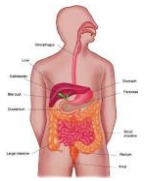


Slide 1

From Gum to Bum: Understanding GI Motility Disorders



Andrea H. Thurler, DNP, FNP-BC
Massachusetts General Hospital
Department of Gastroenterology

Slide 2

What is a Motility Disorder?

- Motility is a term used to describe the contraction of the muscles that mix and propel contents in the gastrointestinal tract.
- The gastrointestinal tract is divided into four distinct parts that are separated by sphincter muscles; these four regions have distinctly different functions to perform and different patterns of motility (contractions).
 - **Esophagus** (carries food to the stomach)
 - **Stomach** (mixes food with digestive enzymes and grinds it down into a more-or-less liquid form)
 - **Small intestine** (absorbs nutrients)
 - **Colon** (reabsorbs water and eliminates indigestible food residues).

Whitehouse WE. Gastrointestinal Motility Disorders of the Small Intestine, Large Intestine, Rectum, and Pelvic Floor. *WFOG* [Gastro Mot](#). 2013; 120(1): 1-11.

Slide 3

Motility is Everywhere

- Top Side 
- Bottom Side 

Slide 4

Common Diagnoses

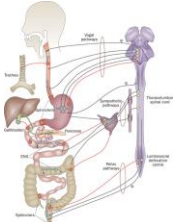
- DYSPHAGIA
- ODYNOPHAGIA
- GERD
- NON CARDIAC CHEST PAIN
- FUNCTIONAL DYSPEPSIA
- CHRONIC ABDOMINAL PAIN
- CYCLIC VOMITING SYNDROME
 - Becoming more recognized
- IBS
 - Diarrhea, Constipation, Mixed
- DIARRHEA
- CONSTIPATION
- PELVIC FLOOR DYSYNERGIA

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RELATIONSHIP OF MOTILITY AND FUNCTIONAL GI DISORDERS

SENSORY VS. MOTOR (PAIN VS. TRANSIT DELAY)

- Chest pain vs. GERD
- Globus vs. Esophageal stricture



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- Objective Testing is key!
 - Overlap of Functional and Motility Disorders
- Functional disorders affect motility
 - Functional dyspepsia (nausea) affects Mr. Smith’s ability to eat.
 - TCA
- Motility disorders are NOT functional
 - Ms. Jones’ gastroparesis (nausea) is caused by motility delay in gastric emptying
 - Reglan

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Swallowing Process

- **Buccal** - mastication, enzymes/salivary amylase, lingual lipase, formation of food bolus, tongue moves up and back against the hard and soft palate for transport of bolus.
 - **Speech/Language Pathologist Intervention**
- **Pharyngeal**- bolus transport to the esophagus relying on nerve receptors stimulated in the deglutition center medulla oblongata and lower pons of brain stem signaling the uvula to close off nasopharynx, epiglottis to seal off larynx. UES relaxes to allow passage into the esophagus then contracts to prevent backflow.
 - **Diverticula**
 - **Stricture**
- **Final phase** - involves simultaneous relaxation of esophagus and LES to receive bolus followed by peristalsis of smooth muscles working in wave like fashion to move bolus toward the LES and allows for entry into the stomach.
 - **Achalasia**
 - **Nutcracker Esophagus**

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The Esophagus

- A tubular muscle 18- to 25-cm long with cervical, thoracic, and abdominal parts made up of striated muscle in the proximal/upper area, smooth muscle in the distal/lower and a combination of the two in the middle.
- Esophageal motility relies on adequate and normal amplitude of contractions, peristalsis, and normal pressure gradients.
- Upper Esophageal Sphincter (UES) and Lower Esophageal Sphincter (LES) are the muscles that relax and contract to allow for passage and prevention of backflow of consumed contents.

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Esophagus

- Backflow and GERD most commonly caused by < LES pressure. Pathological esophageal acid not only causes discomfort, can cause strictures.
 - Schatzki's ring, erosions and ulcerations, can lead to Barrett's Esophagus and Esophageal CA.
- Hiatal hernias are found in 50 % of people, they may be axial, sliding or para-esophageal.
 - These too interfere with LES closure creating > incidence of acid exposure.

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Case Study

- 44 year old healthy woman who developed intermittent dysphagia six months ago to both solids and liquids.
- Initially infrequent became more frequent and severe, including episodes of food impaction.
- Inability to eat now without feeling intense pressure in her sternum.

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Case Study

- Reflux of undigested food sometimes hours after eating.
- Unintentional weight loss of 15 lbs over the past three months.
- Vitals: Wt: 114, Ht: 68 inches, BMI: 17.3
- otherwise unremarkable physical exam

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What are your differentials?
What is your diagnostic work up?
How would you manage and treat this patient?

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Differentials

- **Neurological-discoordination** of oropharyngeal phase resulting in dysphagia with coughing and choking in **the midst of the swallow**.
- **Pharyngeal diverticula**- allows for food pocketing in the pharynx resulting in **choking sensation in the upper esophagus**.
- **Esophageal stricture** most often caused by pathological acid causing narrowing of the esophagus **resulting mainly in solid food dysphagia**.
- **Schatzki's ring**- web like mucosal ring in the lower esophagus caused by pathological acid levels **results in intermittent dysphagia**.

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Differentials

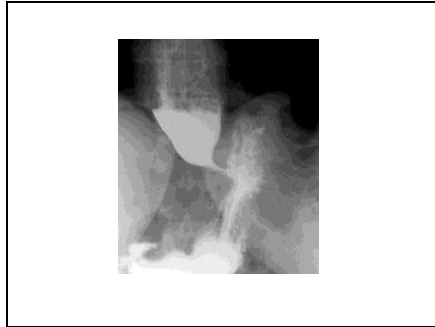
- **EoE** -allergic reaction results in inordinate collection of esophageal eosinophilia, **resulting in intermittent dysphagia to solids and liquids**. >15 eosinophils per hpf.
- **Esophageal Tumor- CA**- Esophageal tumors lead to **dysphagia with odynophagia** pain and other symptoms
- **Achalasia**- inability of LES relaxation and 100 % aperistalsis of the esophagus **resulting in progressive symptoms of dysphagia, red flags of weight loss and/or aspiration**.
- **Rumination Syndrome**- effortless regurgitation of food/liquids
- **Nutcracker Esophagus**-painfully strong contractions in the esophageal muscles. Nutcracker esophagus is less likely to cause regurgitation of food and liquids.

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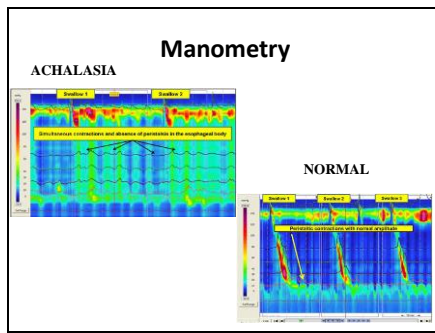
Diagnostics

- **Endoscopy**- esophagitis, ulcerations, strictures, Schatzki's ring, bx dx BE, esophageal CA, EoE, esophageal candidiasis,
- **Barium swallow**- reflux, can detect tumors, strictures, esophageal mucosal ulcerations, achalasia, hiatal hernias, diverticula, limited motility evaluation
- **Modified barium swallow**- evaluates oropharyngeal phase of swallowing, usually performed by SLT, using different textures to evaluate swallowing
- **High Resolution Esophageal Manometry**- evaluates sphincter pressures, amplitude of contractions, peristalsis of esophagus

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Slide 17



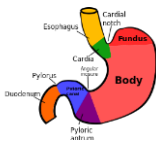
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Treatment Options

- Procedure Based Treatment
- PPIs (Omeprazole)
- H2 Blockers (Ranitidine)
- Neuropathic Agents (SSRI, SNRI, TCA, Gabapentin/Lyrica)

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The Stomach



PHYSIOLOGY

- Accommodation
- Gastric Emptying
- Antroduodenal Coordination
- Migrating Motor Complex

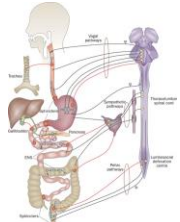
DIFFERENTIALS

- Dyspepsia
- Gastroparesis
- Bezoars
- DM Type II
- Gastroparesis
- Cyclic Vomiting Syndrome

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RELATIONSHIP OF MOTILITY AND FUNCTIONAL GI DISORDERS

SENSORY VS. MOTOR (PAIN VS. TRANSIT DELAY)



- Functional Dyspepsia vs. Gastroparesis
- Chronic Abdominal Pain vs. Gastroparesis

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Case Study

- 34 year old male with cc: abdominal pain one hr after eating
- Reports nausea, vomiting, bloating and regurgitation which all occur with meals
- No recent travel, no sick contacts, began all of a sudden 2 months ago.
- PMH: DM Type II, Asthma
- **Wt:** 145 lbs (lost 10 lbs in past 2 mos) **Ht:** 6 ft **BMI:** 19.7
- **Physical Exam:** significant for abdominal pain with palpation in LUQ and epigastric region, otherwise unremarkable.

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**Presenting Patient
Key History Questions**

- Nausea?
- Vomiting?
 - how soon after meals?
- Abdominal Pain?
 - Where and when does this occur (post-prandial?)
- Bloating
- Does this occur with solids, liquids or both?
- Regurgitation
 - how soon after meals?







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GI Motility Work Up

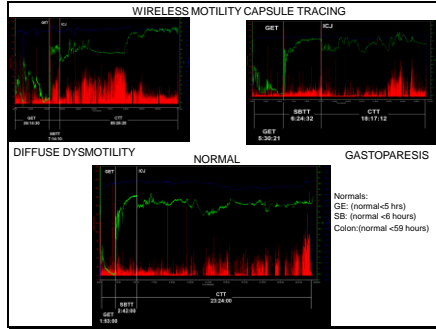
- Upper Endoscopy
- Small Bowel Follow Through
- Gastric Emptying Scan
- Smart Pill (Wireless Motility Capsule)
- Antroduodenal Manometry
- Assessment of gastroduodenal motility
 - Transit
 - Contractility (neuropathy vs myopathy)

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GES

 0 min	 20 min	 40 min
 120 min	 180 min	 240 min

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Causes of delayed gastric emptying

Anatomic	Pyloric stenosis, duodenal stenosis, duodenal web
Metabolic	Hypokalaemia, acidosis, hypothyroidism, diabetic gastroparesis
Drugs	Opioids, anticholinergics, neuromuscular blockade
Neuronal dysfunction	CNS disease, vagotomy, intestinal pseudoobstruction
Muscle disease	Visceral myopathy, SLE, myotonic dystrophy
Infection	Viral, bacterial toxins, post-viral gastroparesis
Idiopathic	Slow-wave arrhythmias

Adapted from: Mills, PJ. Motor disorders including pyloric stenosis. In: Pediatric Gastrointestinal Disease 3rd, Walker, WA, Dune, PR, Hamilton, JO, Walker-Smith, JA (Eds) S.C.Decker, Hamilton, Ontario, 2000, p.415.

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What is your diagnosis for this patient?

- 34 year old male with cc: abdominal pain one hr after eating
- Reports nausea, vomiting, bloating and regurgitation which all occur with meals
- No recent travel, no sick contacts, began all of a sudden 2 months ago.
- PMH: DM Type II, Asthma
- **Wt:** 145 lbs (lost 10 lbs in past 2 mos) **Ht:** 6 ft **BMI:** 19.7
- **Physical Exam:** significant for abdominal pain with palpation in LUQ and epigastric region, otherwise unremarkable.

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Differentials

- Peptic Ulcer Disease
- Functional dyspepsia
- Cyclic Vomiting Syndrome
- **Gastroparesis**

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Treatment

- **Diet:** Small, frequent meals low fiber and low fat
- **Medications:** Reglan, Erythromycin, Domperidone (not FDA approved)
- Consideration of neuropathic agent: TCA, SSRI, SNRI

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Cyclic Vomiting Syndrome

Table. ROME III DIAGNOSTIC CRITERIA FOR CYCLIC VOMITING SYNDROME*

At least 3 months, with onset at least 6 months previously, of:

- Stereotypical episodes of vomiting regarding onset (acute) and duration (<1 week)
- ≥ 3 discrete episodes in the prior year
- Absence of nausea and vomiting between episodes
- Supportive criteria: History of migraine headaches or a family history of migraine headaches

Rome Foundation Guidelines. Rome III Diagnostic Criteria for Functional Gastrointestinal Disorders. *J Gastrointest Liver Dis.* 2006;15(3):307-312.

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Prodromal & Vomiting Acute(abortive)

Anti-emetics

- Ondansetron
- Granisetron
- Aprepitant

Benzodiazapine

- Lorazepam

Anti-Migraine

- Sumatriptan
- Frovatriptan
- Rizatriptan
- Zolmitriptan

Benzodiazapine/ Sedatives

- Lorazepam
- Chlorpromazine
- Dopphenhydramine

Analgesics

- Ketorolac

Recovery

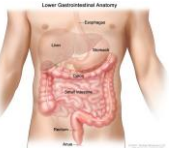
Allow patient to recover without relapse of nausea and vomiting

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Small Intestine, Colon, Rectum

- Absorption of nutrients
- Formation of waste
- Provides for elimination
- Ileus
- Pseudo-obstruction
- Constipation (functional)
- Outlet Obstruction Constipation



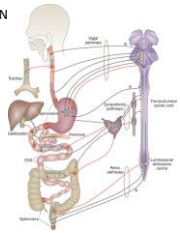
Lower Gastrointestinal Anatomy

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RELATIONSHIP OF MOTILITY AND FUNCTIONAL GI DISORDERS

SENSORY VS. MOTOR (PAIN VS. TRAN)

- IBS-C vs. Constipation
- IBS-D vs. Diarrhea
- Proctalgia vs. outlet obstruction constipation (pelvic floor dysynergia)










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Case Study

- 54 year old female cc: "constipation my whole life"
- Reports urge to defecate and straining to defecate, abdominal pain, bloating
- 2 episiotomies (20 yrs ago) No other prior surgery
- Using Senna tabs which used to help but are no longer efficacious
- **Physical Exam:** significant for LLQ abdominal pain, otherwise unremarkable

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Bristol Stool Chart

Type 1		Separate hard lumps like nuts (hard to pass)
Type 2		Sausage-shaped but lumpy
Type 3		Like a sausage but with cracks on its surface
Type 4		Like a sausage or snake, smooth and soft
Type 5		Soft blobs with clear-cut edges (passed easily)
Type 6		Fluffy pieces with ragged edges, a mushy stool
Type 7		Watery, no solid pieces. Entirely liquid

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Rome III Criteria

- Symptoms ≥ 3 mo; onset ≥ 6 mo prior to diagnosis

Functional Constipation	IBS-C
<ul style="list-style-type: none">- Must include ≥ 2 of the following:<ul style="list-style-type: none">- Straining*- Lumpy or hard stools*- Sensation of incomplete evacuation*- Sensation of abnormal obstruction/bloating*- Manual maneuvers to facilitate defecation (eg, digital evacuation, support of the pelvic floor)*- < 3 defecations/wk- Loose stool rarely present with onset of symptoms <p>*Insufficient criteria for IBS-C</p>	<ul style="list-style-type: none">- IBS: Recurrent abdominal pain/discomfort ≥ 3 days for the past 3 mo, associated with ≥ 2 of the following:<ul style="list-style-type: none">- Improvement with defecation- Onset associated with change in stool frequency- Onset associated with change in stool form- IBS is not explained by predominant stool pattern- IBS-C: hard or lumpy stools* $\geq 25\%$ of defecations; loose or watery stools* $< 25\%$ of defecations*

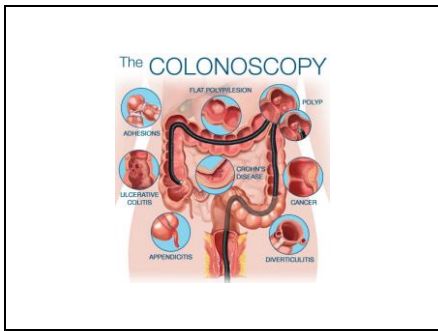
* $\geq 25\%$ of defecations. *Bristol Stool Form Scale 1-2: separate hard lumps like nuts (difficult to pass); or lumpy, sausage-shaped stool. *Bristol Stool Form Scale 6-7: fluffy pieces of stool with ragged edges, mushy stool or watery (usual stool passes without lumps). For the absence of use of enemas/laxatives or suppositories.

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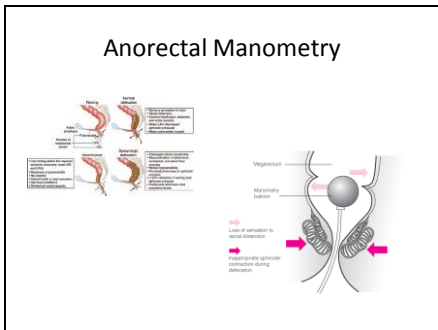
Diagnostics

- Colonoscopy
- Sitz Marker Study
- Anorectal Manometry
- Defecography
- Smart Pill Study

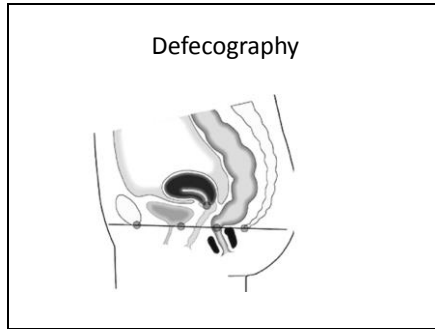
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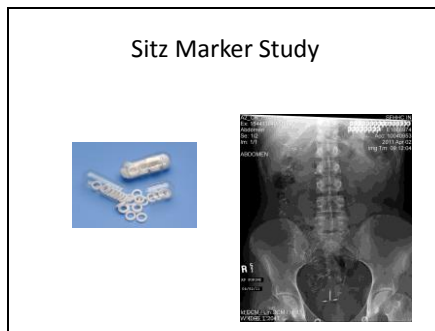
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Slide 45

Differentials

- Slow Transit Constipation
- Outlet Obstruction Constipation
- IBS-C,D,M
- Proctalgia fugax

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Treatment Options

- Lubiprostone (Amitiza)
- Linaclotide (Linzess)
- Osmotic Laxatives-miralax
- Stimulant Laxative-dulcolax, mg citrate
- Enema- type
- Suppository-type
- Neuropathic Agent (SSRI, SNRI, TCA, Gabapentin)
- Pelvic Floor PT

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Motility Affects Everyone!

Figure 1
The Overlapping Symptoms of GI Motility Disorders

GI = gastrointestinal, CC = chronic constipation, IBS = irritable bowel syndrome, GERD = gastroesophageal reflux disease.

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Questions?

Thank you for your attention!!
