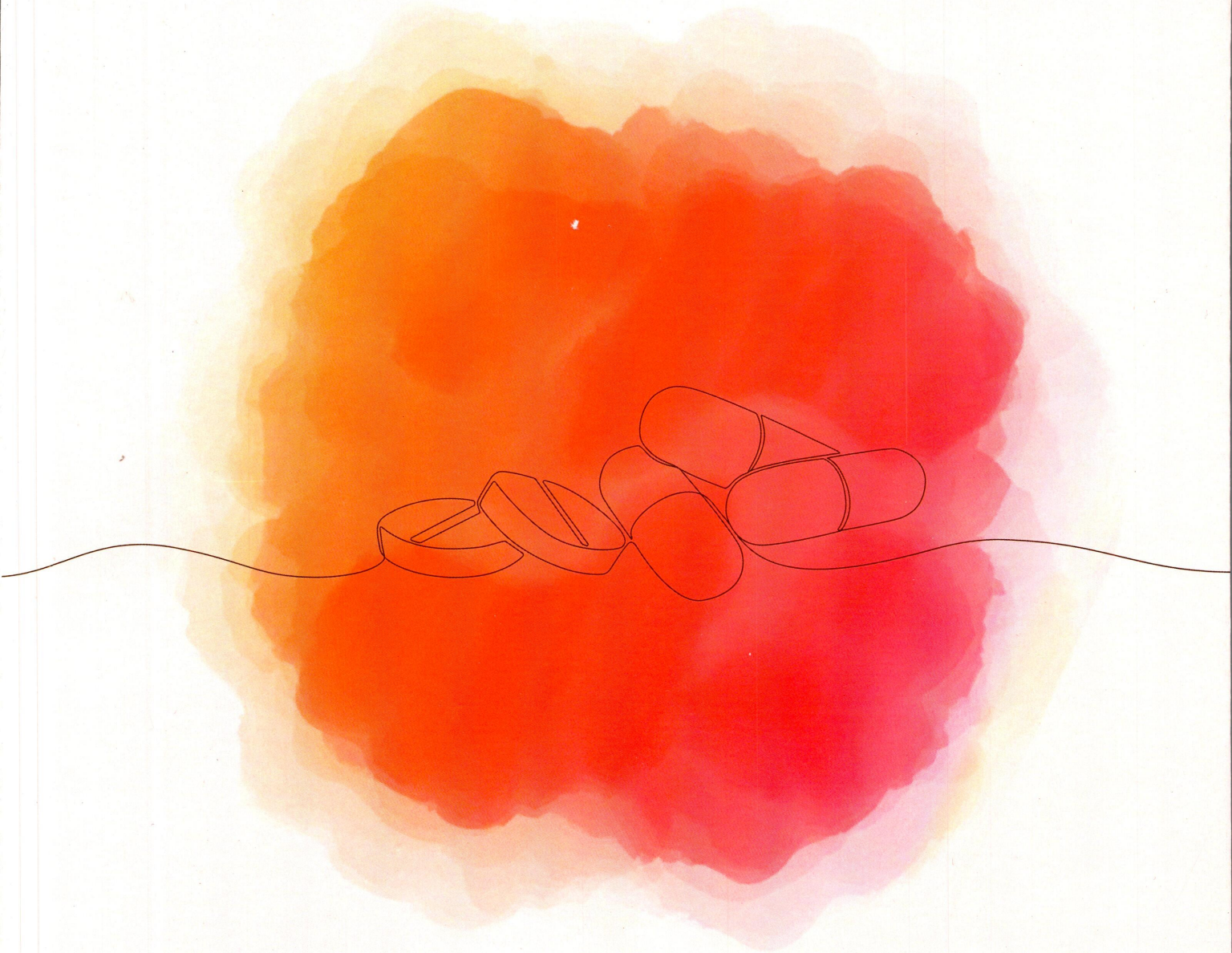
VOLUME-III

PrepLadder



MEDICINE

NEET SS VERSION 4.0

PREFACE

Dear Dreamer,

Pat your back and reward yourself, today you've taken an important step towards reaching your dream. Mark Twain said, "the secret of getting ahead is getting started". You have started in the right direction.

The next few months until your targeted exam or exams are crucial. Every moment counts and each step you take now, will help you reach your goal, your dream.

PrepLadder is your partner in this journey. We are in this together. So, don't worry, do not stress. Just focus on your preparation and stay positive. Set daily targets, achievable and realistic ones. If you pass the target, celebrate. However, if you miss a daily target, forgive yourself, move on and do better the next day.

Always remember that you are special and unique. Do not compare your preparation, your speed, your abilities with others. Believe us, it doesn't help.

Practice a lot. Solve the QBank. Take Grand Tests. Review your performance. But don't let ranks and results drag you down. Rather use them as a guiding light to know your strengths and weaknesses, to increase your speed and accuracy, and to get yourself ready for the exam day.

If you have a doubt or a question, ask us. We are here.

Lastly and most importantly. take care of yourself. You and your health are precious. So, keep up with exercise, eat healthy, get enough sleep and care for yourself.

We're behind you, cheering you on to the finish line. You might be feeling stressed, overwhelmed, and so tired, but you're nearly there. Give it everything you've got, and know that whatever happens next, you've got what it takes for the life you want. You are a Champion.

Own Your Dream
Team PrepLadder

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GASTROENTEROLOGY AND HEPATOLOGY

1 ESOPHAGEAL MOVEMENT DISORDERS

Esophageal Movement Disorders

Chicago Classification 4.0 (2021)

- Based on: High Resolution Manometry (Gold standard)

1. Median IRP (Integrated Relaxation Pressure)

- Normal: < 15 mmHg
- Elevated: > 15 mmHg

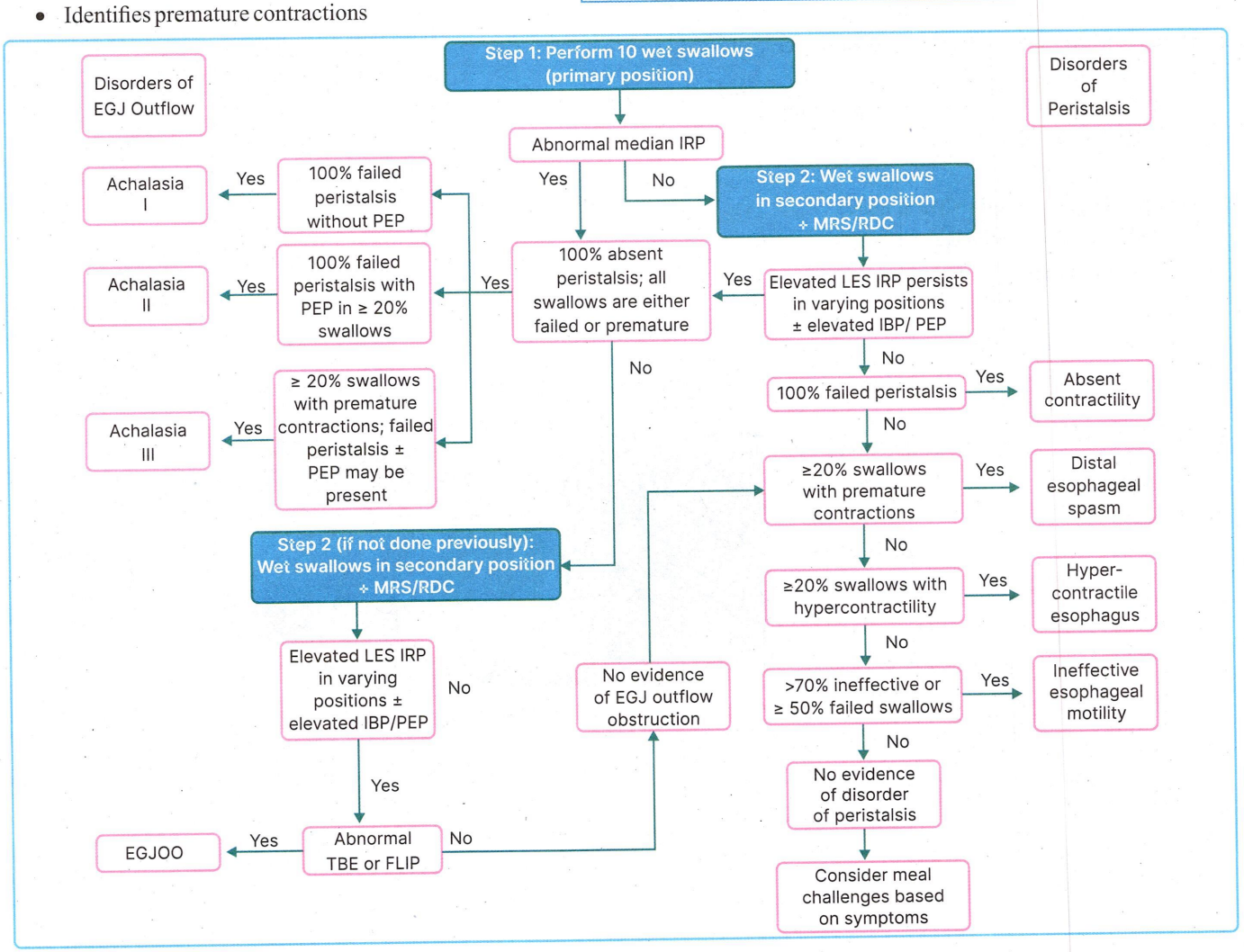
2. DCI (Distal Contractile Integral)

- Normal: < 450 mmHg /m²
- Elevated: > 450 mmHg/cm²
- Indicates force/vigor of contraction

3. DL (Distal Latency)

- Normal: > 4.5 seconds
- Reduced: < 4.5 seconds
- Time from UES opening to contraction in lower esophagus
- Identifies premature contractions

Categories of Esophageal Movement Disorders	
Disorder of esophago-gastric junction obstruction	**Disorders of Peristalsis**
• Achalasia cardia • EGJ outlet obstruction	• No pathology of ileus relaxation • Ineffective esophageal motility • Distal/Diffuse esophageal spasm • Nutcracker/Jack-Hammer esophagus
• Elevated mIRP: > 15 mmHg	• Normal mIRP: < 15 mmHg



Disorders of EGJ Obstruction

Achalasia Cardia

- Diagnostic Criteria
  1. Median IRP > 15 mmHg (elevated)
  2. 100% absent peristalsis

Type	Features
Type 1 (Classic)	• 100% absent peristalsis • No other abnormalities
Type 2	• Pressure buildup
Type 3 (Spastic)	• Spasmodic contractions

Disorders of Peristalsis

1. Absent Contractility

- Median IRP: < 15 mmHg (normal)
- Peristalsis: 100% failed

2. Distal Esophageal Spasm

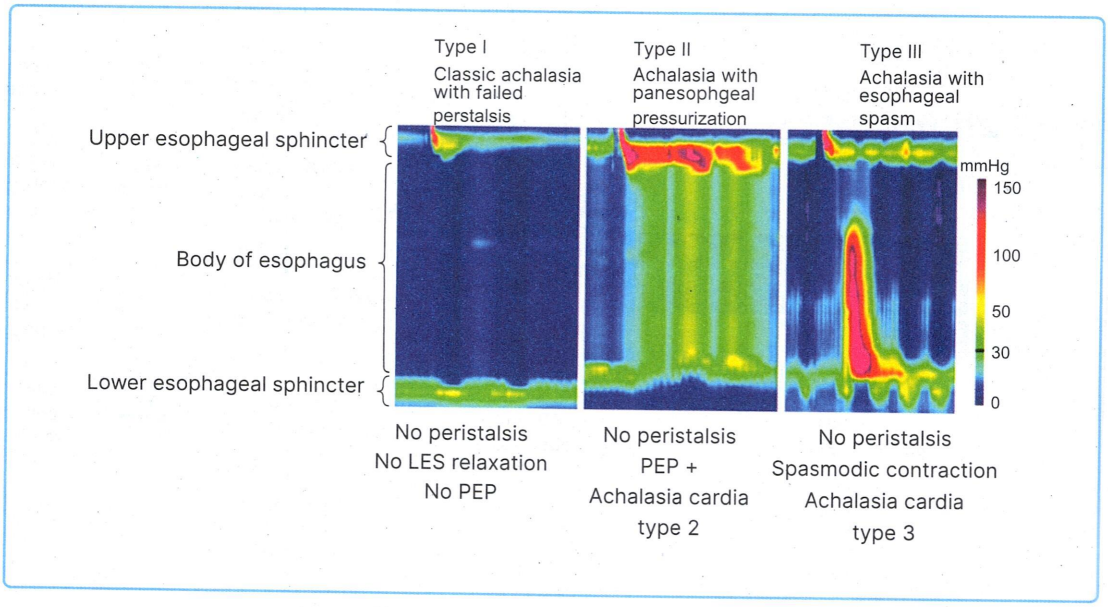
- Median IRP: < 15 mmHg (normal)
- 20% swallows associated with premature contractions

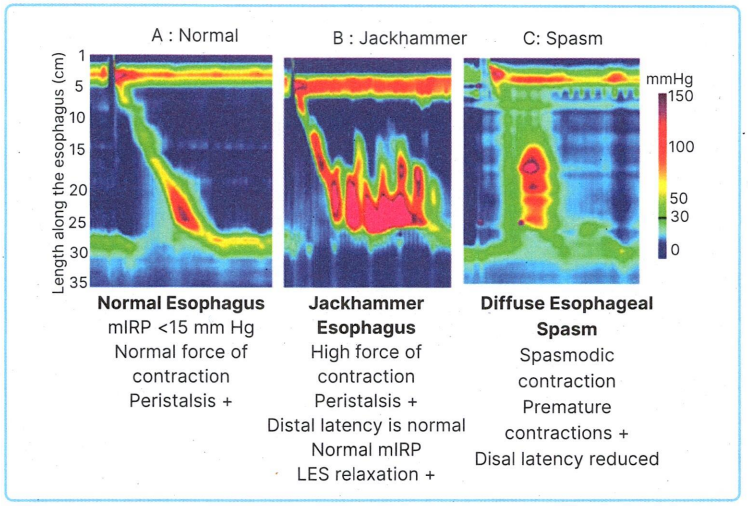
3. Hypercontractile Esophagus (Jackhammer/Nutcracker)

- Median IRP: < 15 mmHg (normal)
- 20% swallows associated with hypercontractility
  - DCI > 8000 mmHg/cm²

Esophageal High-resolution Manometry

- Median mIRP > 15mm Hg
- EGJ disordersBody of esophagus





Distal Esophageal Spasm (DES)

00:43:42

- Peristaltic disorder
- Females>>Males
- Associated with other functional bowel disorders
  - IBS
  - Acid peptic disease
  - Functional dyspepsia
- May often have psychiatric issues
  - Generalized anxiety disorder
  - Depression

Clinical Features

- Chest pain
- Dysphagia
- Regurgitation (esophageal content)
  - Rare to have acid reflux
- Incidence: 5 times less common than achalasia

Evaluation

- Barium study: Corkscrew appearance
  - D/D: Achlasia cardia type III
- HRM finding:
  - mIRP<15 mm Hg (Normal)
  - DCI>450 mmHg
  - DL<4.5 seconds (Reduced)

Management

- Smooth muscle relaxation
  - Nitrates
  - Calcium channel blockers
  - PDE-5 inhibitor (Sildenafil)
- Botulinum injection
- Surgery: Long Myotomy

- Proximally: Extend till the level of increased contractions
- Distally: Till LES

- Anti-depressants
  - Imipramine
  - Trazodone
  - Sertaline

Hypercontractile/Jackhammer/Nutcracker Esophagus

00:52:30

- Males & females are equally effective
- Occurs in all ag groups
- Peristalsis present but hypercontractile
- Most common esophageal motility disorder
- Most painful esophageal motility disorder

Clinical Features

- Chest pain
- Dysphagia

Diagnosis

- HRM findings:
  - Median IRP: Normal (< 15 mmHg)
  - DCI > 8000 mmHg/cm²
  - Distal latency: Normal (> 4.5 seconds)

Management

- Smooth muscle relaxants
  - Nitrates
  - Calcium channel blockers
  - PDE-5 inhibitor (**S**ildenafil)
- Anxiolytics
- Botulinum injection
- Consider myotomy if severe

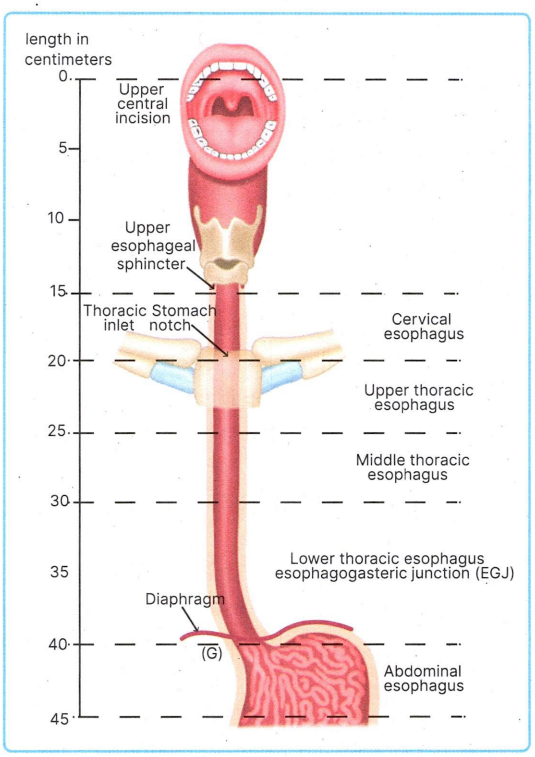
2 ESOPHAGEAL MOTILITY DISORDERS

- Complaints
  - Dysphagia
  - Chest Pain (Rule out cardiovascular causes first)
  - Food Impaction
    - → Structural causes- Mass lesion, esophageal webs
    - → Functional causes- Eosinophilic esophagitis
  - Regurgitation
  - Heartburn (GERD) - Rule out cardiac causes first in at risk group

Esophageal Anatomy & Physiology

00:04:34

- Esophagus is a hollow viscous tube connecting oropharynx (hypopharynx) **to stomach**
  - At both ends it has sphincter
    - → Between hypopharynx and esophagus - Upper esophageal sphincter
    - → Between stomach and esophagus - Lower esophageal sphincter

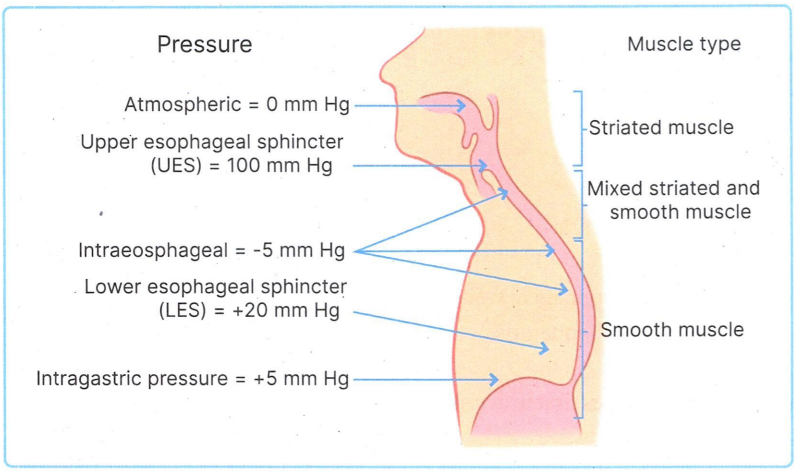


- At rest, esophagus is slightly under negative atmospheric pressure
- Sphincter have significantly higher pressure over and above the atmospheric pressure - To guard against the fluid and food against sphincter
- Length: 25-30 cm (average adult)
- Esophagus can be divided into 3 sections
  - Cervical Esophagus: 4.5-5 cm
    - → Hypopharynx → Sternal notch
  - Thoracic
    - → Upper Thoracic: 5 cm
    - → Middle Thoracic: 5 cm
  - Lower Thoracic: Remaining portion (Largest division)

Pressures

00:07:53

Location	Pressure (mmHg)
Oropharynx	0 (atmospheric)
Upper Esophageal Sphincter (UES)	100
Esophageal Body (remain as collapsed tube)	-5
Lower Esophageal Sphincter (LES)	+20
Stomach/ Gastric pressure	+5



- Conditions where pressure inside esophagus exceeds pressure inside stomach
  - Achalasia cardia and various other movement disorders

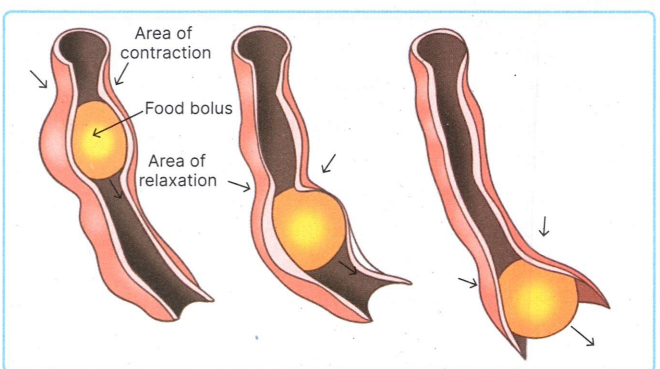
Muscle Distribution

- **Upper Esophagus**: Mixed skeletal + smooth muscle
- **Lower Esophagus**: Predominantly smooth muscle
- **Clinical Relevance**: Smooth muscle relaxants (nitrates, CCBs) work better on lower esophagus

Peristalsis

00:10:09

- Esophagus is collapsed tube with negative pressure inside
  1. UES relaxes → Food bolus enters esophagus
  2. Behind bolus: Contraction wave which pushes the food down into the esophagus
  3. Ahead of bolus: Relaxation wave
  4. LES relaxes BEFORE bolus arrives
  5. Food enters stomach → LES closes



- Disorders affecting relaxation of sphincters causes motility disorders or motility disorders can also be related to body of esophagus through which peristaltic wave moves
- Current classification - Chicago classification version 4.0
  - Classify esophageal utility disorders into 2 categories
    - → Esophago-gatric junction outlet obstructions
    - → Disorders of peristalsis

Diagnostic Evaluation

00:12:03

- Endoscopy
- Radiography - Barium contrast radiography
- Mannometry - Standard for evaluation of motility disorders
  - High resolution mannometry - gold standard

- Reflux testing - Gold standard for GERD
- Endoscopic USG

Endoscopy

00:14:42

- Ideal investigation for Mucosal diseases

- Barrett's esophagus
- CMV esophagitis
- Ulcers
- Vascular ectasia

- Strictures - Endoscopy is Inferior to barium radiography
- Mucosal biopsy
- Submucosal disease

Barrett's Esophagus

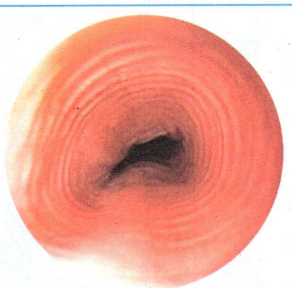
- **Appearance**: Salmon-colored/Red velvety mucosa - Lined by columnar epithelium
  - Rest of the mucosa is relatively pale - Lined by stratified squamous epithelium
- **Location**: Lower esophagus
- **Biospy**: Goblet cells present
- **Clinical**: GERD history



- **Clinical history** - Recurrent food impaction, atopy
- **Diagnosis** - **Eosinophilic Esophagitis**

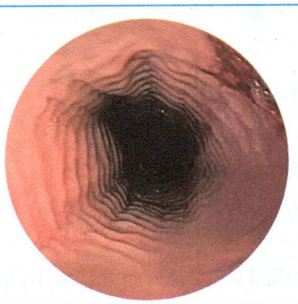
Crepe Paper Mucosa

- Thin, fragile, friable mucosa
- Superficial furrows
- Granularity
- Biopsy - Esosinophilic infiltration



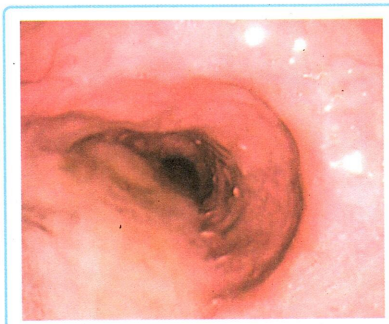
Feline Esophagus

- Horizontal & Vertical furrows
- Seen in cats



Radiography

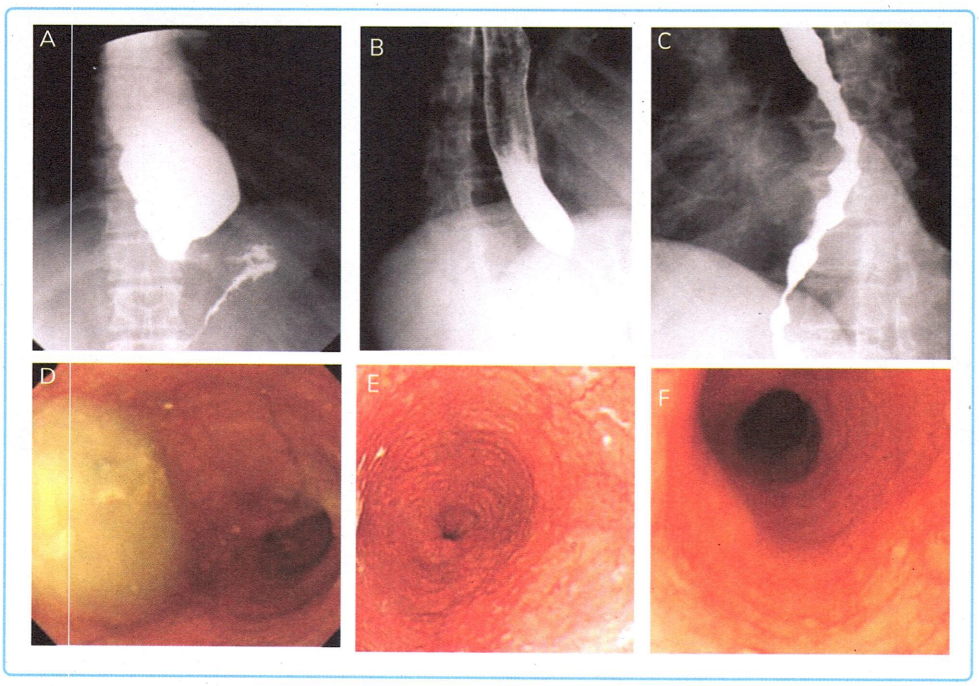
- **Barium contrast radiography**: Suspected strictures
- Endoscopy after radiography must be done for further characterization of lesion





Achalasia Cardia Type 1 (Classic)

- Clinical history - Regurgitation, dysphagia, chest pain, stasis of food (seen in endoscopy images)
- Dilated lower esophagus
- Bird's beak appearance
- Air-fluid level
- Well defined smooth margins of BArium as sphincter have well defined smooth margins
- D/D - Rat tail appearance
  - Seen in Ca of lower end of esophagus
  - Corrugated/ uneven surface from where barium flows



A. Achalasia cardia (classic type)

- Dilated esophagus
- Bird beak appearance
- Endoscopy - Stagnant food

B. Achalasia Cardia Type 2 (With Pan-esophageal Pressurization)

- Similar to Type 1
- Less dilation of esophagus
- Air fluid level
- Tightly closed Ileus
- Bird beak appearance

C. Achalasia Cardia Type 3 (Spastic/Vigorous):

- Corkscrew esophagus (D/D - DES)
  - Diagnosis is confirmed by high resolution mannometry
- Upper GI endoscopy almost appear normal
- Spasmodic/ Segmental contractions
  - All segments are in contraction simultaneously
- Severe symptoms
- Most difficult to treat

Endoscopic Ultrasound

- Staging of esophageal cancer
- Submucosal disease detection
- Barrett's metaplasia evaluation

Reflux Testing (24-HOUR pH MONITORING)

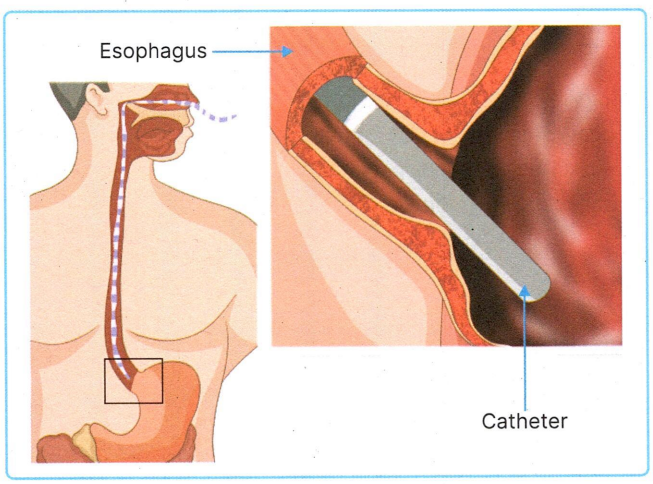
- Gold Standard for GERD diagnosis
- Patient is asked to swallow tube containing pH sensors and place it in lower end of esophagus
- Gather the data externally either connected to the tube or through the wireless transmitters to collect the data externally of ph
- pH changes are passed on to the external device
- Lower esophageal area should have **pH <4 for > 5% of total time (24 hours)**

High-resolution Manometry

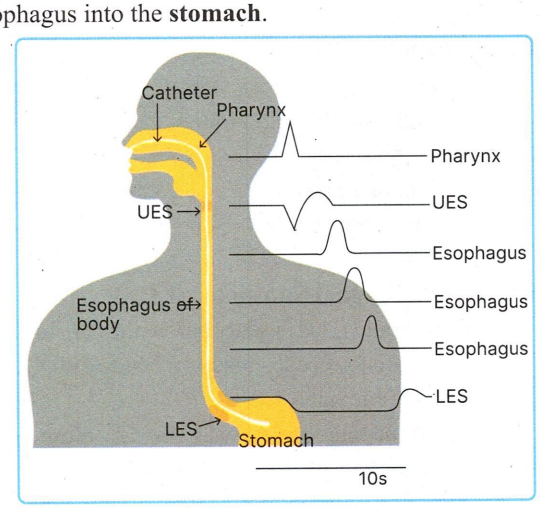
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- Gold Standard for Esophageal Motility Disorders

Conventional manometry (before high-resolution manometry)



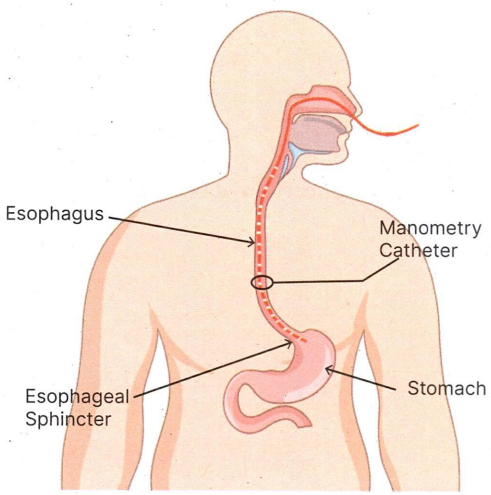
- Involves inserting a tube with **multiple pressure sensors** through the esophagus into the **stomach**.
- Sensors are placed at **intervals** to record **pressure data** along the esophagus.
- Data is transmitted to an **external recording device**.
- The patient is asked to **swallow** during the procedure.
- This helps assess:
  - **Relaxation of sphincters** (upper and lower esophageal sphincter)
  - **Peristaltic activity**
  - **Intra-esophageal pressure changes**
- Output is in the form of **waveforms/graphs** showing pressure changes at:
  - Upper esophageal sphincter
  - Esophageal body
  - Lower esophageal sphincter

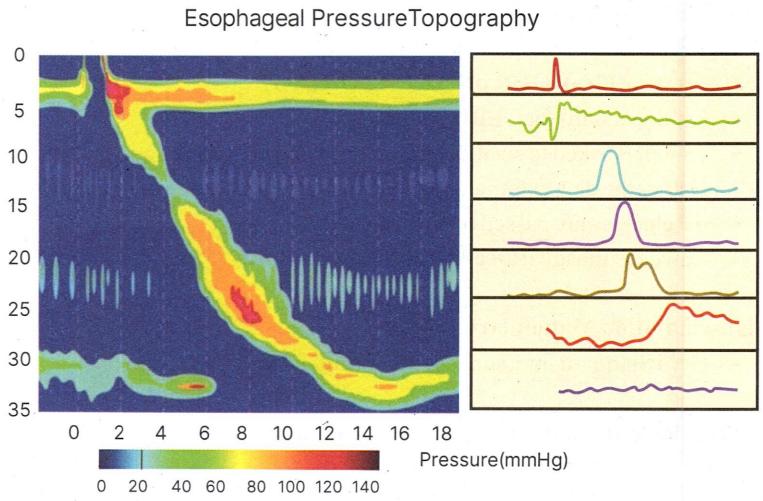


High pressure mannometry

- Purpose: Detects pressure changes throughout the esophagus during swallowing using high-resolution sensors.
- Advantage: Offers a topographic (color-coded) image with higher spatial resolution than conventional manometry.

Esophageal Manometry





Swallowing Process (Normal Physiology)

- Swallow initiated → Upper esophageal sphincter (UES) relaxes.
- Bolus enters the esophagus → Peristaltic waves propels it down.
- Lower esophageal sphincter (LES) relaxes → bolus enters stomach.
- LES closes after bolus entry.

Parametres

- Y-axis: Distance along esophagus (UES to LES).
- X-axis: Time after swallowing initiation (in seconds)
- Pressure changes : Represented by color codes:
  - Blue: Near 0 pressure
  - Green → Yellow → Orange → Red → Purple: Increasing pressure levels

Upper Esophageal Sphincter (UES)

- At rest: Appears green/yellow → indicates higher pressure.
- During swallow initiation:
  - UES relaxes.
  - Pressure drops → seen as a blue tinge.
  - Blue color marks the opening of UES just before esophageal pressure changes begin.

Lower Esophageal Sphincter (LES)

- LES should relax slightly before the peristaltic pressure wave reaches it
- Relaxation precedes bolus arrival to allow smooth passage.
- On HRM image:
  - A blue tinge appears at LES just before the contraction wave reaches it → Indicates opening of LES for bolus entry into the stomach.
- Normal LES pressure: Around 20 mmHg at rest (appears as high-pressure color).

Esophageal Body (Peristalsis)

- With normal peristalsis: Pressure wave appears slanted (diagonal line across the esophagus).

- Absent contractions: HRM shows blue (no pressure).
- Non-peristaltic contractions: Appear as vertical bands (simultaneous contractions at multiple esophageal levels)
  - These are non-propulsive → e.g., spastic/esophageal spasms.

Integrated Relaxation Pressure (IRP)

- Concerns lower esophageal sphincter at rest i.e., it have higher pressure
- Normal LES at rest: >20 mmHg
- Hypertensive LES: >35 mmHg
- Resting LES pressure: Not consistently useful for diagnosis
  - E.g., in achalasia cardia - May have high or normal LES pressure in achalasia
- **Normal IRP:** <15 mmHg
- Elevated IRP: >15 mmHg - Indicates LES relaxation generally seen in Achalasia cardia, EGJOO
- **Median IRP**
  - The patient performs 10 wet swallows (5 mL water each)
  - 30-second gap between swallows.
  - Median IRP of these 10 readings is used for assessment.

Distal Contraction Integral

- Measures: Force/vigor of contraction
- High DCI → Higher force of contraction

DL (Distal Latency)

- From beginning of swallowing where Upper Esophageal sphincter relaxes to noticing contraction in LES
- Normal: >4.5 seconds
- <4.5: Reduced distal latency
  - Seen in Jackhammer esophagus

3 ESOPHAGITIS

00:00:15

Esophagitis

Eosinophilic Esophagitis

- Intense eosinophilic inflammation of esophagus leading to symptoms related to esophagus
- Age - 30-40 years (adults), also affects children
- Male preponderance
- Whites more commonly affected
- >2/3 patients have atopy (asthma, allergic disorders)
- D/D for GERD

Causes

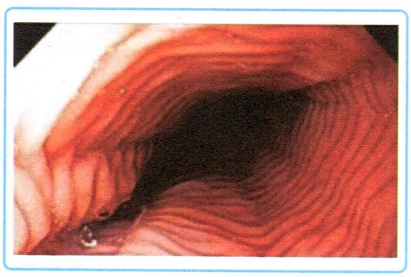
- GERD, CTDs
- Drug hypersensitivity
- Hypereosinophilic syndromes
- Crohn's disease
- Infections

Clinical Features

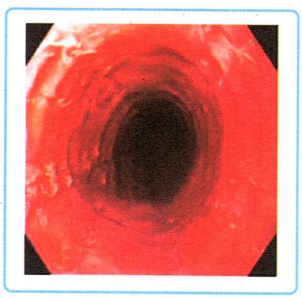
- Heartburn (M/c)
- Esophageal dysphagia (2nd M/c)
- Recurrent food impactions (Schatzki's Ring, Eosinophilic Esophagitis)
- Failure to thrive (especially in children)
- Aversion to food

Diagnosis

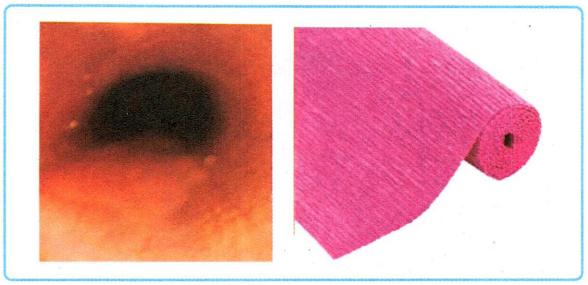
- OGD (endoscopy) and biopsy



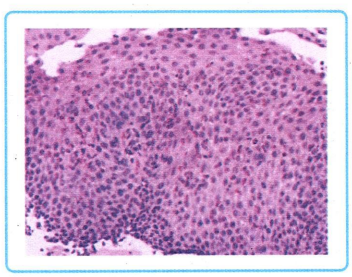
- 1/3 of patients may have normal endoscopy at presentation
- Trachealization of esophagus
- Feline esophagus (similar to cat esophagus)
- Exudates in endoscopy



- Eosinophilic abscess



- Crepe paper mucosa - look like crepe paper, very delicate
- GERD - primarily affects distal esophagus
- Eosinophilic esophagitis can affect entire lung - proximal as well as distal, intensity is more distal
- The American College of Gastereontology (2019) recommends 2 - 4 site biopsies and distribution between distal and proximal
- Latest recommendation comes from American Gastroenterology Association, recommends (2022) 5-site biopsy



- On HPE - for eosinophilic esophagitis > 15 eosinophils/ hpf, GERD - 0 to 7/hpf
- Basal layer hyperplasia

Management of Eosinophilic esophagitis

1. Diet
   - Majority of dietary allergens are peptides/proteins
   - Use an elemental diet (remove protein from diet and give amino acids)
   - Elimination diet -
     - For example, remove egg, soy, and cow's milk that can cause allergies, Do a skin prick test and then eliminate it
   - 2 types of elimination diets
   1. SFED (Six-food elimination diet)
      - Soy, peanuts, cow milk, egg, wheat, seafood
      - Modified SPED - results from prick test allergy test also added
   2. OFED (One food elimination diet)
      - Removes cow milk from diet,2/3 rd patients have shown recovery
2. Medications
   - Topical/Systemic steroids
   - Recommended by ACG and AGA - PPI trial is recommended
   - If patient is responding to PPI, then combine PPI trial with food-elimination diet
   - If patient is not responding to PPI trial -
     - Topical steroids - strongly recommended
     - Oral steroids - only in refractory cases
     - Not recommended by latest guidelines for real-world implementations -
       → Anti- IgE MAbs (Omalizumab), Anti-IL5 MAbs
       → Anti - ILI3, anti IL4R MAbs
       → Montelukast/cromolyn sodium/ anti-TNF α

3. Endoscopic Dilation - for esophageal strictures (patients have dysphagia)

American Gastroenterology Association/ Joint Task Force 2022 Recommendations

- PPIs over no treatment
- Topical glucocorticoid over no treatment
- Topical steroids over systemic steroids
- Elemental diets over no diet
- Empirical SFED over no treatment
- Allergy testing based clinic diet over no treatment - poor yield
- Continued topical steroid treatment after initial response over discontinuation
- In EoE dysphagia with strictures, AGA recommends endoscopic dilatation

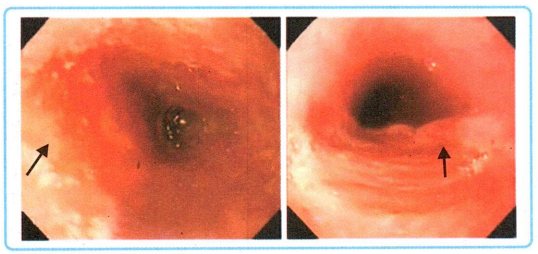
EoE (Practical Implementation)

- If patient responds to PPI trial, treat them with PPI
- If it doesn't respond, topical steroids are given -> esophageal dilation

Comparison of Eosinophilic Esophagitis and GERD		
Characteristic features	**Eosinophilic esophagitis**	**GERD**
Clinical		
Prevalence	~1:1000	~1:10
Prevalence of atopy	Very high	Normal
Prevalence of food sensitization	Very high	Normal
Gender preference	Male	None
Abdominal pain and vomiting	Common	Common
Food impaction	Common	Uncommon
Investigative Findings		
pH probe/ impedance study	Normal	Abnormal
Endoscopic furrowing	Very common	Occasional
Histopathology/ Pathogenesis		
Involvement of proximal esophagus	Yes	No
Involvement of distal esophagus	Yes	Yes
Epithelial hyperplasia	Severely increased	Increased
Eosinophil levels in mucosa	> 15/HPG	0-7/HPF
Elevated eotaxin-3 level	Yes	No
EoE diagnostic panel positive	Yes	No
Treatment		
H_2 receptor antihistamines	Not helpful	Helpful
Proton pump inhibitors	Helpful in subset	Helpful
Glucocorticoids	Helpful	Not helpful

Infectious Esophagitis

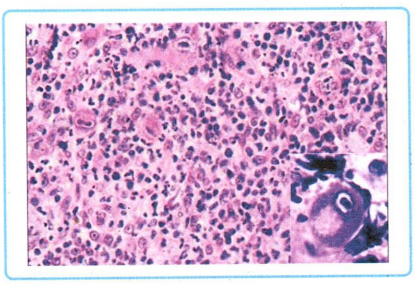
CMV Esophagitis



- Occurs in immunocompromised patients secondary to organ transplantation
- Clinical features - odynophagia, dysphagia
- On endoscopy - serpiginous ulcers, only ulcers carry CMV viruses, surrounding mucosa may be normal
- For diagnosis - HPE (cytomegalic cell), Biopsy (immunostain biopsy specimen, perform PCR for CMV)
- Treat with Ganciclovir/Valganciclovir

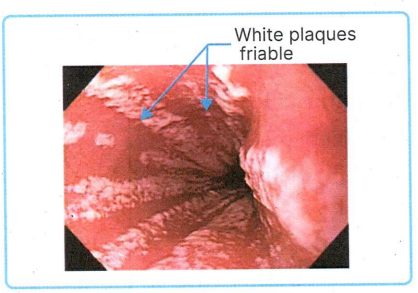
HPE

- Cytomegalic cell - Shows presence of intra-nuclear basophilic inclusion bodies



- Surrounding cytomegalic cell - clear halo (Owl eye appearance)

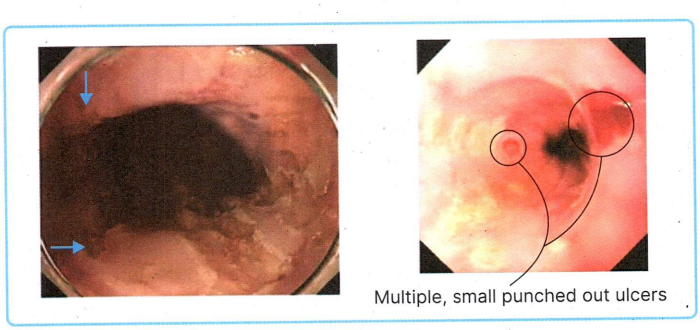
Candida Esophagitis



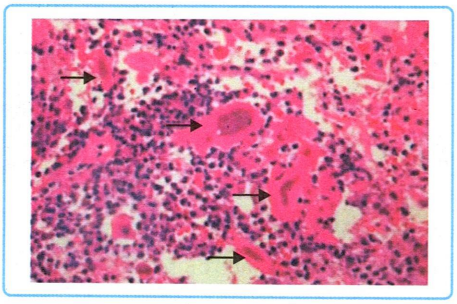
- Clinical features - odynophagia, dysphagia
- Majority patients are immunocompromised/diabetic
- >75 % of patients have oral candidiasis with esophageal candidiasis - Endoscopy not required
- On endoscopy - White plaques are friable, extensive/localised
- Treatment - antifungals (1st line - Fluconazole)

HSV Esophagitis

- M/c in immunocompromised
- Clinical features - odynophagia, dysphagia
- On presentation - 20-25% patients may have associated herpes labialis
- On endoscopy - Multiple small punched-out ulcers/ volcano like ulcers



- Biopsy of ulcers - taken from edge, shows multi-nucleate giant cells and intranuclear (Cowdry type A)/intracytoplasmic inclusion bodies



- Nucleus - ground glass in appearance
- Perform PCR for HSV (Biopsy specimen)
- Treatment - Acyclovir (1st line)

Organism	Important Findings	Treatment
Candida	White plaques on OGD	• Oral fluconazole 200 - 400 mg on d-1 -> 100 - 200 OD x 14 d • 2nd line - Voriconazole/Posiconazole • Systemic candidemia/ oral treatment failure - I/V echinocandins
Herpes Simplex I and II	Vesicles and small punched-out lesions on OGD, Biopsy - Cowdry A	• Acyclovir 200 mg 5 times day x 5 - 7 days(immunocompetent) • Acyclovir 400 mg 5 times a day x 5-7 days
Cytomegalovirus	Serpiginous ulcers more in Distal esophagus	Ganciclovir / valganciclovir - 3 - 6 weeks

Pill-induced Esophagitis

- Poor pill-taking habits (lying down after taking pills)
  - Medications -
    - → Doxycycline/tetracycline - M/c
    - → Quinidine, Phenytoin
    - → KCl, Biphosphonates
    - → NSAIDs, $FeSO_4$
- M/c Middle 1/3rd of esophagus (junction of crossing of carina/arch of aorta) affected
- Patients may have Kissing ulcers
- Patients heal in 14 - 21 days, for treatment - PPIs may be given

Corrosive Esophagitis

- Alkali more injurious > Acids
- Absence of oral injury does not rule out corrosive esophageal injury
- Clinical presentation - Pain/burning sensation in throat and esophagus after consumption of corrosive substances
- Evaluation and management -
  - Stabilization -airway, breathing, circulation
  - No stomach wash, No steroids
  - Endoscopy (early endoscopy (preferred within 12 hrs)- done within 24 hours, late endoscopy - > 24 hrs up to 96 hrs) - zargar grading
  - Ryle's Tube/Nasogastric tube
  - Endoscopic ultrasound helps to predict risk of stricture formation (signal changes in muscularis layer - strong predictor of stricture formation)

Zargar classification

Zargar classification	Description
Grade 0	Normal mucosa
Grade I	Edema and erythema of the mucosa
Grade II A	Hemorrhage, erosions, blisters, superficial ulcers
Grade II B	Circumferential lesions
Grade III A	Focal deep gray/brownish-black ulcers
Grade III B	Extensive deep gray/brownish-black ulcers
Grade IV	Perforation

Zargar Grade

I, II A

- Observe 24 hrs- 48 hrs
- Gradual progression to diet

II B

- Close monitoring
- OGD guided nasojejunal tube
- NPO for 2-3days

III A, III B

- ICU monitoring
- NPO for 2-3days
- In-hospital observation for 1 week, follow up in 2nd week

Stricture management

- Follow up with upper OGD, if stricture present → endoscopic dilatation done

4 BARRETT'S ESOPHAGUS

- Barrett's Esophagus (BE) occurs in patients with GERD
- A/w ↑ Risk of esophageal malignancy

Key Questions for Discussion

00:01:48

1. BE is associated with which type of esophageal malignancy?
   - Ans: Adenocarcinoma (m/c site is lower 1/3rd)
2. What is the Prevalence of BE among GERD patients?
   - Ans: 7-10%
   - In general population: 1-2%
3. Who should be screened for Barrett's esophagus?
   - Patients with H/o GERD
   - Aged > 50 years
   - Having risk factors for BE or esophageal adenocarcinoma

MCQ

Q. Which of the following is the endoscopic grading system for BE?

A. Modified Truelove and Whitley's criteria
B. Czech classification
C. Prague classification
D. Montreal classification

Ans: C

Q. Which of the following protocol is followed for biopsy of BE?

A. Modified Truelove and Whitley's criteria
B. Czech classification
C. Prague classification
D. Seattle protocol

Ans: D

Barrett's Esophagus

00:04:09

Epidemiology

- On of the complication of GERD:
  - Can result from acid reflux or alkaline/bile reflux
- Other GERD complications:
  - Bleeding
  - Strictures
  - Barrett's Esophagus
- Trends:
  - Incidence/prevalence of bleeding & strictures ↓ with PPIs
  - Incidence/prevalence of Barrett's Esophagus ↑ despite potent PPIs
- BE is a/w adenocarcinoma of the esophagus, particularly lower third
- Risk Factors for BE & Adenocarcinoma (in addition to GERD):
  - Age: Typically 40-60 years
  - Gender: Males ↑↑ affected more than females (some studies 14:1 ratio).
  - Obesity

- Smoking
- Alcohol consumption
- F/h/o esophageal adenocarcinoma or Barrett's Esophagus

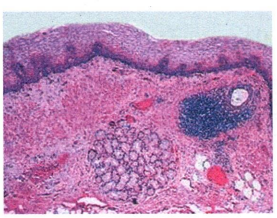
- Prevalence:
  - Around 10% of GERD patients have BE
  - General population: 1-2%
- Risk of Malignancy:
  - BE patient has 40x higher risk of adenocarcinoma compared to general population
  - Real incidence of adenocarcinoma in BE patients is still minimal (but increasing)
  - Annual incidence: Around 0.1-0.3% per year

Pathophysiology

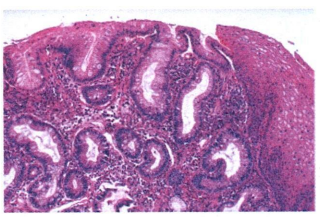
00:09:50

- Cause: Chronic acid reflux
- Duration of reflux: Unknown, often decades
- Exposure to chronic acid reflux → Esophageal injury → Metaplastic changes
  - Normal esophageal epithelium: Stratified squamous epithelium
  - Replaced by: Intestinal type columnar epithelium
- Progression:
  - Metaplastic epithelium (Barrett's Esophagus) may develop dysplastic changes
  - Non-dysplastic Barrett's Esophagus (NDBE) → Low-grade dysplastic Barrett's Esophagus → High-grade dysplastic Barrett's Esophagus (premalignant) → Intramucosal adenocarcinoma (invading mucosa) → Extensive invasion (submucosa and beyond)
- Diagnosis:
  - Majority diagnosed at NDBE stage
  - Not all patients progress through the full cycle

Histopathology



This is normal esophageal squamous mucosa at the top, with underlying submucosa and muscularis propria



Barrett's esophagus in which there is gastric-type mucosa above the gastroesophageal junction. Note the columnar epithelium to the left and the squamous epithelium at the right.

- Normal Esophagus: Lined by stratified squamous epithelium
- Barrett's Esophagus: Replaced by intestinal type columnar epithelium
- Hallmark of BE: Presence of goblet cells
  - Mucin-producing
  - Not normally found in esophagus
- Stain for goblet cells: Alcian blue
- Diagnosis criteria: Must see goblet cells to definitively diagnose BE on biopsy

Surveillance of GERD patient for BE

00:16:11

- Screening for BE:

- Not recommended for all GERD patients
- Suggested strategy: Identify at-risk population
- At-risk population:
  → Patients with GERD + Age >50years + at least one additional risk factor (other than GERD) for BE or malignancy
  → Risk factors include
    - Obesity
    - F/h/o adenocarcinoma / BE
    - Smoking
    - Alcohol consumption

- Surveillance for NDBE (already diagnosed):
  - Recommendation: Perform surveillance endoscopy compared to no surveillance.
  - Frequency: Once every 3-5 years.
  - Evidence: Poor, but still recommended.

Summary of recommendations and quality of evidence

Statement	Strength of Recommendation	Quality of Evidence
1. In patients with nondysplastic BE, we suggest performing surveillance endoscopy compared with no surveillance	Conditional	Very low
2. There is insufficient evidence on the effectiveness of screening for BE. However, if screening endoscopy for BE is performed, we suggest a screening strategy that identifies an at-risk population. An at-risk population is defined as individuals with a family history of EAC or BE (high risk) or patients with GERD plus at least 1 other risk factor (moderate risk)	NA	NA
3. In patients with BE undergoing surveillance, we recommend using chromoendoscopy, including virtual chromoendoscopy and Seattle protocol biopsy sampling, compared with white-light endoscopy with Seattle protocol biopsy sampling	Strong	Moderate
4. In patients with BE undergoing surveillance, we suggest against routine use of confocal laser endomicroscopy compared with white-light endoscopy with Seattle protocol biopsy sampling	Conditional	Low
5. In BE patients with high-grade dysplasia/IMC or nodules, we recommend against routine use of EUS to differentiate mucosal vs submucosal disease.	Moderate	Moderate
6a. In patients with known or suspected BE, we suggest using WATS-3D in addition to Seattle protocol biopsy sampling compared with white-light endoscopy with Seattle protocol biopsy sampling.	Conditional	Low
6b. In patients with BE, undergoing surveillance, there is insufficient evidence to recommend for or against routine use of VLE	No recommendation	NA

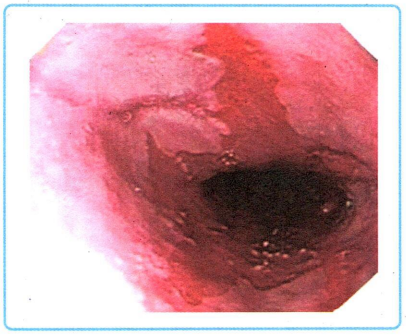
- Recommended Visualization Modality of Choice: Chromoendoscopy
- Biopsy Protocol: Seattle protocol
  - Alternative/Considered: WATS 3D (Wide Area Transepithelial Sampling with Computer-Assisted 3D Analysis)
    → Advantage: Increases biopsy area →↓ likelihood of missing dysplastic areas

Modalities Not Recommended (ACG 2019)

- Endoscopic ultrasound (EUS): Against use for differentiating mucosal, intramucosal, submucosal disease
- Confocal microscopy/ confocal laser- microscopy/ confocal volumetric laser endomicroscopy are not recommended
- Volumetric laser endomicroscopy (VLD): Insufficient evidence for or against routine use

Endoscopic Evaluation

00:31:30

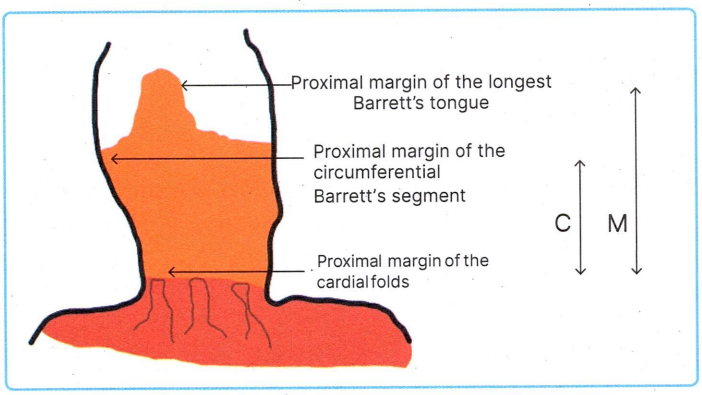


- Appearance of BE: Red velvety mucosa or salmon-colored mucosa (normal is pale whitish).
- Morphology: Tongue-like projections of abnormal columnar epithelium moving cephalad from GE junction, with interspersed normal squamous epithelium

Endoscopic Grading (Extent):

- Short segment BE: < 3 cm from GE junction
- Long segment BE: > 3 cm from GE junction
- Significance: Long segment BE is more likely to be associated with dysplastic changes and adenocarcinoma

Prague Classification:



- Expresses circumferential involvement (C) and maximal tongue-like projection (M) in centimeters
- Example: C3M4 (3 cm circumferential, longest tongue has height of 4 cm)

Definitive diagnosis

- Gold Standard for Diagnosis: Biopsy aided by endoscopy
- **Seattle Protocol**
  - Protocol for biopsy
  - Method: From GE junction to end of BE, take 4-quadrant biopsies at every 2 cm interval

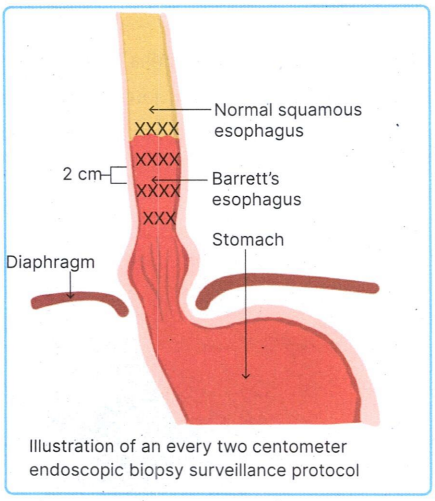


Illustration of an every two centometer endoscopic biopsy surveillance protocol

Management of Barrett's Esophagus

00:39:05

Non-Dysplastic Barrett's Esophagus (NDBE)

- Surveillance: Endoscopy with biopsy (chromoendoscopy + Seattle protocol) once every 3-5 years.
- Treatment:
  - GERD management: Primarily medical (PPIs)
    → PPIs: Superior to H2 receptor blockers
    → Histopathological regression (BE to normal epithelium) possible in 50-55% with PPIs
  - Surgical management:
    → Only if clear indications for surgery (e.g., PPI failure), not solely for BE
    → Procedure: Nissen's fundoplication
  - Endoscopic ablation or esophagectomy have no role due to low malignancy risk

Low-Grade Dysplastic Barrett's Esophagus

- Treatment:
  - Most guidelines do not recommend oesophagectomy or endoscopic ablation
  - Standard recommendation: Surveillance (3-5 years)
  - Rossi & colleagues study
    → Favour the use of surgical management (Nissen's fundoplication) over medical management
    → Better regression rates (>80-85%) with surgery compared to high-dose PPIs (around 50-55%)
    → Note: Surgery carries higher risks, medical management is often preferred by gastroenterologists
  - Medical management: PPIs

High-Grade Dysplastic Barrett's Esophagus

- Malignancy risk: Extreme high risk
- Current recommendation: Endoscopic ablation
- Past recommendation: Esophagectomy

Intramucosal Adenocarcinoma

- Treatment options:
  - Endoscopic ablation (preferred choice)
  - Esophagectomy (major surgical procedure, high mortality, no longer preferred)

Extensive Adenocarcinoma

- Treated as a standard adenocarcinoma case