Evaluation and Management of Patients with Gastroparesis

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Major Take Home Points

- Definition and Facts About Gastric Emptying
- Practical Evaluation for Gastroparesis
- Initial Stepped Approach to Treatment
- How to Manage the Patients that are not easy

  - When to consider an enteral feeding tube or Gastric Electrical Stimulation
Digestive Mechanism - Simplified

- Food bolus transported along esophagus (7-10”, 25 cm long)
- LES relaxes to allow food to pass into the stomach
- Impulses generate gastric peristalsis
- Food is mixed and ground, chemically broken-down, ingested microbes killed
- Pylorus controls the emptying of the food into the duodenum
- Via sphincter of Oddi, bile emulsifies fats, pancreas secretes digestive juice and transports wastes into the rectum
Slow contractions (1–3 minutes) with superimposed rapid contractions

Slow tonic muscular contractions in the proximal stomach produce a gradient between the stomach and duodenum, resulting in emptying of liquids.

Gastric pacemaker electrical activity aborally conducted

3 cycles/min

Pacemaker
Motilin

Distal stomach electromechanical activity

Peristaltic contractions
Propagated pacemaker potential with superimposed action potential

From the ileum
Fat
Gastric Motility

- In its resting state, the stomach is small and contains about 50 ml of fluid
- Swallowing causes the fundus to relax (receptive relaxation) to receive a bolus of food from the esophagus
- Relaxation is coordinated by vagal fibers and is facilitated by gastrin and cholecystokinin (two polypeptide hormones secreted by the GI mucosa)
Gastric Motility

- Mixing occurs as food is propelled to the antrum

- As food approaches the pylorus, peristaltic waves force contents back toward the body (retropulsion)
  - Mixes food with digestive juices and breaks down large food particles
  - Pylorus = 1.5 cm long/always open about 2.0 mm
    - Opens wider during antral contraction
    - Normally no regurgitation from duodenum to antrum
Gastric Emptying

- Rate depends on:
  - Volume
  - Osmotic pressure
  - Chemical composition of gastric contents

- Larger volumes of food increase gastric pressure, peristalsis, and rate of emptying

- Solids, fats, and non-isotonic solutions delay gastric emptying

- Certain hormones inhibit gastric motility thereby delaying emptying

200 Kcal/hour
Gastric Emptying Rates

[Graph showing gastric emptying rates for liquids and solids in normal and diabetic gastroparesis]

Camilleri M. NEJM 2007; 356:820
Patient # 1: “I throw up”

- 44 year old man with Type II Diabetes is referred from the ED with recurrent vomiting. 18 ED visits in the last 6 months for pain and sedation medications, fluids and anti-emetics. He complains of abdominal pain, constant nausea and vomiting at least 8 times weekly. His HgbA1c is 9.4. Endoscopy, RUQ US, HIDA Scan and CT (with Enterography) all were normal. A solid phase Gastric Emptying Study was abnormal.

- Consider the key points from his history, physical exam, initial laboratory values and imaging.

Diabetic Gastroparesis

- Delayed gastric emptying in absence of mechanical obstruction.
- Post-prandial fullness, nausea, vomiting (often of old food) and bloating.
- Diabetes = 1/3 of all GP
- 5-12% of patients with diabetes have symptoms of GP.
- Prevalence of definite GP in the population (2007) was 24/100,000
- Diabetics with GP – worse with poor glycemic control but persists
  - 4.8% Type I
  - 1% Type II
  - 0.1% of non-diabetics
Additional Causes

- Post-viral
- Anorexia nervosa
- Meds (narcotics, anti-cholinergics)
  - Bentyl, Antivert, Phenergan, Cogentin, Atrovent, Ditropan
- Amyloid and scleroderma
- Addisons
- Migraines
- Hypothyroidism
Evaluation of Symptoms

- History and physical examination
  - Medications and past treatments
- Endoscopy and SBFT (CT or MR Enterography)
- Lactose, Fructose, Glucose Breath Tests
- Ultrasound and possible Nuclear GB Scan
- Solid phase Gastric Emptying Study or Capsule Motility
- Evaluation for Central causes (Neurological, Tumor)
### Scintiscans of Residual Gastric Contents

<table>
<thead>
<tr>
<th></th>
<th>0 Hr</th>
<th>1 Hr</th>
<th>2 Hr</th>
<th>4 Hr</th>
</tr>
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<tbody>
<tr>
<td>Diabetic Gastroparesis</td>
<td>0%</td>
<td>20%</td>
<td>23%</td>
<td>82%</td>
</tr>
<tr>
<td>Normal Gastric Emptying</td>
<td>0%</td>
<td>39%</td>
<td>63%</td>
<td>91%</td>
</tr>
<tr>
<td>Diabetes with Accelerated Gastric Emptying</td>
<td>0%</td>
<td>61%</td>
<td>92%</td>
<td>99%</td>
</tr>
<tr>
<td>Normal Range in Healthy Adults</td>
<td>0%</td>
<td>11–39%</td>
<td>40–76%</td>
<td>90–100%</td>
</tr>
</tbody>
</table>

Table 1. Principles in the Management of Diabetic Gastroparesis

- Restore hydration, electrolytes, nutrition (enteral is preferable to parenteral), and glycemic control
- Antiemetic with caution (because of interactions in drugs involved in cytochrome P450 metabolism)
- Current prokinetics: 5-HT₄ agonists, dopamine antagonists
- Pain relief without narcotics: tramadol 50–75 mg
- Surgery and venting gastrostomy; Botox injections
- GES
Blood Sugar Signals

Low Blood Sugar
- Cravings
- Depression
- Fatigue
- Insomnia
- Lack of Focus
- Irritable

High Blood Sugar = Insulin
- Increased Gastroparesis Activity
- Inflammation
- Fat Storage
- Weight gain
- High Cholesterol
- High Triglycerides
- High Blood Pressure

Blood Sugar Levels

Balanced Blood Sugar
- Decrease in Gastroparesis Activity
- Increased Energy
- Weight Loss
- Even Moods
- Eliminate Cravings
- Lower Cholesterol
- Sense of Well-Being
Management Progression

Least invasive/risky

- Lifestyle
- Pharmacology
- Tube feeding
- Gastric Pacing

Most invasive/risky

- Surgery
- Total parental nutrition
Lifestyle Changes

- **Mild (Gastric Retention 10-15% at 4 hours)**
  - Low fat
  - Small meals
  - Tobacco cessation

- **Moderate (16-35%)**
  - Periodic homogenized food

- **Severe (>35%)**
  - Homogenized food
  - Often with J tube (10% weight loss in 6 months)
Medical Treatments

- Reverse underlying conditions
  - Optimize glucose and electrolyte levels

- Medication Review
  - Anti-hypertensive meds (calcium channel blockers)
  - Anti-cholinergics (anti-depressants)
  - Exenatide and pramlintide (hyperglycemia meds)
Anti-emetics

- **Tricyclic Anti-depressants**
  - 86% at least moderate improvement
  - Amitriptyline or nortriptyline
    - 10-100 mg daily
    - Start with 10-20 mg at bedtime and work up in 10 mg increments over several weeks
    - Sedative side effects

- **Benzodiazepines**
  - Lorazepam (Ativan) – anxiety – 1-2 mg PO q day

- **Cannabinol (Marinol)** 2.5 – 5 mg BID

- **Apepritant (Emend)** 80 mg daily

- **Acupuncture (P6) or Relief Band**
Prokinetics

- Promote antral contractility
- Antiemetic qualities
- Metoclopramide (acetylcholine release and inhibition of dopamine receptor)
  - Proximal gut only
  - Side effects 50% - Medical Legal Risk
    - Parkinsons, somnolence, tardive dyskinesia, depression, breast engorgement
    - Detailed documentation needed
    - 10 mg 30 minutes prior to meals (20 mg QID)
Prokinetics

- **Domperidone (Motilium) – peripheral acting dopamine-2 antagonist**
  - Does not cross BB barrier
  - 10 mg before meals and q HS (max 30 mg QID)
  - Need at least 3 months of therapy
  - Breast engorgement, irregular menses
  - Canada, New Zealand, Texas

- **Tegaserod – withdrawn March 2007**

- **Macrolide antibiotics**
  - Erythromycin 2-3 mg/kg IV q 6 or 125-250 mg TID (suspension)
Abdominal Pain

- 89% of patients with gastroparesis
- Acetaminophen and NSAID’s
- IV ketorolac can be used to interrupt gastric dysrhythmias in DM hospitalized for gastroparesis
  - 15-30 mg IV q 6 hours
- Tramadol 50-100 mg PO q 6
- Gabapentin 100-1200 mg TID (Neurontin)
Abdominal Pain

- **Tricyclic Anti-depressants**
- **SSRI’s**
  - Panic attacks – Paroxetine (Paxil)
  - Remeron – increase appetite and sedation
  - Effexor and Cymbalta – chronic pain
- **Short acting narcotics** – oxycodone, ms, dilaudid
- **Long acting narcotics** – oxycontin, MS contin or transdermal fentanyl (or Actique lozenges – 400 micrograms of fentanyl)
- **Alvimopan (Entereg) 6 mg/day** – blocks intestinal effects of narcotics (recently withdrawn)
The most accurate formula for determining caloric intake for individuals

The Mifflin Equation

Simply plug in your numbers to find your RMR (Resting Metabolic Rate). This is the number of calories needed per day simply to keep alive and kicking. Next, multiply the resulting number by the factor that best fits your personal activity level.

Anything lower than that number will result in weight loss.

- For men: \((10 \times w) + (6.25 \times h) - (5 \times a) + 5\)
- For women: \((10 \times w) + (6.25 \times h) - (5 \times a) - 161\)

Where:

- \(w\) = weight in kg (2.2 = pounds in kilograms)
- \(h\) = height in cm
- \(a\) = age

Activity Factor Category Definition

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
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<tbody>
<tr>
<td>1.2</td>
<td>if sedentary, little or no exercise and desk job</td>
</tr>
<tr>
<td>1.375</td>
<td>if lightly Active, light exercise, or sports 1-3 days a week</td>
</tr>
<tr>
<td>1.55</td>
<td>if moderately active, moderate exercise, or sports 3-5 days a week</td>
</tr>
<tr>
<td>1.725</td>
<td>if very active, hard exercise, or sports 5-7 days a week</td>
</tr>
<tr>
<td>1.9</td>
<td>if extremely active, hard daily exercise or sports and physical job</td>
</tr>
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Below is a website you can use as a shortcut. Plug in ht, wt and activity level of patient and it will calculate formula for you.

http://www.diet-blog.com/05/how_to_calculate_your_daily_calorie_needs.php
“Enterra Therapy is indicated for the treatment of patients with chronic, intractable (drug refractory) nausea and vomiting secondary to gastroparesis of diabetic or idiopathic origin.”
Gastric Electrical Stimulation
Lead Fixation
Stimulator Pocket
Conclusion: What are we missing and How Can we Help?