A NEET SS (SURGERY) PREPARATION COURSE
BY MARROW, WITH A TEAM OF SELECTED
SUPER-SPECIALITY FACULTY

SURGERY NEET SS

GASTRO SURGERY

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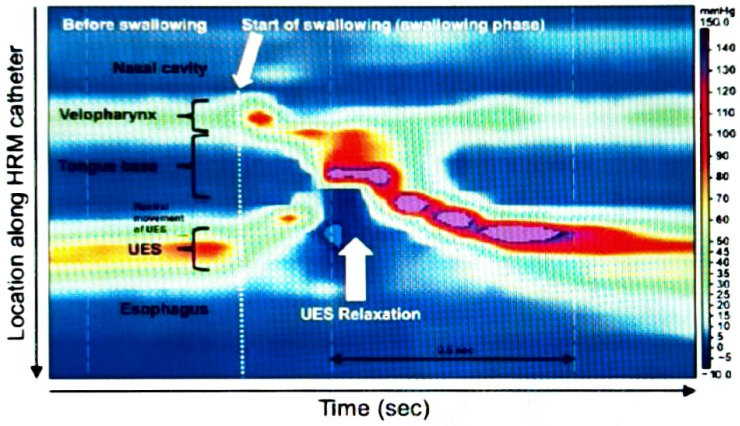
CONTENT

ANATOMY AND PHYSIOLOGY OF ESOPHAGUS

Upper Esophageal Sphincter 00:01:17

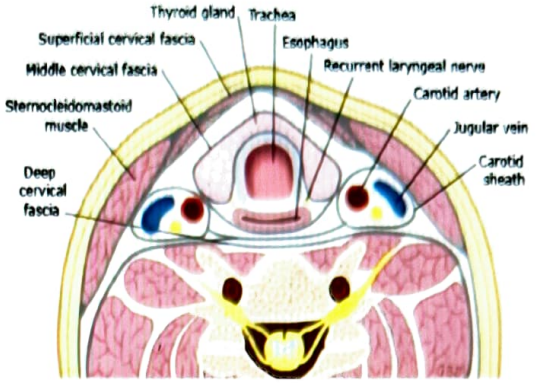
- Cricoid cartilage at the ventral (anterior) border.
- Cricopharyngeal muscles in the lateral and posterior borders.
- Pressure profile (High Resolution Manometry) asymmetric
- Innervation is mainly by the Vagus, also by 9th & 12th cranial nerves.



Cervical Esophagus 00:04:10

- 5 cm in length.
- Extends from the : cricoid cartilage at C6 vertebra
  - to
    - Supra sternal notch anteriorly.
    - T1-T2 Interspace posteriorly.

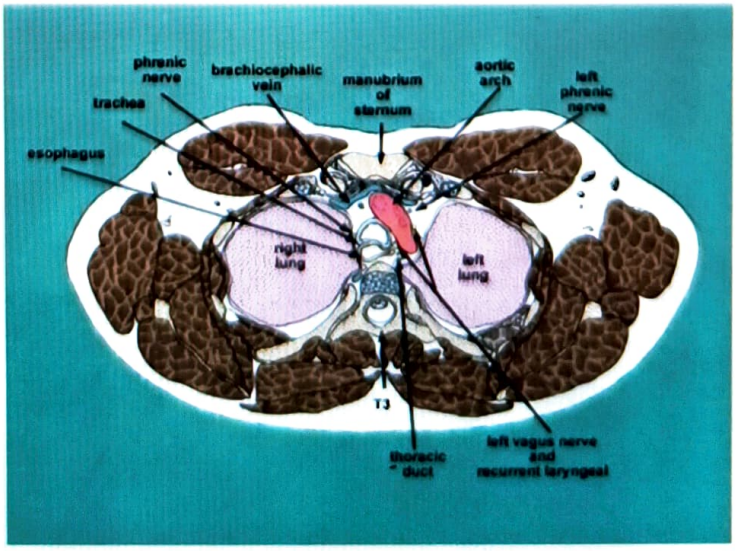
- Blood supply : Superior and Inferior thyroid arteries and drains into the Inferior thyroid veins. middle thyroid vein is divided for exposure of cervical esophagus.
- Nerve supply : Recurrent laryngeal nerves.



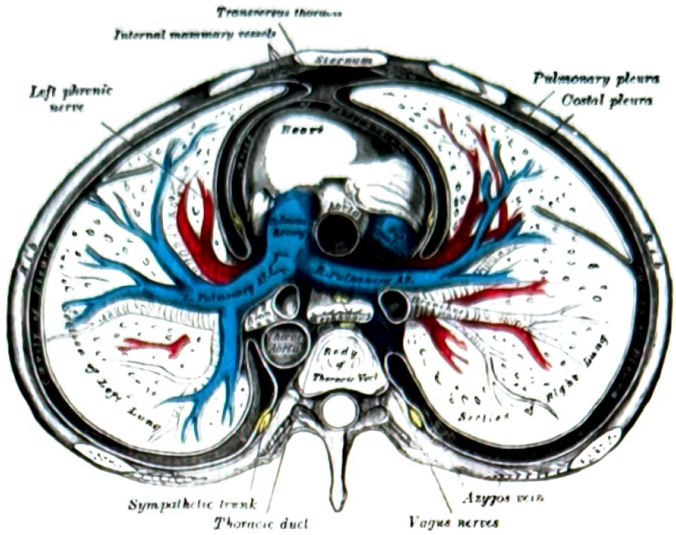
Thoracic Esophagus

00:07:00

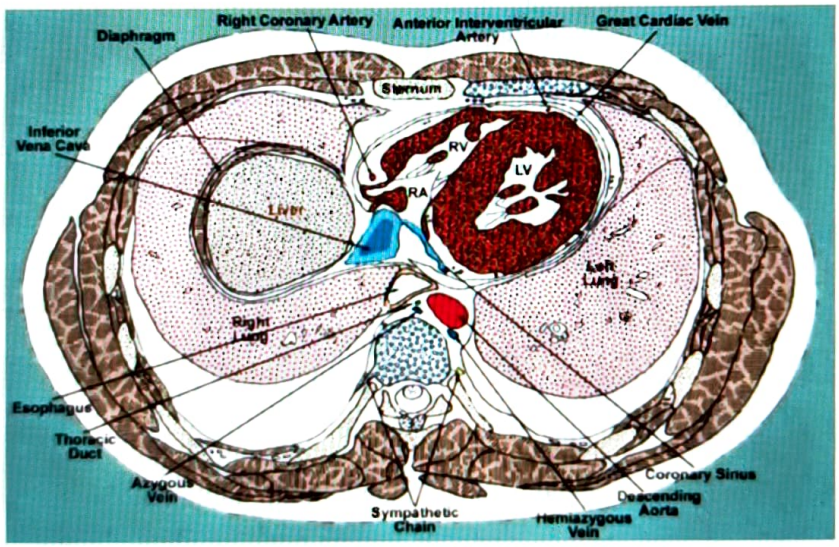
- 20 cm long, extends from thoracic inlet → Diaphragmatic hiatus.
- Blood supply: Bronchial arteries, branches from descending aorta. Venous drainage → azygous and bronchial veins.
- Upper thorax : Anteriorly → Trachea ; Right → Azygous vein ; Left → Left subclavian artery and aortic arch.
- Upto T8 : Descending aorta turns posteriorly and runs to the left of esophagus.
- From T8 : Esophagus moves anterior to the aorta.



Esophagus at T4.



Esophagus at Carina.



Esophagus at T9.

Lower Esophageal Sphincter 00:13:39

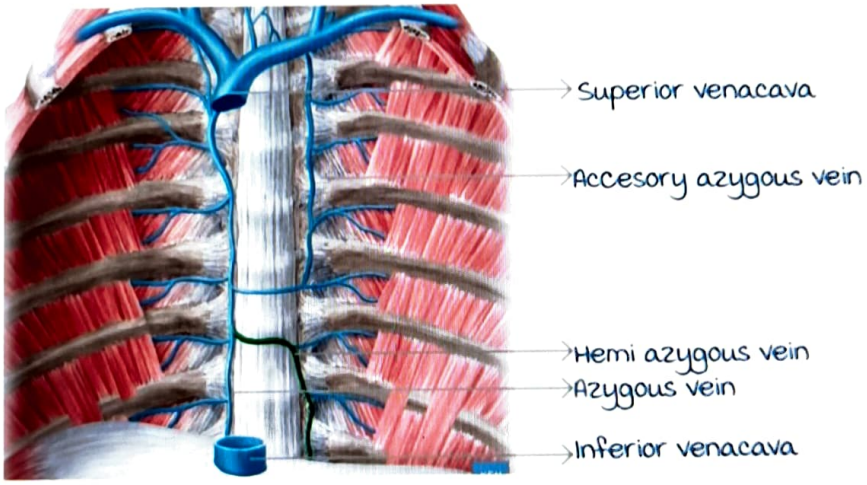
- Mechanical description: Demeester School.
- 3 manometrically assessed components : Overall length of the high pressure zone (minimum 3 cm), sphincter pressure and sphincter position expressed by intra abdominal length of high pressure zone.
- Dynamic concept by gastroenterologists → Dent and Dodds → Transient LES relaxations (tLESR) → To explain GERD.

- If duration or number of relaxation of LES more, then called as pathological tLESR.

Azygous Vein

00:15:48

- Origin : Lumbar azygous vein at the level of IVC.
- Tributaries : Hemiazygous and accessory hemiazygous vein.
- Drains: To superior venacava just before SVC pierces the pericardium.
- Course: Ascends in posterior mediastinum ; present to the right posterolateral aspect of descending thoracic aorta; and anterior to T_4-T_{12} Vertebrae.
- At T_4 arches above the right pulmonary hilum and then drains into SVC.



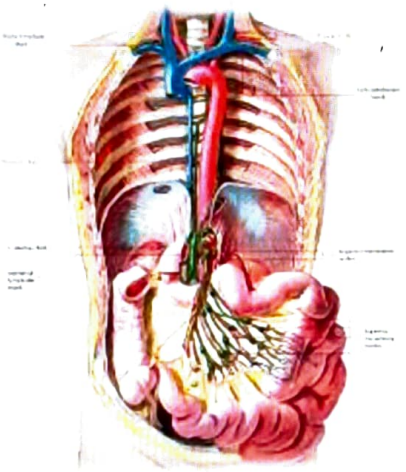
Thoracic Duct

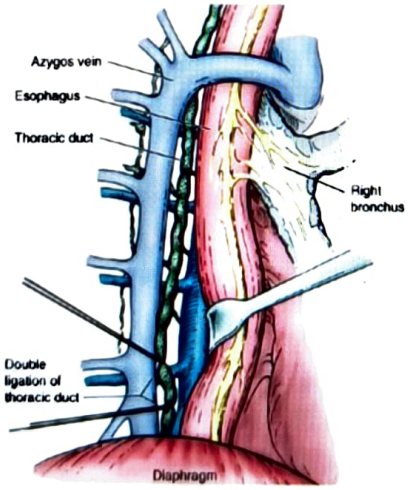
00:17:27

- Begins in the abdomen as the cysterna chyli at T_{12}.
- Passes through aortic hiatus along with azygous vein.
- Lies on the anterior surface of vertebra, posterior to the esophagus between the azygous on right and descending aorta on left.
- Right and posterior to the esophagus upto T_7, crosses midline to left side at T_5.
- Ascends 2 to 3 cm above the clavicle and descends to

empty into junction of left subclavian and internal jugular veins.

- For mass ligation in chylothorax, best measure is to clip the thoracic duct, if all measures fail, tissues between azygous vein and aorta is ligated just above the diaphragm.





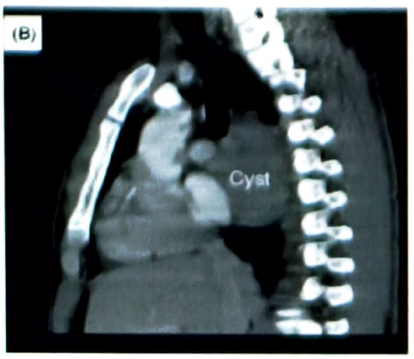
BENIGN ESOPHAGEAL LESIONS

Esophageal duplication cyst 00:00:20

- 2nd most common benign posterior mediastinal lesion in children after bronchogenic cyst. (Foregut cysts form 20 % of all GI cysts).
- Cystic form : most common (80 %) with no luminal communication.
- Tubular form (20 %) communicates with esophageal lumen.
- may contain heterotopic gastric or pancreatic mucosa.
- CT reveals a smooth, well defined hypodense lesion in posterior mediastinum close to esophagus.
- Endoscopy reveals a submucosal lesion.
- Resection recommended compared to EUS/FNA as there is a risk of hemorrhage, ulceration, malignant transformation.

Palmer's criteria for Esophageal duplication cysts :

- To differentiate it from bronchogenic cysts.
- Lesion should be within or attached to esophageal wall.
- 2 layers of smooth muscle (Inner circular and outer longitudinal).
- Cyst wall lining should contain ciliated epithelium or embryological tissue (Bronchogenic cyst is made up of cartilage, hallmark differentiating factor).



Esophageal Leiomyoma

00:04:47

- most common benign esophageal or GEJ tumor.
- most common location is distal 2/3rd of the esophagus.
- Ratio of men : women is 2 : 1.
- Originates in the intramural (muscularis propria > muscularis mucosa) layers of the esophagus.
- 50 % asymptomatic.

Indications for resection of leiomyoma :

- Symptomatic lesions.
- Inability to rule out malignancy or distinguish from GIST (High chance for malignancy).
- Atypical imaging findings (To rule out leiomyosarcoma).
- Overlying mucosal erosion or dysplastic changes.
- Regional lymphadenopathy, large tumors.
- Tumor growth during surveillance.

Esophageal GIST :

- Less common than leiomyoma, but more common than Schwannoma.
- Male preponderance (2 : 1).
- Highest malignant potential.

- Indications for surgical resection :
  1. Size > 2 cm.
  2. < 2 cm with high risk (High mitotic index etc.).
  3. Symptomatic or increasing size.

- Lymphadenectomy not required unless pathologically positive nodes are present.
- Re-resection of microscopically positive resection margins, is generally not indicated.

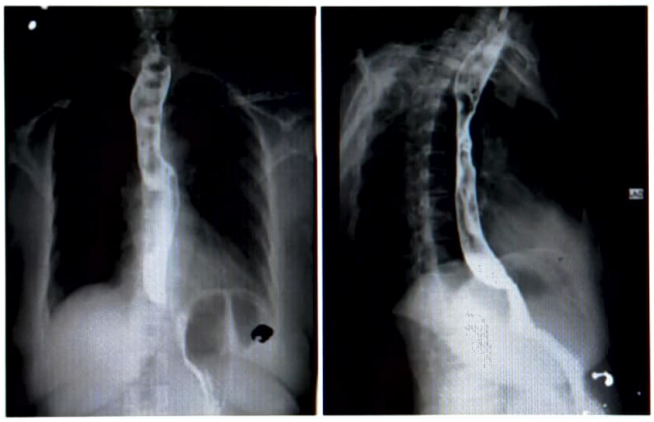
Fibrovascular Polyps

00:08:39

- Rare, but most common Intraluminal tumor of the esophagus.
- Originate as submucosal thickening near cricopharyngeus muscle and elongates into polypoid shape due to esophageal peristalsis.
- Resection in all cases due to potential airway compromise.

Approach :

- Open surgery : Transcervical approach or thoracotomy. (Esophagus is opened opposite to the origin of the polyp).
- Endoscopic : Risk of bleeding.



MCQ's :

Q. Palmer's pathologic criteria are used to define ?

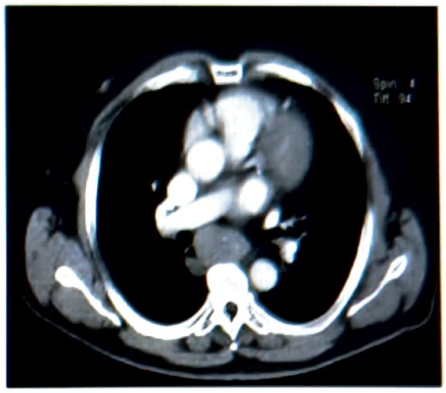
A. Leiomyoma esophagus.

B. Esophageal duplication cyst.

C. GIST esophagus.

D. Herpes esophagitis.

Q. Diagnosis ?



Ans : Leiomyoma.

Q. Diagnosis ?

Ans : Leiomyoma.

ACHALASIA CARDIA

Esophageal motility disorders 00:00:38

- Dysphagia.
- Non cardiac chest pain.
- Structural abnormalities excluded.
- Eosinophilic esophagitis ruled out.

Achalasia cardia :

Greek : a – Khalan : Failure to relax.

Recognised as cardiospasm in the 1600's :Treated by self dilatation with whale rib bone with attached sponge.

Epidemiology :

- Incidence 0.5 to 1.2/100,000 per year, with prevalence rates of approximately 10/100,000.
- Males = Females.
- All age groups.
- Etiology : Unclear.
  Could be autoimmune, viral or neurodegenerative factors.
- Basic pathology is absence of myenteric neuron plexus.

Symptoms :

- Progressive dysphagia to both solids and liquids (90 %).
- Regurgitation of undigested food (76 % to 91 %).
- Nocturnal cough (30 %).
- Aspiration (8 %).
- Chest pain.

Eckhardt score :

Developed as a prognostic score.

Symptom	Score			
	0	1	2	3
Dysphagia	None	Occasional	Daily	With every meal
Regurgitation	None	Occasional	Daily	With every meal
Chest pain	None	Occasional	Daily	Several times a day
Weight loss (kg)	0	<5	5–10	>10

The final score is the sum of the four component scores, ranging from 0 to 12

Allgrove disease :

Also known as AAA syndrome.

- Achalasia.
- Alacrima (Dryness of eyes ⟶ synechiae formation).
- Addison disease.

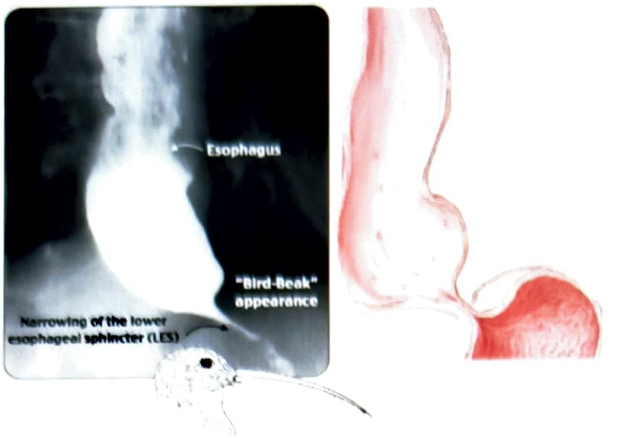
Investigations

1. Endoscopy :
   - R/o mechanical obstruction or pseudoachalasia.
   - Dilated esophagus containing retained saliva or food residue, stasis changes in the mucosa, candidiasis.
   - Resistance at Gastro Esophageal Junction.

2. Radiology :

Dilated esophagus with food and contrast retention.

Narrowed GEJ (bird beak).

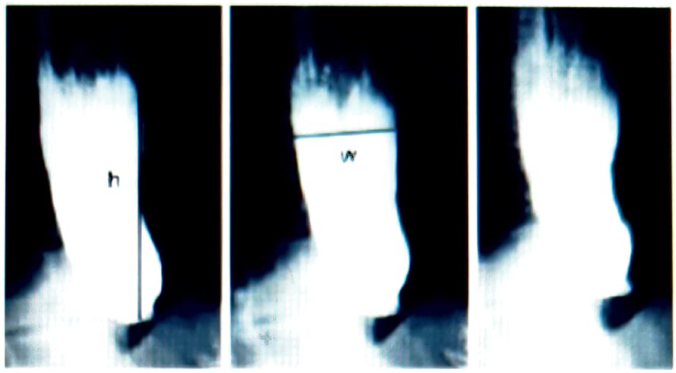


Type III variant :

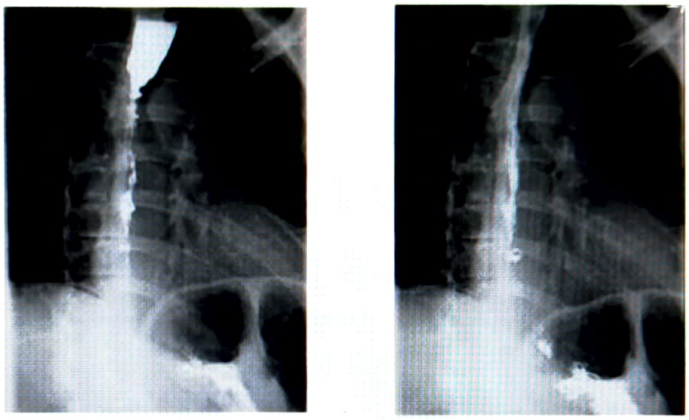
Can present with corkscrew appearance : spastic contractions.

3. Timed Barium Esophagogram :
   - 100 to 200 mL of low density barium sulfate is given in the upright position.
   - Radiographs are obtained at 0, 1, 2 (optional) and 5 minutes.
   - Percentage change in area of the barium column in the esophagus with time is noted.
   - Barium completely empties from esophagus in 1 minute in most and in 5 minutes in all healthy individuals.

Timed Barium Esophagogram :



1 min 2 min 5 min



Before Surgical intervention After surgical intervention

- Lack of adequate reduction in the height of the barium column after therapy : Associated with higher risk of treatment failure.
- Test of prognostic value.

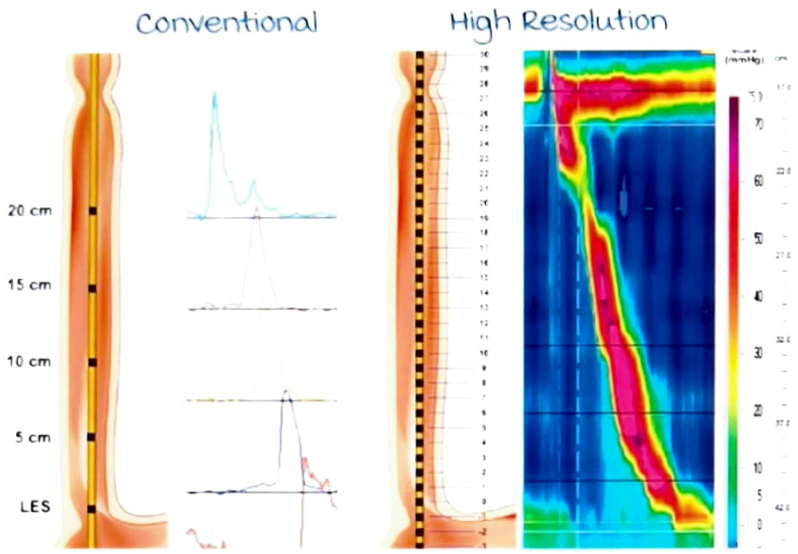
High resolution manometry 00:10:38

Esophageal Manometry :

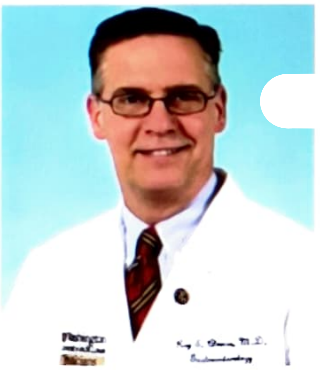
- To study contractile characteristics (motor function) of the esophagus.
- Identify and classify motility disorders.
- To plan treatment based on motor abnormalities.

Types of esophageal manometry :

1. Conventional manometry :
   3 to 8 sensors, 3 to 5 cms apart.
2. High resolution manometry (HRM) :
   36 sensors, 1 cm apart



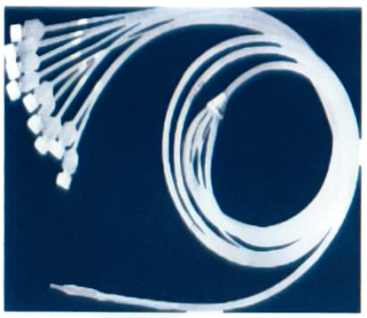
High-resolution manometry (HRM) was developed Dr. Ray Clouse. Also known as clause plots.



High resoltuion manometry machine.

Probe

Water perfused High Resolution Manometer catheter :



Solid state HRM catheter :

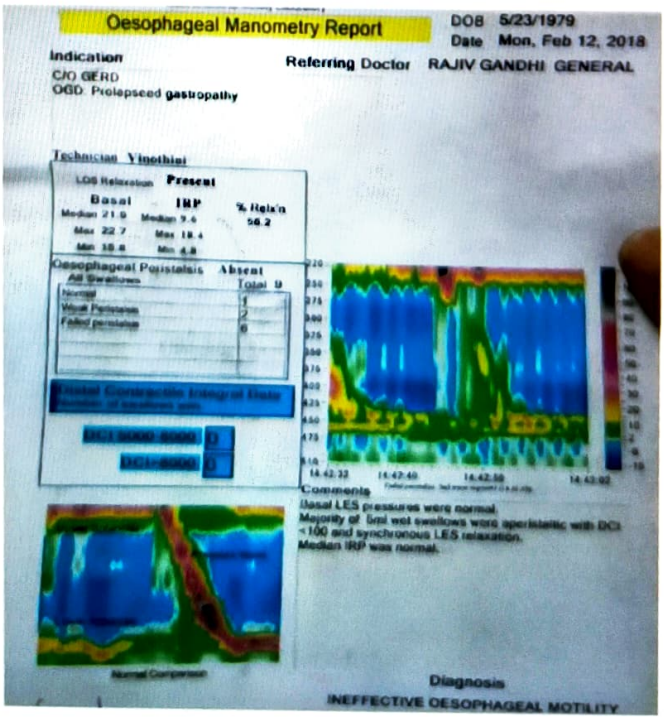
Gravity has no effect.
Patient can sit and do the test.

HRM Protocol :

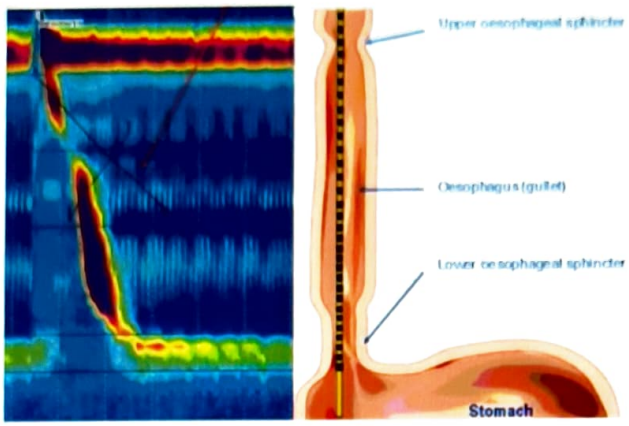
- Supine position.
- Once catether is inserted, allow 30 seconds rest.
- 10 swallows of 5 ml each.
- 20 seconds rest between each swallow.
- Once the test begins it is important to breathe slowly and smoothly, remain as quiet as possible.
- High density viscous fluid can be used,but usually water is preferred.

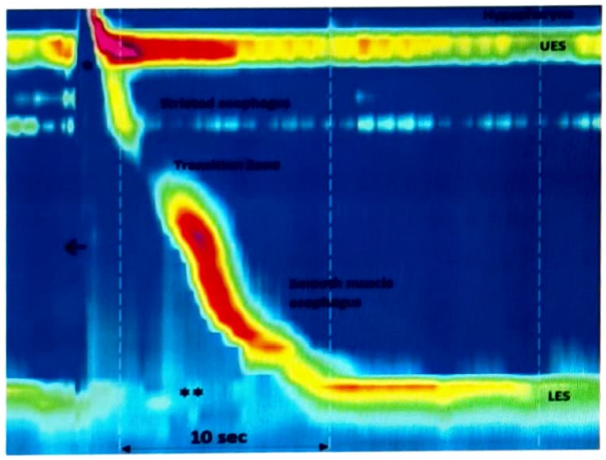
Esophageal pressure topography 00:17:15

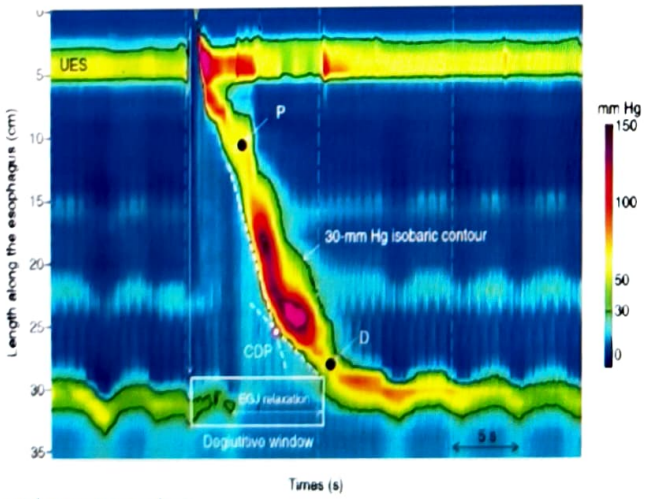
X axis represents time.
Y axis represents the axial length of the esophageal body.
Pressure is represented as color, with "hot" colors (red, orange) representing higher pressures & "cool" colors (green, blue) depicting lower pressures.
Report comparing normal EPT with patient's EPT :



Normal EPT will have a sloping pattern.







Points on the graph :

- Point P : Transition zone (Striated esophagus changes to mixed [striated + smooth] esophagus)
- Point D :
- CDP : Point represents how early esophagus contracts.

Parameters from EPT

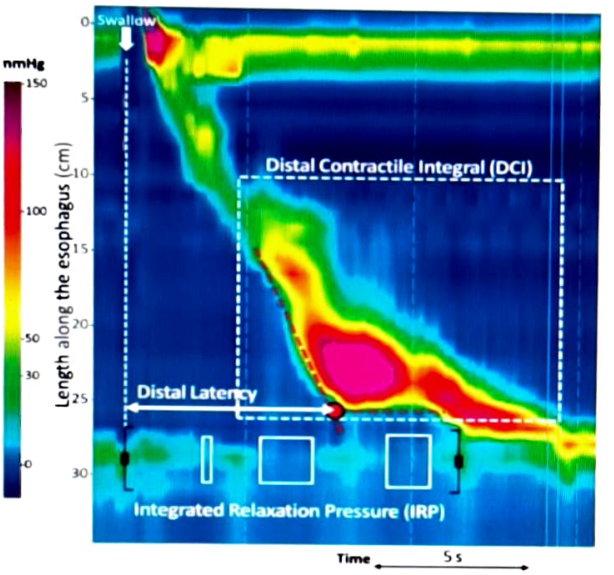
- IRP : Integrated Relaxation Pressure.
- DL : Distal Integral Latency.

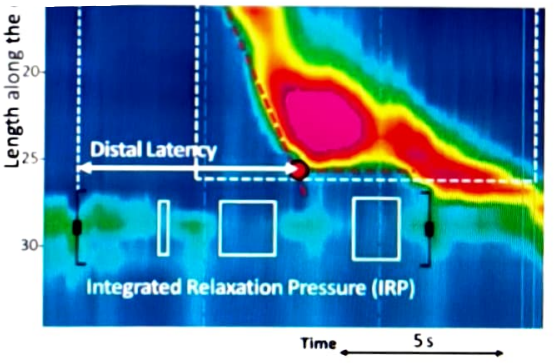
- DCI.
- Contraction pattern.

Integrated Relaxation Pressure :

Lowest average pressure of EGJ for 4 seconds (either contiguous or non contiguous) within the 10 second relaxation.

Normal < 15 mm Hg.



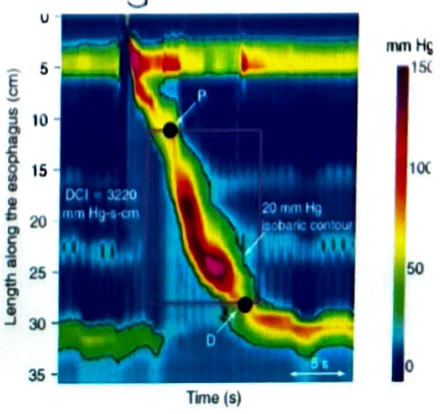


Contraction Vigor / DCI :

DCI : Distal Contractile Integral.

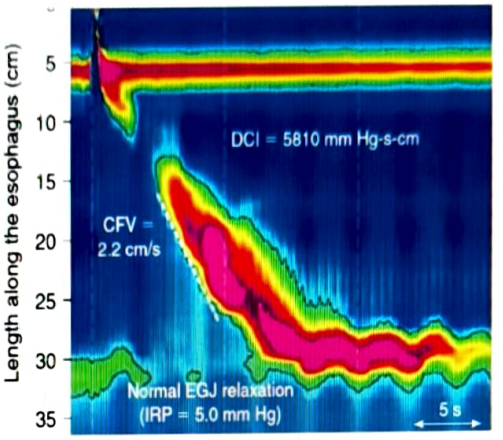
DCI is calculated by multiplying the average pressure x the duration x the length of the contractile segment.

Expressed as (mm Hg-s-cm).

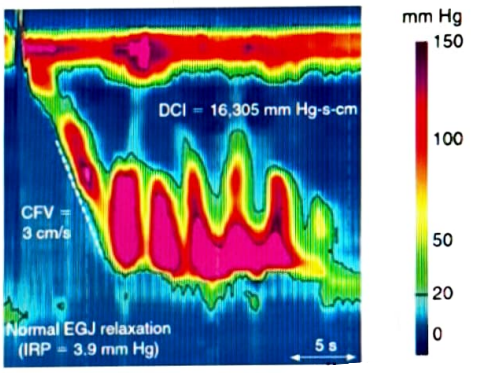


- Ineffective peristalsis :
  Failed DCI < 100 mm Hg-s-cm.
  Weak DCI > 100 mm Hg-s-cm, < 450 mm Hg-s-cm.
- Normal DCI : ≥ 450 mm Hg-s-cm, < 8000 mm Hg-s-cm.
- Hypercontractile DCI : ≥ 8000 mm Hg-s-cm.

Normal since DCI value falls between 450-8000.



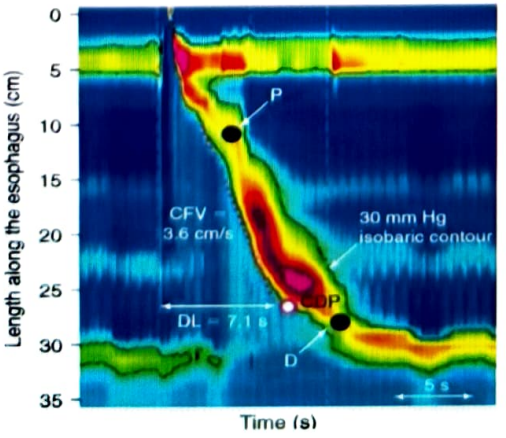
Hypercontractile



Distal latency :

Distal contractile latency (DL) is defined as the duration of the interval between UES relaxation and the CDP.

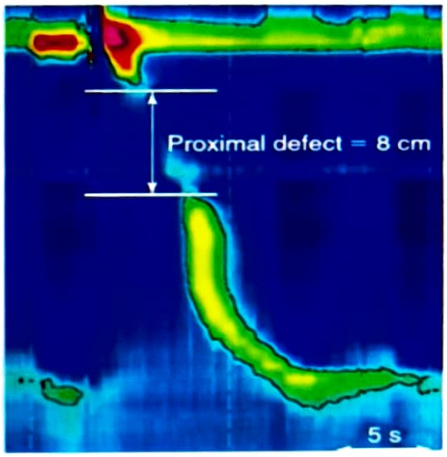
A DL shorter than 4.5 seconds is defined as a premature, or spastic, contraction.



Contraction pattern :

Swallows with large breaks (> 5 cm) : Classified "fragmented" pattern.

These swallows must have normal DL (> 4.5 seconds) and DCI (≥ 450 mm Hg-s-cm) or else they would be primarily classified as premature or ineffective.



Interpretation of EPT

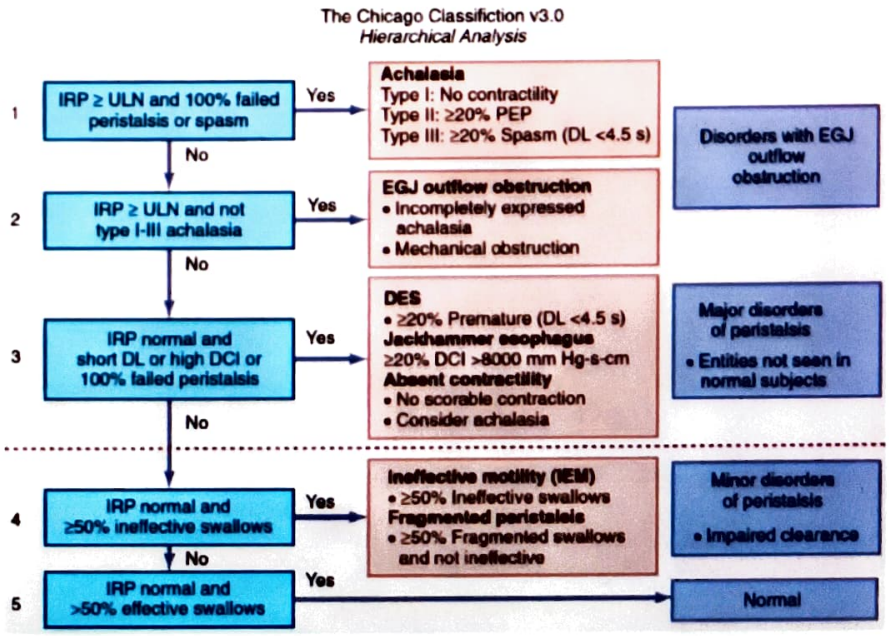
00:35:32

Chicago classification ver 3.0

Hierarchical analysis

Motility Disorders of esophagus :

1. Disorders of both esophageal body and LES :
   - Achalasia.
2. Disorders of esophageal body :
   - DES.
   - Nutcracker esophagus.
3. Disorders of esophageal LES :
   - EGJ outflow obstruction.



Hierarchical analysis :

Step 1,2.

- Assess EGJ deglutitive relaxation : LES relaxation (measure IRP).

IRP (> 15mmHg) + Failed peristalsis / spasm.

↓

Achalasia Types 1, 2, 3.

IRP (> 15mmHg) only.

No Achalasia

↓

EGJ outflow obstruction.

Step 3

- Esophageal body (DL, DCI, Contraction pattern).

IRP normal.

DL < 4.5 s.

↓

Diffuse Esophageal Spasm.

IRP normal

DCI > 8000.

↓

Jackhammer Esophagus.

Types of Achalasia based on EPT 00:41:38

Common component : Incomplete or failed relaxation of the LES.

Type 1 (classic achalasia) : No contraction in esophageal body.

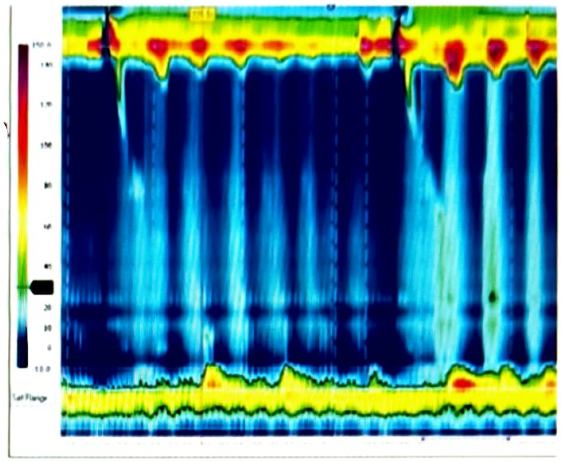
Type 2 : Panesophageal pressurization.

Type 3 (spastic/vigorous achalasia) : Premature / spastic contractions.

Achalasia Cardia Type 1 :

- Classic achalasia.
- Diagnostic criteria :

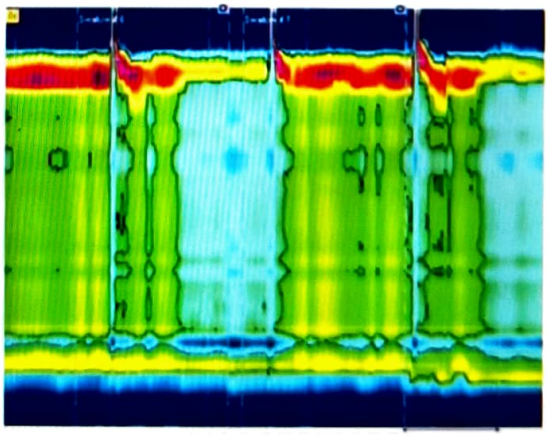
  Elevated median IRP (>15 mm Hg), 100% failed peristalsis (DCI <100 mm Hg-s-cm).



Achalasia Cardia Type 2 :

Diagnostic criteria :

- Elevated median IRP (>15 mm Hg), 100% failed peristalsis, panesophageal pressurization with ≥ 20% of swallows.
- Contractions may be masked by esophageal pressurization and DCI should not be calculated.

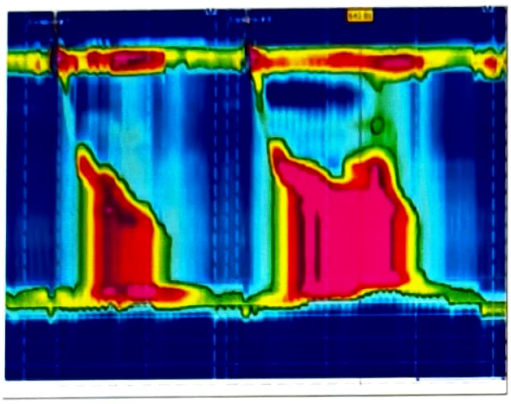


Achalasia Cardia Type 3 :

Spastic / Vigorous Achalasia.

Diagnostic criteria :

Elevated median IRP (> 15 mm Hg), no normal peristalsis, premature (spastic) contractions with DCI > 450 mm Hg-s-cm with ≥ 20 % of swallows.



Management of Achalasia

00:47:36

Non surgical :

- Pharmacotherapy.
- Botulinum A toxin.
- Pneumatic dilatation.

Surgical :

- Heller's myotomy with fundoplication (Gold standard).

Pharmacotherapy :

- Isosorbide dinitrate (Nitrate) sublingually 5 mg, 10 to 15 minutes before meals.
- Nifedipine (calcium channel blocker) 10 to 30 mg, 30 to 45 minutes before meals sublingually.
- Limited response : Useful in high risk patients.
- Side effects : Hypotension, dizziness, and headaches.

Botulinum A toxin :

- Neurotoxin
- Inhibits release of acetylcholine from nerve terminal.
- Blocks neurogenic but not myogenic component of LES.
- Relapse in approximately 50% of patients by 1 year.
- Suitable in high risk patients.

Method of injection :

- Injected endoscopically by a sclerotherapy needle just above squamocolumnar junction.
- Total dose of 100 U, divided in four, injected to four quadrants of LES.

Pneumatic dilatation for Achalasia

00:50:50

Pneumatic dilation (PD) is considered to be the first line non surgical therapy for achalasia.

Principle: weaken LES by tearing its muscle fibers by generating radial force.

Types of Pneumatic dilatation :

1. Endoscope guided :
   - Without fluoroscopy.
   - Determine mucosal injury during dilation, so repeat endoscopy is not need.
2. Fluoroscopy guided :
   - Need longer time, more radiation exposure.
   - Repeat endoscopy to assess mucosal tearing.

Types of Pneumatic Balloon dilators :

1. High compliance balloons (soft balloon):
   - Rider Moeller device.
   - Brown McHardy dilator.
   - Witzel dilator.
2. Low compliance balloons (rigid balloon) : most favoured type.
   - Gruntzig type dilator.
   - Rigiflex dilator.

Pneumatic Balloon dilatation :

Most commonly used is Rigiflex dilator (30, 35 & 40 mm diameter).

Graded dilatation is performed, starting with 30 mm.

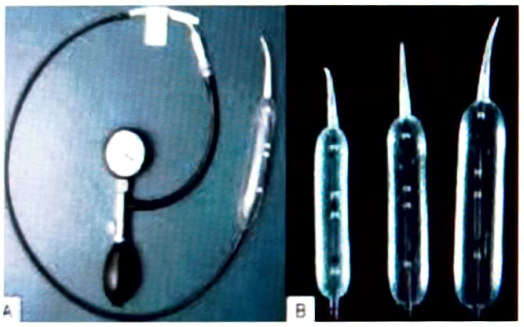
4 to 6 weeks between each dilation.

Risk of perforation increases with size of the balloon.

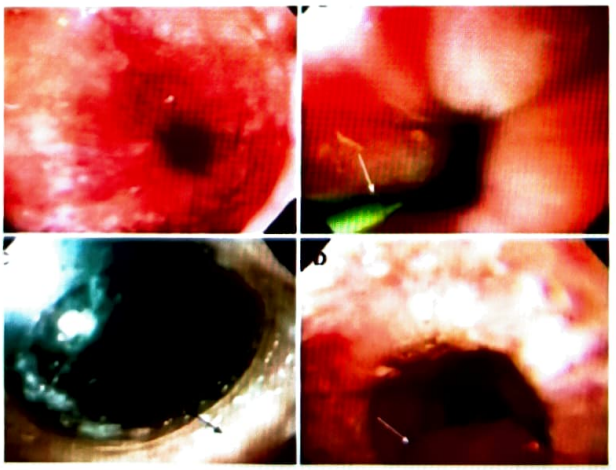
Method of Pneumatic dilatation :

- Balloon is positioned across LES and inflated with air to forcefully stretch the muscle.
- Balloon is kept inflated for about 60 seconds, with average inflation pressure of 10 to 12 psi.
- Post dilation contrast study done to exclude esophageal perforation (1%).

Rigiflex dilator :



Endoscopic Pneumatic dilatation :



Manometric studies following Pneumatic dilatation :

- Important predictor of treatment failure with balloon dilation.
- Post dilated LES pressure is relevant to better remission.
- Decrease in LES pressure of > 50% after PD, or an absolute end expiratory LES pressure of < 10 mm Hg, are more indicative of clinical success.