresia:

- * Absence of some biliary channels
- * Exact cause not known
- * Due to inflammatory fibrosis starting in 1st wk of life.
- * Associated anomalies -
 - Polysplenia
 - Absent venacava
 - situs inversus
 - Pre duodenal portal vein

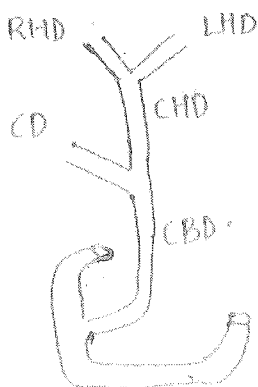
* Types → I, II, III
III → MC (Pakistan)

- * Type I → -nt CBD
- II → -nt CHD
- III → -nt R/L HD

Common bile duct: CBD

Common hepatic duct: CHD

R/L HD: Right & left hepatic duct



* C/F: Jaundice starting in 1st wk of life + steatorrhea

* Clinical approach:

Cl. examⁿ

↓

1st Invⁿ: Liver function test (LFT)

& USG

↓

Liver might be congested (Hepatomegally)

[ERCP: Endoscopic Retrograde Cholangio pancreatography
→ Endoscope → reach D₂ → push contrast to CBD & pancreatic duct]

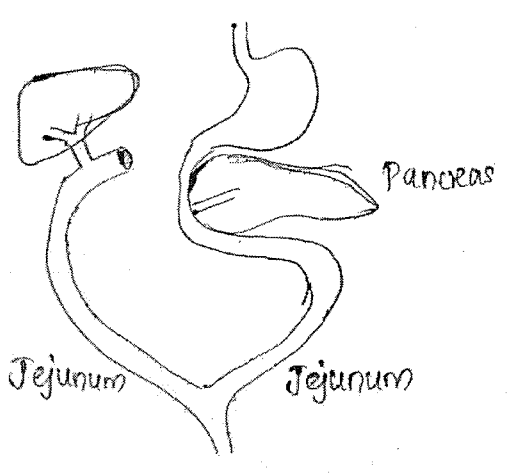
[HIDA scan → isotope injected in peripheral vein → reaches liver → liver excretes it to R & L hepatic duct → CHD → CBD → cystic duct → gall bladder contracts \bar{c} in 1 hr → CBD → D₂]
(So should see \bar{c} in 1 hr)

↓
IOC: HIDA scan

↓
Best Invⁿ for type III biliary atresia: Liver biopsy

↓

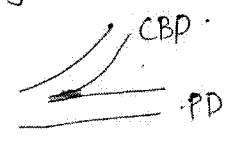
Rx: Hepaticojejunostomy
 RxOC →



Choledochal cyst.

chole-bile, ductal-duct
 cyst-bag

- * Abnormal cystic dilatation of biliary channels
- * Exact cause not known.
- * Due to anomalous pancreatico biliary duct junction



* Todani-Alonso-Lej classification
 → 5 types

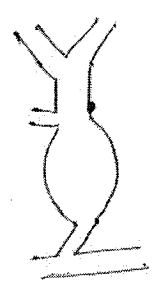
- * I, II, III → CBD
- * IV, V → Hepatic ducts
- * MC is type I

* In type II & III BA → NO common hepatic duct →

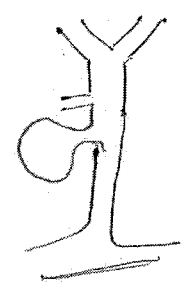
Rx: Liver transplant (RxOC)

* If liver not available then
Kasai operation (initial Rx)

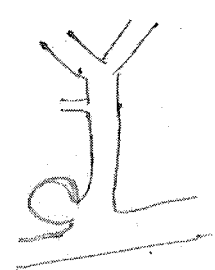
- Type I: Hepaticojejunostomy
- Type II & III: Kasai operation
- RxOC: Liver transplant



Type I



Type II



Type III

* In Kasai operation → jejunum directly connected to liver → some bile drains to it → but absence of biliary channels.

* Type I → diffuse dilatation of CBD

* Type II → Diverticula of CBD above pancreas

* Type III → Diverticula of CBD in pancreas



Type Ia



Multiple & both intra & extra hepatic cyst



Ib



multiple cysts only in extrahepatic



Ic

Multiple only intra hepatic cyst

↓
k/a Caroli's disease

* Type I ⇒

• MC CF: Painless, intermittent jaundice in infancy

• After 2 yrs^{age}, pain can be +ve

• Mass in Rt. hypochondrium

• Triad → Pain, mass, jaundice
→ choledochal Triad

• complication:

1) cholangitis (inf. of bile duct)

1) cholangitis - Pain, fever, jaundice



Charcot's triad

+ Hypotension, Mental confusion



Reynold's pentad

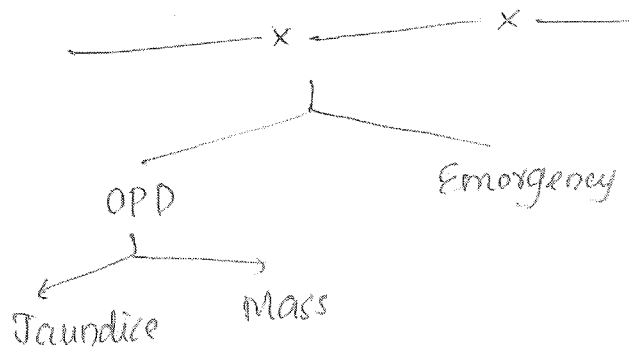
2) Choledocholithiasis (stone in bile duct)

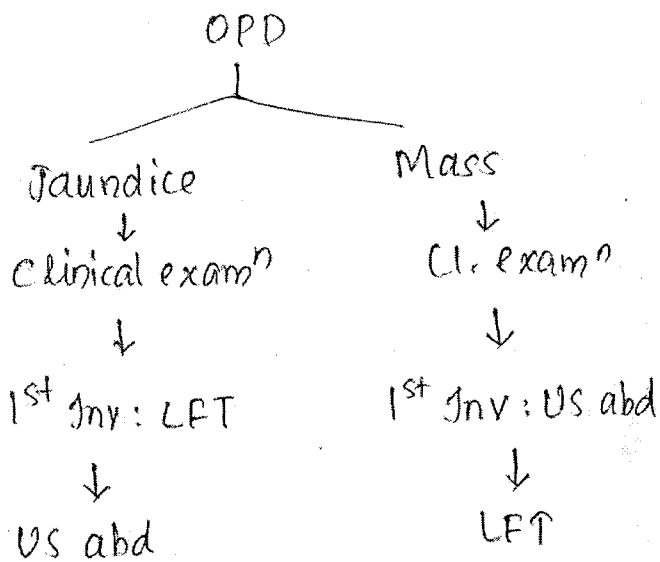
3) Choledochal cyst → Pre-malignant → Cholangiocarcinoma

Note

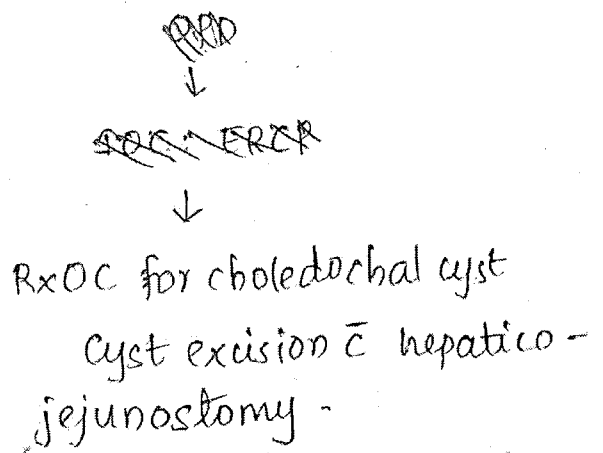
* MC site of Cholangiocarcinoma
Hilum of Rt. & Lt. hepatic ducts → also k/a Hilar Cholangiocarcinoma

or
Klatskin's tumor





IOC: ERCP



Cholelithiasis

* Also k/a Gall stone disease.

* Types -

1) Cholesterol

- > 50% cholesterol
- Pale yellow
- MC in US, Europe

2) Pigment stones

- < 30% cholesterol
- Black, Brown, Green
- Infections
- In Asia

3) Mixed stones

- 30-50% cholesterol
- Grey in color

Emergency

↓
Pain, Fever, Jaundice
(Charcot's triad)
+ HypoT / Mental confusion
(Reynold's Pentad)

↓
Basic resuscitation -
i.v fluids & i.v antibiotics,
Endobiliary stenting.
(drains fluid present in duct
in to intestine → ↓ E.coli load)

Cholesterol stones

- * Fat, fertile, female, forty
 - * ↑ cholesterol
 - * ↓ bile salt / bile acid
- } Lithogenic or Super saturated bile

(Normally bile salt & acid-bile acid prevents precipitation of cholesterol to form gall stones)

- * Diseases of terminal ileum - Crohn's disease, Ulcerative colitis, Tropical sprue.

- * Due to abnormal enterohepatic circulation

(Normally → bile salt & B. acid → Duodenum → Jejunum → Ileum → sup mesenteric vein → portal vein → 95% reabsorbed to liver → so ↑↑ conc. of B. salt & B. acid in gall bladder which prevents stone formation)

Pigment stones

- * ↑ RBC breakdown in spleen → splenic vein → portal vein → liver → CHD → ~~cystic duct~~ → gall ^{GB} → so all pathologies - ↑ RBC breakdown, ↑ pigment stone formation

* Seen in

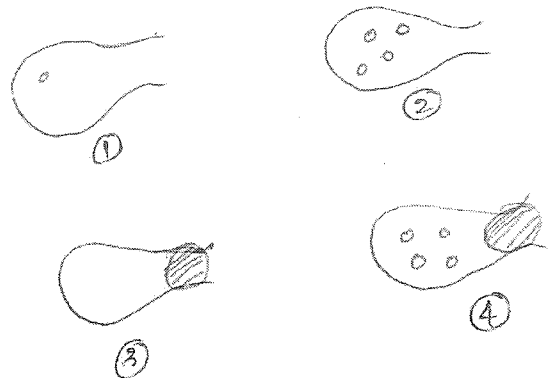
1) Hemolytic disorders - Hereditary spherocytosis, Sickle cell anemia

2) Infections -

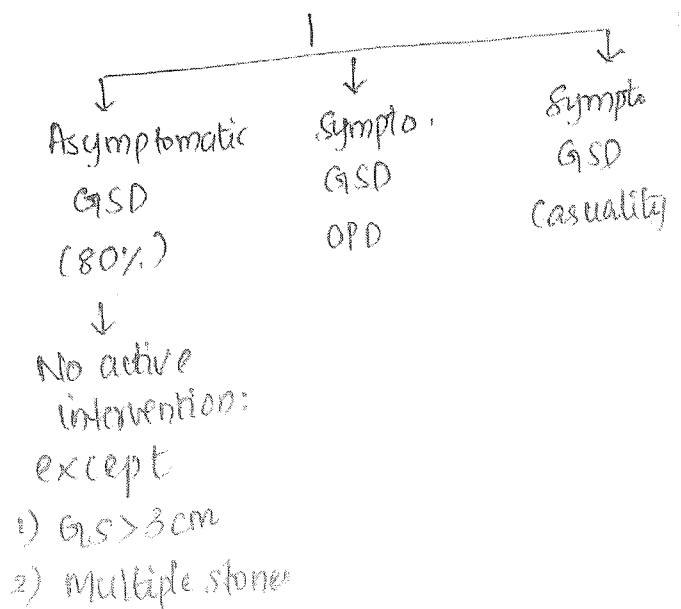
- Bacterial: E. coli → soft, brown stone
- Parasitic: Ascaris, Clonorchis

* Most imp. process in formation

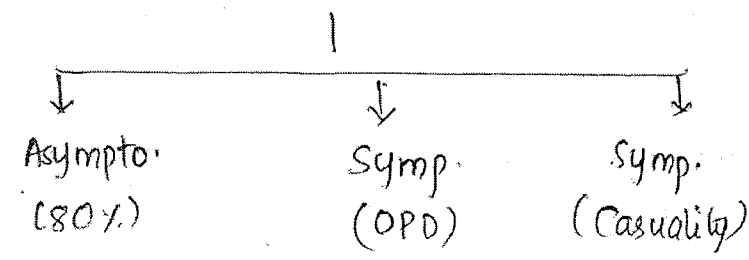
- of
- Gallstone → Nucleation
- Urinary stone → Crystallization



Gall stone disease (GSD)



Gall stone disease



↓
No active intervention

except

- 1) GS > 3cm
- 2) Multiple stone
- 3) Elderly
- 4) Immunocompromised (DM)
- 5) Pregnancy (2 lives)
- 6) Typhoid carrier
- 7) Porcelain GB → Deposition of Ca inside GB.
- 8) Adenomatous polyps > 10mm in size
- 9) Hemolytic disorders
- 10) Bariatric Sx (done for morbid obesity → chops some part of stomach → vagus injury → ↓ motility in GB → stones)

Bariatric Sx

* Done for morbid obesity

* Indication:

- 1) BMI > 35 + asso. co-morbidities like CAD, CVA, uncontrolled

diabetes, severe osteoarthritis, sleep apnea syndrome.

CAD: Coronary artery disease

CVA: Cerebrovascular accidents

2) BMI > 40 ± Co-morbidities

* Types of bariatric Sx

(1) Bypass - Most effective B. Sx is Roux en Y Gastric bypass

(2) Restrictive -

a) LAGB: Laparoscopic Adjustable Gastric banding

b) Vertical banded Gastroplasty

c) Sleeve gastrectomy.

Symptomatic GSD

(OPD)

30yr, ♀

↓
Pain off & on in Rt. hypochondrium

↓
Cl. examⁿ - x

↓
1st Invⁿ: USG abd

Gold standard investigation

↓
Rx: Laparoscopic cholecystectomy

(RxD) Gas - CO₂

Intra abd. pressure - 12-15 mmHg

- standard 4 port Laparoscopy.

Calot's Δ^le

* Boundaries

• Sup \rightarrow Cystic artery (earlier-inf. surface of liver)

• Inf \rightarrow Cystic duct

• Medial \rightarrow Right hepatic artery /
& Common hepatic artery
 ~~\rightarrow before~~

(Before - common hepatic duct)

— x — x — x

Symptomatic GSD
(Emergency)



↓
• Sudden, severe pain in the right hypochondrium radiating to back - at the inferior angle of (R) scapula

MCQ

can also radiate to the tip of (R) shoulder.

- ~~*~~ Anorexia, nausea, vomiting
- Fever - Not 1st presenting symptom.

↓

Clin. approach - Basic resuscitation
i.v fluids & i.v antibiotics

i.v antibiotics - Cefuroxime
Amikacin

↓

Cl. examⁿ: Murphy's sign.
(Tenderness in right hypochondrium)

Sign of acute cholecystitis.
* (Not chronic)

• Boa's sign \rightarrow Hyperaesthesia in the region of 9th-11th ribs posteriorly.

• Localised guarding & rigidity in right hypochondrium

↓

US Abdomen

↓

IOC to differentiate acute calculus cholecystitis from Acalculus cholecystopathy
(\downarrow motility) \Rightarrow HIDA scan.

(i) On HIDA scan in acute calculus cholecystitis -
Non visualization of GB

(ii) Acalculus cholecystopathy
Persistence of the isotope \bar{c} in GB despite washout of isotope from remainder of biliary tree.

↓

RxOC: Conservative - i.v antibiotics, * Hemobilia → Blood in bile

i.v fluids

↓

Discharge and advise patient -

Interval cholecystectomy after 3-6 wks

- MCC: Trauma
- OY parasitic (Ascaris)
- Pain, melena, jaundice → k/a Quincke's triad

(Normally → omentum will cover the red, hot, inflamed GB & thus prevents from peritonitis. Along \bar{c} omentum nearby organs may also takes part → so if we try to do Sx → it can perforate the organs there)

~~* Triad of Gallstones:~~

* Saint's triad:

- Gall stones
- Hiatus hernia
- Diverticulosis of colon

Cholelithiasis

- * due to slipping of stones from GB in to CBD (common bile duct)
- * associated \bar{c} infection in CBD

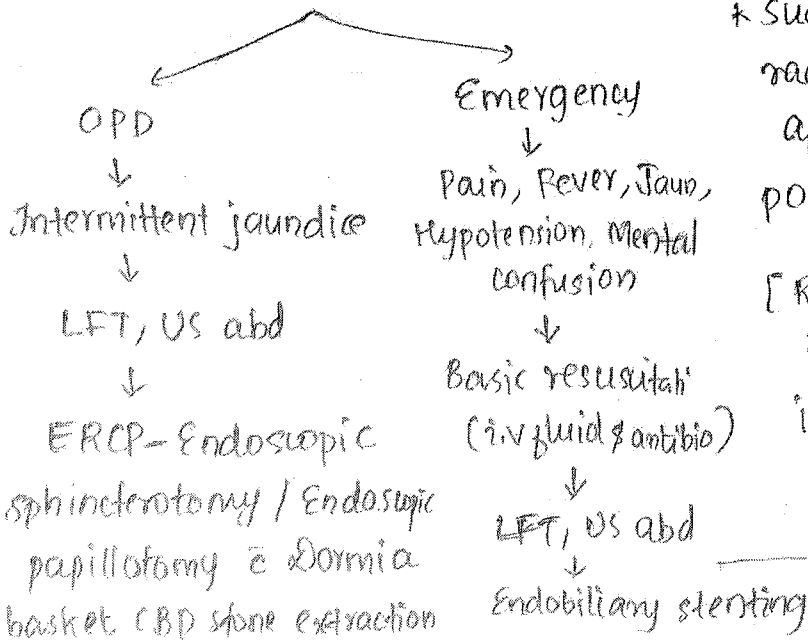
PANCREAS

- * Weight → 85 gm
- * Fused with D2, D3

Acute pancreatitis

- * Sudden severe epigastric pain radiating to back, aggravated after meals, ↑ in supine position, ↓ on bending forward

[Retroperineal pathologies call] → if lies supine - all weight on it - ↑ discomfort, relief on sitting & bending forward)



* Raised levels of pancreatic enzymes.

* MCC - Gall stones (50-70%)

* 2nd MCC - Alcohol

* MCC in children → Hereditary, (earlier it was - Trauma)

* Operative cause: ERCP

(Sphincter damage → GI contents to pancreas → Reflux pancreatitis)

Pathogenesis

1) Obstruction of pancreatic duct - due to gall stone → proximal pancreatic duct dilated → ↑ in pressure in proximal pancreatic duct → rupture of pancreatic duct → release of pancreatic enzymes outside in to retroperitoneum

Necrosis

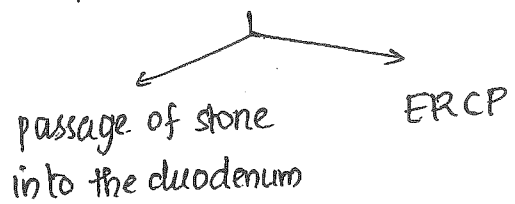
↓ (af)

- Retroperitoneal fat
- Pancreas → Acute Necrotizing pancreatitis, Auto pancreatectomy
- Pancreatic blood vessels
 - Bleeding → Acute hemorrhagic pancreatitis

Activation of inflam. cascade

↓
↑↑ fluid sequestration
↓
shock.

2) Splinting of fibers of the sphincter of Oddi either due to



* Stages of acute pancreatitis

- Acute ~~Interstitial~~ Interstitial Pancreatitis
- Acute Oedematous Pancreatitis
- Acute Necrotizing / hemorrhagic Pancreatitis.

* C/F:

- MC → Epigastric pain, radiating to back - Sudden, severe
- Anorexia, Nausea, Vomiting
- Fever - not a presenting feature
 - ↳ may be present after 2° bacterial infection
- Shock like features: Tachycardia, hypotension, (both in hypovolemic & hemorrhagic shock), Tachypnea
- Ascites, pleural effusion, hydrocele.

• In acute hemorrhagic pancreatitis
→ bluish discoloration around:

• Flanks ⇒ k/a Grey Turner sign

MCC

• Umbilicus ⇒ k/a Cullen sign

* Clinical approach → Emergency

↓

1st: Basic Resuscitation:

* i.v fluids

- No role of prophylactic antibiotics -

[Antibiotic of choice in 2^o infection]
{ Imipenem }

↓

• Enteral Nutrition (small, frequent meals)

↓

Clinical examⁿ: Pancreatic enzyme assessment

a) Serum amylase - Start ↑↑ immediately

- But non specific

- If > 3 times (N) value

→ favors Acute P.

b) Serum lipase

- Specific

- Start ↑ after 3 days

↓

Radiological Investigation:

CT scan

• CT Baltazar Grading for severity of acute pancreatitis.

* Rx: Conservative Rx.

• In gall stone induced pancreatitis

→ ERCP + Remove the stone
E in 48-72 hrs.

• Sx is not required

• Indications of Sx :-

1) Ascites/Pleural effusion

→ Tapping

2) Pancreatic abscess:

Rx: US/CT guided percutaneous drainage

————— x ————— x —————
Note:

• Appendicular abscess

- Extra peritoneal drainage

• Empyema of GB

- Tube cholecystostomy.

————— x ————— x —————

3) Pancreatic necrosis

- Sterile: Conservative Rx.
- Infected:
 - ↓
 - Pancreatic debridement or Pancreatic necrosectomy

- IOC: CT scan

- MC diff. diagnosis on a CT scan → Mucinous cystadenoma of pancreas

- To differentiate: can analyse the cyst fluid for

a) Amylase: ↑↑ → Pseudocyst

b) CEA - ↑↑ → Mucinous cystadenoma.

(CEA: Carcinoembryonic Ag)

- Rx: If symptomatic/complicated

↓

RxOC: Cystoenterostomy
 C cystojejunostomy
 cystogastrostomy
 Cystoduodenostomy)

4) Pseudocyst of pancreas:

- (Not lined by true epithelium)
- It is accumulation of pancreatic enzyme & sequestered fluid around the pancreas
- MC: Acute pancreatitis, Alcoholic Pancreatitis
- Usually small, patient asymptomatic, resolves spontaneously.
- Can become large, if large can extend from mediastinum above to pelvis below.
- Pressure symptom → MC epigastric pain/post prandial fullness/malabsorption.
- Complication: Infection/rupture

* Prognosis: APACHE II score. (for Acute pancreatitis)

- Ranson's
- Glasgow's

* Mortality rates:

- mild acute pancreatitis < 1%
- Severe acute P: 20-25%
- Acute necrotising P: 50%

MC

Malignancy is not a complication (since no lining epithelium)

Chronic pancreatitis

- * Irreversible morphological changes in pancreas
- * Characterised by
 - Cellular atrophy.
 - Ectasia & strictures in pancreatic duct.
 - Pancreatic calcification.

* MCC : Alcohol

2nd → Gall stones

- * Alcohol & Smoking → dehydration → ↓ H₂O content in all glandular ducts in body.

Basic pathogenesis

- * Alcohol → dehydration → protein plugs → partial blockade at multiple places in pancr. duct

* C/F :

- Pain: ↑ after meals
- Malabsorption: > 70%.
exocrine function is lost
- Diabetes mellitus

* 4 times MC in ♂ > 40 yr

* Clinical exam? X

* Pancreatic function test →
Volume & concentration of
HCO₃⁻.

* In ERCP : "Chain of lakes"
appearance

* Rx

• Malabsorption:

- Pancreatic enzyme supplements

- Creon / Pancreatoflat

• Diabetes mellitus

- Insulin

• Pain :

- Stop alcohol

- ↑↑ fluid intake

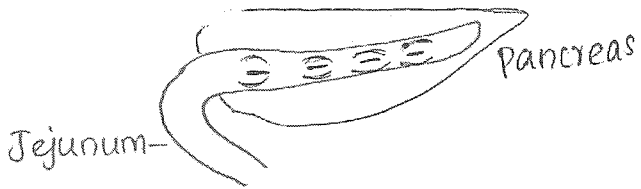
- Small frequent meals

- Analgesics / ~~steroids~~ before meals

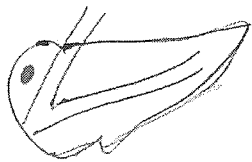
- Octreotide (to reduce congestion)

- Sx Rx : Side to side pancreaticojejunostomy / longitudinal pancreaticojejunostomy / modified Pustow's operation.

(stitch jejunum over pancreatic duct area → multiple openings in the dilated area of duct → enzymes can drain in to jejunum)



Tumors in Pancreas



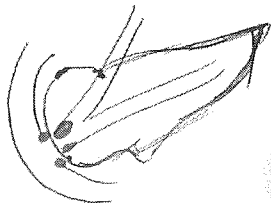
Ca. Head of Pancreas

↓

• MC cancer of pancreas

↓

CT



Periampullary Ca

↓

- Terminal P.D
- Terminal CBD
- Ampullary mucosa
- Duodenal mucosa close to ampulla

* Has better prognosis

* Endoscopic biopsy

* MC CF:

Head Ca

↓

- Jaundice
- Progressive

- Pain

- Significant weight loss

Periampullary Ca

↓

- Jaundice
- Waxing & Waning

(

✓

✓

Trousseau's sign - migratory thrombophlebitis

- MC - Panc Ca
Also in - Ga Ca

ERCP + Biopsy

IOC: CEET abd

Risk factor

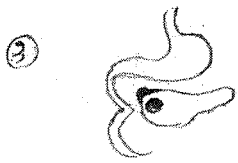
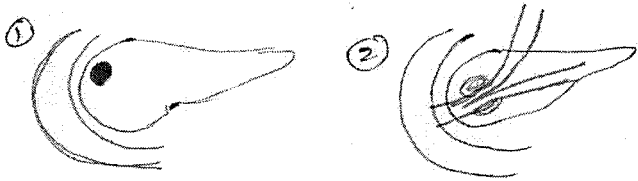
- 40% sporadic
- 30% smoking
- 20% dietary, chronic pancreatitis
- 5-10% hereditary

↓

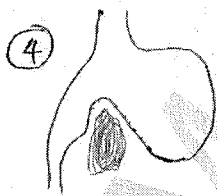
75% of hereditary P. Ca are asso. ~~to~~ suppression of inactivation of cancer/tumor suppressor gene p.53.

Ca head of pancreas

- 1) CECT abd → widening of duodenal C-loop
- 2) ERCP : Double duct sign
- 3) Barium meal follow through → "Reverse 3 sign" or Frostberg sign.
- 4) Upper GI endoscopy - Antral pad sign.



(Tumor attracts duodenum)



* Tumor marker : ~~CA 19-9~~ CA 19-9

* Rx : Sx ✓ Only curative

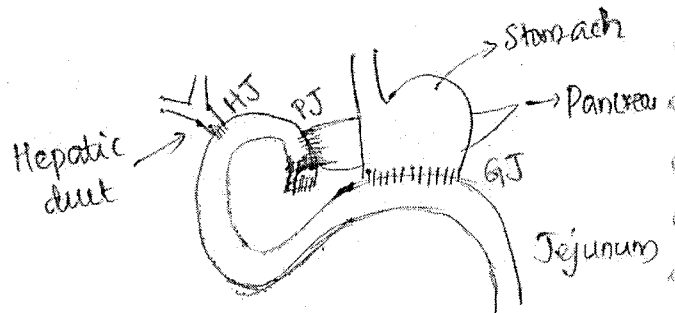
CTh x 5FU, Gemcitabine
- 40% response
RTh x

* Sx Rx DC : Pylorus preserving pancreaticoduodenectomy

- Whipple's operation (Pancreas head + D₂ + D₃)
- Triple bypass operation PJ, HJ, GJ

Pancreatico jejunostomy
Hepatico jejunostomy
Gastrojejunostomy

- * Overall survival : 11-20 months
- * In unresectable disease : survival 6-10 months
- * In metastatic disease : survival 2-6 months



Triple bypass operation

SMALL & LARGE INTESTINE

Anatomy

* Length of:

Small intestine = 600 cm
(300-850 cm)

Large intestine = 160 cm
(colon)

Rectum = 15-18 cm (15 > 15-18)

Anal canal = 4 cm

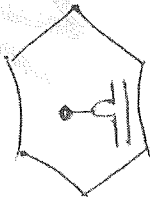
* Anorectal angle = 120°

* Most mobile part of rectum is
→ upper part.

Congenital anomalies:

Meckel's diverticulum

* Persistence of intestinal end of vitello intestinal duct (omphalo mesenteric duct)



* Congenital, true, contains all layers of intestine.

* Has its own blood supply

* Present in antimesenteric border

* Follows rule of 2:

2% population / 2 inches long
(5 cm) / 2 ft (60 cm) proximal

to ileocaecal junction.

* 20% heterotopic epithelium
MC - Gastric.

Pancreatic & colonic epithelium
can also seen.

* If Meckel's \emptyset in hernia sac
→ k/a Littre's hernia.

* Usually asymptomatic

* Sometimes symptomatic →
Mimick Acute appendicitis.

* Sometimes can get complicated

• MC → Bleeding

• MC in adults → Diverticulitis



• Diverticular perforation

• Peptic ulceration

• Intussusception

• Intestinal obstruction
(not due to Meckel's but
due to band from umbilicus
to the apex of Meckel's)

* IOC: Isotope scan - Tc Pertechnetate scan

(Reveals site of
Meckel's in 90% people)


* Contrast study - Small bowel
enema

(SBE > Ba. meal follow through)

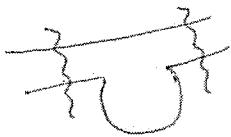
- CECT abd
- Double balloon enteroscopy
- Video capsule endoscopy

* Rx → NO Rx for asymptomatic
→ If symptomatic / complication:



a) Narrow mouth Meckel's -
diverticulectomy 

b) Wide mouth Meckel's -
Resection of segment of
intestine bearing meckel's \bar{c}
end to end anastomosis



Hirschsprung's disease

- * Also k/a Congenital megacolon / congenital Aganglionosis
- * Absence of ganglion cells in Auerbach's plexus (myenteric p.) & also in Meissner's plexus
- * So absence of peristalsis
- * Mc site: Rectosigmoid - Rectum is always involved.
- * Associated \bar{c} Down's syndrome
- * Incidence = 1 : 4500 live birth

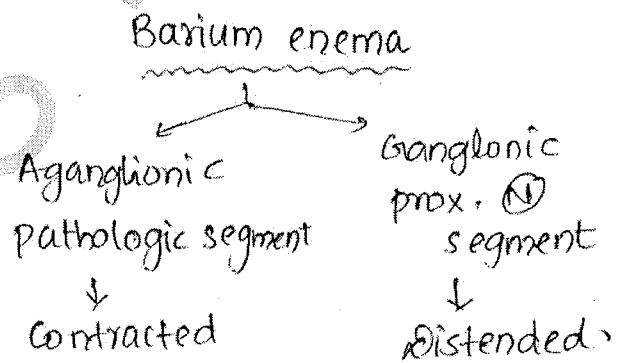
* If long segment is aganglionic
→ neonate → Intestinal obstruction
→ Emergency → Basic resuscitation →
Transverse window colostomy.

* If a short segment is aganglionic
→ childhood → constipation →
Elective Rx ↓

Evaluation & Rx:

* Evaluation - \bar{c} oc : Suction rectal biopsy.

* \bar{c} oc to access length of aganglionic segment is

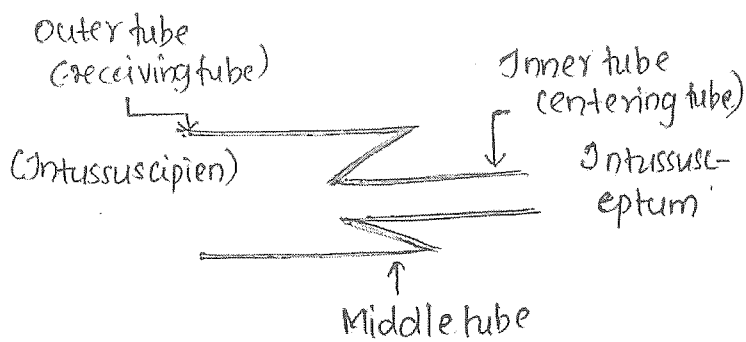


* Rx : Soave & Park's colo-anal anastomosis

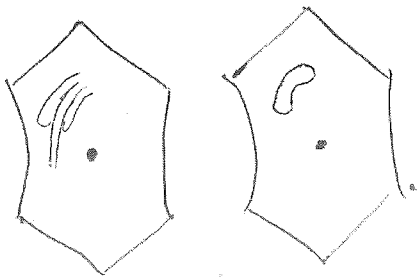
Intussusception



* Invagination of one part of intestine in to adjacent part



- * MC - 6 months of age (5-10m)
- * MC - Ileocolic (MC type in adults → Colo-colic)
- * MCC - Hypertrophy of Peyer's patches.



- * Excessive cry
- * Listless (fatigue)
- * Sausage lump in Rt. hypochondrium
- * Blood + mucus in stool
↳ Red Currant Jelly stools
- * Empty Rt. iliac fossa
↳ Sign of Dan's (MC)
- * Digital rectal examination → examiner's finger is stained ± blood.

- * 1st Invⁿ : US abd.
- * On USG gets
- Doughnut sign / Target sign

- * On x-ray → gets
- Crescent sign / Meniscus sign.

- * On Barium enema →
Claw sign / coiled spring sign.

- * Best Invⁿ → IDC : CECT abd.

- * Rx : Hydrostatic reduction
↓ if fails
Operative reduction of inner tube from outer tube

Diverticulosis of colon

- * MC site : Sigmoid colon
- * Rectum is usually spared
- * MC seen on mesenteric border (meckels - antimesenteric)
- * Elderly
- * Have constipation
- * Acquired, false diverticulum
- * Bleeding per rectum



* Complication:

- Diverticulitis (mucus inside it → stasis → infection)
- Diverticular perforation
- Massive bleeding per rectum

↓
Kla Hartmann's operation

————— x —————
Inflammatory Bowel diseases

* IOC: Ba-enema

"Saw tooth appearance"

* IOC for diverticulosis of colon

- Barium enema

* But IOC for diverticulitis / diverticular perforation

CT scan

(Any perforation in GIT: CT scan)

* Rx

• Elective, OPD → Diverticulosis of colon

If symptomatic / complication

↓

Resection & Anastomosis

• Emergency - Diverticulitis / Diverticular perforation →

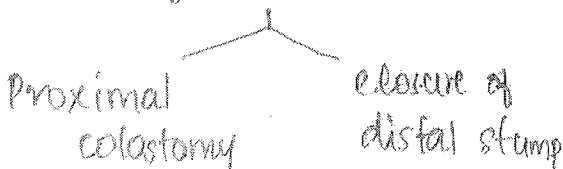
Basic resuscitation

↓

Exploatory laparotomy

+ Peritoneal lavage +

(since gross contamination)



1) Ulcerative colitis

* Multiple minute ulcers in the colon.

* Always start in rectum & spread proximally in continuity.

* Proctitis → Proctosigmoiditis → Proctosigmoidocolitis → Pancolitis (Universal colitis) → Backwash ileitis.

* ~~Ex~~ Exact cause not known

* Immunological reaction.

* Pathological →

• No specific inflammation of mucosa

• Pseudopolyp - 20% (characteristic)

* C/P: MC: 20-40yr

• MC → Diarrhea (mucus / watery / bloody)

• Systemic signs: Fever, Tachycardia, Hypoalbuminemia, weight loss

• Extraintestinal manifestations:

- 1) Ankylosing spondylitis, Sacroiliitis
- 2) Iritis
- 3) Cholangiocarcinoma
- 4) Skin lesions -

Erythema nodosum,
Pyoderma gangrenosum

* Complications:

- Bleeding per rectum - massive
- Perforation
- Toxic megacolon (when the transverse diameter of transverse colon > 6)



- Malignancy

* Investigations

• IBC: Colonoscopy $\left\{ \begin{array}{l} \text{Multiple ulcers} \\ \text{Pseudo polyp} \end{array} \right.$

• Barium enema: Lead pipe appearance

(No haustrations)



* Rx:

Mild \rightarrow Rectal steroids
Mod \rightarrow Oral steroids
Severe \rightarrow i.v steroids

* Sx Rx (severe sym/complicatn)

- If entire rectum & colon are involved \rightarrow

Total proctocolectomy \bar{e}

- a) Permanent ileostomy
- b) Ileal pouch anal anastomosis (MC: J pouch) - Pouch Sx

• Complication of pouch Sx:

- Pelvic sepsis
- Intestinal obstruction
- Pouchitis

2) Crohn's disease

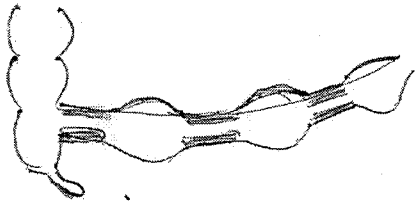
* Also k/a Regional ileitis/
Granulomatous ileitis

* Transmural disease characterized by skip lesion (not continuous)

* MC - Terminal ileum,
- Ileocaecal region
- Anal lesions common

* Can affect any part of GIT: Mouth to anus

- * Exact cause not known
- * Asso. c vasculitis
- * Patho. → Non caseating granulomas
- * Mc in 25-40 yr



Imatinib, Rituximab,
Infliximab.

- * Sx rarely done.
- * If Sx has to be done, massive resection of small intestine is avoided.

Note

- Massive resection of small intestine
 - Removal of $> 2/3$ of SI
 - Results in ~~severe~~ severe nutritional deficiency

MC: Vit B12

- * Pain in Rt. iliac fossa / mass in Rt. iliac fossa.
- * Constipation
- * Fissure, fistula, sinus, abscess are common.

* Invⁿ: Small bowel enema



String sign of Kantor

- Cobble stone appearance



- Serpiginous ulcers
(collar button ulcers seen in ulcerative colitis)

* Rx: Aminosalicylates - Steroids

if fails: Immunomodulators



6-Mercaptopurine
Methotrexate

APPENDIX

* Positions of Appendix:

- Retrocaecal (74%)
- Pelvic (21%)
- Paracaecal (2%)
- Subcaecal (1.5%)
- Pre-ileal (1%)
- Post-ileal (0.5%)

- * Length : 7.5 - 10 cm
- * Appendicular artery → branch of ileocolic artery : end artery
- * McBurney's point : 1/3 distance from (R) Ant. sup. iliac spine to umbilicus

- * Mcc of acute abdomen
Acute appendicitis
- * Mc extra uterine cause of acute abdomen in pregnancy

- * Mc major operation done by a surgeon during training
Emergency appendicectomy

- * Mc major operation done in emergency is
Appendicectomy

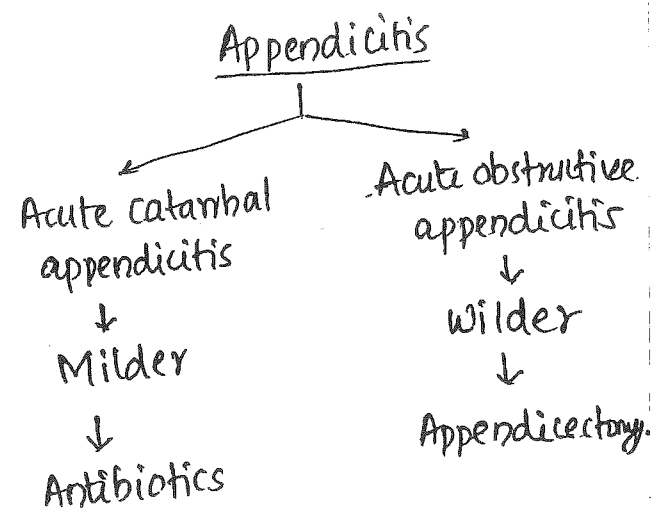
- * Mc major elective operation done
Laparoscopic cholecystectomy.

Acute appendicitis
 * Mcc : Fecolith obstruction → Constipation → ↓ fibre in diet, ↓ fluids, ↑ carbohydrate

- * Other causes:
 - Bacterial (Bacteroides, E. coli)
 - Viral
 - Parasitic - Pinworms
 - Polyp / parasite / tumor

* Most silent appendicitis
Retrocaecal

* Most viral appendicitis
Preileal



* Mc c/f : Pain { Typical
 Atypical

* Typical pain → Periumbilical pain
which shift to R. iliac fossa

* Atypical pain → R. iliac fossa
pain.

* Anorexia - Most constant /
specific symptom
(Aversion to food)

* Nausea, Vomiting.

* Fever - (Not 1st presenting feature)
- Low grade temperature
($< 38.4^{\circ}\text{C}$)

* Clinical approach
(casualty) ↓

Basic resuscitation
(Avoid analgesics initially)

* Pointing sign → Pain path
demonstrated by patient's
index finger

* Clinical examⁿ: Pulse → 80-90
(mild tachycardia) beats/min
Temp. $< 38.4^{\circ}\text{C}$

* Tenderness / Rebound tenderness /
Localised guarding & Rigidity
↓
all in right iliac fossa

* Mc Burney's sign → Pain in
right iliac fossa (RIF)

- Elicited on pressing (LIF)
- Retrocaecal

* Rovsing's sign

- Pain in RIF
- Elicited on pressing LIF
- Paracaecal

* Obturator's sign

- Pain in RIF
- Elicited on internal rotation
of flexed (R) hip
- Pelvic

* Psoas sign

- Pain in RIF
- Elicited on ~~pressing~~ &
hyperextension of (R) hip
- Retro caecal

* Dumphy's sign

- Pain in RIF
- Elicited on coughing
- Any position
preileal

* All these signs helps in deciding site of incision.

* Total leucocyte count (TLC)
11000 - 14000 / cu. mm
(4-11) - mild leucocytosis.

* DLC (Differential leukocyte count)
Polymorphs \uparrow

* No Invⁿ is required.

MANTRELS / ALVARADO score

- Migratory RIF pain (1)
- Anorexia (1)
- Nausea (1) Vomiting (1)
- Tenderness (2)
- Rebound tenderness (1)
- Elevated temp. (1)
- Leucocytosis (2)
- Shift of Neutrophils (1)

Total score : 10

>7 \Rightarrow \uparrow probability of acute appendicitis

* Best Invⁿ : CECT abd

* US abd is required to rule out other differential diagnosis

* MC diff. diagnosis (DD) in children :

Acute gastroenteritis /
Non specific mesenteric ~~ly~~
lymphadenitis

* MC DD in a female

PID / Rupture ectopic pregnancy / Torsion (R) ovarian cyst.

* MC DD in male :

(R) mid ureteric stone

* MC DD in elderly

Diverticulitis of colon.

* Rx :

- Rx DC in acute appendicitis
Emergency appendicectomy

1) Mc Burney's incision
(Grid Iron Incision)

\hookrightarrow Muscle splitting incision.

2) Rutherford Morrison incision
Muscle cutting incision,
can be extended upwards
laterally.

3) Lanz incision

Cosmetic, \uparrow , along
Langer's line

4) Laparoscopic -
Standard 3 port
Laparoscopy.

* MC early complication of
appendicectomy -
Wound infection
(> 4-5 days of operation)

* MC late complication of
appendicectomy
Adhesive intestinal
obstruction.

* MC nerve injured in appendicectomy
Iliohypogastric.

* Appendicular abscess →
Extraperitoneal drainage

Appendicular mass



MC Rx OC: Conservative Rx -
Ochsner Sherren regime
(i.v fluids, i.v antibiotics)



Successful



Discharge, advice - ↑ fibre,
fluids in diet

Interval Appendicectomy
not required now.

* If conservative Rx / Ochsner
Sherren regime fails (OSR)



Pulse ↑↑, temperature ↑↑

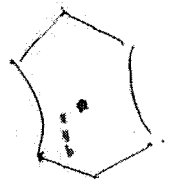
Abandon OSR



Operative Rx



(R) lower paramedian
incision (laparotomy)
+ Peritoneal lavage +
Drainage ± Appendicectomy



Tumors in Intestine

Polyps:

- 1) Inflammatory
- 2) Hyperplastic (metaplastic) - MC
- 3) Hamartomatous
- 4) Adenomatous

a) Tubular 10% (least)

b) Tubulovillous 15%

c) Villous 10%

(most malignant)

Juvenile polyp:

[Juvenile < 18 yrs age]

- * Also k/a cherry tumor
- * Mcc of bleeding per rectum in children.
- * If asymptomatic → No Rx.
- * If symp. → Polypectomy
- * Not associated \bar{c} carcinoma

Villous adenoma

- * Mc - Rectum
- * Associated \bar{c} profuse mucous discharge (Hypoproteinemia, hypokalemia)
- * ↑↑ risk of cancer
- * Rx: TEM (Transanal endo microsurgery)

Familial hamartomatous polyposis

- * Also k/a Peutz Jegher's syndrome.
- * Multiple Juvenile polyps in intestine + Melanin pigmentation of lips, oral mucosa, hands, forearm (characteristic)

- * Autosomal dominant
- * Associated \bar{c} STK 11 gene situated on 19th chromosome
- * Usually not associated \bar{c} malignancy. (if juvenile polyp in option - ans: that)

Familial adenomatous polyposis:

- * Multiple adenomatous polyps usually in the colon (>100 adenoma are diagnostic)
- * Autosomal dominant associated \bar{c} mutation in APC gene.
- * In 50% cases → Congenital hypertrophy of retinal pigment epithelium.
- * Associated \bar{c} Gardner's syndrome (familial adenomatous polyposis + Desmoid tumor + Epidermoid cyst)

[Desmoid tumor → arises from muscles/aponeurosis → Mc in ♀ in ant. abd wall → sarcomatous (no LN) → Rx is wide excision, no LN resection]

* Associated \bar{E} Turcot's syndrome
(FAP + Brain tumors)

* Familial, \uparrow risk of malignancy

* Screening DOC: Gene testing (APC)
Flexible sigmoidoscopy

* Bleeding per rectal

* DOC: Colonoscopy - >100
Adenomas

* Rx: Resection & Anastomosis

* If entire colon is involved
 \rightarrow Total colectomy +
Ileorectal anastomosis

* If rectum & entire colon
involved \rightarrow Total proctocolectomy
+ Ileostomy or Ileal
pouch anastomosis.

Colon cancer

* MC site: Rectosigmoid
(reservoir \rightarrow stores fecal
matter \rightarrow \uparrow exposure to toxin)

+ Rectum $\rightarrow 38\%$
Sigmoid colon $\rightarrow 21\%$ } 59%

* MC is adenocarcinoma.

Risk factor

* Diet \rightarrow \uparrow Animal fat, red
meat, canned foods,
 \downarrow fibres

* Smoking

* Alcohol

* Familial adenomatous polyposis,
Adenomatous polyp, Gardner's
syndrome, Turcot's syndrome.

* Genetic \Rightarrow

- APC gene mutation
- Activation of K-ras
- Microsatellite instability

* Radiation

* Inflammatory bowel disease

* Cholecystectomy (\downarrow fat digestion,
 \uparrow bile acid & B. salt comes here)

* Ureterosigmoidostomy

Pathogenesis

* (R) colon cancer - Ulcerative

* (L) colon Ca - Annular

C/F

* (R) colon Ca - Bleeding, anemia,
Hematochezia (Bld + Mucus
in stool)

* (L) colon Ca → Intestinal obstruction

Rectal cancer

- * MC c/f - Bleeding per rectal
- * Alternating constipation/diarrhea.
- * Tenesmus - Irritation feeling
- * Spurious diarrhea - early morning mucus diarrhea

Spread of Colon Ca

- * Local ⇒ Mucosa → Submucosa → Muscularis → Serosa → adjacent organs
- * Lymphatics ⇒ Epicolic, Pericolic, Intermediate & principal LN (Inf-mesenteric LN)
- * Blood ⇒ Liver
- * LN staging on the basis of no. of LN involved.
- * IOC: Colonoscopy + Biopsy
- * Staging IOC: CECT abd.
- * PET scan
- * Tumor marker: Serum carcino embryonic Ag (CEA)

• Virtual colonoscopy - 3D reconstruction of CT scan images.

* Rx

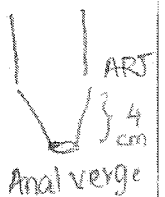
- Sx → Best curative option.
- CTh → 5 FU, Levamisole
- RTh (X)
- Sx → (R)/(L) hemicolectomy

* Sx Rx for rectal cancer -
Margin of resection to be taken = 2 cm.

* Sx Rx IOC: Ant. resection of rectum.

* If rectal ca is situated \bar{e} in 2 cm of anorectal junction
→ Endoscopic circular stapler sphincter saving Sx

↓
If not possible, \bar{e} , if can't preserve AR junction, remove both anus & rectum



↓
Abdomino Perineal resection
 \bar{e} permanent sigmoid colostomy



* Cancer anal canal →

Squamous cell carcinoma,
HPV (Human Papilloma Virus)

Rx OC → chemo radiation

↓

~~No~~ Nigro regime

* If tumor persists even
after chemo radio

↓

Abdominal perineal resection

⊖ permanent sigmoidocolostomy

⇒ MCC of death in colon cancer
Distant metastasis

⇒ Prognosis depends on the

- 1) Pathological staging
- 2) LN status

(Areas near natural openings: HPV)

Rectal prolapse

Risk factors

- * ↑ in intra-abdominal pressure
→ constipation.
- * Weakness of pelvic floor

Types

- 1) Partial - Only mucosa of rectum
protrude outside the
anal verge.
- 2) Complete - All layers protrude
outside the anal verge
 - Usually > 4cm in length
 - Also k/a Hernia engligssade

Rx.

* Children ⇒ Digital repositioning
(Non-operative) × 6 weeks

* Adult ⇒ Resection Rectopexy
(Abdominal operation)

* Elderly ⇒ Thiersch wiring -
perineal operation

[Digital repositioning → using
finger introduce a tissue paper
by pushing the rectum inside]

• Resection rectopexy → a polyene mesh is introduced b/w the re-positioned rectum & sacrum → attach it → inflammation, fibrosis → thus rectum wont come down again)

• Thiersh wiring → push the rectum back to \odot position & reduce anal opening size by suturing it.

* Painful 5 day self limiting disease → Thrombosed external hemorrhoids.

Grading of internal hemorrhoids

* 1st degree → Mass does not protrude outside the anal verge. But it should be symptomatic

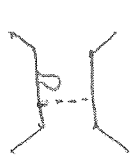
* 2nd degree → Mass protrude outside the anal verge at straining, goes back spontaneously.

* 3rd degree → Mass protrude outside the anal verge ~~doe~~ at straining, does not go back spontaneously has to be repositioned manually

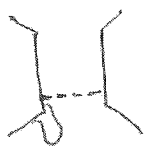
* 4th degree → Mass permanently prolapsed outside anal verge

Hemorrhoids (Piles)

* Abnormal anal cushions which may protrude outside the anal verge.



Internal → Above dentate line, painless, sup. hemorrhoidal plexus of veins



External → Below dentate line, painful, inf. HP of veins



Interocutaneous → Communicating, painful

• Principal / Earliest / MC symptom Bleeding per rectum like a splash in the pan.

* Internal hemorrhoids are located at 3, 7, 11 o'clock position

• Doc: Proctoscopy



Note:

- * Colonoscopy → see upto 160 cm
- * Flexible sigmoidoscopy → 60 cm
- * Rigid sigmoidoscopy → 18 cm
- * Proctoscopy → 12 cm
- * Digital rectal examination - 6-8 cm.

Rx:

- * 1° → Injection sclerotherapy
 - Sclerosing agent: 5% Phenol in Almond oil
 - Injected at the apex of mass.
- * 2° → Banding - Band applied at the base of mass.
- * 3°/4° → Hemorrhoidectomy.

* Other modalities:

- THD → Transanal hemorrhoidal dearterialization.
 - ↓
 - done by using a Doppler probe.

~~Stapler anopexy~~ →

- Stapler Anopexy → Circular stapler gun → Procedure for prolapsed hemorrhoids

Anorectal abscess

- * MC → Perianal abscess
- * MCC → Infection in anal gland.

- * Rx → Incision & Drainage + Antibiotics

- * Cruciate incision (diamond shaped)



Fistula in ano



- * Abnormal communication b/w
 - Perianal skin
 - Anal canal / Rectum

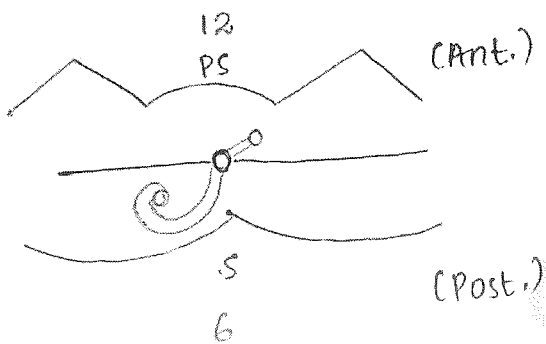
- * MCC → Idiopathic
 - Rupture of anorectal abscess
 - Crohn's ds / TB

* MC type - intersphincteric

* Goodall's rule → suggests

MCB

- Anterior fistula is direct & straight track
- Posterior fistula is indirect & curved track open in midline posteriorly.



* IOC : MR fistulogram

* Rx :

- Fistulotomy
- Fistulectomy
- Seton placement → To preserve the anal sphincter (seton is prolene thread → place it → inflam. → fibrosis → closed)



used in immunocompromised
- AIDS patients.

Pilonidal sinus

- * Jeep driver bottom disease
- * Prolonged sitting
- * 20-29 yr
- * 4 times MC in O →
- * Hairy gluteal skin
- * MC CF → Serous discharge from skin opening

* IOC : Sinogram

* RxOC : Bascom's plastic reconstruction

- + Lord's operation also done
 - Excision of multiple sinuses & pits

(Bascom's → flap of soft tissue from area nearby is used to close the resected part)

Anal fissure



Laceration of anal canal just proximal to anal verge distal to dentate line

- * Midline
- * Posteriorly

- * At 6'o clock position
- * Usually asso. \bar{c} narrow anal opening
- * Constipated
- * Extremely painful
- * Bleeding - Longitudinal streak of blood on post. aspect of stool.

- * IOC: Inspection only
 - Patient does not allow digital rectal examination
 - Sentinel skin tag which guards a chronic anal fissure.

- * RxOC: Conservative.
 - Sitz bath twice a day (plain lukewarm water \rightarrow to relax anal sphincter. Don't put betadine or anything in that water)
 - Muscle relaxant creams
 - Diltiazem (twice a day)
 - Nitroglycerine (4 times a day)
 - Stool softeners.

- * If conservative Rx fails then

\downarrow

Sx: SxRxOC: Lateral sphincterotomy

- Also can do Internal sphincterotomy
- Lord's 4-8 finger anal dilatation
 - obsolete
 - Faecal incontinence

