Hiatal Hernia with Complications of Gastric Volvulus

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Agenda

• Patient Report: DB
• Differential diagnosis
• Anatomy Review
• What is a hiatal hernia?
• Importance of proper diagnosis
• Menu of tests
• Radiologic examples
• Return to diagnose DB
• Resolution of case
• Review
Patient Report

- **HPI**: DB is an 89 year old woman complaining of several days of nausea, vomiting, and retrosternal “heaviness” following meals
- Has been unable to tolerate liquids or solids since symptoms began
- Now experiencing some episodes of acute pain
Patient Report

- **PMH:** known hiatal hernia, HTN, A. fib, CAD, DM
- **PSH:** Aortic valve replacement, ORIF R hip
- **Meds:** Non-contributory
- **Vitals:** T: 100.0  HR: 89  BP: 124/67  RR: 20 02sat: 95% on RA
- **Focused Physical Exam:** No rebound tenderness/guarding, +BS
Exhaustive Differential Diagnosis

• Myocardial Infarction
• Aortic Dissection
• Pulmonary Embolism
• GERD
• Achalasia
• Diffuse esophageal spasm
• Scleroderma
• Chagas Disease
• Esophageal mass (neoplasm, foreign body, bezoar, Schatzki’s)
• Esophageal stricture or webs
• Diverticula (Zenker’s, Killian-Jameson)
• Hiatal Hernia
Narrowed Differential Diagnosis

- Hiatal Hernia
- Achalasia
- Diffuse esophageal spasm
- Esophageal mass
- Esophageal stricture or webs
- Diverticula (Zenker’s, Killian-Jameson)
For our teaching purposes we will only be discussing what our patient was ultimately found to have
DB’s Final Diagnosis

- Hiatal Hernia
- Achalasia
- Diffuse esophageal spasm
- Esophageal mass
- Esophageal stricture or webs
- Diverticula (Zenker’s, Killian-Jameson)

Hiatal Hernia
Anatomy Review & BaSw: The Esophagus

- 24 cm muscular tube from pharynx to stomach

- Described as “featureless”

- A Ring: muscular ring at tubulovestibular junction

- B Ring: Marker of GEJ

Slide courtesy of Jay Pahade, MD
Anatomy Review: The Diaphragm

- Muscle layer that separates chest from abdomen
- 3 openings for the esophagus, aorta, & IVC
- Esophageal hiatus is not perfectly tight so contents can pass through

Anatomy Review: The Stomach

http://www.histopathology-india.net/stomach.jpg
Anatomy Review: Normal

GEJ is held within the abdomen by diaphragmatic crus

http://www.nlm.nih.gov/medlineplus/ency/presentations/100028_1.htm
Hiatal Hernia: The Basics

• **Definition:** Herniation of abdominal contents through the esophageal hiatus of the diaphragm
• Thought to be due to muscle weakening and loss of elasticity, particularly of phrenicoesophageal ligament
• Incidence increase with age, 60% of population over age 60 affected
• Four types categorized by anatomical relationships of critical structures
  – GEJ, Stomach, Diaphragmatic Hiatus, Other Viscera
Hiatal Hernias: Type I

- **Sliding Hiatal Hernia (95%)**
  - GEJ 2 cm or more above the diaphragmatic hiatus
  - Clinically silent or presents with GERD
  - Places the LES in the thorax, thus eliminating the bolstering affect of the crura and exposing the LES to negative intrathoracic pressure
  - Dynamic action of swallowing adds to difficulty of diagnosis

*Abbara S. et Al. Intrathoracic Stomach Revisited. AJR 2003 181:403-414*
Hiatal Hernias: Type II

• Paraesophageal or Rolling Hiatal Hernia
  – GEJ remains fixed in proper location
  – Part of stomach herniates into the chest
  – Clinically asymptomatic or presents with symptoms of substernal pain, postprandial fullness, nausea/vomiting, and SOB

Abbara S. et Al. Intrathoracic Stomach Revisited. AJR 2003 181:403-414
Hiatal Hernias: Type III

• Mixed Hiatal Hernia
  – both GEJ and part of the stomach herniates into the chest
  – Clinically asymptomatic or presents with symptoms of substernal pain, postprandial fullness, nausea/vomiting, and SOB

Abbara S. et Al. Intrathoracic Stomach Revisited. AJR 2003 181:403-414
Hiatal Hernias: Type IV

- Non-Stomach Viscera Herniates
  - Some debate about name, some believe this is a variation of a type 2 or 3
  - Clinically asymptomatic or presents with symptoms of substernal pain, postprandial fullness, nausea/vomiting, and SOB

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Hiatal Hernias: Management

- **Type I** is either asymptomatic or associated with GERD and if so, typically responds to **medical** management and is only surgical in rare cases.
- **Types II-IV** tend to expand over time and have the ability to rotate and are therefore typically reduced **surgically**.
Type II-IV Hiatal Hernias: Major Complications

Visceral Rotation:

- This can cause Gastric Volvulus and subsequent strangulation of the stomach (33%)
  - Surgical emergency due to potential for ischemia
  - **Borchardt’s Triad**: Pain, Retching without vomiting, Inability to pass NG tube (found in 70% of pts with strangulation)
Diagrams of Gastric Volvulus

Mesenteroaxial Rotation

Organoaxial Rotation
- Most Common

Abbara S. et Al. Intrathoracic Stomach Revisited. AJR 2003 181:403-414
Menu of Tests for Imaging Hiatal Hernias

- **BaSw**: test of choice (see next slide)
- **CT**: occasionally obtained to better characterize the hernia in unclear cases or before surgery
- **Plain Film**: diagnosis can be suggested by an air-fluid level in retrocardiac area on CXR or KUB
  - Often an incidental finding given the high prevalence of hiatal hernia
- **Endoscopy**
- **Manometry**
Imaging Modalities: Barium Swallow

- **Barium Swallow**: the study of choice for initial evaluation
  - Often all that is needed for diagnosis
  - Double or single contrast ($\text{BaSO}_4$, $\text{NaHCO}_3$)
  - Dynamic study done with fluoroscopy
  - Important because GEJ moves with swallowing

http://theodoregray.com/PeriodicTable/Elements/056/index.s7.html#sample3
How to evaluate the imaging

- Hiatal Hernia diagnosis is based on anatomy:
  - Need to identify the GEJ, the stomach, and their relationship to the diaphragmatic hiatus
  - Use clues such as the contour of esophagus which should be “featureless” vs. rugae in stomach
  - Type I: 2 cm rule- at least 2 cm between EGJ and diaphragmatic hiatus to differentiate from “physiologic herniation”
  - Type II-IV: Gastric Volvulus- look for the NG tube, distention, obstruction of flow, and inversion of curvatures or other signs of rotation
Type I: Sliding Hiatal Hernia on BaSw

Gastric Rugae  Diaphragm

Type II: Paraesophageal Hiatal Hernia on CT

NG Tube Illustrating the path of the esophagus and that the GEJ is below the diaphragm

Gastric Antrum is protruding into the thorax

CT Sagittal

Type III: Mixed Hiatal Hernia on BaSw

- GEJ is displaced above the diaphragm
- A large part of the stomach has herniated as well
- Rugal folds at diaphragmatic hiatus

BaSw fluoroscopy
Image Courtesy of Yiming Gao, MD
Type IV: Companion Pt 1 with Other Viscera Herniating on BaSw

Hiatal Hernia

Colon has also herniated
Now let’s apply what we have learned to our patient’s imaging
Our patient DB: Frontal CXR

The Stomach has herniated across the diaphragm and is now lying in the chest behind the heart.

Retrocardiac Air-fluid Level
Our patient DB: Lateral CXR

The Stomach has herniated across the diaphragm and is now lying in the chest behind the heart

Retrocardiac Air-fluid Level
Our patient DB: Barium Swallow 1

NG Tube
Greater Curvature
Lesser Curvature

Inversion of curvatures suggests organoaxial rotation

Antrum/Pylorus
Duodenum

Body of stomach

BaSw Fluoroscopy
PACS, BIDMC
Our Patient DB: Barium Swallow 2

Passage of Barium to small intestine

No gastric distention is noted

BaSw Fluoroscopy

PACS, BIDMC
Contrast-filled stomach next to the right lung that extends to the left chest and back below the diaphragm.
Our Patient DB: Sagittal CT+

Contrast filled stomach in the chest, resting on the diaphragm
Our patient DB: Coronal CT+

Part of the bowel has also passed through the diaphragmatic hiatus

Stomach protruding above the diaphragm and into the thoracic cavity
Now let’s answer some questions about our patient’s hiatal hernia

1. Is it a type I or a type II-IV?
   Type II-IV (specifically II and IV), since we see that the GEJ remains intra-abdominal while both the stomach and another portion of bowel have herniated

2. Is there rotation or other signs of gastric volvulus?
   Yes. There is inversion of the greater and lesser curvature along the axis of the stomach, making this an organoaxial rotation. However, there is also free passage of barium and the stomach is not overly distended, indicating that no obstruction currently exists.
Patient report

• DB was thought to have a Type II & IV hiatal hernia, complicated by organoaxial rotation.
• These findings corroborate her clinical presentation of retrosternal fullness, vomiting and pain.
• However, the easy passage of an NG tube, non-distended stomach, visualization of contrast in the small bowel, and no rebound tenderness on physical exam suggest that she does not yet have strangulation of the stomach
Our Pt DB: Post-Op Frontal CXR

- DB was thus a candidate for surgery, but not an emergent procedure.
- The following day she underwent a successful laparoscopic repair of the hiatal hernia.

The stomach has been retuned to its anatomical position beneath the diaphragm.

Free air

Frontal CXR
Review

• Hiatal Hernia: herniation of abdominal contents through the esophageal hiatus of the diaphragm
• Four types of Hiatal Hernias categorized by anatomical relationships of critical structures
• Barium Swallow is the initial test of choice and often all that is needed to diagnose
• Important to distinguish between Type I and Types II-IV because they have different management
• If Type II-IV, look for volvulus and obstruction
Acknowledgements

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References


Images:
http://www.histopathology-india.net/stomach.jpg
http://www.nlm.nih.gov/medlineplus/ency/presentations/100028_1.htm
http://theodoregray.com/PeriodicTable/Elements/056/index.s7.html#sample3