Esophageal and Gastric Motility Disorders: A case based approach

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Conflicts of Interest:
• None

Overview
• Esophageal anatomy
• Dysphagia-case based approach
• Reflux disease-case based approach
• Gastric physiology
• Gastroparesis-case based approach

Dysphagia-Case based approach
Esophagus: Anatomy

• 25 cm muscular tube.
• Extends from upper esophageal sphincter to stomach.
• Proximal 1/3rd consist of striated muscles while distal 2/3rd is formed by smooth muscles.
• Lined squamous epithelium.

Terminology

• Dysphagia: derived from the Greek word dys (difficulty, disordered) and phagia (to eat).
• Odynophagia: painful swallowing.
• Globus Sensation: Sensation of lump in throat between meals.

History

Oropharyngeal
• Oral:
  – Drooling of saliva
  – Food spillage
  – Sialorrhea
  – Piecemeal swallows
  – Associated dysarthria
• Pharyngeal:
  – Choking/cough during swallow
  – Associated dysphonia

Esophageal
• Food stuck in suprasternal notch or retrosternal region
• Motility:
  – dysphagia to solids and liquids
  – Associated with heartburn or chest pain.
• Mechanical:
  – progressive dysphagia to solids; may involve liquids at later stages

Dysphagia Assessment

Fluoroscopic examination

Endoscopic examination

Manometric examination
Case Study 1:
78-year-old female with no significant medical history presenting with:
- Dysphagia to both solids and liquids
- Chest pain
- Denies any heartburn
- 50 lb weight loss

- Epiphrenic diverticulum
- Resistance at GEJ
- Beaking at GEJ

Post extended myotomy and diverticulectomy
Fairly doing

Achalasia
- Rare esophageal motility disorder
- Esophageal aperistalsis
- Impaired LES relaxation

Achalasia: Subtypes

Type I is characterized by a quiescent esophageal body, type II has pan-esophageal pressurization, and type III is characterized by simultaneous contractions.

Achalasia: Treatment Algorithm

Achalasia: Treatment Options

<table>
<thead>
<tr>
<th>Treatment Options</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
</table>
| Medications (CaCB/Nitrates) | • On Demand  
                  • Minimal risk  
                  • For non-operative candidates | • Least effective  
                  • Not durable                                                   |
| Botulinum toxin injection | • Good option for nonoperative candidates  
                        • Short procedure time | • Durability of 6–12 months                                 |
| Pneumatic dilation     | • Most effective nonsurgical option  
                        • Short recovery time  
                        • Durability 2–5 years  
                        • Procedure time <30 minutes | • Perforation (1%–5%)                                             |
| Surgical myotomy      | • Durability 5–7 years  
                        • Procedure time ~90 minutes | • General anesthesia required  
                        • Hospital stay of 1–2 days                                         |
| Esophagectomy          | • For end-stage disease | • High morbidity and mortality                                      |

Case Study 2:

24-year-old female presented with dysphagia to solids and liquids.
- Mean DCI: NA
- Mean LES IRP: 24 mm Hg
- Mean DL: NA

Diagnosis??

Type 2 Achalasia. Patient sent for myotomy
Diagnosis?? Opioid induced esophageal dysfunction

**Case Study 3:**

64-year-old female with CAD, chronic backache on morphine is presenting dysphagia and spasmodic pain in the neck and chest.

- Mean DCI: 2765
- Mean LES IRP: 18 mm Hg
- Mean DL: 3.8 s

**Opioid-induced esophageal dysfunction**

Opioid-induced esophageal dysfunction is often characterized by EGJ outflow obstruction and type III achalasia pattern.


**Achalasia syndromes beyond the CC v3.0**

<table>
<thead>
<tr>
<th>CC v3.0 diagnosis</th>
<th>IRP &gt; 1.0 N?</th>
<th>Oesophageal contractility</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oesophageal function</td>
<td>Yes</td>
<td>Sufficient period to exclude type III achalasia</td>
<td></td>
</tr>
<tr>
<td>outflow obstruction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent contractility</td>
<td>No</td>
<td>Absent contractility</td>
<td></td>
</tr>
<tr>
<td>Cardiac achalasia</td>
<td>Yes</td>
<td>Abnormal IHP dilatability index</td>
<td></td>
</tr>
<tr>
<td>Abnormal Sphincter function with swallow or MRI support achalasia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distal oesophageal spasm</td>
<td>Yes or no</td>
<td>&gt;10% premature contractions (OLM &lt; 0.4)</td>
<td></td>
</tr>
<tr>
<td>Oesophageal inflammation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barium swallow</td>
<td>Yes or no</td>
<td>&gt;20% of swallowing with OD &gt;300 mm by barium</td>
<td></td>
</tr>
<tr>
<td>Oesophageal contractile or permission</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oesophageal effect on CC</td>
<td>Yes</td>
<td>Normal, hypercontractile or permission</td>
<td></td>
</tr>
<tr>
<td>Mechanical obstruction</td>
<td>Yes</td>
<td>Absent, normal or hypercontractile</td>
<td></td>
</tr>
<tr>
<td>OES or jejunal syndrome</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Kahrilas, P. J., et al. (2017) Advances in the management of oesophageal motility disorders. in the era of high-resolution manometry: a focus on achalasia syndromes.


**GERD-Case based approach**
Gastroesophageal Reflux Disease Definition

GERD is a condition that develops when the reflux of gastric content causes troublesome symptoms or complications.

- Mild symptoms once in > 2 days/week
- Moderate/Severe once in >1 day/week

Risk factors:

- Obesity
- Family history for GERD
- Tobacco smoking
- Alcohol consumption
- Associated psychosomatic complaints

Impact of Gastroesophageal Reflux Disease

<table>
<thead>
<tr>
<th>Gastroesophageal Reflux Disease</th>
<th>Impairs quality of life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-erosive GERD (EGD negative)</td>
<td>Esophagitis</td>
</tr>
<tr>
<td>Stricture</td>
<td>Bleeding</td>
</tr>
<tr>
<td>Barrett’s metaplasia</td>
<td>Adenocarcinoma</td>
</tr>
</tbody>
</table>


**Goals for Treatment of GERD**

- Eliminate symptoms
- Heal erosive esophagitis
- Prevent the relapse of erosive esophagitis and complications from GERD

**Life-Style Modifications include:**

- Elevate the head of the bed on 4” to 6” blocks.
- Advise weight loss for obese patients.
- Avoid recumbency for 3 hours after meals.
- Avoid bedtime snacks.
- Avoid fatty foods, chocolate, peppermint, onions, and garlic.
- Avoid cigarettes and alcohol.
- Avoid drugs that decrease LES pressure and delay gastric emptying.

**Medical treatment options:**

**Proton Pump Inhibitors:**

- Higher healing rates in mild to moderately severe reflux esophagitis (80% to 100%).
- Improves dysphagia.
- Decreases the need for esophageal dilation in patients who have peptic esophageal strictures.
- About 70% may have nocturnal acid breakthrough that requires H2RA.

**Maintenance of Healing Erosive Esophagitis**

![Graph showing maintenance of healing erosive esophagitis](image)

Decisions to start, properly dose, continue, or discontinue PPI therapy should be personalized based on indication, effectiveness, patient preferences, and risk assessment.
Indications for anti-reflux surgery

- Unwillingness to remain on medical therapy
- Intolerance of medical therapy
- Medically refractory symptoms with objective evidence of GERD
- GERD in the setting of a large hiatal hernia


Case Study 4:

42-year-old female with prior history of scleroderma is presenting with persistent reflux inspite of twice daily PPI, referred for fundoplication.

- Mean DCI: NA
- Mean LES IRP: 2mm Hg
- Mean DL: NA

Acid exposure:
- Total AET: 14.5%
- Reflux events: 112
- Reflux symptom analysis:
  - SI: 54
  - SAP: 98

What would be the next step?

- Educated on lifestyle measures.
- Added H2B at bedtime.
- Was doing much better.
Case Study 5:

• 28 yr old female with anxiety presenting with persistent heartburn inspite of PPI twice daily
• EGD: normal esophagus with biopsy

Case Study 5:

• Acid exposure:
  • Total AET:10.5%
  • Reflux events:119
• Reflux symptom analysis
  • SI:50
  • SAP: 96

What would be the next step?

DDx to PPI-Refractory GERD

• Refractory reflux symptoms with esophagitis
• Eosinophilic esophagitis
• Pill induced esophagitis
• Skin disorders like Lichen planus
• Hypersecretory condition like ZES
• Genotypic differences in CYP450 2C19

Effect of DBT on belching and GERD

Case Study 5:

- Continued PPI,
- Started on behavioral therapy and anti-anxiety medication,
- Educated on DBT

Gastroparesis-Case based approach

Physiology of stomach

Normal Velocities of emptying of solid and liquid chyme.
Definition:

Gastroparesis is defined as a delay in the emptying of ingested food in the absence of mechanical obstruction of the stomach or duodenum.

Etiology of Gastroparesis

- Idiopathic gastroparesis
- Diabetic gastroparesis (30-35%)
- Post-surgical gastroparesis
  - Cholecystectomy
  - Vagotomy
  - Nissen fundoplication
  - Partial gastrectomy
  - Obesity related surgeries
  - Pancreatectomy (5-10%)

Clinical Presentation:

- Nausea
- Vomiting
- Early satiety
- Bloating
- Postprandial fullness
- Abdominal pain
- Weight loss/weight gain
- Constipation and/or diarrhea
- Wide glycemic fluctuations
In 416 patients from the NIH Gastroparesis Registry, symptoms prompting evaluation more often included vomiting for diabetic gastroparesis and abdominal pain for idiopathic gastroparesis.

![Pair-wise P values](image)

### Treatment Algorithm for Suspected Gastroparesis

1. **Suspected Gastroparesis**
2. Confirm Diagnosis Testing for Cause
   - Restoration of Fluids and Electrolytes
   - Dietary Modifications
   - Glucose Control
3. **Prokinetic Therapy**
   - qac Anti-emetics prn
   - Consider Feeding Jejunostomy, Decompressive Gastrostomy, Gastric Electrical Stimulation
4. **OR Surgical Therapy**

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### Diagnostic Testing for Gastroparesis:

**TABLE 2. Diagnostic Testing for Gastroparesis**

<table>
<thead>
<tr>
<th>Modality</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastric scintigraphy</td>
<td>Widely available</td>
<td>Radiation exposure</td>
</tr>
<tr>
<td>4-hour solid phase</td>
<td>Considered the “gold standard” for diagnosis</td>
<td>False positives with liquid phase only studies</td>
</tr>
<tr>
<td>Wireless motility capsule</td>
<td>Smart Pill, given imaging, Avoids radiation exposure</td>
<td>Less validated than scintigraphy</td>
</tr>
<tr>
<td>Radiolabeled carbon</td>
<td>FDA approved for diagnosis</td>
<td>Cannot be used in those with pacemaker or defibrillator</td>
</tr>
<tr>
<td>breath test</td>
<td>13C-labeled octanoic acid or Spirulina platensis</td>
<td>Low cost</td>
</tr>
<tr>
<td></td>
<td>Has primarily been used as a research tool</td>
<td>Lack of standardization</td>
</tr>
</tbody>
</table>

**Radionuclide Gastric Emptying Scintigraphy**

- Best current test for measuring gastric emptying because it is sensitive, quantitative, and physiological.
- Uses 99mTc sulfur colloid-labeled low-fat egg white meal as a test meal.
- Imaging is performed in the anterior and posterior projections at least at four time points (0, 1, 2, and 4 h).
- The 1 h image is used to help detect rapid gastric emptying.
- The 2 and 4 h images are used to evaluate for delayed gastric emptying.
- Hyperglycemia (glucose level > 270 mg/dL) delays gastric emptying in diabetic patients.

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**Gastroparesis: A Review of Current Diagnosis and Treatment Options. Stein, Benjamin; Everhart, Kelly. Lange, Brian. Journal of Clinical Gastroenterology. 49(7):550-558, August 2015.**


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Radionuclide Gastric Emptying Scintigraphy


Medications Mechanism Pros Cons

Metoclopramide D2 Antagonist Improves gastric emptying: lowest possible dose (5 mg TID before meals). No long term study available. Efficacy 26-53%. Comparable to Domperidone

Black box warning: >12 weeks use of tardive dyskinesia
Acute dystonias: Parkinsonism type movements
Associated with QTc interval

Domperidone D2 Antagonist Improvement in symptoms (54% to 79%). Drug interaction.

Less CNS effect
Associated with QTc interval
Increases Prolactin levels
Requires IND for approval

Erythromycin Motilin agonist Useful during acute exacerbation. IV better than PO

Cisapride 5-HT4 agonist Significant improvement in symptoms.

Cardiac arrhythmias and death
Requires IND

Cannabinoids

Pharmacological

NK1 receptor antagonists

Dronabinol Agonist of CB1

Anti-emetics:

Medications MDA Pros Cons

Diphenhydramine Antihistamines Useful in mild nausea/vomiting

Sedative effect
Anticholinergic S/E

Hyoscine Anti-cholinergics Available and widely available. Useful in mild cases.

Anti-cholinergic side effects (dry mouth, glaucoma, etc.)

Phospholipid prochlorperazine D1/D2 Antagonist Useful in severe nausea and vomiting

QT prolongation
Psychomotor issues in elderly
Dystonia/Parkinsonism

Topiramate

Transdermal granisetron 5HT3 antagonists Not widely available. Cost: Useful in mild vomiting

Diabetes mellitus and death
Requires IND

Aprepitant NK1 receptor antagonists Not widely available: cost

Fatigue
Neutropenia


Increased meal frequency, decreased meal volume. Join for low-particle size, fat, and fiber diet.

In DIR, optimize glyceric contents. Balance diet with GP symptoms. Target plasma glucose <200 mg/dL.

Nutritional assessment with correction of dietary deficiencies.

Trial withdrawal of medications known to impact gastric emptying (eg., GP 1 antagonists). Consider external nutrition if the patient cannot tolerate oral diet.

Prokinetic Agents Metoclopramide (recommended dosage <12 wk due to risk of T9)

Scopolamine (antiemetic use limited by tachycardia and Anti-nociceptive agents

Symptom Control Anti-emetics:

Triphasic prokinetic laxatives may benefit patients with post-surgical GP-consider gastric bypass in obese patients.


Pro-kinetics:

Medications Mechanism Pros Cons

Diphenhydramine Antihistamines Useful in mild nausea/vomiting

Sedative effect
Anticholinergic S/E

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### Neuromodulators:

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<th>MOA</th>
<th>Pros</th>
<th>Con</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nortriptyline/Amitriptyline</td>
<td>TCA</td>
<td>Modest improvement in N/V and abdominal pain</td>
<td>Worsens gastric emptying. Anti-cholinergic side effects. Constipation.</td>
</tr>
</tbody>
</table>

### Gastric electric stimulation

- Patient Selection: Diabetic gastroparesis with refractory N/V even after 1 year of pro-kinetics.
- Response to therapy:
  - Diabetics.
  - Not on narcotics.
  - Predominant nausea/vomiting.
- Response was modest with 43% over a period of a year and half.

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### Final Case Study

- 42-year-old gentleman with type 2 diabetes (HgbA1c:9) on exenatide presenting with recurrent vomiting and nausea for the last 6 months?

What would be the next step?

Normal upper endoscopy with moderate food retention in the stomach. Bx: negative for H. pylori.
4-hour GES: 43%. What do we do next?

Switch exenatide to insulin+CGM.
Nutrition consult for gastroparesis.

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