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
- Manometric examination
- Endoscopic 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

- Epiphrenic diverticulum
- Beaking at GEJ

Case Study 1:

- Mean DCI: 2380
- Mean LES IRP: 32 mm Hg
- Mean DL: 3.8 sec
Case Study 1:

- Post extended myotomy and diverticulectomy
- Fairly doing


Achalasia

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

Loss of inhibitory neurons secreting VIP and NO leads to unopposed excitatory activity and failure of 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>
<tbody>
<tr>
<td>Medications(CaCB/Nitrates)</td>
<td>• On Demand</td>
<td>• Least effective</td>
</tr>
<tr>
<td></td>
<td>• Minimal risk</td>
<td>• Not durable</td>
</tr>
<tr>
<td></td>
<td>• For non-operative candidates</td>
<td></td>
</tr>
<tr>
<td>Botulinum toxin injection</td>
<td>• Good option for nonoperative candidates</td>
<td>• Durability of 6–12 months</td>
</tr>
<tr>
<td></td>
<td>• Short procedure time</td>
<td></td>
</tr>
<tr>
<td>Pneumatic dilation</td>
<td>• Most effective nonsurgical option</td>
<td>• Perforation (1%–5%)</td>
</tr>
<tr>
<td></td>
<td>• Short recovery time</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Durability 2–5 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Procedure time &lt;30 minutes</td>
<td></td>
</tr>
<tr>
<td>Surgical myotomy</td>
<td>• Durability 5–7 years</td>
<td>• General anesthesia required</td>
</tr>
<tr>
<td></td>
<td>• Procedure time ~90 minutes</td>
<td>• Hospital stay of 1–2 days</td>
</tr>
<tr>
<td></td>
<td>• General anesthesia required</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hospital stay of 1–2 days</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Procedure time</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Mean DCI:NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Mean LES IRP:24 mm Hg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Mean DL: NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diagnosis??</td>
<td></td>
</tr>
</tbody>
</table>

### 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

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; ULN?</th>
<th>Oesophageal contractility</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Oesophago gastric junction outflow obstruction | Yes | Sufficient peristalsis to exclude type I, II or III achalasia | • Heterogeneous group  
• Early or incomplete achalasia  
• Can resolve spontaneously  
• Recording artefacts |
| Absent contractility | No | Absent contractility | • Can be achalasia  
• Abnormal FLIP distensibility index supports achalasia  
• Oesophageal pressurization with swallows or MRS supports achalasia |
| Distal oesophageal spasm | Yes or no | ≥20% premature contractions (DL < 4.5 s) | Might be spastic achalasia |
| Jackhammer | Yes or no | ≥20% of swallows with DCI > 8,000 mmHg·s·cm | Might be spastic achalasia if DL < 4.5 s with ≥20% swallows |
| Opioid effect (not in CC) | Yes | Normal, hypercontractile or premature | Can mimic EGJOO, type III achalasia, DES or jackhammer |
| Mechanical obstruction (not in CC) | Yes | Absent, normal or hypercontractile | EUS, CT or MRI of the EGJ might clarify the aetiology |

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

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**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

Gastroesophageal Reflux Disease

- Non-erosive GERD (EGD negative)
- Esophagitis
  - Stricture
  - Impairs quality of life
  - Barrett's metaplasia & Adenocarcinoma
- Bleeding
- Extra-esophageal GERD
  - ENT
  - Asthma
  - Dental

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

GERD Is a Chronic Condition Likely to Relapse

![Graph showing patients in symptomatic remission over time after cessation of therapy]


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Appropriateness of PPI use

<table>
<thead>
<tr>
<th>Reason for use</th>
<th>Long-term PPI therapy appropriate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Benign esophagus</td>
</tr>
<tr>
<td></td>
<td>Healing and maintenance of healed Los Angeles grade C or D erosive esophagitisa</td>
</tr>
<tr>
<td></td>
<td>PPI-responsive esophageal eosinophilia</td>
</tr>
<tr>
<td></td>
<td>Idiopathic HH pylori and NSAID/aspirin negative peptic ulcer disease</td>
</tr>
<tr>
<td></td>
<td>Zollinger-Ellison diseaseb</td>
</tr>
<tr>
<td></td>
<td>PPI-responsive GERD/non-erosive reflux diseasec</td>
</tr>
<tr>
<td></td>
<td>Long-term non-selective NSAID users at high-risk for upper GI complications or long-term cox-2 inhibitor users with a prior episode of GI bleeding</td>
</tr>
<tr>
<td></td>
<td>Anti-platelet therapy in patients at high-risk for upper GI complications (age &gt; 65 years or concomitant use of corticosteroids or anticoagulants or history of peptic ulcer disease)</td>
</tr>
<tr>
<td></td>
<td>Steatorrhea refractory to enzyme replacement therapy in chronic pancreatitis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short-term PPI therapy appropriate (4- to 12-week course)</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Healing of Los Angeles grade A or B erosive esophagitis</td>
</tr>
<tr>
<td></td>
<td>Eosinophilic esophagitis</td>
</tr>
<tr>
<td></td>
<td>H. pylori eradication (in combination with antibioticsd)</td>
</tr>
<tr>
<td></td>
<td>Stress ulcer prophylaxis in high-risk patients (i.e., critically ill patients with respiratory failure or coagulopathy)</td>
</tr>
<tr>
<td></td>
<td>Functional dyspepsa</td>
</tr>
<tr>
<td></td>
<td>Treatment and maintenance of peptic ulcer disease</td>
</tr>
<tr>
<td></td>
<td>Prior to endoscopy for acute upper GI bleeding</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PPI use not appropriate</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Following endoscopic treatment of a high-risk ulcer or bleeding</td>
</tr>
<tr>
<td></td>
<td>Corticosteroid users without concomitant NSAID therapy</td>
</tr>
<tr>
<td></td>
<td>To prevent bleeding from hypertensive gastropathy in cirrhotic patients</td>
</tr>
<tr>
<td></td>
<td>Acute pancreatitis</td>
</tr>
<tr>
<td></td>
<td>Stress ulcer prophylaxis in non-critically ill hospitalized patients that are not at high-risk for ulcer formation and GI bleeding</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PPI use of uncertain benefit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PPI non-responsive GERD</td>
</tr>
<tr>
<td></td>
<td>Extra-digestive GERD</td>
</tr>
</tbody>
</table>

Yadlapati and Kahrilas BMC Medicine (2017) 15:36
Decisions to start, properly dose, continue, or discontinue PPI therapy should be personalized based on indication, effectiveness, patient preferences, and risk assessment.

Medical treatment options:

- **Antacids and Alginic Acid:**
  - Temporarily relieve episodic heartburn
  - Useful add on therapy

- **Histamine H2-Receptor Blocking Agents:**
  - Safe and effective in mild esophagitis
  - Not useful in severe esophagitis
  - Useful for breakthrough symptoms
  - Concern for tachyphylaxis

- **Prokinetic Agents:**
  - Limited efficacy and side effects in up to 30%

- **TLESR Inhibitors:**
  - As addon for non-acid reflux/post prandial reflux
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
Case Study 4:

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

What would be the next step?

Case Study 4:

- 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
- Refractory reflux symptoms with normal esophagus
- Eosinophilic esophagitis
- Achalasia
- Gastroparesis
- Aerophagia and Belching disorder
- Rumination syndrome
- Functional heartburn

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.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>IG (n 254) N (% or mean)b</th>
<th>T1DM (n 78) N (% or mean)b</th>
<th>T2DM (n 59) N (% or mean)b</th>
<th>IG vs all DM</th>
<th>IG vs T1DM</th>
<th>IG vs T2DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms prompting evaluation for gastroparesis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nausea</td>
<td>214 (84.3)</td>
<td>66 (84.6)</td>
<td>56 (94.9)</td>
<td>.19</td>
<td>.94</td>
<td>.03</td>
</tr>
<tr>
<td>Vomiting</td>
<td>152 (59.8)</td>
<td>69 (88.5)</td>
<td>54 (91.5)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Bloating</td>
<td>145 (57.5)</td>
<td>44 (56.4)</td>
<td>37 (62.7)</td>
<td>.75</td>
<td>.87</td>
<td>.46</td>
</tr>
<tr>
<td>Early satiety</td>
<td>148 (57.5)</td>
<td>37 (47.4)</td>
<td>44 (74.6)</td>
<td>.75</td>
<td>.12</td>
<td>.02</td>
</tr>
<tr>
<td>Postprandial fullness</td>
<td>136 (53.5)</td>
<td>44 (56.4)</td>
<td>39 (66.1)</td>
<td>.18</td>
<td>.66</td>
<td>.08</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>193 (76.0)</td>
<td>47 (60.3)</td>
<td>41 (69.5)</td>
<td>.01</td>
<td>.007</td>
<td>.07</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>98 (35.6)</td>
<td>35 (44.9)</td>
<td>30 (50.9)</td>
<td>.09</td>
<td>.32</td>
<td>.08</td>
</tr>
<tr>
<td>Constipation</td>
<td>112 (44.1)</td>
<td>32 (41.0)</td>
<td>34 (57.6)</td>
<td>.44</td>
<td>.63</td>
<td>.06</td>
</tr>
<tr>
<td>Anorexia</td>
<td>32 (12.6)</td>
<td>12 (15.4)</td>
<td>17 (28.8)</td>
<td>.03</td>
<td>.53</td>
<td>.02</td>
</tr>
<tr>
<td>Weight loss</td>
<td>118 (48.5)</td>
<td>41 (52.6)</td>
<td>31 (52.6)</td>
<td>.25</td>
<td>.35</td>
<td>.40</td>
</tr>
<tr>
<td>Weight gain</td>
<td>45 (17.7)</td>
<td>14 (18.0)</td>
<td>14 (23.7)</td>
<td>.57</td>
<td>.96</td>
<td>.24</td>
</tr>
<tr>
<td>Gastroesophageal reflux</td>
<td>137 (53.9)</td>
<td>43 (55.1)</td>
<td>35 (59.3)</td>
<td>.57</td>
<td>.85</td>
<td>.45</td>
</tr>
<tr>
<td>Problems with diabetes control</td>
<td>0 (0.0)</td>
<td>39 (50.0)</td>
<td>27 (45.8)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

In 416 patients from the NIH Gastroparesis Registry, symptoms prompting evaluation more often included vomiting for diabetic gastroparesis and abdominal pain for idiopathic gastroparesis.


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**Treatment Algorithm for Suspected Gastroparesis**

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

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>Avoids radiation exposure</td>
<td>Less validated than scintigraphy</td>
</tr>
<tr>
<td>Smart Pill, given imaging</td>
<td>FDA approved for diagnosis</td>
<td>Cannot be used in those with pacemaker or defibrillator</td>
</tr>
<tr>
<td>Radiolabeled carbon breath test</td>
<td>Low cost</td>
<td>Lack of standardization</td>
</tr>
<tr>
<td>$^{13}$C-labeled octanoic acid or Spirulina platensis</td>
<td>Has primarily been used as a research tool</td>
<td></td>
</tr>
</tbody>
</table>

Radionuclide Gastric Emptying Scintigraphy

- Best current test for measuring gastric emptying because it is sensitive, quantitative, and physiological.
- $^{99}$mTc 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.

Radionuclide Gastric Emptying Scintigraphy


**Pro-kinetics:**

<table>
<thead>
<tr>
<th>Medications</th>
<th>Mechanism</th>
<th>Pros</th>
<th>Con</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metoclopramide</td>
<td>D2 Antagonist</td>
<td>Improves gastric emptying. Lowest possible dose (5 mg TID before meals). No long term study available. Efficacy: 29-53%. Comparable to Domperidone</td>
<td>Black box warning: &gt;12 weeks use of tardive dyskinesia. Acute dystonias. Parkinsonism type movements. Associated with QTc interval</td>
</tr>
<tr>
<td>Domperidone</td>
<td>D2 Antagonist</td>
<td>Improvement in symptoms (54% to 79%). Drug interaction.</td>
<td>Less CNS effects. Associated with QTc interval. Increases Prolactin levels. Requires IND for approval.</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>Motilin agonist</td>
<td>Useful during acute exacerbation. IV better than PO.</td>
<td>Tachyphylaxis. Associated with QTc prolongation.</td>
</tr>
<tr>
<td>Cisapride</td>
<td>5-HT4 agonist</td>
<td>Significant improvement in symptoms.</td>
<td>Cardiac arrhythmias and death. Requires IND</td>
</tr>
<tr>
<td>Prucalopride</td>
<td>5-HT4 agonist</td>
<td>Improves gastric emptying and colon transit times. FDA approved for chronic constipation.</td>
<td>Diarrhea and suicidal ideations. Avoidance in ESRD. No cardiac toxicity document.</td>
</tr>
</tbody>
</table>

**Anti-emetics:**

<table>
<thead>
<tr>
<th>Medications</th>
<th>MOA</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphenhydramine</td>
<td>Antihistamines</td>
<td>Useful in mild nausea/vomiting.</td>
<td>• Sedative effect. · Anticholinergic S/E.</td>
</tr>
<tr>
<td>Hyoscine</td>
<td>Anti-cholinergics</td>
<td>Cheap and widely available. Useful in mild cases.</td>
<td>• Anti-cholinergic side effects (dry mouth, glaucoma, etc.).</td>
</tr>
<tr>
<td>Phenothiazines/</td>
<td>D1/D2 Antagonist</td>
<td>Useful in severe nausea and vomiting.</td>
<td>• EKG changes. · Psychomotor issues in elderly. · Dystonia/Parkinsonism</td>
</tr>
<tr>
<td>prochlorperazine</td>
<td>SHT3 antagonists</td>
<td>Widely available. Useful in mild vomiting.</td>
<td>• QT prolongation. · Serotonin syndrome. · Constipation.</td>
</tr>
<tr>
<td>Ondansetron</td>
<td>SHT3 antagonists</td>
<td>Not widely available/cost. Useful in those who cannot tolerate oral meds.</td>
<td>• QT prolongation. · Serotonin syndrome. · Constipation.</td>
</tr>
<tr>
<td>Transdermal</td>
<td>SHT3 antagonists</td>
<td>Not widely available/cost. Useful in reducing N/V.</td>
<td>• Fatigue. · Neutropenia.</td>
</tr>
<tr>
<td>Granisetron</td>
<td>NK1 receptor antagonists</td>
<td>Not widely available/cost. Useful in reducing N/V.</td>
<td>• Delays gastric emptying.</td>
</tr>
<tr>
<td>Dronabinol</td>
<td>Agonist of CB&lt;sub&gt;1&lt;/sub&gt; and CB&lt;sub&gt;2&lt;/sub&gt;</td>
<td>Helpful for N/V when other therapies have failed.</td>
<td>• Delays gastric emptying.</td>
</tr>
</tbody>
</table>
### Neuromodulators:

<table>
<thead>
<tr>
<th>Medications</th>
<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.**

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.