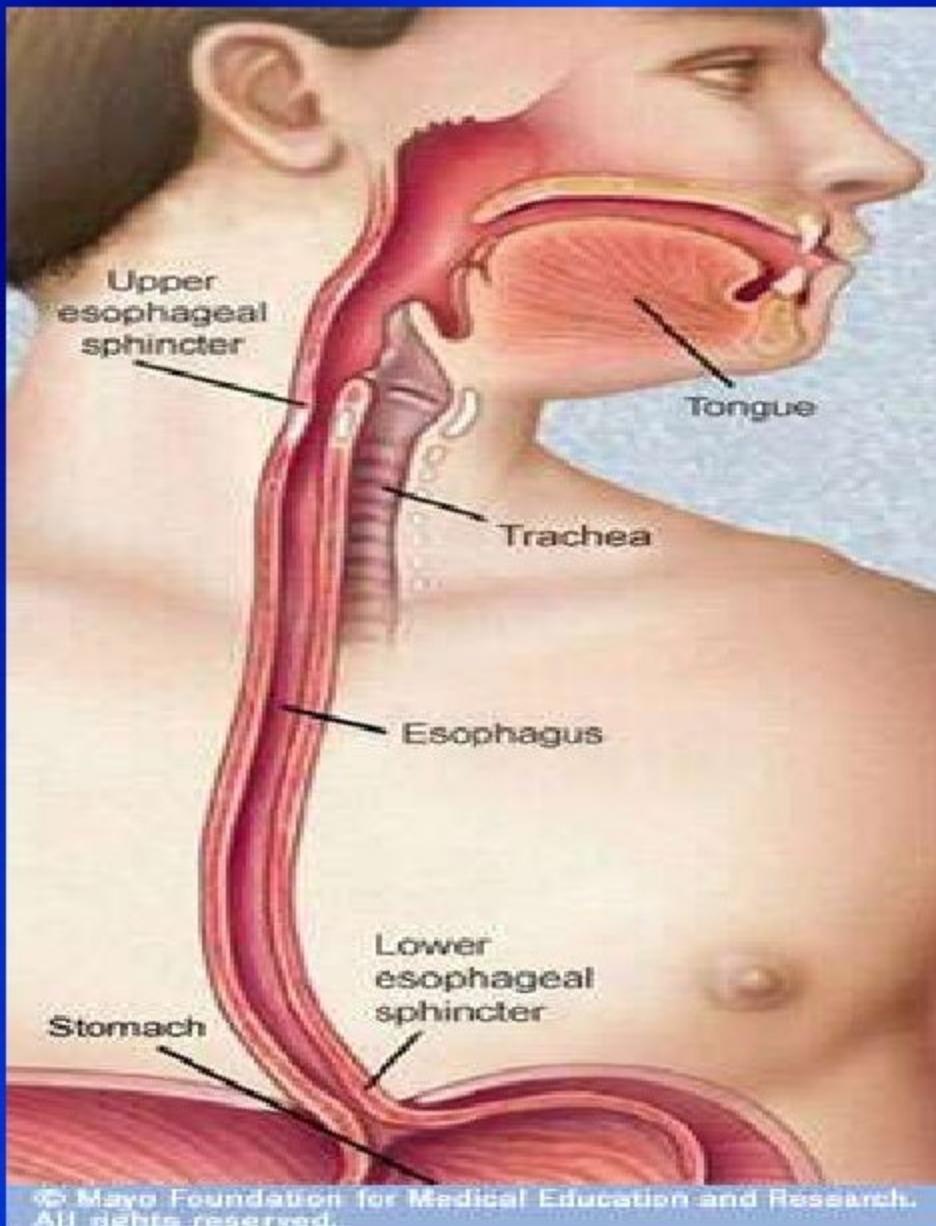


BARIUM SWALLOW

DR.SHAIK FARID
RMMCH

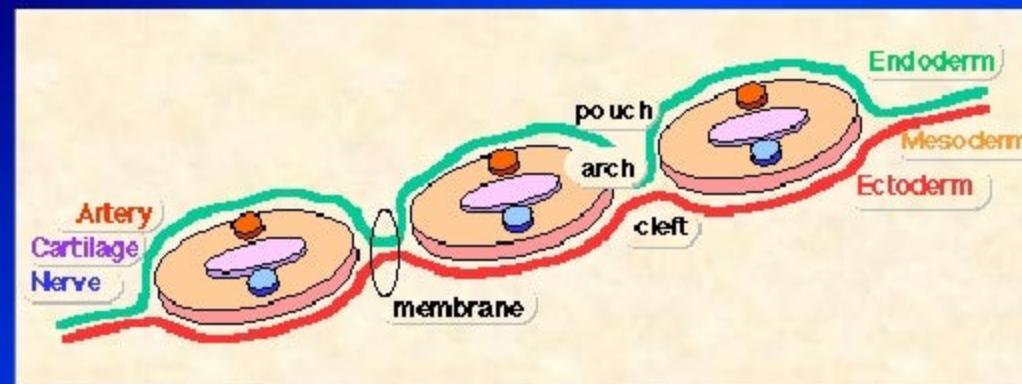
INTRODUCTION



- Barium swallow is a radiological study of pharynx and esophagus upto the level of stomach with the help of contrast.

EMBRYOLOGY OF PHARYNX

- Head & neck structures are derived from pharyngeal arches 1 & 2.
- Each arch contain similar component derived from endoderm, ectoderm & mesoderm.
- The cavity within the pharyngeal arches forms the pharynx.



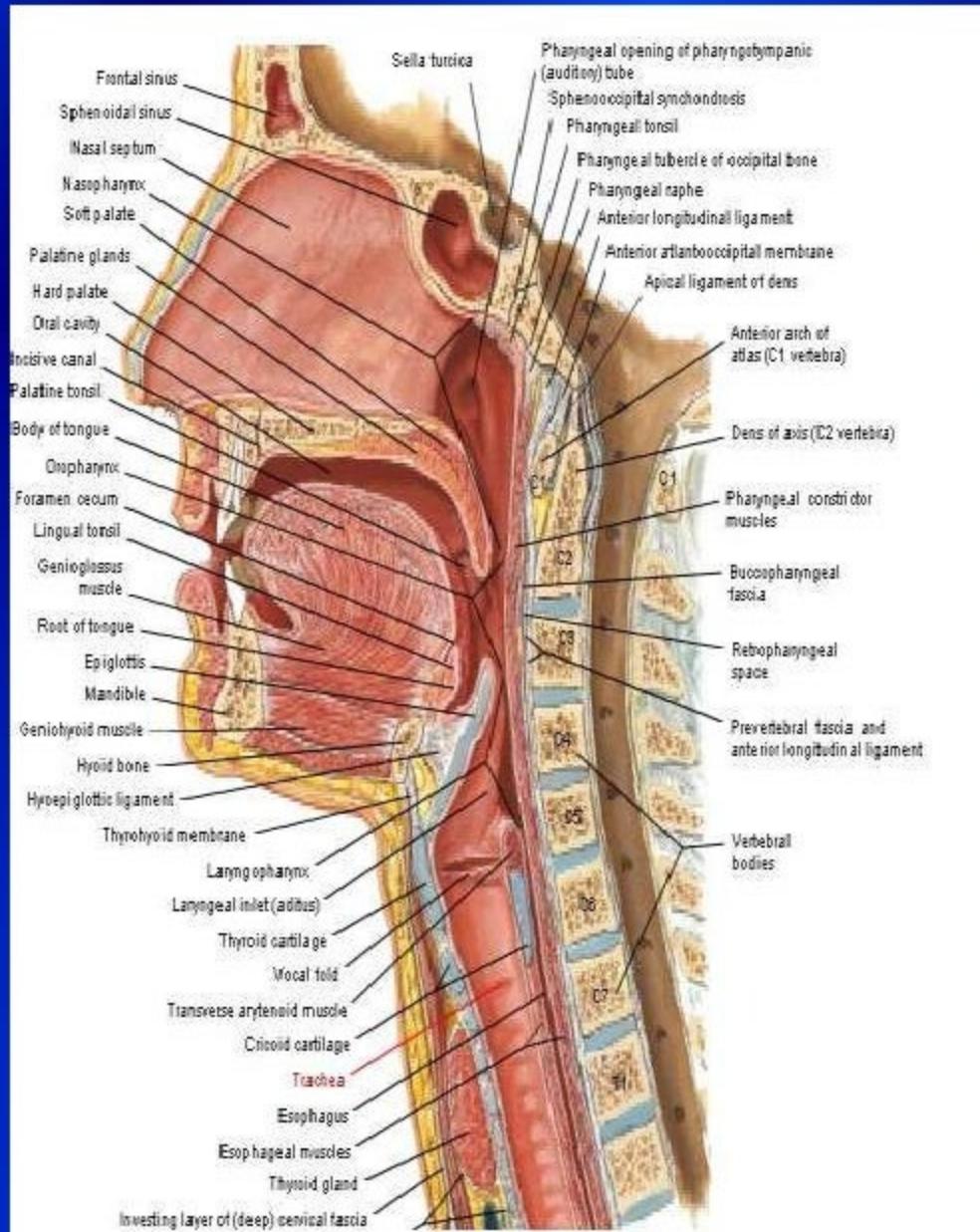
BOUNDRIES OF PHARYNX

- Anteriorly-mouth & nasal choanae
- Superiorly-soft palate & portion of skull
- Inferiorly- postr of tongue
- Posteriorly- pharyngeal constrictors

PARTS

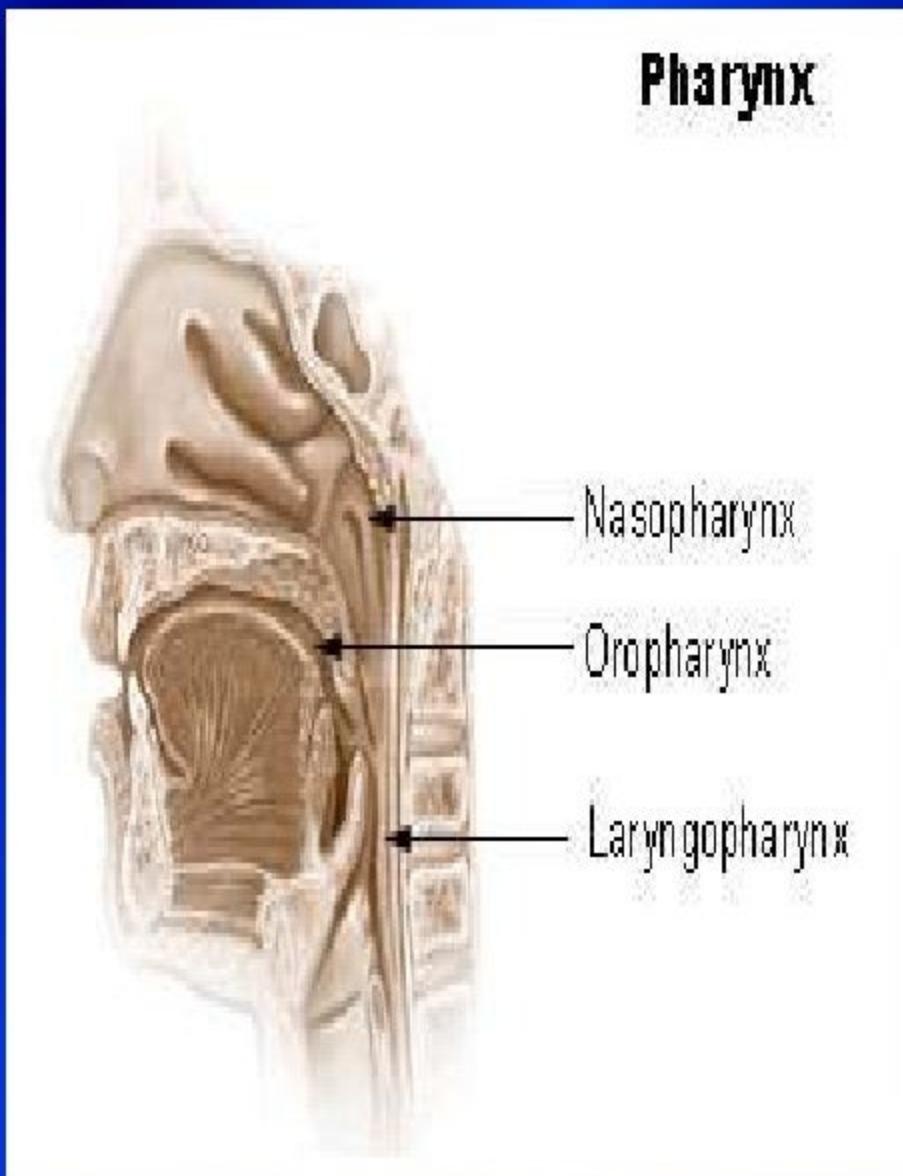
- Naso - ant.pharynx joins nasal cavity
- Oro- midportion of pharynx joins oral cavity
- Hypo-inferior pharynx joins larynx.

NASOPHARYNX



- Lies behind the nasal cavity.
- Postero-superiorly this extends from the level of the junction of the hard and soft palates to the base of skull, laterally to include the fossa of Rosenmuller.
- The inferior wall consists of the superior surface of the soft palate.

OROPHARYNX



- Lies behind the oral cavity.
- The anterior wall - the base of the tongue and the epiglottic valleculae.
- the lateral wall – tonsil, tonsillar fossa, and tonsillar (faucial) pillars;
- the superior wall - inferior surface of the soft palate and the

LARYNGOPHARYNX / HYPOPHARYNX

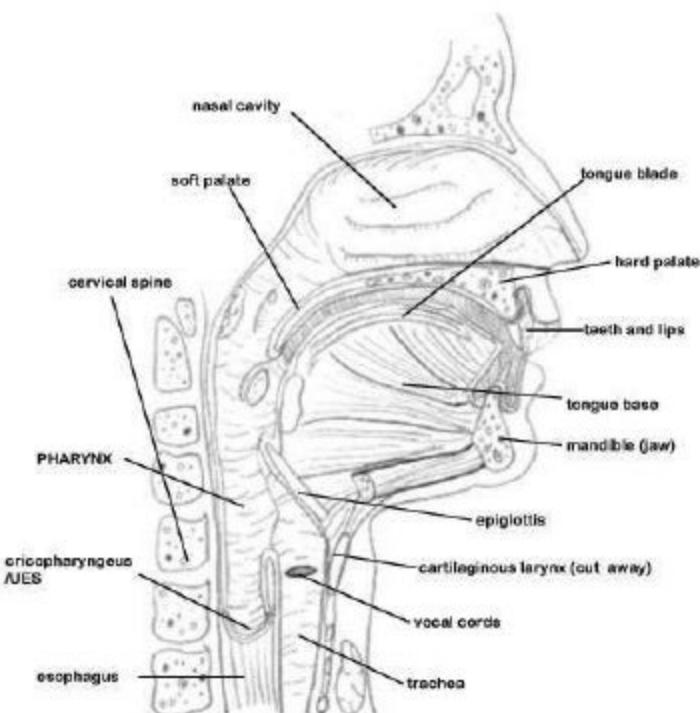


Figure 1—Swallowing Anatomy

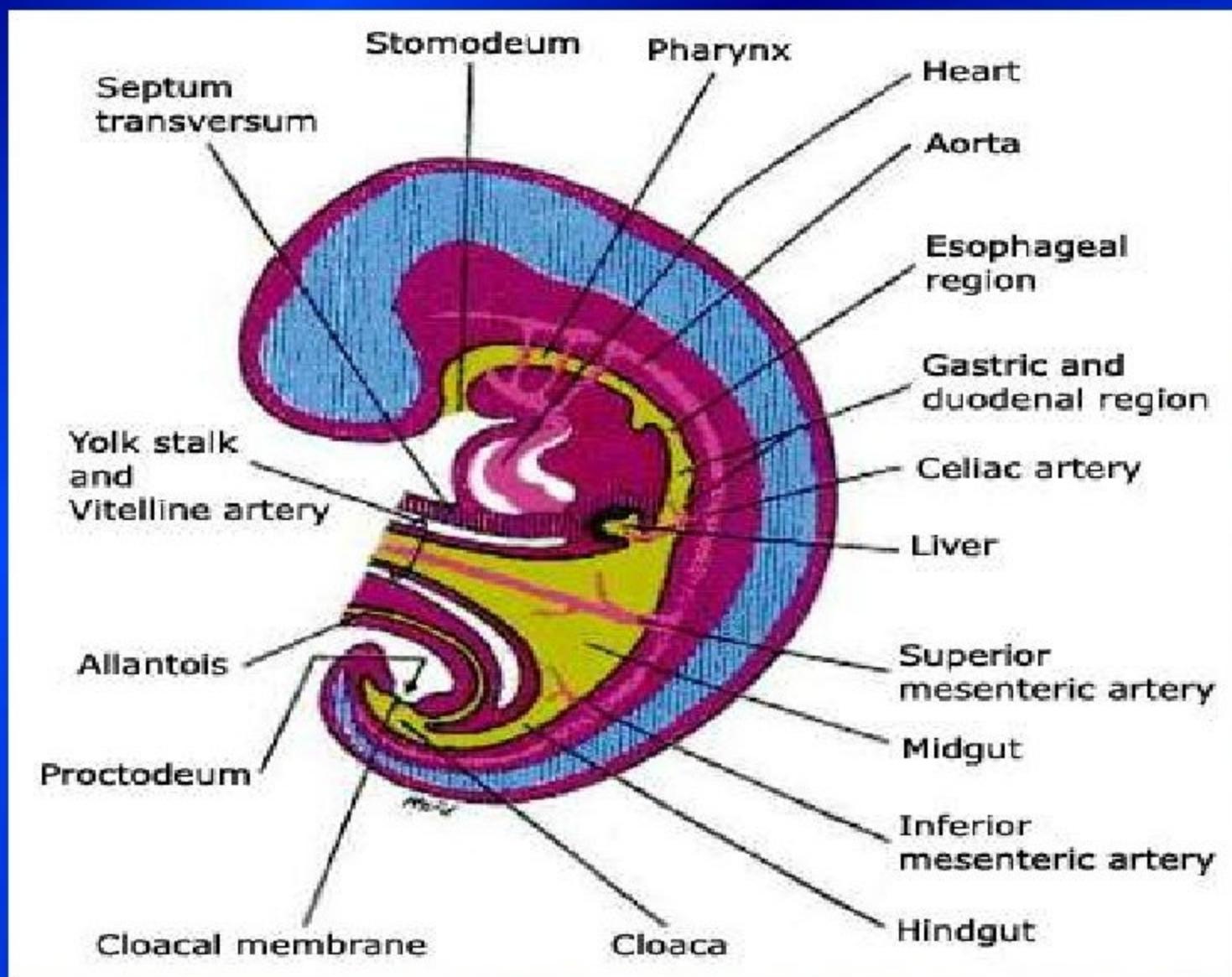
- Levels between C4 to C6, it includes the pharyngoesophageal junction (postcricoid area), the piriform sinus and the posterior pharyngeal wall.
- Lined with a stratified squamous epithelium.
- It lies inferior to the upright epiglottis and extends to the larynx, where the respiratory and digestive pathways diverge.
- At that point, the laryngopharynx is continuous with esophagus posteriorly.

EMBRYOLOGY OF ESOPHAGUS

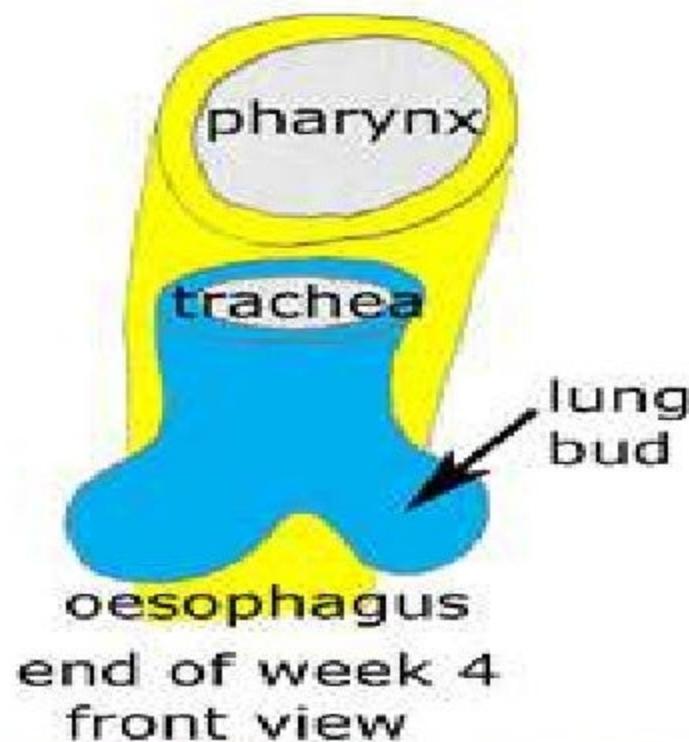
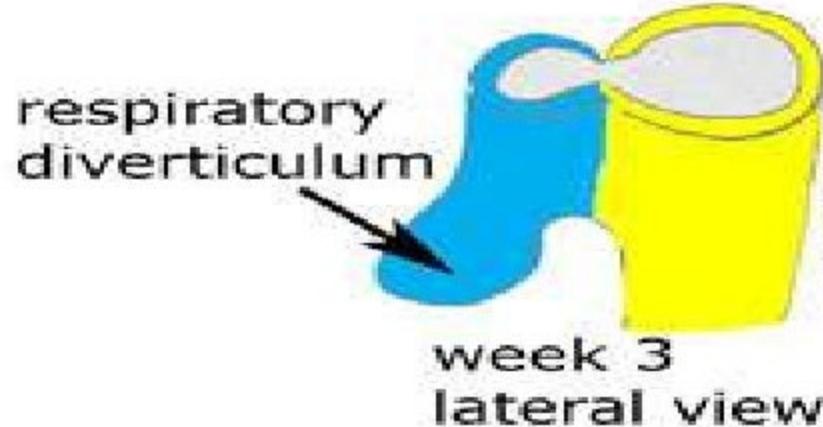
- Primitive gut tube forms during 4th week of gestation.
- It is derived from incorporation of the dorsal part of the definitive yolk sac into embryo due to embryonic folding.

- Primitive gut is divided into foregut, midgut and hindgut.
- Laryngotracheal diverticulum develop in the midline of the ventral wall of the foregut.
- The distal end enlarges to form lung buds, which is separated from the foregut by tracheo-esophageal folds.

Primordial Gut



- Tracheo-esophageal fold fuse in midline to form tracheo-esophageal septum.
- The foregut divide into laryngotracheal tube(larynx,trachea,bronchi & lungs) ventrally and esophagus dorsally.
- Esophagus is initially short ,but lengthens with descent of heart and lungs.

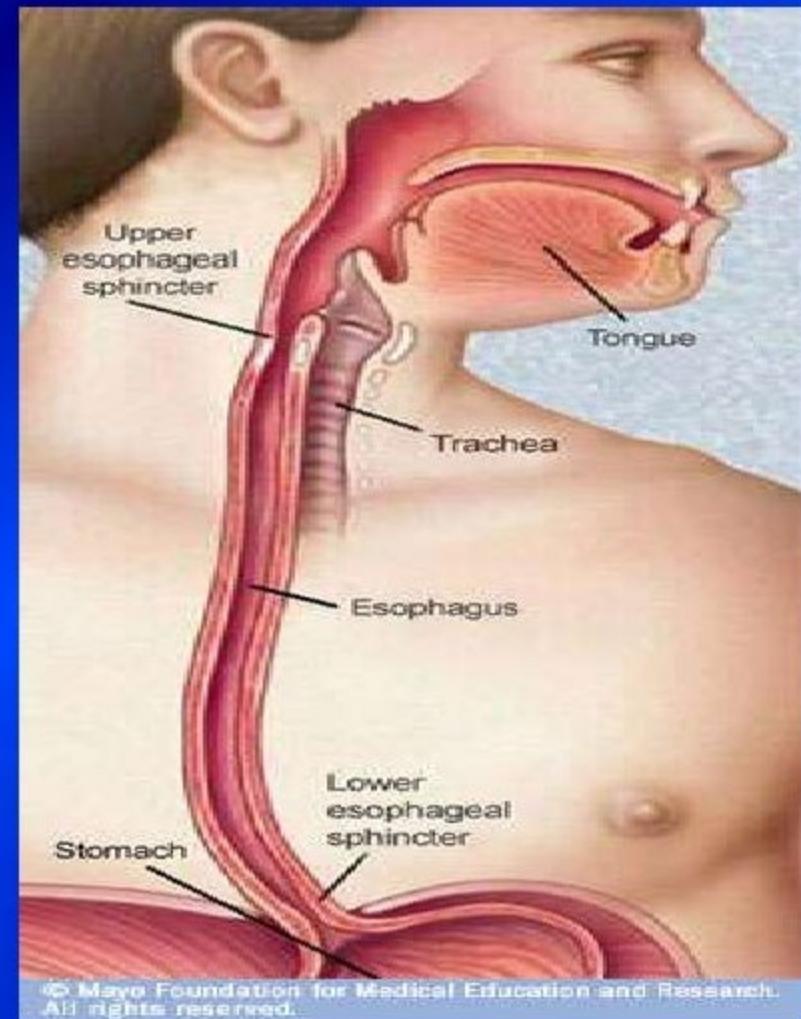


CONGENITAL ANOMALIES

- esophageal atresia, EA,
- tracheoesophageal fistula, TEF,
- esophageal stenosis,
- esophageal cyst,
- tracheobronchial remnant,
- esophageal atresia and tracheoesophageal fistula, EA-TEF,
- esophageal web,
- esophageal muscular hypertrophy,
- esophageal duplications,
- columnar epithelium–lined lower esophagus,
- Barrett's esophagus, laryngotrache oesophageal cleft, LTEC

ANATOMY OF ESOPHAGUS

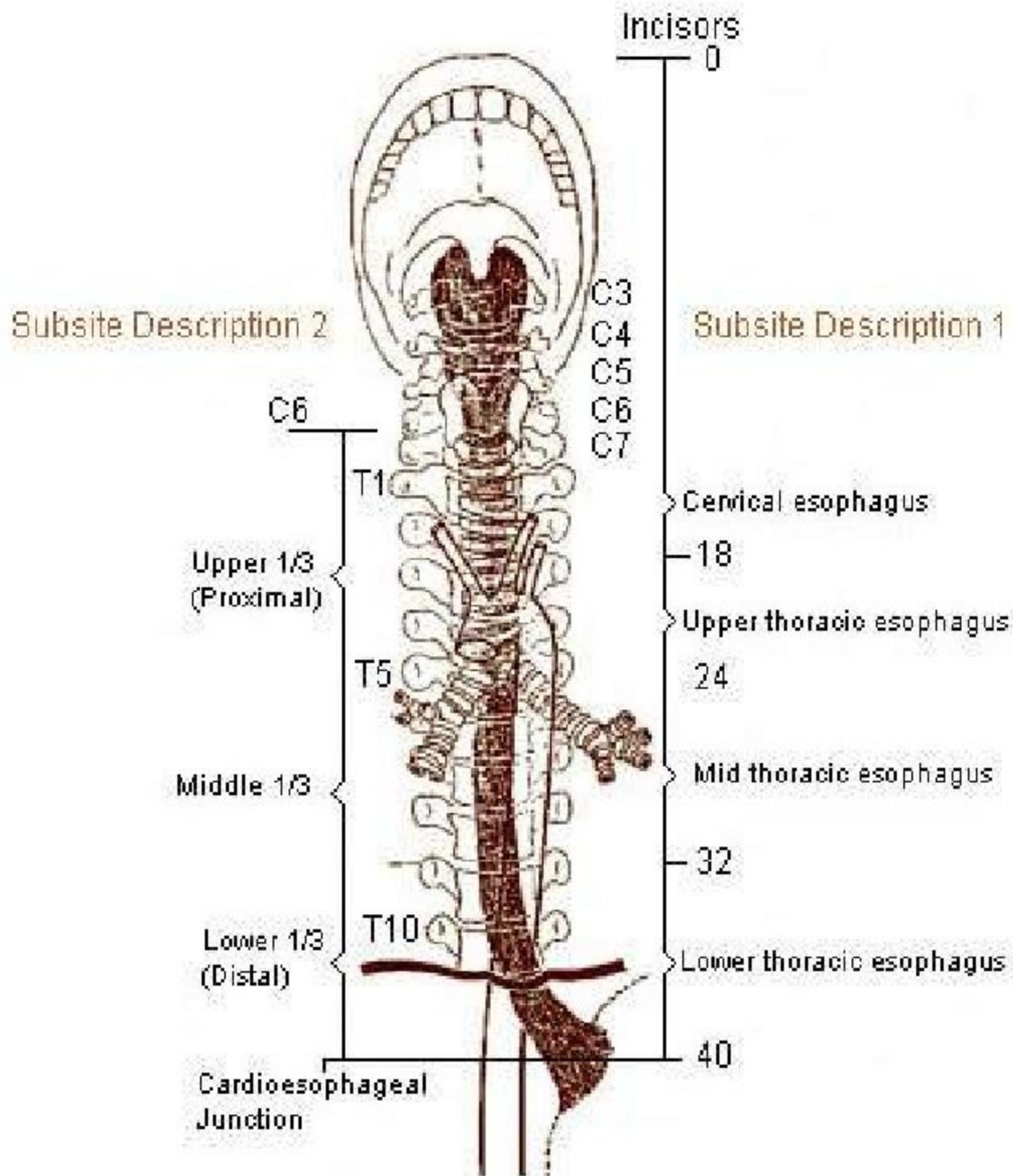
- Flattened muscular tube, size 18 to 26cm beginning at lower border of cricoid cartilage(opp 6th cervical vertebra) and ending at cardiac orifice of stomach(opp 11th cervical vertebra)
- Divided into 3 anatomical segments i.e., cervical, thoracic & abdominal



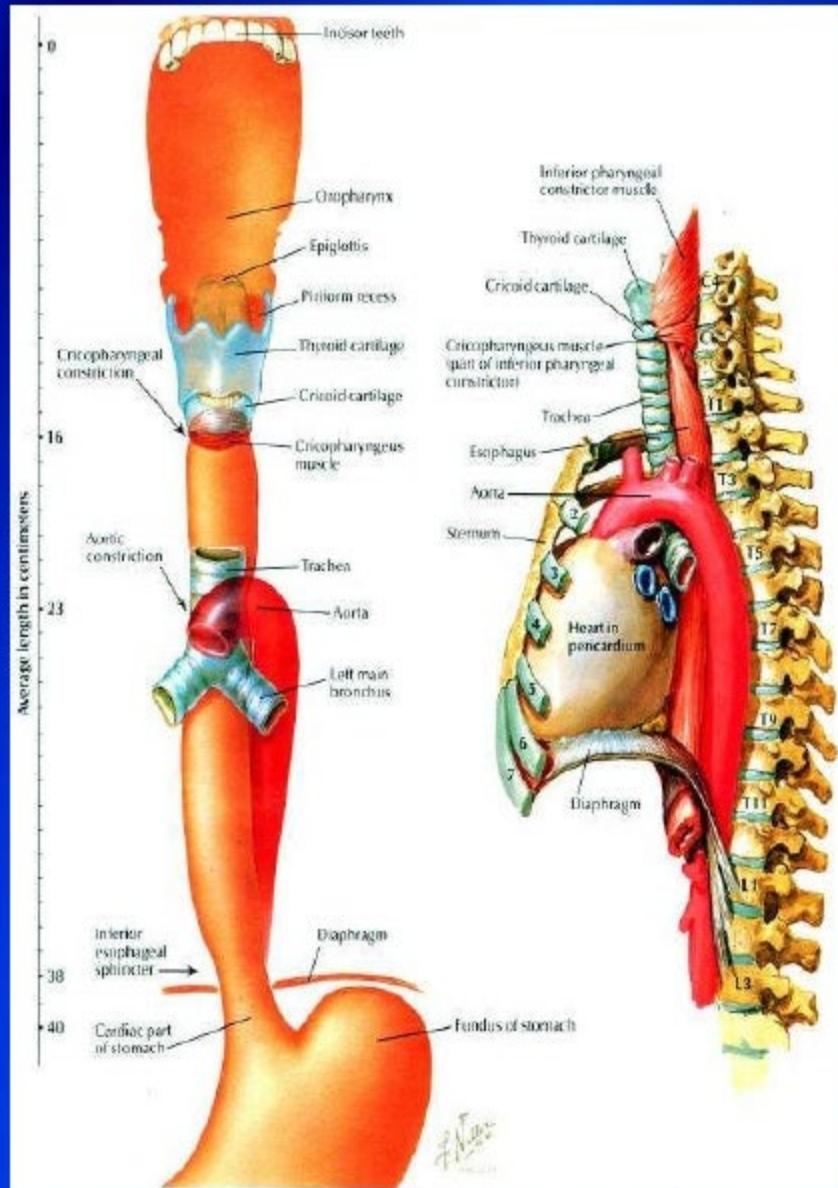
- Cervical esophagus extend from pharyngeal junction to suprasternal notch and is abt 4-5cm.
- At this level,eosophagus bordered anteriorly by trachea,post by vertebral column and lat by carotid sheath and thyroid gland.

- Thoracic esophagus extend from suprasternal notch(opp T1) to diaphragmatic hiatus(opp T10).18cm in length.
- Anteriorly lies the trachea, rt pulmonary artery, left main bronchus & diaphragm.post it rest on vertebral column and closely related to thoracic duct, azygous & hemiazygous vein.

- Abdominal esophagus extend from diaphragmatic hiatus to orifice of cardia of stomach.size abt 1 cm.
- Its right border is continuous with lesser curvature & left border is demarcated from fundus by esophagogastric angle of implantation(angle of His)



ESOPHAGEAL CONSTRICTION



- Superiorly: level of Cricoid cartilage, juncture with pharynx
- Middle: crossed by aorta and left main bronchi
- Inferiorly: diaphragmatic sphincter

SPHINCTERS

Two high pressure zones prevent the backflow of food:

- Upper Esophageal sphincter.
- Lower Esophageal sphincter.
- It is located at upper and lower end of esophagus.

LAYERS OF ESOPHAGUS

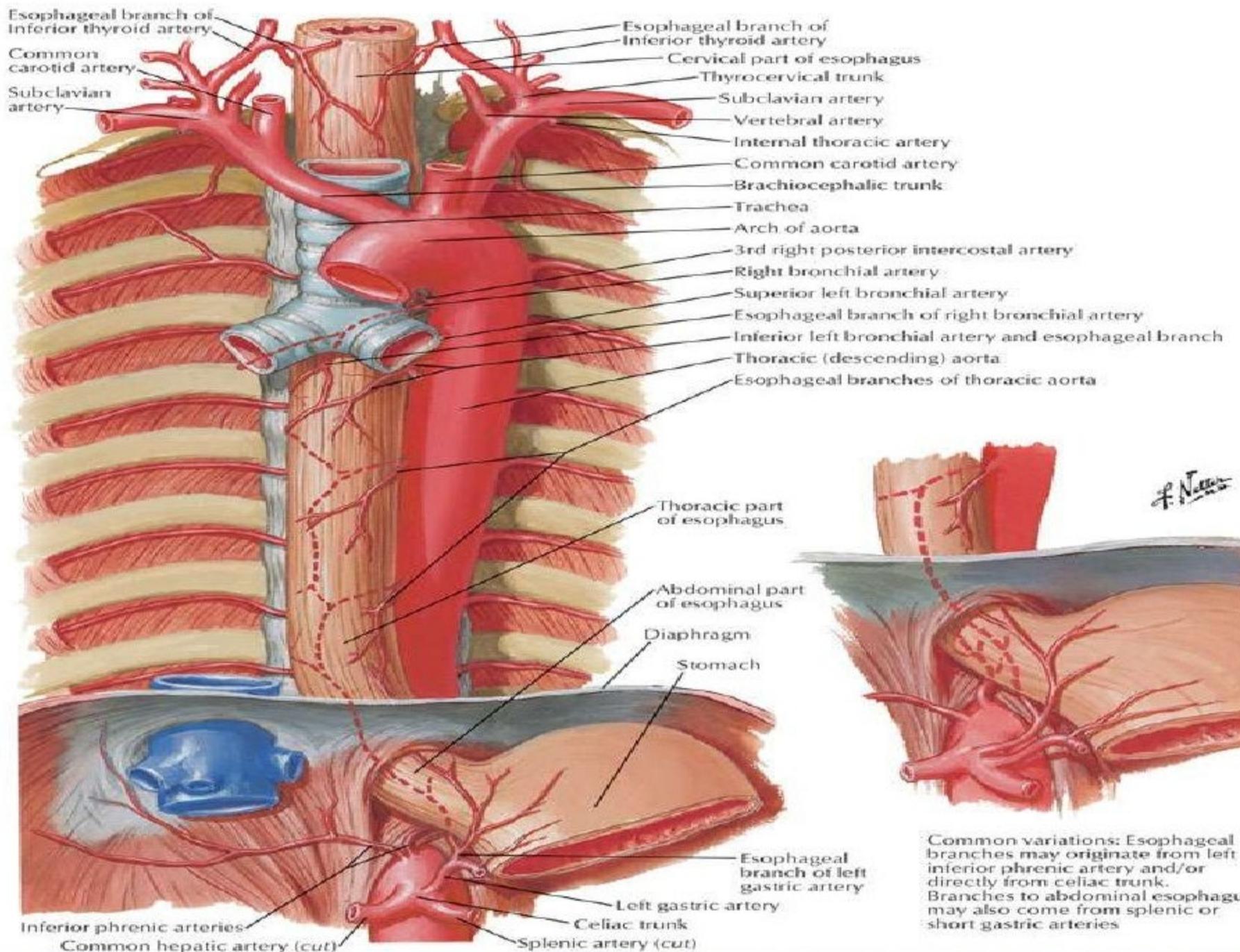
Structurally, esophagus wall composed of 4 layers:

- Innermost mucosa,
- Submucosa,
- Muscularis propria
- Adventitia.
- No serosa.

BLOOD SUPPLY

- Arterial supply
- Branches of inf thyroid artery - UES & cervical esophagus.
- Paired aortic esophageal arteries or terminal br.of bronchial artery – thoracic esophagus
- Left gastric & br.of left phrenic art- LES & distal esophagus.

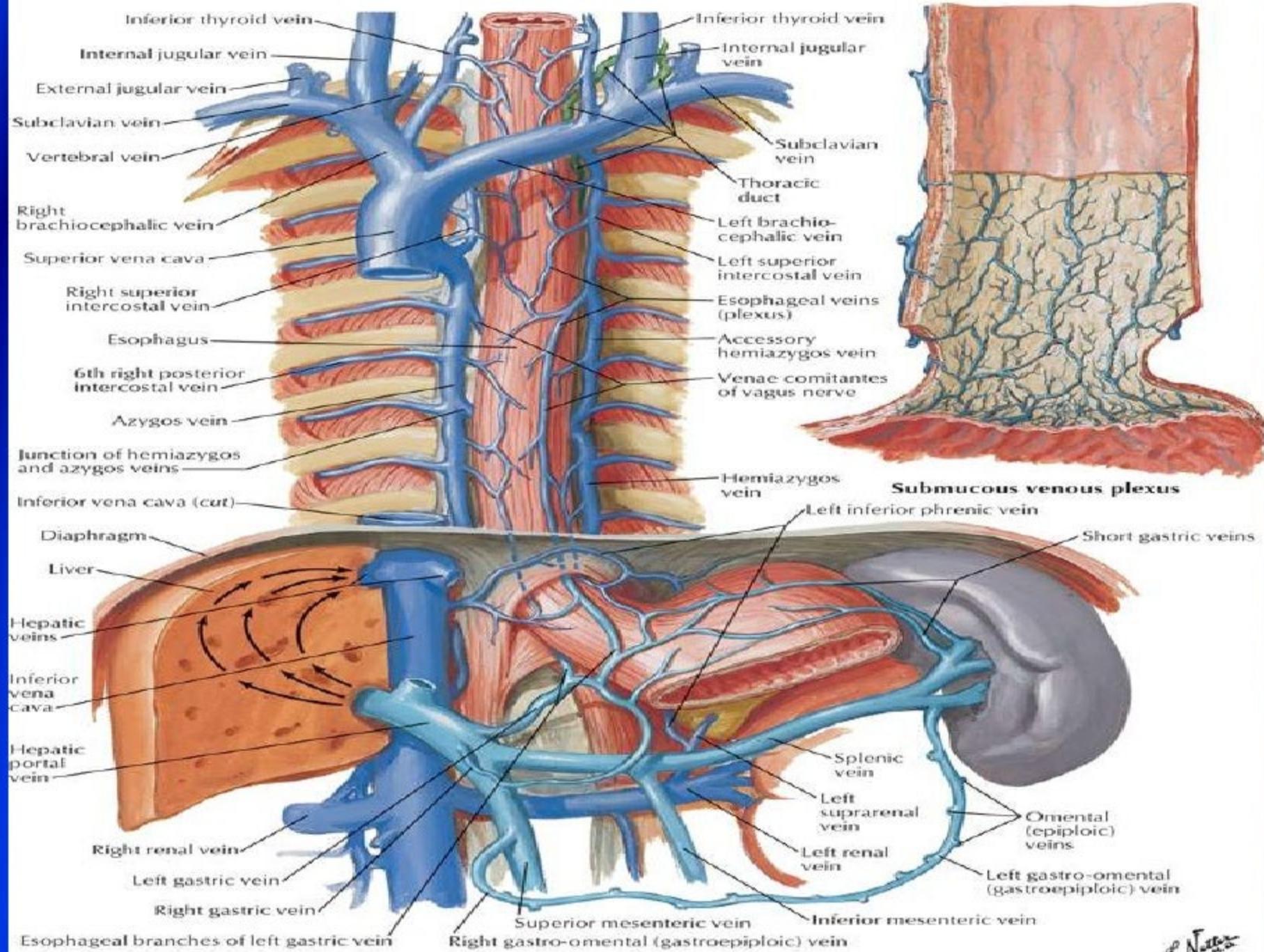
Arteries of Esophagus



VENOUS DRAINAGE

- Proximal & distal esophagus drains into azygous veins.
- Mid-esophagus drains into collaterals of left gastric vein, br. of portal vein.
- Submucosal connection between portal and systemic venous system in distal esophagus form esophageal varices in portal hypertension.

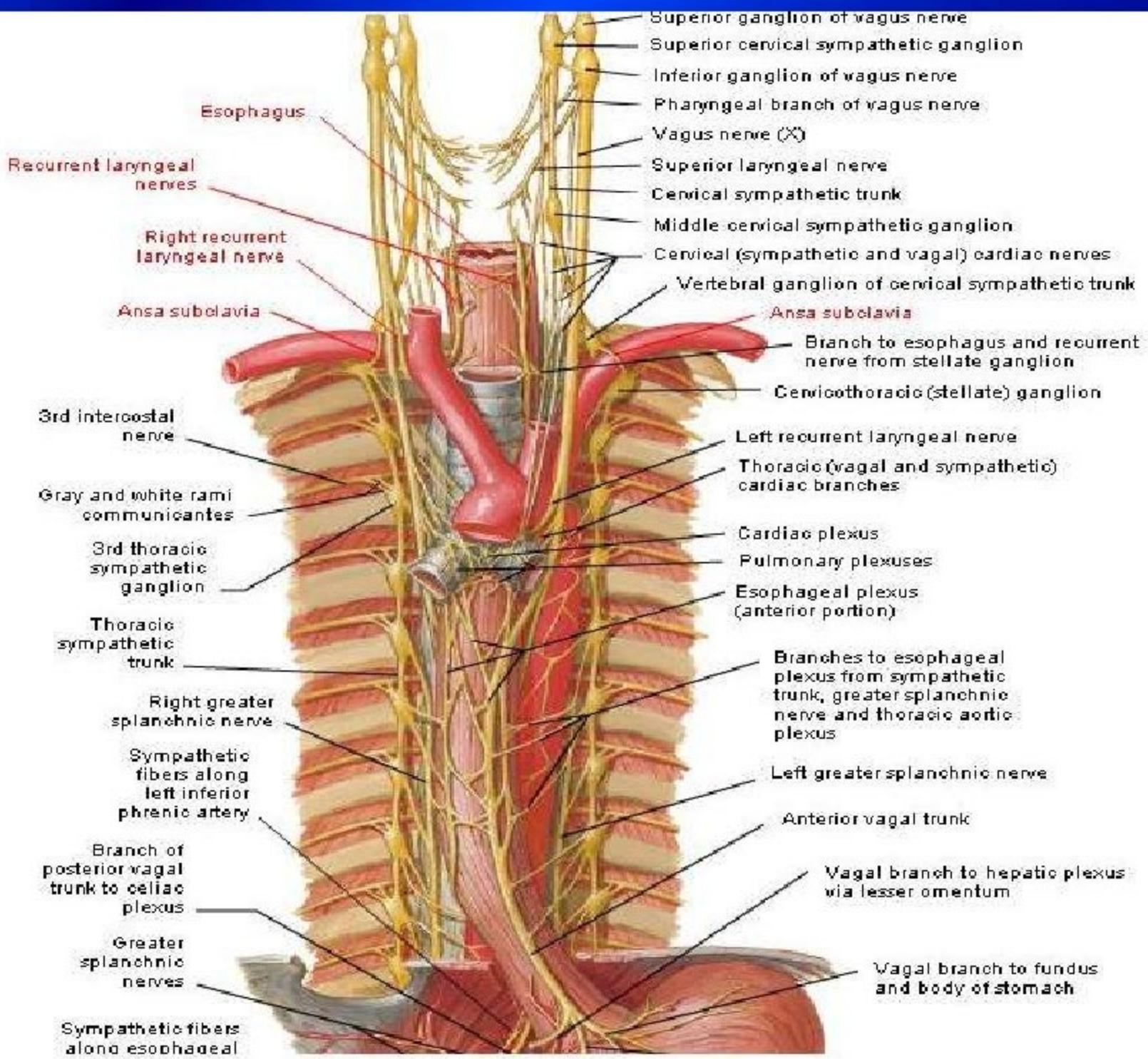
Veins of Esophagus



F. Netter M.D.

NERVE SUPPLY

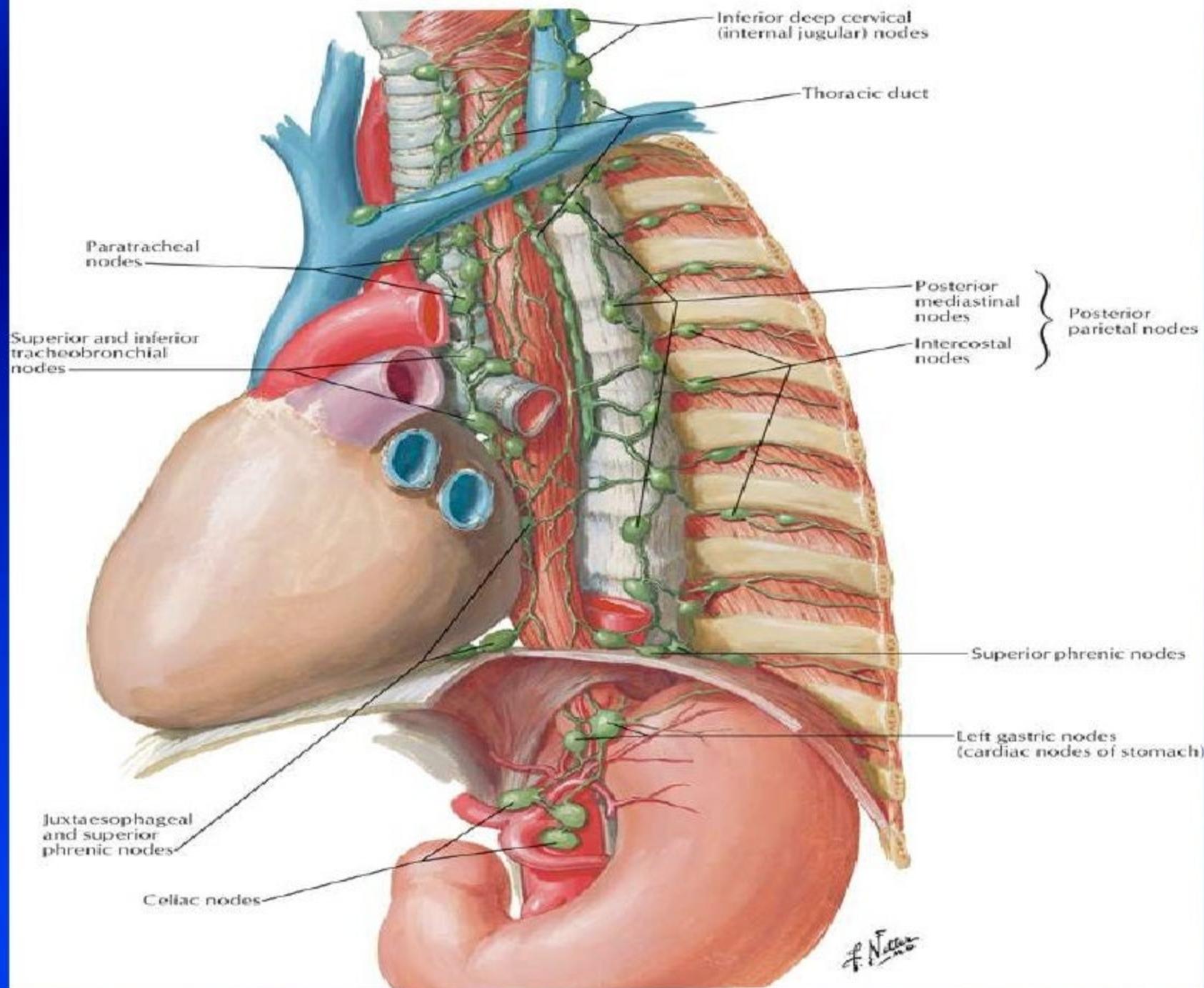
- Extrinsic network
 - sympathetic & parasympathetic.
- SYMPATHETIC:
 - Neck - sup & inf cervical ganglion ,
 - Thorax - upper thoracic and splanchnic nerve .
- PARASYMPATHETIC :
 - from recurrent laryngeal nerve & br of vagus in thorax & abdomen.
- Intrinsic
 - from 2 intramural plexuses
 - 1 in submucous layer.



LYMPHATIC DRAINAGE

- Originate from 2 plexus-submucosal layer & other within the muscle layer.
- Upper 2/3 flow in cranial direction.
- Lower 1/3 flow in caudal direction.

Lymph Vessels and Nodes of Esophagus



BARIUM SWALLOW

- It is a medical imaging procedure used to examine upper gastrointestinal tract, which include the esophagus and to a lesser extent the stomach.
- The contrast used is barium sulfate.

CONTRAST

- TYPES OF CONTRAST STUDY
 - (i) SINGLE CONTRAST STUDY
 - (ii) DOUBLE CONTRAST STUDY

CONTRAST USED

- 100% BARIUM SULPHATE PASTE
- 80% BARIUM SULPHATE SUSPENSION
- 30% BARIUM SULPHATE SUSPENSION FOR HIGH KV TECHNIQUE
- 200-250% HIGH DENSITY,LOW VISCOSITY FOR DOUBLE CONTRAST STUDY

INDICATION

- Dysphagia
- Heart burn, retrosternal pain, regurgitation & odynophagia.
- Hiatus hernia
- Reflux oesophagitis
- Stricture formation.
- Esophageal carcinoma.
- Motility disorder like
 - i. Achalasia
 - ii. diffuse esophageal spasms.
- Pressure or invasion from extrinsic lesions.
- Assessment of abnormality of
 - i. pharyngo esophageal junction including zenkers diverticulum
 - ii. cricoid webs
 - iii. cricopharyngeal Achalasia.

CONTRAINDICATION

- Suspected leakage from esophagus into the mediasternum or pleura and peritoneal cavities.
- Tracheo-esophageal fistula

XRAY VIEW

- SOFT TISSUE NECK – AP & LAT – SCOUT
- NECK-AP & LATERAL
- THORAX-RAO VIEW

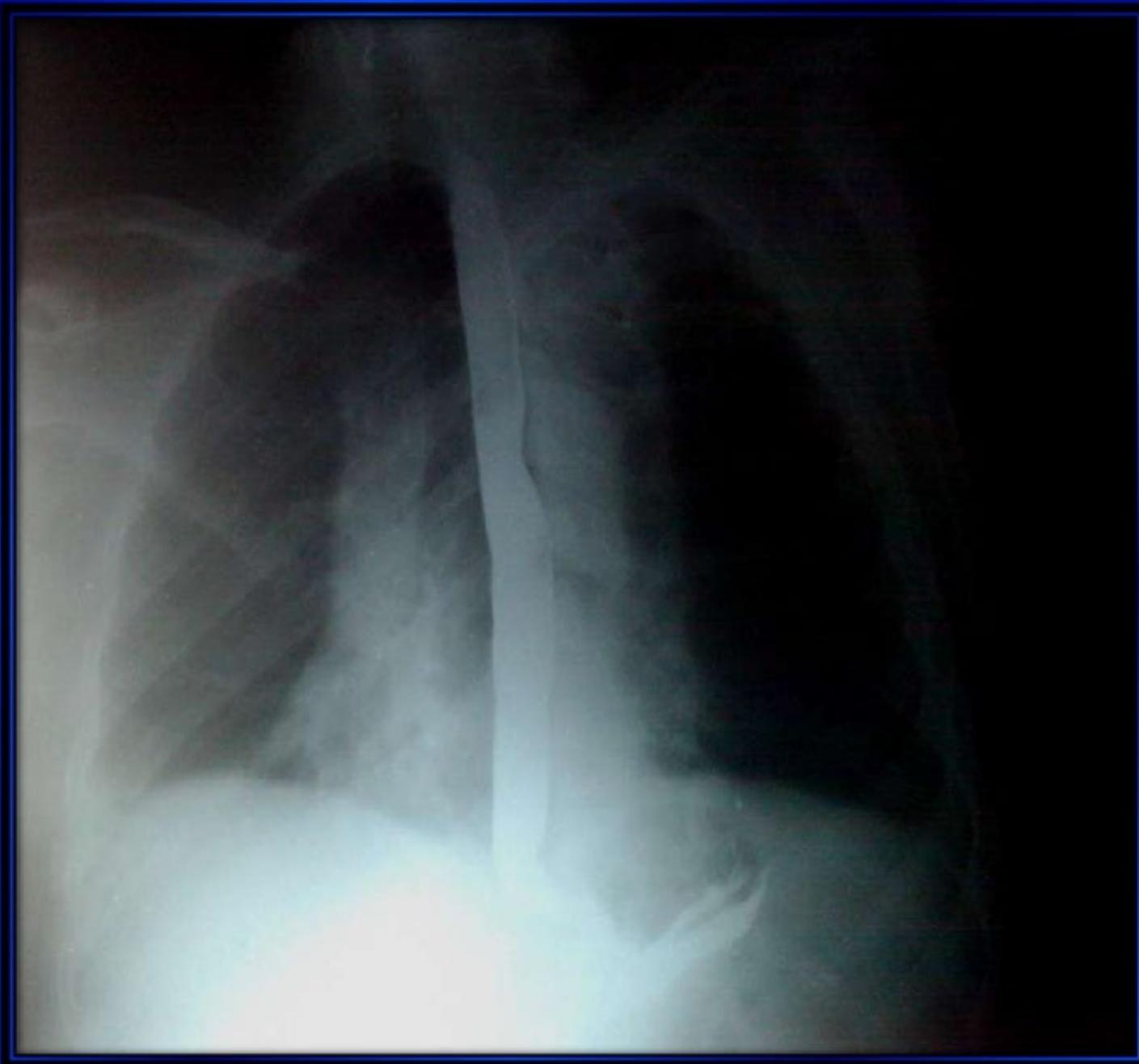
NORMAL-AP /LAT VIEW - SCOUT



AP/LAT VIEW WITH BARIUM



RAO VIEW



PATIENT PREPARATION

- None in particular but advisable to be in NPO prior to the procedure .
- Ensured that no contraindication to the pharmacological agent used.
- Check pregnancy state.
- Procedure should be explained to patient before undergoing the procedure.

TECHNIQUE

- PHARYNX
- -One mouthful contrast bolus with high density(250% w/v).
- -Patient is asked to swallow once and stop swallowing there after.
 - This is to get optimum mucosal coating.
 - frontal and lateral view x-ray taken.

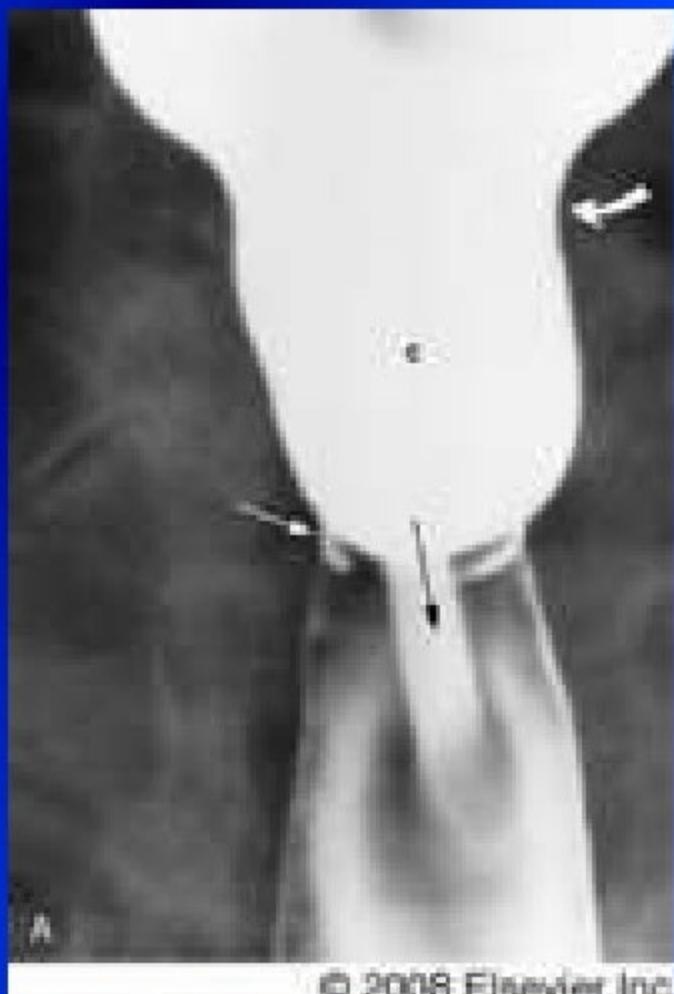
- **ESOPHAGUS**
- Single contrast
- -Multiple mouthful 80% w/v barium suspension given.
- -prone swallow to assess esophageal contraction.
- -useful in esophageal compression, displacement or disordered motility.

- Double contrast
- -Contrast high density,low viscosity(200-250%).
- -15-20 ml given & asked to swallow.
- -Then effervescent powder given with another mouthful of barium.
- -In erect posture,gas tend to stay up so adequate distention stays longer time.
- Inj.buscopan I.V given before the procedure to keep esophagus distended for longer time.

SPECIFIC CONDITION



- PHARYNGEAL WEB
- 50/50 dilution of standard high density barium.
- Film in supine for frontal and erect for lateral view.



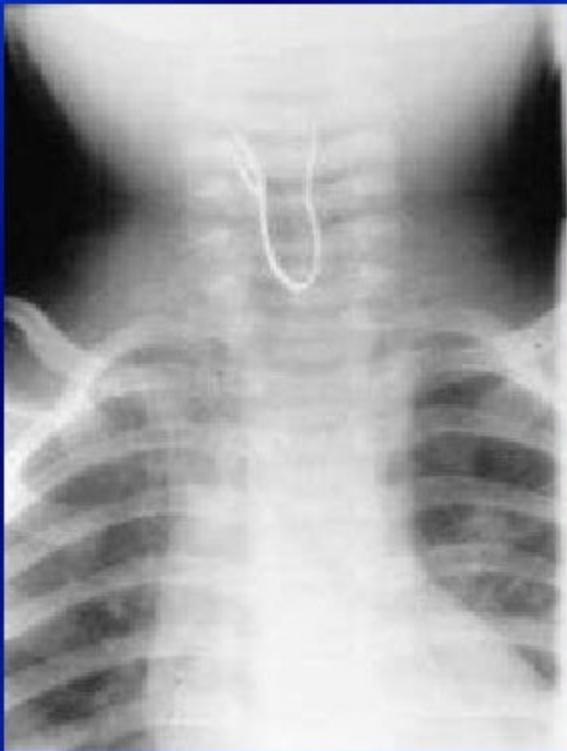
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- Partially obstructing cervical esophageal web. Frontal view shows a circumferential, radiolucent ring (straight white arrows) in the proximal cervical esophagus. Partial obstruction is suggested by a jet phenomenon (black arrows), with barium spurting through the ring, and by mild dilatation of the proximal cervical esophagus .

FOREIGN BODY IMPACTION



- To detect the level of obstruction in case of radiolucent foreign body in esophagus, marsh mellow coated with barium is swallowed.
- Passage of marsh mellow will be hindered at the level of obstruction



Xray showing foreign body



- AP and lateral plain films showing a metallic foreign body in the upper esophagus. Most foreign bodies are found at the level of the cricopharyngeus muscle.

Sceleroderma esophagus



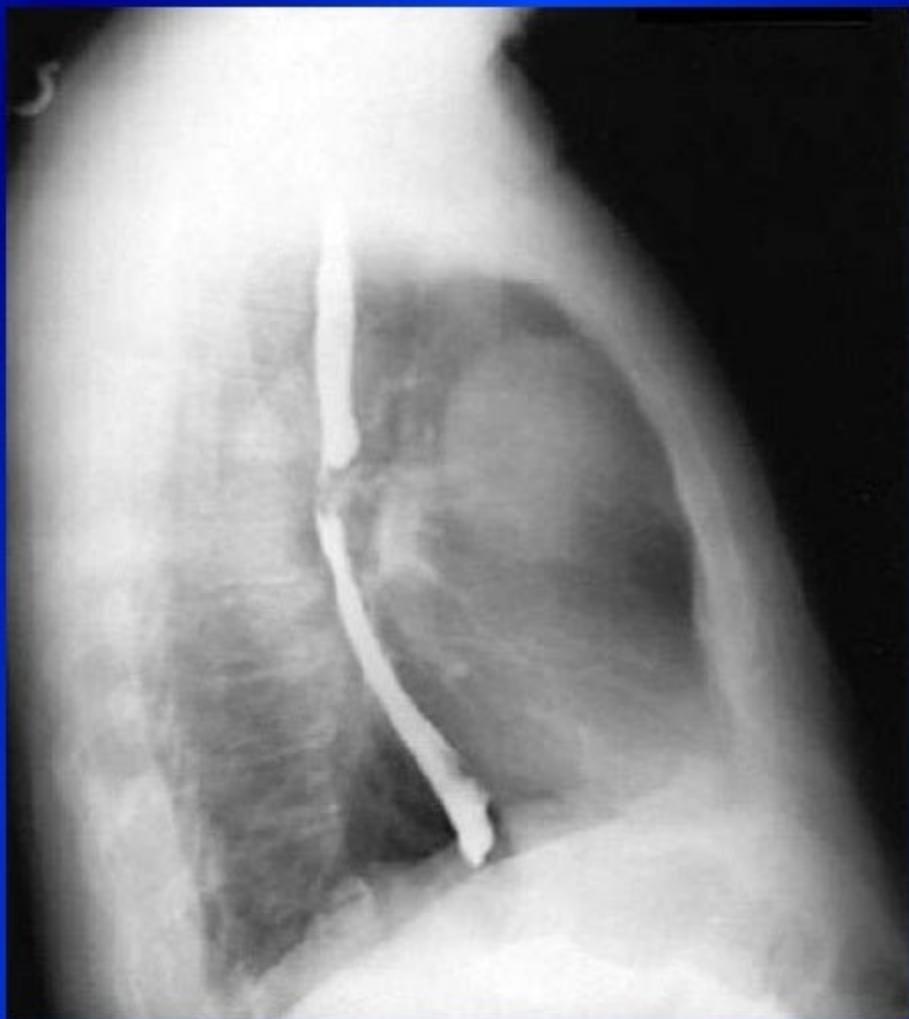
- Upright left posterior oblique spot image from double-contrast esophagography shows two wide-mouthed sacculations en face (*black arrows*) in upper and mid thoracic esophagus. Note how upper sacculation extends superiorly just above level of aortic arch (*white arrow*).

DYSPHAGIA



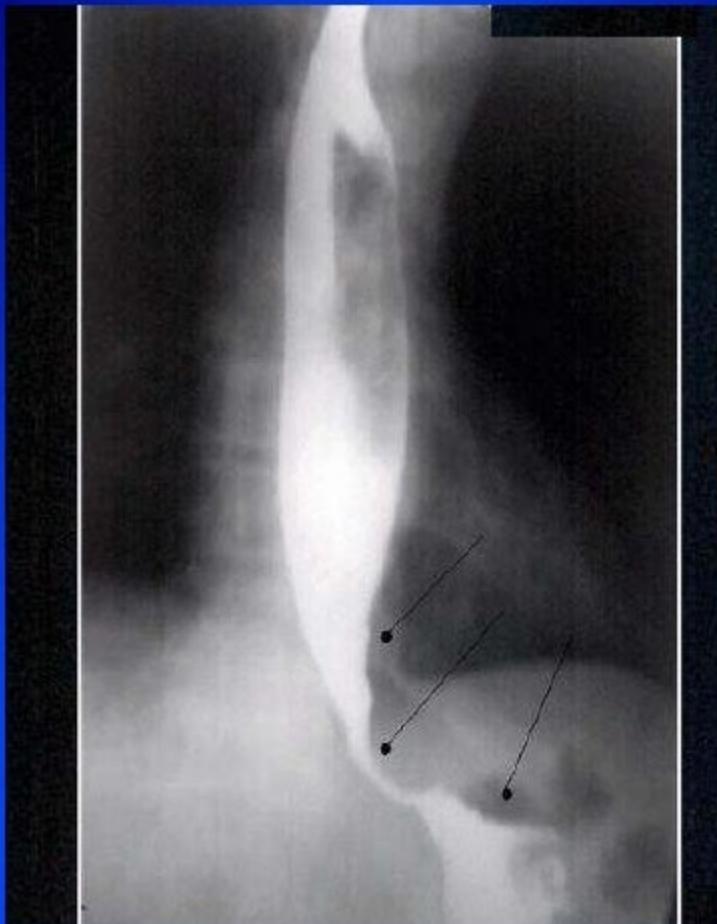
- Post swallow oral (thick arrow) and pharyngeal (thin arrow) stasis in a patient with base of tongue cancer.

MEDIASTINAL MASS



- Image showing anterior mediastinal mass in lateral view.

CARCINOMA



- Preferably high viscosity with normal density barium is used.
- Classical finding in carcinoma –rat tail appearance.



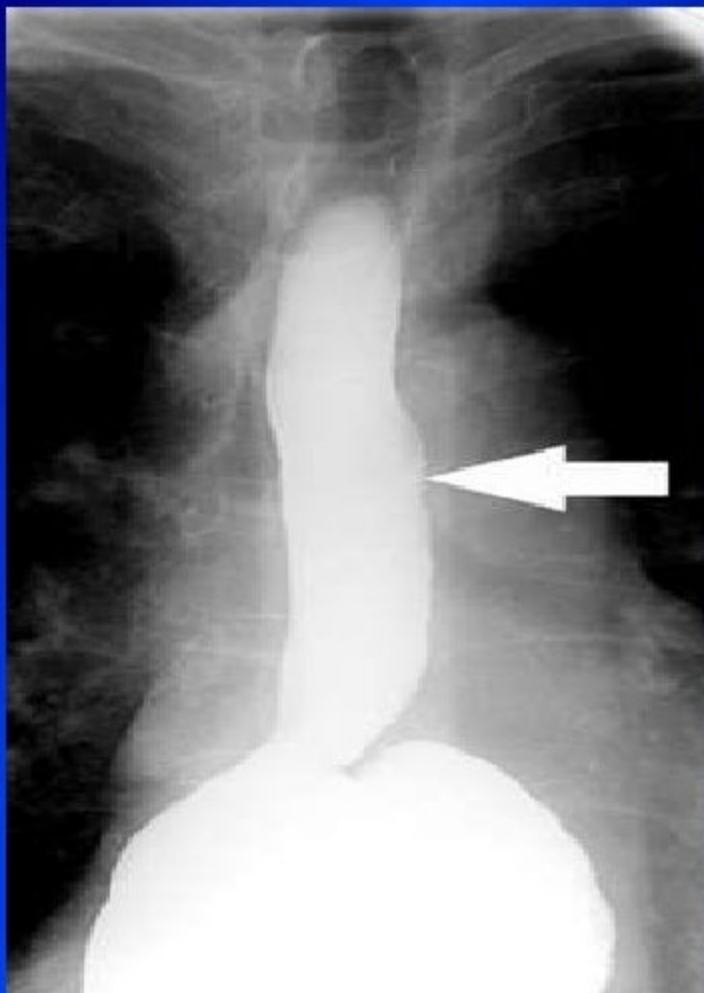
CA ESOPHAGUS

With shouldering

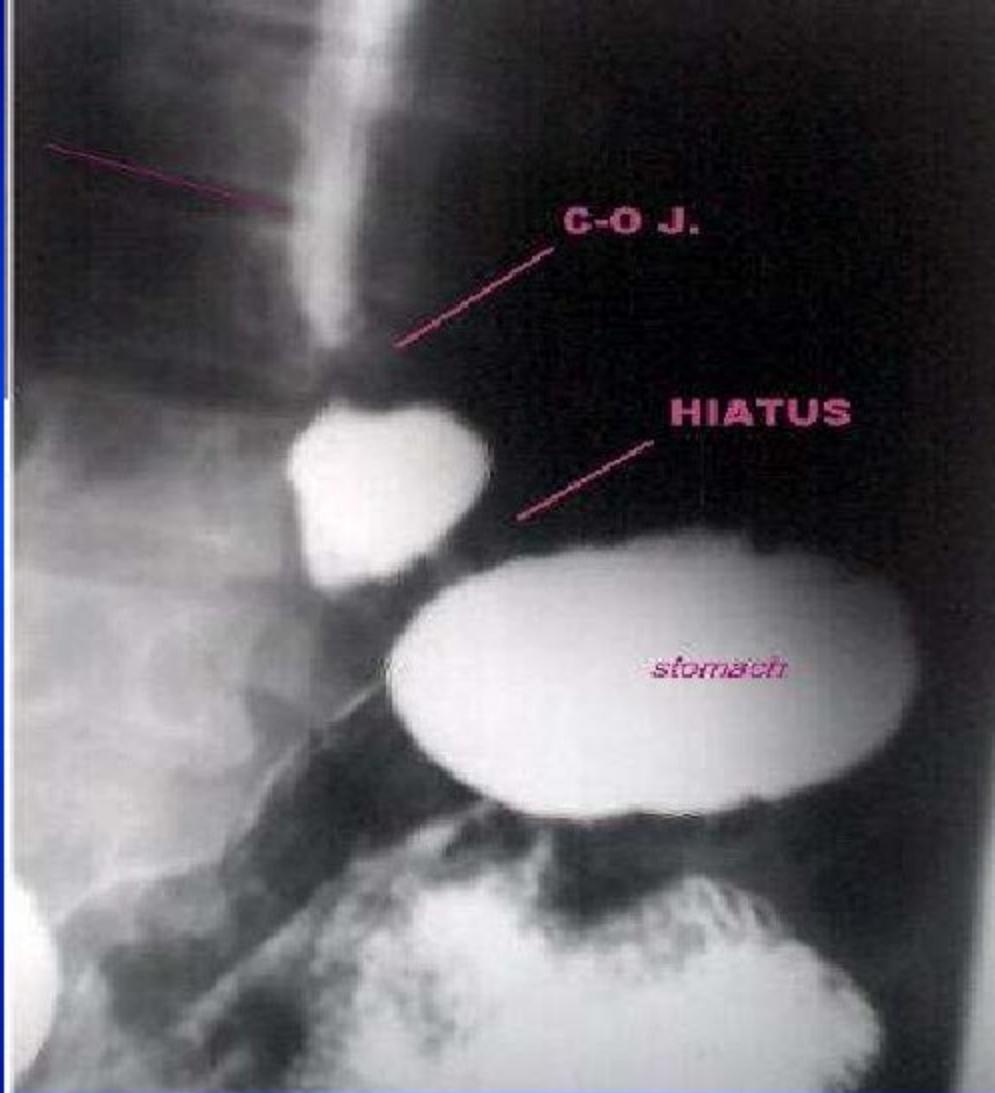
The stenotic segment is long giving a "" *rat-tail" appearance

Barium swallow shows mild dilatation of the esophagus with irregular stenotic lesion in the lower end of the esophagus "moth eaten" appearance

HIATUS HERNIA



- High abdominal pressure is required to demonstrate.
- Pt has to strain.
- Lie down, straighten legs & then raise them up.
- Manual compression of abdomen.
- Pt stands upright, ask him to bend downward with leg straight.
- Stomach should be distended to demonstrate HH.



HIATUS HERNIA

Barium meal in Trendelenberg position
Displacement of the cardio-esophageal junction
above the esophageal hiatus
Part of the stomach is present in the chest
Reflux of barium into the esophagus

ACHALASIA CARDIA

- Eosophagus should be cleaned thoroughly (aspirate & wash) – secondary achalasia d/t Ca esophagus not missed.
- Barium 80% w/v used, pt erect position.
- Meholyl test- hyperperistalsis, pain & streak of contrast entering stomach.



ACHALOSIA CARDIA

- Barium swallow showing dilatation of the esophageal body

*With short segment stricture.

* A "bird-peak " like tapering of the esophagus at the GE junction. OR

*A Sigmoid " Mega esophagus



DIFFUSE ESOPHAGEAL SPASM

- Barium swallow shows irregular areas of narrowing and dilatation ----- “Shish kebab” “corkscrew” “rosary bead” esophagus
- The esophageal muscle is hypertrophied, but histologically normal



ESOPHAGEAL VARICES



- Supine right side up position, high density thin barium should be used.
- Varices are best demonstrated in mucosal relief study after using Buscopan/ valsalva maneuver.

ESOPHAGEAL VARICES

- Mild dilatation of the esophagus with multiple persistent filling defects in the lower third of the esophagus and/or longitudinal furrows.



TRACHEOESOPHAGEAL FISTULA



- Congenital/Acquired
- Ideal contrast non ionic water soluble media
- Barium fluid like & pt lying laterally.
- In case fistula not identify laterally, put in prone.
- If fistula seen, stop procedure as barium aspiration result in inflammation and granuloma.

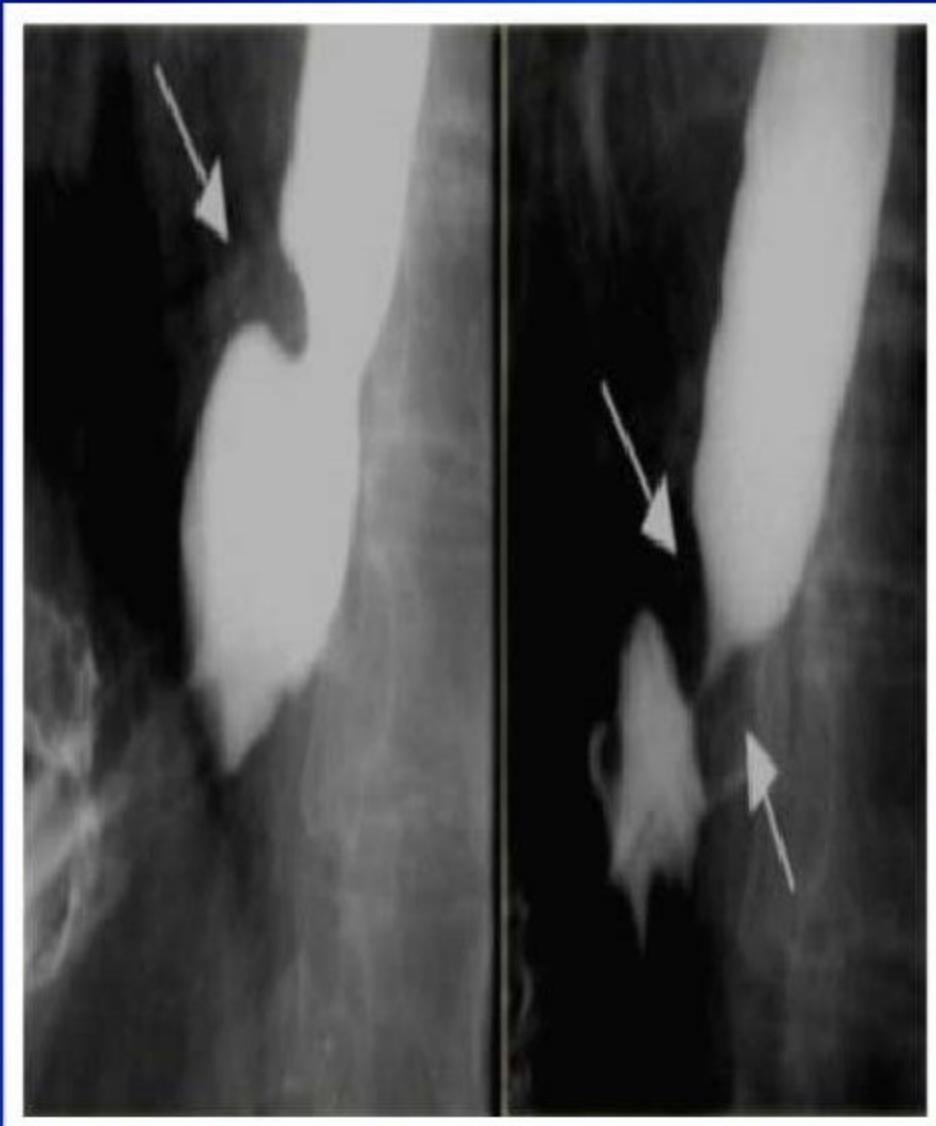
TRACHEOESOPHAGEAL FIST(INFANT)

- A Ryle's tube is introduced to the level of mid esophagus & contrast is injected.
- The tube is withdrawn slowly.
- This will force the contrast thro' any small fistula.
- Both lat & prone views to be assessed.

- Oblique barium esophagogram demonstrates a fistula (arrow) arising from the anterior esophagus and extending anterosuperiorly to the trachea.



ESOPHAGEAL A-RING



- Esophageal A-ring due to muscular contraction at junction of tubular and vestibular esophagus . It varies during examination and may not persist.

ESOPHAGEAL B-RING



- The esophageal B-ring is located at the squamocolumnar junction, also termed the 'Z' line.
- On the left a patient with a 'B' ring (arrows) several cm above diaphragm at the apex of sliding hiatus hernia.
Note unchanged appearance on these two images.

GASTRO ESOPHAGEAL REFLUX

- SIPHON TEST
- Fill the stomach with 50% barium(150-200ml)
- Follow this 1-2 mouthful of water to remove traces of barium in esophagus
- Pt in supine with left side raised 15% up
- Keep one mouthful of water in pt mouth
- Ask pt to swallow water-a jet of barium will shoot into water column as it enter GO junction
- Alternatively with full stomach,ask pt to roll side to side
- Reflux will be seen

ESOPHAGEAL REFLUX



- **Reflux oesophagitis with a deep ulcer (*straight arrow*).** There is also asymmetric narrowing of the distal esophagus with a relatively abrupt cutoff (*curved arrow*) at the proximal border of the narrowed segment.

Barrett's Esophagus



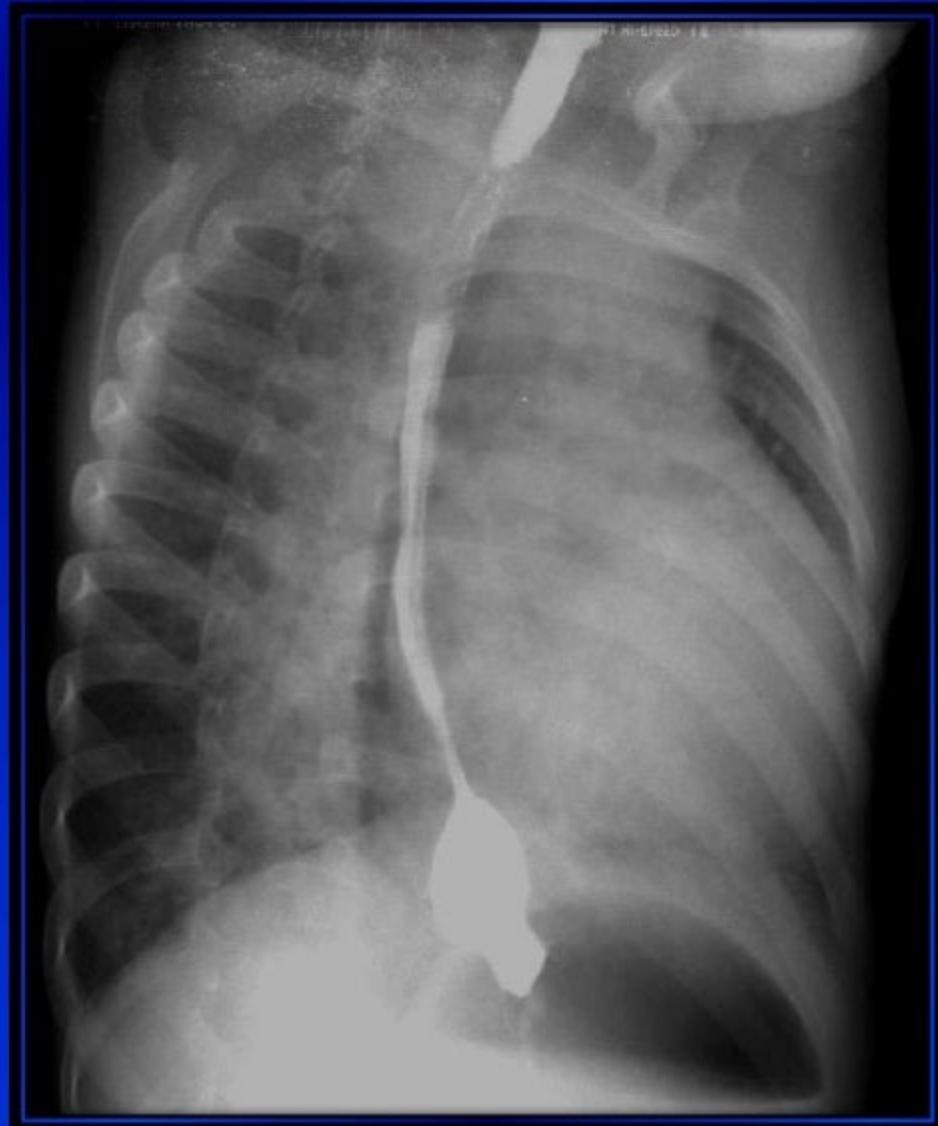
- The reticular mucosa is characteristic of Barrett's columnar metaplasia, especially with the associated web-like (arrow) stricture.

Candida Oesophagitis



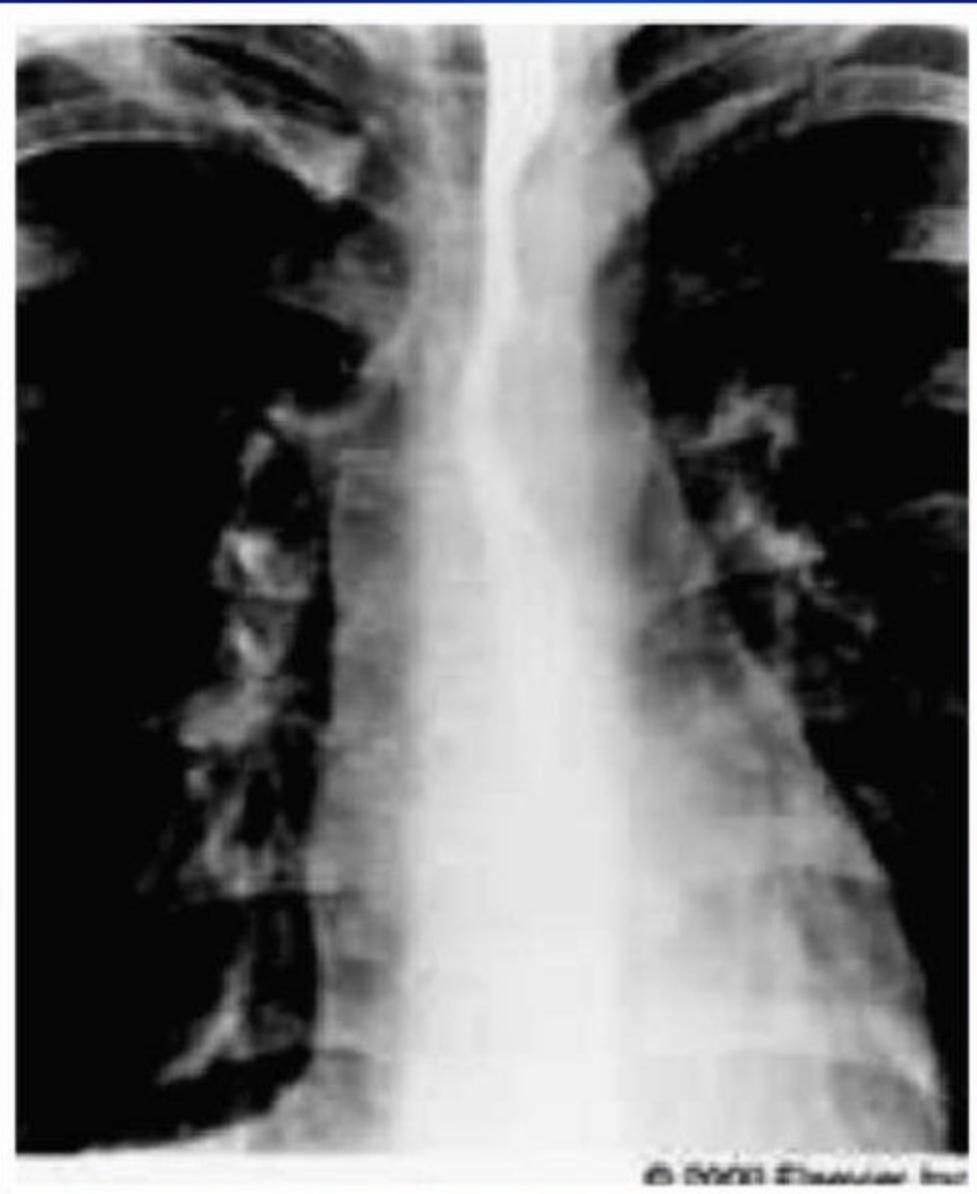
- The barium study shows numerous fine erosions and small plaques due to *Candida albicans* in immunocompromised patient.

LEFT ATRIAL ENLARGEMENT



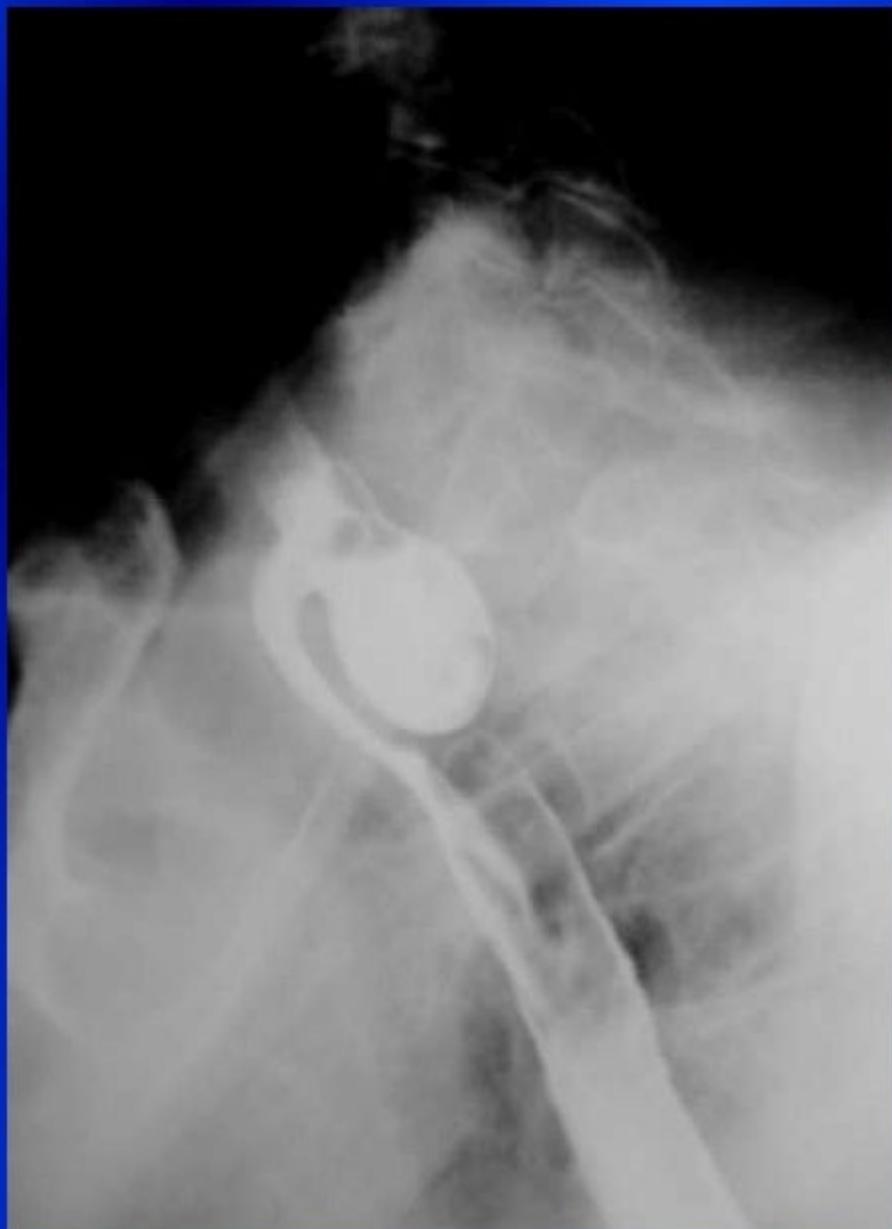
- Right anterior oblique film and barium swallow demonstrates left atrial compression of the esophagus confirming left atrial dilation.

COARCTATION OF AORTA



- Barium in the esophagus exhibits the 'reverse 3 sign' outlining the medial site of the aortic indentation in the descending aorta

ZENKERS DIVERTICULUM



- A Zenker's diverticulum is a pulsion hypopharyngeal false diverticulum with only mucosa and submucosa protruding through triangular posterior wall weak site (Killian's dehiscence) between horizontal and oblique components of cricopharyngeus muscle.
- The esophagram shows collection with midline posterior origin just above cricopharyngeus protruding lateral, usually to left, and caudal with enlargement.

KILLIAN JAMIESON DIVERTICULUM



- **Killian-Jamieson diverticulum** is a pulsion diverticulum, that protrudes through a lateral anatomic weak site of the cervical esophagus below the cricopharyngeus muscle. AP view shows diverticulum (arrow) originating laterally. Lateral view confirms diverticulum does not originate posteriorly as a Zenkers diverticulum would.



- An oblique view of the pharynx shows Zenker's diverticulum (Z) with its opening (short arrow) above the prominent cricopharyngeus (C). The Killian-Jamieson diverticulum (K) has its opening (long arrow) below the prominent cricopharyngeus.

COMPLICATION



Shiraz E Medical Journal, Vol. 8, No. 1, January 2007.

- Leakage of barium from unsuspected perforation.

COMPLICATION



- Aspiration



Thank u very much.