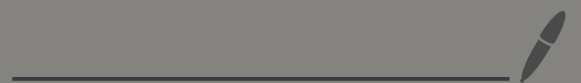
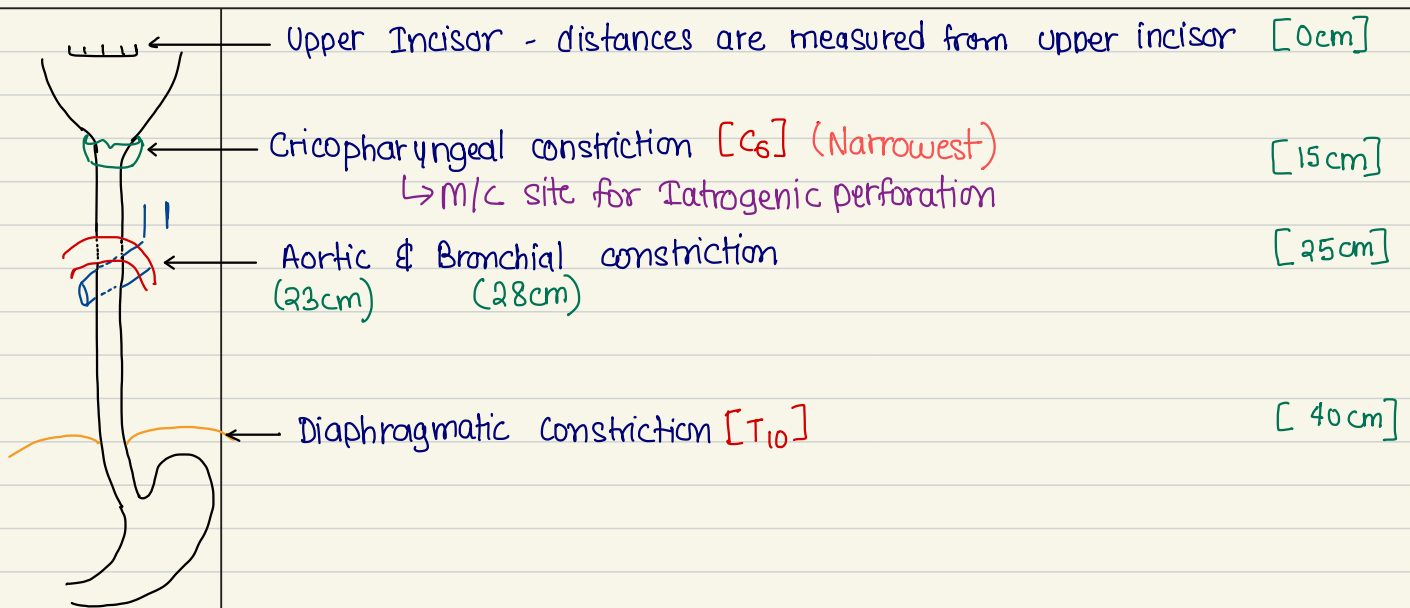


Oesophagus



Anatomy



- Oesophagus
 - Extent - Inferior border of cricoid cartilage [C₆] to Cardiac opening of stomach [T₁₁]
 - Length - About 25 cm
 - Constrictions -
 - ① Pharyngo-oesophageal junction
 - ② Super mediastinum - Arch of aorta
 - ③ Posterior mediastinum - Left main bronchus
 - ④ Oesophageal hiatus of diaphragm.

• Diaphragmatic Openings

T ₈	10EQQ ₃	AT12
↓	↓	↓
T ₈	T ₁₀	T ₁₂
↓	↓	↓
• Ivc	• Esophagus	• Aorta
• Phrenic N.	• Vagus	• Thoracic duct
	• Lt. Gastric Artery	

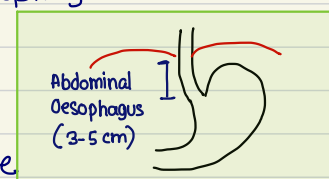
• Sphincters

• Upper oesophageal Sphincter

- Anatomy & physiological entity
- Principle muscle is Cricopharyngeal part of Inferior Constrictor muscle
- Normally closed → Protective against
 - Regurgitation
 - Air entry in esophagus (Except small amount that enters during swallowing)

• Lower oesophageal Sphincter

- Physiological sphincter
- Zone of relatively high pressure in lower oesophagus
- Length = 3-4 cm
- Pressure = 10-25 mmHg
- Remains in tonic state of contraction
- Relaxes ① In response to primary peristaltic wave
 - ② Burping & vomiting
- Relaxes too frequently - GERD
- Does not relax - Achalasia cardia.
- ✱ Presence of physiological sphincter was demonstrated by **Code** using manometry with water balloons.



• Blood Supply

• Segmental

Segment	Arteries	Veins
• Cervical	Inferior thyroid	Inferior thyroid
• Thoracic	Descending thoracic aorta Bronchial arteries	Azygous veins Hemiazygous veins
• Abdominal	Inferior Phrenic Left gastric	Inferior Phrenic Left gastric (Coronary vein) ↓ drains into portal vein

• Lymphatics

Longitudinal lymphatic spread

↳ skip metastasis of cancer may be seen

Histology

① Mucosa

Shows folds which disappear when distended

a) Epithelium Non keratinised stratified squamous epithelium.

b) Lamina propria

c) Muscularis mucosa

{ Consist of longitudinal fibres
{ Poorly developed in upper esophagus
{ Thickest at oesophago gastric junction.

② Submucosa

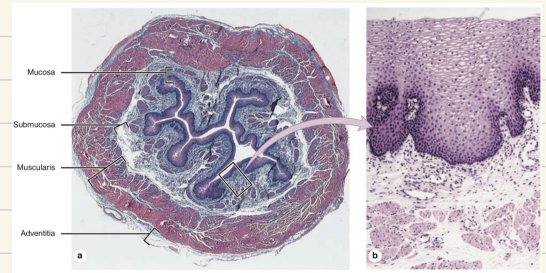
Contains compound tubuloalveolar mucous glands.

③ Muscularis Externa

a) Circular muscle layer

b) longitudinal muscle layer.

- Upper $\frac{1}{3}$ - Striated muscles
- Middle $\frac{1}{3}$ - mixed
- Lower $\frac{1}{3}$ - Smooth muscles



④ Adventitia

No serosa

Peristaltic Waves

• Primary

- Coordinated oesophageal contraction wave that follows a conscious swallow.
- Pushes food down & carries saliva with high bicarbonate content to neutralise gastric acid.

• Secondary

- Normal reflex preceded by a conscious swallow.
- Aids primary peristalsis in propulsion.

• Tertiary

- Non propulsive contractions.
- Generated between meals.

• Manometry

- Used to assess speed & amplitude of oesophageal body contractions.
- Also used to ensure that peristalsis is propagated down entire length of oesophagus.

Gastro-Oesophageal Reflux Disease (GERD/GORD)

• factor that prevent reflux:

① Length of intraabdominal oesophagus. (m/I factor)

② Angle of His - Gastro-oesophageal angle.

③ Pinching effect of Right diaphragmatic crura.

④ Arrangement of gastric mucosal folds. (Least contribution)

• GERD develops when

a) Intra abdominal oesophagus length $< 2\text{cm}$

b) Pressure in LOS $< 6\text{mmHg}$

• Earliest physiological Indicator - Increase in transient LOS relaxation.

• C/F

• Classical triad -

- Retrosternal burning sensation (Heartburn)
- Epigastric pain
- Regurgitation

- Bad taste in mouth
- Pharyngitis, Laryngitis
- Dental caries

Dx

- IOC - Endoscopy

- Gold standard - 24 hour pH monitoring

• 24 Hour pH monitoring

- Indications $\left\{ \begin{array}{l} \text{Endoscopy is inconclusive} \\ \text{patient has been planned for surgery} \end{array} \right.$

- pH probe is kept 5 cm proximal to gastro-oesophageal junction.

↓

pH < 4 for more than 4% time in 24 hrs period

→ indicative of GERD.

- Scoring System - Johnson - DeMeester

→ DeMeester score of > 14.7 - GERD

✱ Wireless pH monitoring method - Bravo 24

• Complications of GERD

- Shortening of Oesophagus → Collis gastroplasty
- Stricture → Day case dilatation & PPIs
- Barrett's Oesophagus
- Increased risk of Cancer

• Mx

Lifestyle changes

- Avoid food items that ↓ LOS pressure
 - fried / spicy food
 - Chocolates
 - Tea / Coffee
 - Citrus fruits
 - Mints
 - Carbonated drinks
- Ensure adequate protein intake.
- Avoid smoking and alcohol
- Take small and frequent meals (Avoid large meals)
- Meals should be taken at least 2 hrs before going to bed
- Modest degree of head tilt up of bed. (Additional pillows ineffective)
- Weight loss

• Medical Mx

- H₂ receptor antagonists
- Proton pump inhibitors - most effective medical Rx
- Prokinetics

• Endoscopic

- ① Endoscopic injection of submucosal polymers around LOS to tighten sphincter. (High recurrence rates)
- ② Radio frequency ablation to the level of sphincter.
↳ only effective long term endoscopic Rx.
- ③ Endoscopic suturing devices that plicate gastric mucosa just below cardia to accenuate angle of His.
- ④ Linx device - magnetic beads around oesophagus.

Surgery

Fundoplication

Indications

- ① Medical management fails
- ② Complications
- ③ GERD associated with hiatal hernia.

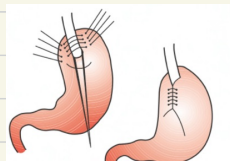
Principles

- ① Restore adequate intraabdominal oesophagus length (min-3cms)
- ② Tighten diaphragmatic crura around oesophagus
- ③ Wrap fundus around oesophagus (Shoe Shine Manoeuvre)

Types

- ① Total Fundoplication - Nissen's technique (360° wrapping)

- Most durable repair in terms of long term reflux control.
- Complications - M/C intraoperative - Pneumothorax

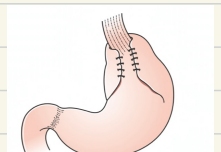


m/c overall - Gas bloat Syndrome
↳ Not seen in

Partial wraps
Floppy nissen's

- ② Partial Fundoplication

- Watson - 90° anterior
- Dor - 180° anterior
- Belsey Mark operation - 270° anterior
- Toupet - 180°-270° posterior →

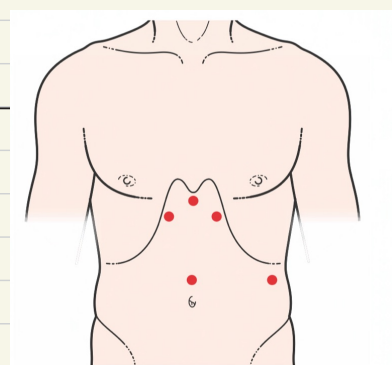


Complications

- Recurrent reflux
- Persistent dysphagia - due to
 - ① too tight wrap
 - ② Slipping of wrap
 - ③ Hiatal fibrosis

Laparoscopic Sx

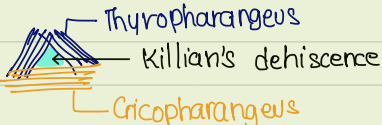
5 cannula ports used.



Barrett's Oesophagus

• <u>Pathology</u>	Metaplasia of lining mucosa of oesophagus (lower oesophagus) ↳ Stratified squamous epithelium → Simple columnar epithelium.
• <u>Aetiology</u>	Long standing GERD.
• <u>Hallmark Feature</u>	Presence of Goblet cells (Intestinal metaplasia)
• <u>C/f</u>	• Asymptomatic • Should be suspected in long term GERD patients.
• <u>Dx</u>	Endoscopic biopsy ↳ Multiple biopsies taken from typical red velvety mucosa. Dx → Endoscopic biopsy ↓ Multiple Biopsies taken from typical red velvety mucosa
• <u>Types</u>	a) Long segment - >3cms b) Short segment - <3cms c) Cardia metaplasia/microscopic - Diagnosed using Chromoendoscopy ↳ Stains used [Lugol's iodine - Squamous epithelium methylene blue - Barrett's / Adenocarcinoma
• <u>Complications</u>	Increased risk for adenocarcinoma
• <u>Mx</u>	PPIs + Seattle Protocol ↳ yearly endoscopic surveillance & biopsy Barrett's ↓ Continue with same protocol Dysplasia ↓ Ablate abnormal mucosa ① Argon Photocoagulation ② Radiofrequency ablation ↓ If dysplasia was Low grade ↓ 6month endoscopy protocol High grade ↓ 3month endoscopy protocol Cancer ↓ Surgery ↓ Oesophagectomy

Oesophageal Diverticula

① Upper Oesophageal	<u>Zenker's Diverticulum</u> - It is a pulsion pseudodiverticulum through the Killian's dehiscence Position { Initially - Midline posteriorly { Later - Left of midline • Killian's dehiscence - Potential space b/w oblique fibres (Thyropharyngeus) and horizontal fibre (Cricopharyngeus) of inferior pharyngeal constrictor.  - Formation of diverticulum involves loss of coordination b/w pharyngeal contraction & opening of upper sphincter leading to pulsion. - Generally occur after 4th decade of life. • <u>C/F</u> - Pouch fills with food leading to regurgitation on lying down ↳ Earliest manifestation. - Halitosis - Intermittent dysphagia - Aspiration & choking • <u>Complications</u> - Aspiration pneumonitis [m/c] - Lung abscess Risk of cancer [0.5%] • <u>Dx</u> Barium Swallow • <u>Mx</u> - Small diverticulum (<2cm) - Cricopharyngeal myotomy (or) Inj. Botulinum toxin 2-4 cm $\Rightarrow$ Myotomy + Endoscopic Diverticulopexy or Endoscopic Diverticulo-oesophagostomy - If diverticulum too large to perform endoscopic - Diverticulectomy
• <u>Endoscopic Diverticulo-oesophagostomy</u>	- Dohlman's procedure Endoscopic division of common wall b/w oesophagus & diverticulum using LASER or a stapler device.
• <u>Diverticulopexy</u>	- diverticulum is sutured in inverted position to the prevertebral fascia using non absorbable suture

② Mid Oesophageal Para Bronchial

Only true diverticulum of oesophagus.

[True diverticula contain all the layers].

- It is a traction diverticulum mostly a consequence of a granulomatous disease (TB, Histoplasmosis)
- Fibrotic healing of lymph nodes exerts traction on esophageal wall & produces an outpouching.
- May form a tracheo-oesophageal fistula.
- Dx - Barium Swallow
- Mx - Diverticulectomy (only if symptomatic)

③ Lower Oesophageal Epiphrenic diverticulum

- Pulsion pseudodiverticulum (only mucosa involved)
- Often asymptomatic.
- mostly due to loss of coordination b/w incoming pressure wave & appropriate relaxation of LOS.
- Mx - Diverticulectomy (If very large or symptomatic).

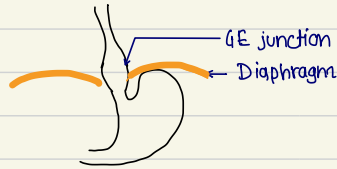
* Diffuse Intramural Pseudodiverticulosis

- Rare condition
- Presence of multiple tiny outpouchings from lumen of oesophagus.
- Pseudodiverticula are dilated excretory ducts of oesophageal sebaceous glands

Hiatal Hernia

• Type I Sliding Hernia (m/c hiatal hernia)

- Cardia or GE junction migrates proximally and herniates through hiatus.



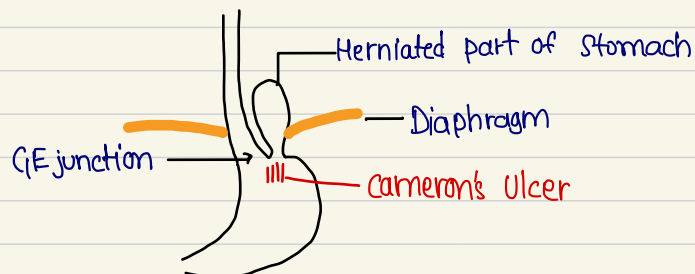
- C/F - Asymptomatic
Symptoms of GERD

- IOC - Traditional - Barium meal
Bailey - CECT with oral contrast

- Mx - Fundoplication (only in patients with GERD symptoms).

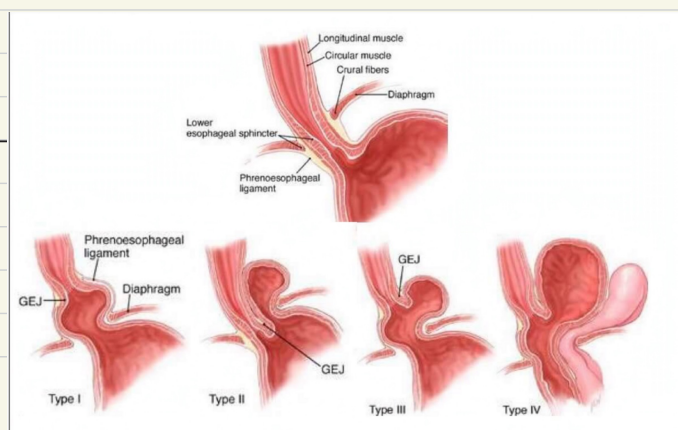
• Type II Rolling Hernia / Paraesophageal Hernia:

- Part of stomach herniates through hiatus.
- True paraesophageal hernias have cardia in normal position.
- Type II hiatal hernias are rare.



- * Cameron's Ulcer - Longitudinal linear ulceration of mucosa of stomach at the site where it is constricted by diaphragm i.e just below herniated portion. (May occur in some case of Rolling hernia).

- As stomach rolls up in chest, there is always an element of rotation (volvulus).



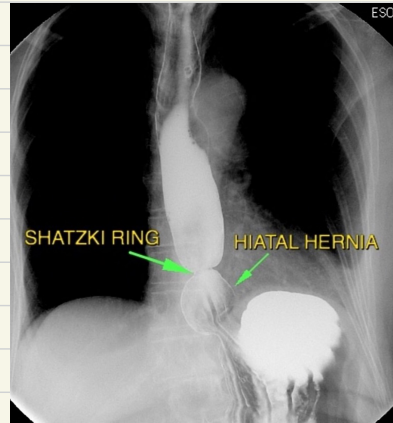
- C/E - Dysphagia
Chest pain due to distension of obstructed stomach.
- * Classically the pain is relieved by a loud belch.
- Complications -
 - ① Strangulation
 - ② Necrosis & gangrene
 - ③ Gastric perforation.
- IOC - Traditional - Barium meal
Bailey - CECT with oral contrast
- Mx - All cases must be treated because complications have high mortality rates.
- Surgery - Abdominal approach
 - ↓
 - Reduction of hernia
 - ↓
 - Excision of sac
 - ↓
 - Tightening of diaphragmatic crura
- * large defect may require mesh reinforcement.
- Type III Mixed paraoesophageal (m/c para oesophageal)
 - Rolling + sliding
- Type IV Paraoesophageal with contents other than stomach (Small intestine, Colon)

most common diaphragmatic hernia - Sliding hernia

most common congenital diaphragmatic hernia - Bochdalek Hernia

Schatzki ring

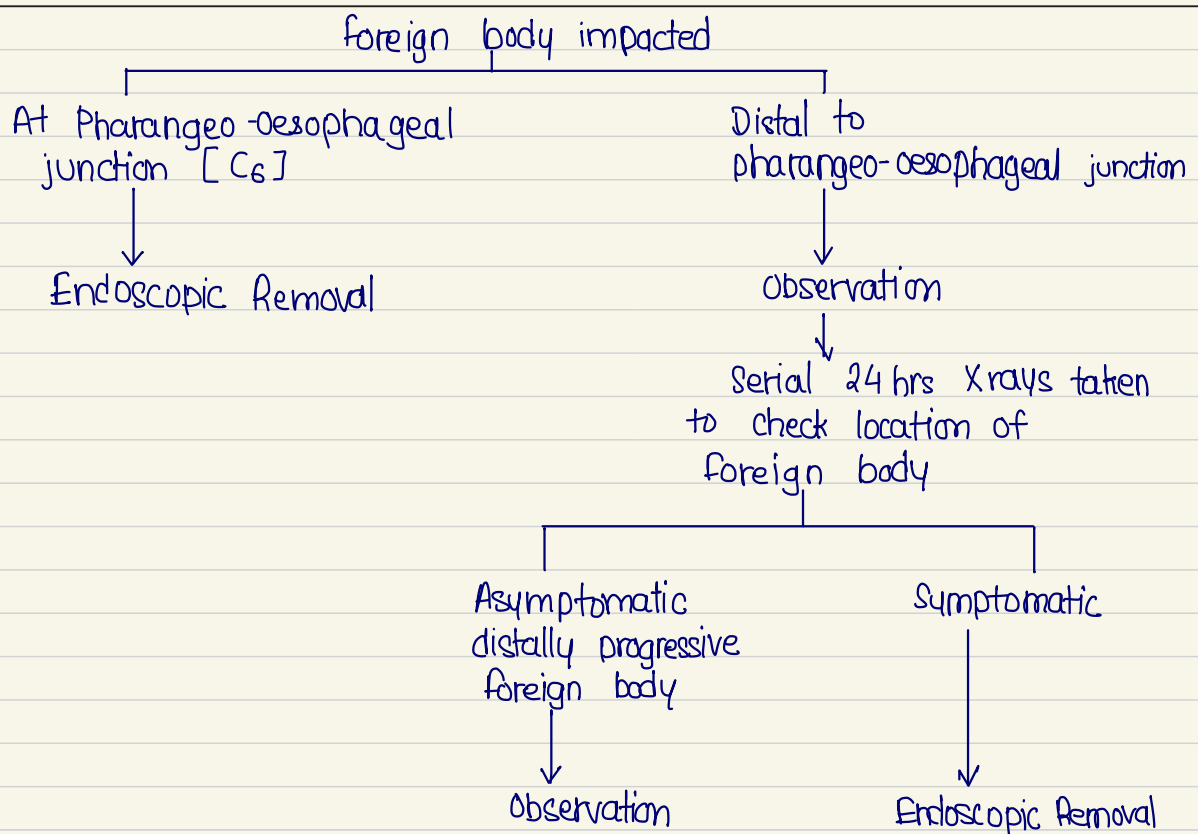
- Benign Condition
- Involves mucosal ring (m/c)
Submucosal ring
- C/E Intermittent dysphagia
- Dx Barium Swallow - 'B' Ring appearance



- mx
 - Asymptomatic - observation
 - Symptomatic - Balloon dilation

- Ring types
- A ring - Proximal limit of vestibule
 - B ring - Schatzki's Ring - at squamo-columnar junction
 - C ring - Distal limit of hiatal hernia.

Foreign Body Ingestion



• Button batteries

- Are corrosive And can cause perforation
- Endoscopic removal must be done in all cases regardless of other factors

Oesophageal Injuries

Corrosive Injuries

due to

Acid

Alkali

- Acid causes coagulation with Eschar formation.

- Ingested in larger quantities because they are odourless.

- This coagulation limits penetration

- Cause deeper penetration due to liquefaction & saponification of fats.

- Also cause gastric damage by induction of intense pylorospasm

Corrosive Injury increases the risk for oesophageal carcinoma.

• Management

- IV fluids. (Not much benefit from prophylactic antibiotics)

- Early skilled Endoscopy (most important)



check extent of damage & plan further management.

• Complication

Stricture formation



Dilatation



Bougie / Balloon



Severe case



Oesophagectomy



Oesophagus replaced by colon / jejunum
(Because stomach may be involved)

Drug induced injury

• <u>most common site</u>	mid oesophagus where it is crossed by aorta
• <u>Risk factors</u>	Consuming inadequate liquids Lying down immediately
• <u>Drugs responsible</u>	Doxycycline Quinidine Phenytoin Bisphosphonates NSAIDs

Oesophageal perforations

• <u>Iatrogenic Perforation</u>	• Most common perforation • Increased risk in : ① Endoscopy of malignant oesophagus ② Rigid endoscopy ③ Therapeutic endoscopy • m/c site - Pharyngo-oesophageal junction		
• <u>C/F</u>	Chest pain / Abdominal pain post endoscopy.		
• <u>Ioc</u>	CECT		
• <u>Mx</u>	<table border="1"> <tr> <td> • Small perforation • No / minimal sepsis • Stable patient • Cervical Oesophagus ↓ Conservative Mx - Nil per oral (NPO) - IV fluids - IV antibiotics - Analgesics </td><td> • Large perforation • Late presentation • Sepsis • Thoracic Oesophagus ↓ Thoracotomy & Perforation repair </td></tr> </table>	• Small perforation • No / minimal sepsis • Stable patient • Cervical Oesophagus ↓ Conservative Mx - Nil per oral (NPO) - IV fluids - IV antibiotics - Analgesics	• Large perforation • Late presentation • Sepsis • Thoracic Oesophagus ↓ Thoracotomy & Perforation repair
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• Boerhaave Syndrome Spontaneous Oesophageal perforation

- Occurs due to forceful vomiting against closed glottis (Barotrauma)
- Common in alcoholics
- **Most serious Oesophageal perforation**
- M/c site - Left posterolateral wall of lower $\frac{1}{3}$ oesophagus
- M/c cause of mortality - **Mediastinitis**

- C/F
- Mackler's triad:
 - ① Retching
 - ② chest pain
 - ③ Subcutaneous Emphysema

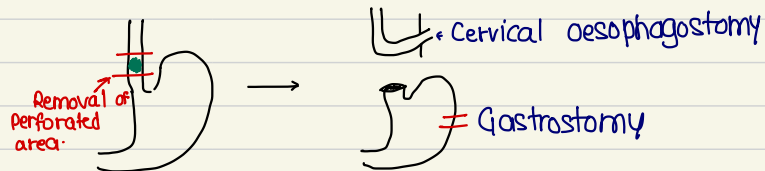
Pneumo mediastinum - Air from oesophagus enters mediastinum
↳ Auscultation - **Hamman's Crunch**

- IOC
- Stable patient - CECT
 - Unstable patient - Contrast Study → Water Soluble contrasts used
 - └ Gastrografin
 - └ Iohexol

- Chest Xray Signs
- ① Continuous diaphragm sign
 - ② Spinnaker sign
 - ③ Ginkgo leaf sign

- Management
- **Early presentation** (within 12 hrs) → **Thoracotomy & repair with Chest tube insertion**
 - minimal Sepsis
 - Stable patient

- **Late presentation** → **Cervical oesophagostomy with Gastrostomy**
 - ↑ sepsis
 - Unstable patient



- Steps-
- ① Perforated area removed
 - ② Proximal end of oesophagus - Cervical Oesophagostomy
 - ③ Distal end of oesophagus - Closed
 - ④ Gastrostomy (for nutrition).

↓
If patient survives ; anastomosis is done after 10-12 weeks

Pathological Perforations

- Due to ulcers, tumors.
- Free perforation into pleural space is rare.
- Erosion to adjacent structure with fistula formation is more common.
 - ↳ m/c - Aerodigestive fistula.
- Erosion into major vessel is fatal

Mallory-Weiss Syndrome

- Due to forceful vigorous vomiting.
It a mucosal tear at cardia rather than a full perforation.
- 90% - Tear below squamo-columnar junction
10% - Oesophageal tear
- C/F
 - Haematemesis - Bleed from Left Gastric Artery
 - Intramural ruptures - Chest pain & odynophagia
- Complication - Intramural Haematoma (Pt. on anticoagulants or Coagulation disorder)
- Dx - Endoscopy
- Mx - Conservative
 - If persistent bleed, angioembolisation or cautery of bleed is done

Motility disorders

Achalasia Cardia

• <u>Aetiology</u>	Failure of relaxation of LOS due to loss of ganglion cells (derived from neural crest) in Myenteric / Auerbach's plexus		
• <u>C/F</u>	• Regurgitation (earliest) • Dysphagia [Initially - more to liquids Later - Solid > liquids] • Halitosis • Aspiration		
• <u>Complications</u>	• Aspiration pneumonia (m/c) • Lung abscess • ↑ Risk for Squamous Cell Carcinoma		
• <u>Forms</u>	• Primary achalasia - due to loss of ganglion cells • Secondary achalasia - Chagas disease (due to Trypanosoma cruzi) • Vigorous achalasia - Rapidly progressive • Pseudoachalasia - due to malignancy • Allgrove Syndrome / Triple A syndrome (Autosomal Recessive) - Achalasia - Alacrima - Adrenal insufficiency due to ACTH resistance		
• <u>Chicago Classification</u>	Based on High Resolution Manometry		
	<u>Type I</u> (Classical)	<u>Type II</u> (with oesophageal compression)	<u>Type III</u> (Spastic)
• <u>IRP</u>	Elevated >15 mmHg	Elevated (>15 mmHg)	Elevated (>15 mmHg)
• <u>Peristalsis</u>	100% failed peristalsis	100% failed peristalsis with Panoesophageal pressurisation in > 20% swallows	No Normal peristalsis Premature spastic contractions in > 20% swallows
Distal Contractile Index (DCI)	< 450 mmHg / sq.cm	Should not be calculated	> 450 mmHg / sq.cm

* IRP - Integrated Relaxation Pressure

- Mean of 4 seconds of maximal swallow induced LOS relaxation.
- Elevated IRP signifies loss of relaxation of LOS.

- Diagnosis

- Barium Swallow - Bird beak appearance



- Gold Standard - **manometry**



Findings

- ① Failure of LOS to relax
- ② Ineffective contraction in body of oesophagus (Aperistalsis)
- ③ LOS pressure > 26 mm Hg (Elevated)

- Mx

- Medical

- Nitrates
- Calcium Channel blockers

- Endoscopic

- Botox (Highest recurrence)
- Balloon dilatation (High risk of perforation)
- NOTES procedure → **POEM**

- **POEM**

Per Oral Endoscopic Myotomy

- ① Endoscope inserted in the inner layer of oesophagus
- ② Cut in mucosa
- ③ Tunnel passed at oesophago-gastric junction.
- ④ Remove circular muscle layer.



LOS relaxes



Mucosa Sutured

* Done for Classical / Type I Achalasia.

- Surgery Laparoscopic Heller's Myotomy
 - ↓
 - Muscle incised 5 cm proximal & 2 cm distal to GE junction
 - ↳ LOS relaxation
- M/C complication- GERD
- * Hence, Heller's myotomy + Partial Anterior fundoplication done
 - ↳ Heller-Dor's Operation

Diffuse Oesophageal Spasm

- New term Distal Oesophageal Spasm
- C/F
 - Chest pain similar to angina (Normal ECG)
 - Dysphagia.
- Investigations
 - Barium swallow
 - ↓
 - Corkscrew appearance or Rosary bead appearance
 - ↓
 - due to spasm of circular muscle
 - Manometry
 - └ ↑ duration of contraction (> 2.5 seconds)
 - └ ↑ amplitude (> 120 mmHg)
 - High Resolution Manometry
 - └ IRP Normal
 - └ DCI > 450 mm Hg/sq cm
- Mx
 - Medical - Nitrate ; CCBs
 - ↓
 - does not respond
 - ↓
 - Myotomy



Nutcracker oesophagus

- most Common motility disorder.

- CLF
 - Dysphagia (M/C)
 - Chest pain

- Investigation
 - Manometry : Pressure >180 mm Hg
Normal peristalsis
Duration of contraction >7 seconds

- Jack Hammer oesophagus
 - variant of Nutcracker
 - New Name - Hyper Contractile Oesophagus.
 - Manometry $\Rightarrow$ Pressure >300 mmHg
 - High Resolution manometry $\Rightarrow$ DCI >8000 mmHg/sqcm

Feline Oesophagus

Presence of linear furrows & multiple corrugated rings in oesophagus.

- Seen in ① GERD [m/c cause of feline oesophagus.
lower $\frac{1}{3}$ of oesophagus affected

② Eosinophilic oesophagitis

- Eosinophilic oesophagitis
 - Idiopathic
 - Seen in children
 - Proximal $\frac{1}{3}$ of oesophagus affected
 - Deep ulcers may lead to strictures
 - Dx - Endoscopy - stacked up mucosa.
 - Mx -
 - Immunotherapy against IL-5
 - Steroids

Oesophageal infections

• <u>Oesophageal Candidiasis</u>	• Associated with oral thrush in immunocompromised patients. • <u>Endoscopy</u>- Shaggy depositions on oesophagus • <u>Barium Swallow</u>- Mucosal deposits ↓ Shaggy appearance / worm like ulcers (similar to varices)
• <u>Cytomegalo virus infection</u>	• Seen post transplant and as a part of Graft versus Host disease. • Classical appearance- Serpiginous / Geographical ulcers.
• <u>Herpes infection</u>	• Associated with Herpes labialis. • Small ulcers with raised margins

Dysphagia Lusoria

• <u>Aetiology</u>	Aberrant Right Subclavian Artery (arises from descending Aorta) ↓ Travels behind oesophagus to supply right upper limbs ↓ Posterior compression of oesophagus
• <u>C/F</u>	Dysphagia
• <u>Dx</u>	• Barium Swallow • Angiography.
• <u>Mx</u>	Reconstruction or ligation of aberrant artery

Neoplasia

Benign

- Leiomyoma

- most common benign tumor of oesophagus.

- more common in males

- Seen in 4-5th decade on mid to distal oesophagus

- C/F

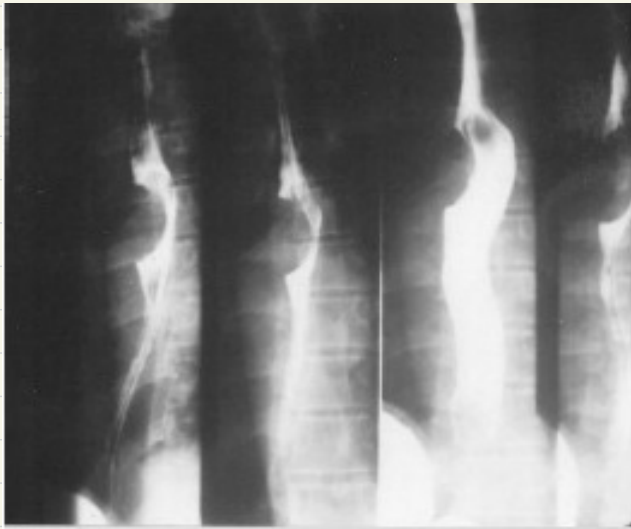
Asymptomatic

Dysphagia

Chest pain

- Dx

Barium Swallow - Punched out / semilunar defect



- Mx

Enucleation

Oesophageal Cancer

	<u>Squamous Cell Carcinoma (SCC)</u>	<u>Adenocarcinoma</u>
	• M/C Oesophageal Ca overall • M/C Oesophageal Ca in India.	• M/C oesophageal Ca in western world
• <u>M/C site</u>	Middle 1/3	Lower 1/3
• <u>Risk factors</u>	• Smoking ; Alcohol • Preservative rich food • Smoked food • Tylosis/Palmoplantar Keratoderma • Zenker's diverticulum • Achalasia Cardia • Vit. E & Selenium deficiency	• Smoking, Alcohol • Obesity • GERD • Barrett's Oesophagus • CREST syndrome (type of scleroderma) ↳ Adenocarcinoma > SCC
• <u>C/F</u>	• Progressive dysphagia (Solids > liquids) (M/C) • Regurgitation /vomiting • Weight loss	
• <u>Advanced signs</u>	• Hoarseness of voice - due to involvement of Recurrent Laryngeal N. • Chronic Cough - due to Malignant Tracheo Oesophageal fistula. • Horner's Syndrome • Chronic Spinal Pain • Diaphragmatic Paralysis.	
• <u>Investigations</u>	• IOC for diagnosis - Endoscopic Biopsy • IOC for staging (Overall) - Positron Emission tomography with CT (PET - CT) ↳ isotope used - FDG - 18 (Fluoro deoxy Glucose) • IOC for TNM staging - Endoscopic Ultrasound (EUS)	



On EUS,

- Mucosal Interface - Hyperechoic (white)
- Muscularis mucosa - Hypoechoic (Black)
- Submucosa - Hyperechoic
- Muscularis propria - Hypoechoic
- Adventitia - Hyperechoic

• Barium Swallow -

Rat tail appearance (Abrupt narrowing)

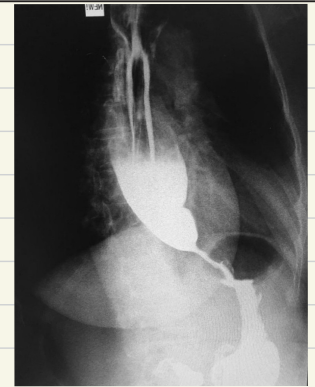
or

Shouldering effect

or

Apple Core Appearance

↳ ALSO seen Ca Colon on barium enema



• Staging (TNM)

Tis	High-grade dysplasia
T1	Tumour invading lamina propria or submucosa
T2	Tumour invading muscularis propria
T3	Tumour invading beyond muscularis propria
T4a	Tumour invading adjacent structures (pleura, pericardium, diaphragm)
T4b	Tumour invading adjacent structures (trachea, bone, aorta)
N0	No lymph node metastases
N1	Lymph node metastases in 1–2 nodes
N2	Lymph nodes metastases in 3–6 nodes
N3	Lymph node metastases in 7 or more lymph nodes
M0	No distant metastases
M1	All other distant metastases
Stage	1A: T1N0M0; 1B: T2N0M0; 2A: T3N0M0; 2B: T1/2N0M0; 3A: T4aN0M0, T3N1M0, T1/2N2M0
Stage	3B: T3N2M0; 3C: T4aN1/2M0, T4bN0–3M0, T1–4N3M0; 4T:1–4N1–3M1

• Grading (Histological)

- G₁ - Well differentiated
- G₂ - Moderately differentiated
- G₃ - Poorly differentiated
- G₄ - Undifferentiated

* m/c site for Metastasis
↳ Liver

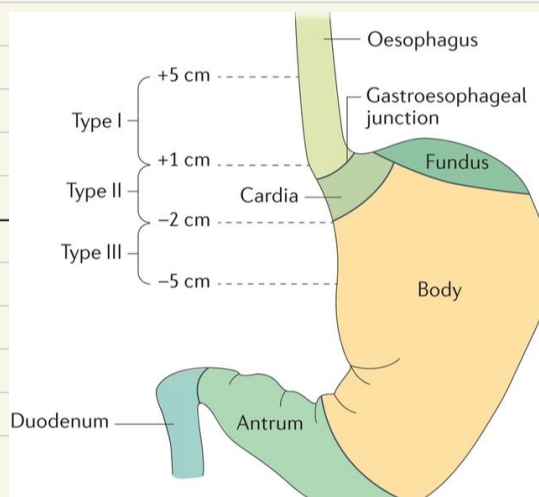
• Siewart Classification

Done for Gastro-oesophageal junction tumors-

• Type I: 5cm proximal to 1cm proximal to GE junction

• Type II: 1cm proximal to 2cm distal to GE junction

• Type III: 2cm distal to 5cm distal to GE junction → Rx for Gastric Ca



- 8th AJCC Update

- T₁ subcategorized as
 - T_{1a} - Tumor invading lamina propria / muscularis mucosa
(Tumor above submucosa → Amenable to Endoscopic Resection)
 - T_{1b} - Tumor invading submucosa.
- T_{4a} - Also includes direct invasion of peritoneum.
- G₄ was eliminated
- Cancers with epicentre within proximal 2 cm from the gastric cardia are staged & managed as Oesophageal Ca.
 - ↳ Siewart type I & type II - Oesophageal Cancer.
- Cancers with epicentre > 2 cm from gastric cardia are staged as Gastric cancers even if oesophagus is involved.
 - ↳ Siewart type III - Gastric Cancer

- Management

Surgery

Oesophagectomy

- margins
 - Proximally - 10 cm
 - Distal - 5 cm

① Transhiatal Orringer's

Orri nger's

- Useful for lesions of lower $\frac{1}{3}$ oesophagus.
- Incisions
 - 1st - midline abdominal
 - 2nd - left Neck (for anastomosis)
- Site of anastomosis - Neck
- No thoracotomy required
- Lymph node in upper and middle mediastinum can't be removed.

• Replacement conduits after Oesophagectomy-

- Best conduit / Most commonly used - Gastric tube

* Blood supply to Gastric conduit is based on

- a) Right Gastroepiploic artery
- b) Right Gastric artery

- Best conduit after benign conditions (acid/alkali injury)
(since stomach may be involved)

↳ Colon (left) or jejunum
[preferred]

* Blood supply to Left colon conduit is based on Lt. Colic Artery

- Preferred route for placement of conduit - Posterior mediastinal (Shortest)

• Chemotherapy

5 Fluorouracil (or) Cisplatin based.

↳ Given in lymph node positive or advanced cancers.

- In advanced cancers (T_3/T_4)- Neoadjuvant Chemotherapy used.

• Radiotherapy

Trials have shown that Chemotherapy + Radiotherapy is better than Chemo or Radiotherapy alone

* Chemoradiation followed by surgical resection maximise chances of survival in advanced cancers.

* Prognostic factors for oesophageal cancer:

- a) T stage of cancer (depth of tumor penetration through oesophageal wall)
- b) Regional Lymph node spread

Malignant Tracheo-Oesophageal Fistula

- Seen in middle $\frac{1}{3}$ rd tumors of oesophagus.
- C/F - Chronic cough.
- Mx - SEMs (Self expanding metallic stent)
- Complications of oesophageal stent
 - ① Migration of stent (m/c complication)
 - ② Dysphagia
 - ③ Tumor ingrowth & overgrowth
 - ④ Chest pain