Robotic and Minimally Invasive Approaches to Hiatal and Paraesophageal Hernias (and Other foregut surgery)

Chris Schneider, MD, FACS

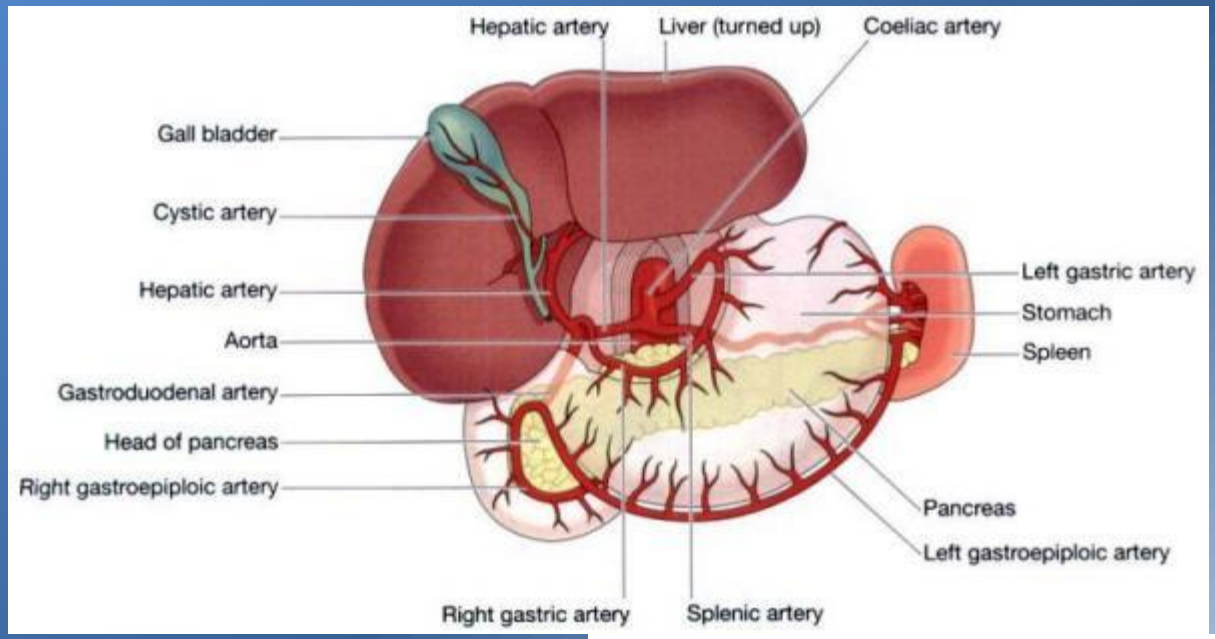
Grand Rounds, Feb 17, 2017

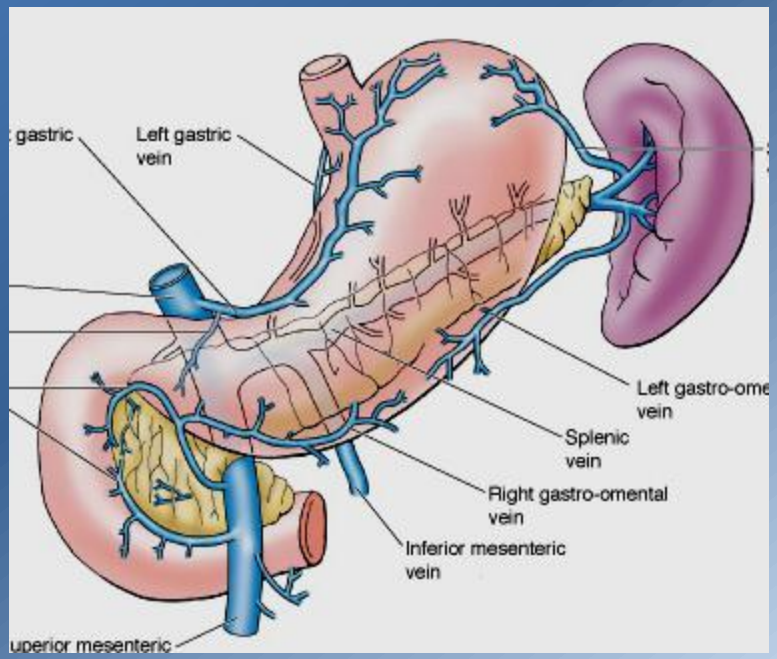
Kettering Medical Center

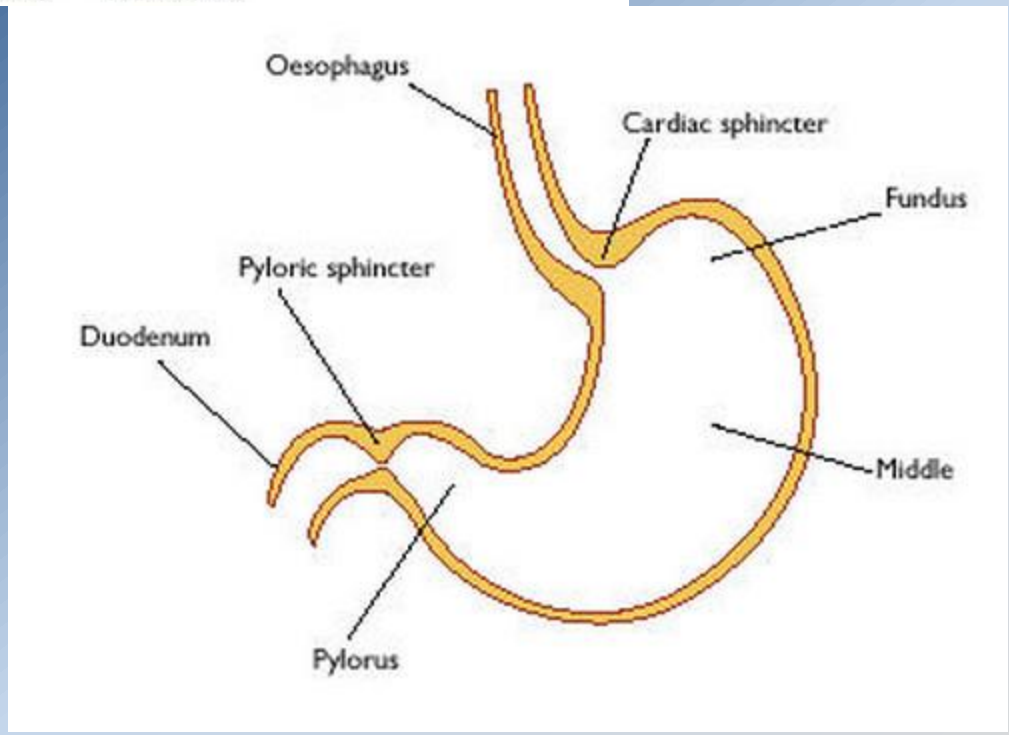
Objectives

- Review pertinent anatomy of the foregut
- Discuss non-malignant foregut pathologies
- Review treatment options focusing on surgical intervention
- Explain benefits of minimally invasive approach to these conditions

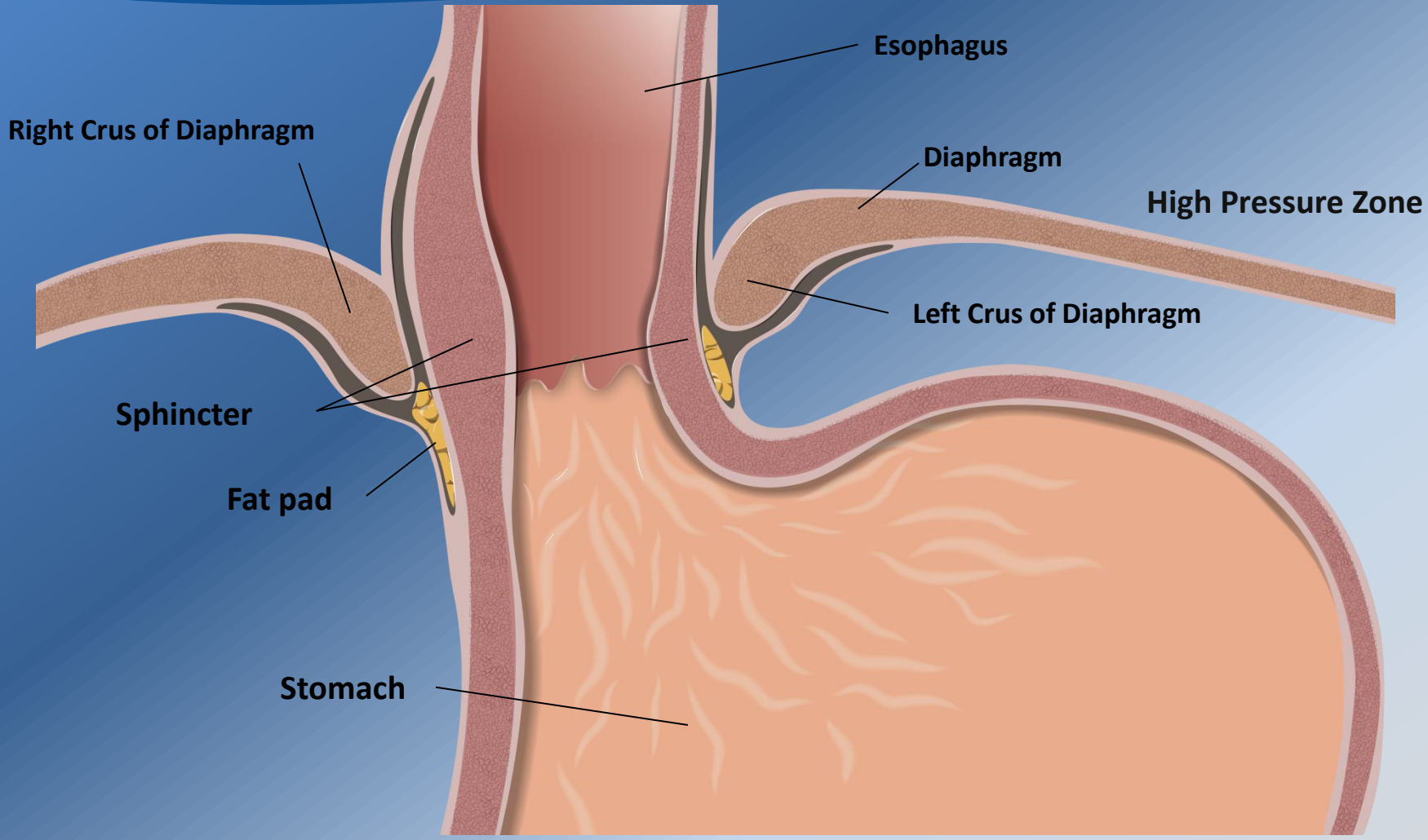
Anatomy Review

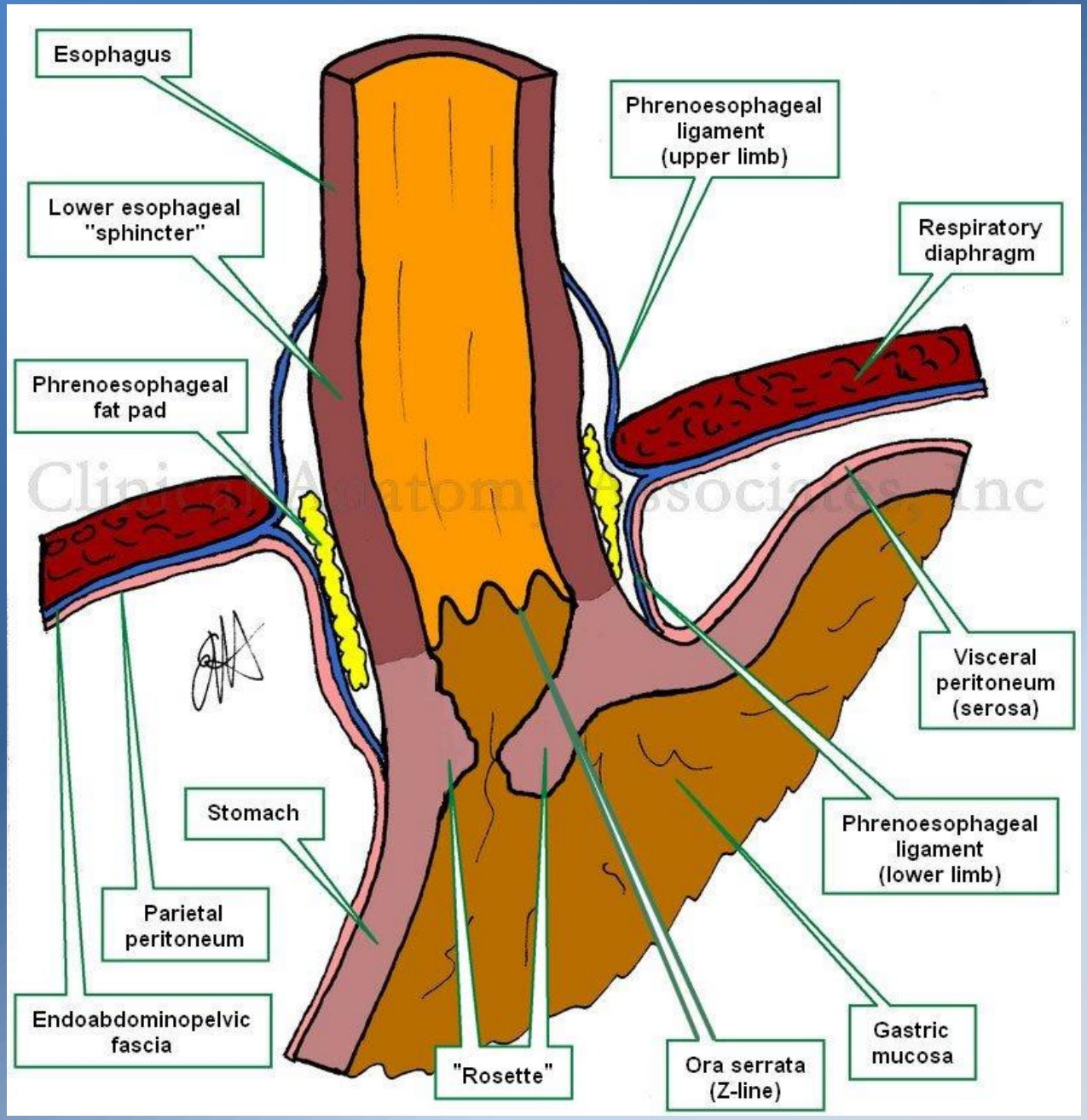

Hepatic artery
Liver (turned up)
Coeliac artery
Gall bladder
Cystic artery
Hepatic artery
Aorta
Gastroduodenal artery
Head of pancreas
Right gastroepiploic artery
Left gastric artery
Stomach
Spleen
Pancreas
Left gastroepiploic artery
Right gastric artery
Splenic artery


gastric
Left gastric vein
Left gastro-ome vein
Splenic vein
Right gastro-omental vein
Inferior mesenteric vein
uperior mesenteric


Oesophagus
Cardiac sphincter
Fundus
Pyloric sphincter
Duodenum
Middle
Pylorus

Gastroesophageal (GE) Junction




Esophagus
Lower esophageal "sphincter"
Phrenoesophageal fat pad
Stomach
Parietal peritoneum
Endoabdominopelvic fascia
"Rosette"
Phrenoesophageal ligament (upper limb)
Respiratory diaphragm
Visceral peritoneum (serosa)
Phrenoesophageal ligament (lower limb)
Ora serrata (Z-line)
Gastric mucosa

Phrenoesophageal Membrane

- Formed from fascia transversalis on under surface of diaphragm
- Elastic membrane that inserts into esophageal musculature circumferentially
- Responsible for pulling squamocolumnar junction back to position after peristalsis

Reflux and Treatment

Gastroesophageal Reflux

- Typical “heartburn”
  - Tightness in the chest, sour taste in the mouth, regurgitation, nausea, etc.
  - Barrett’s Change
- Or Laryngopharyngeal Reflux (LPR)
  - Hoarseness, “lump” in the throat, chronci cough, asthma, apnea
  - A lot of crossover between the two.

Workup

- Typically treat first – H2 Blocker, PPI

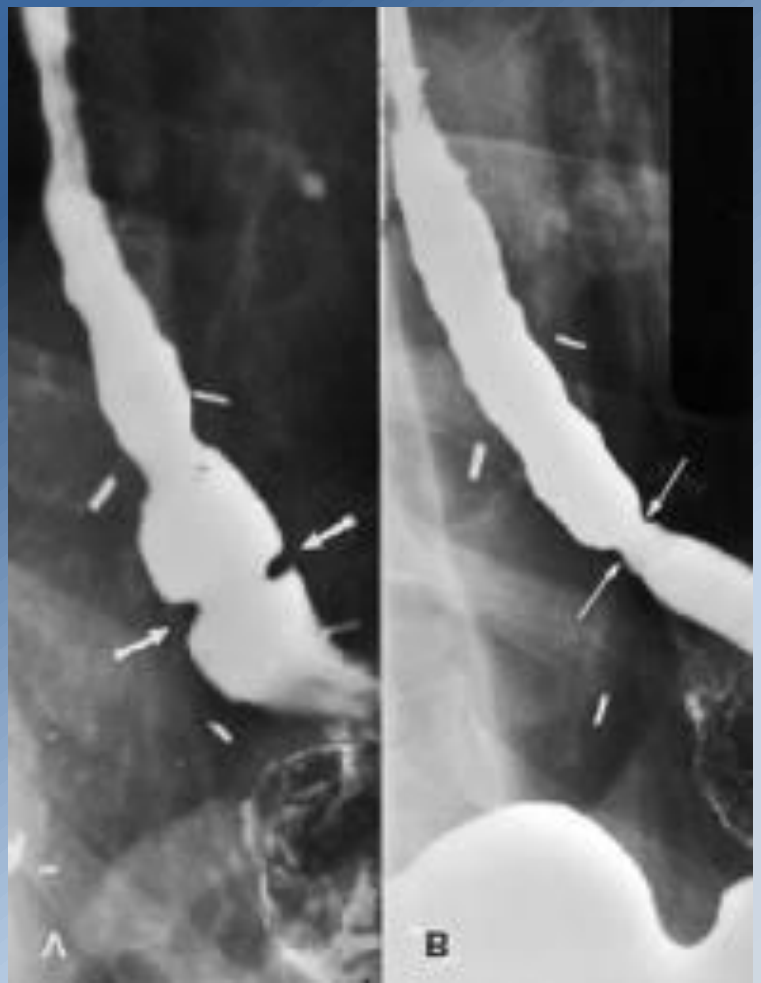
- Continued Workup (persistent symptoms)
  - EGD – Barrett's Change? Hiatal Hernia? Peptic Stricture?
  - pH Probe (Bravo Probe)
  - Manometry?
  - Desire to not be on meds, failure of meds…

EGD

- Barrets Metaplasia –
  - No Change in risk for adenocarcinoma
- Peptic Stricture – treatment at time
- Both are diagnostic for acid exposure consistent with severe GERD.

Peptic Stricture (Schatzki's ring)

- Due to or protective against reflux
  - Dilation



Peptic Stricture

pH Probe

- 24 hour or “BRAVO” probe
  - deMeester score > 14.72
  - Any time pH < 4:
    - >5.5% of the time total
    - >8.3% of the time upright
    - >3% of the time supine
    - >1.6% of total time.
- Unless suspicious of motility disorder manometry is un-necessary

Surgical GERD Management

- TIF – Transoral incisionless fundoplication
  - Hiatal hernia <3cm
  - No stricture

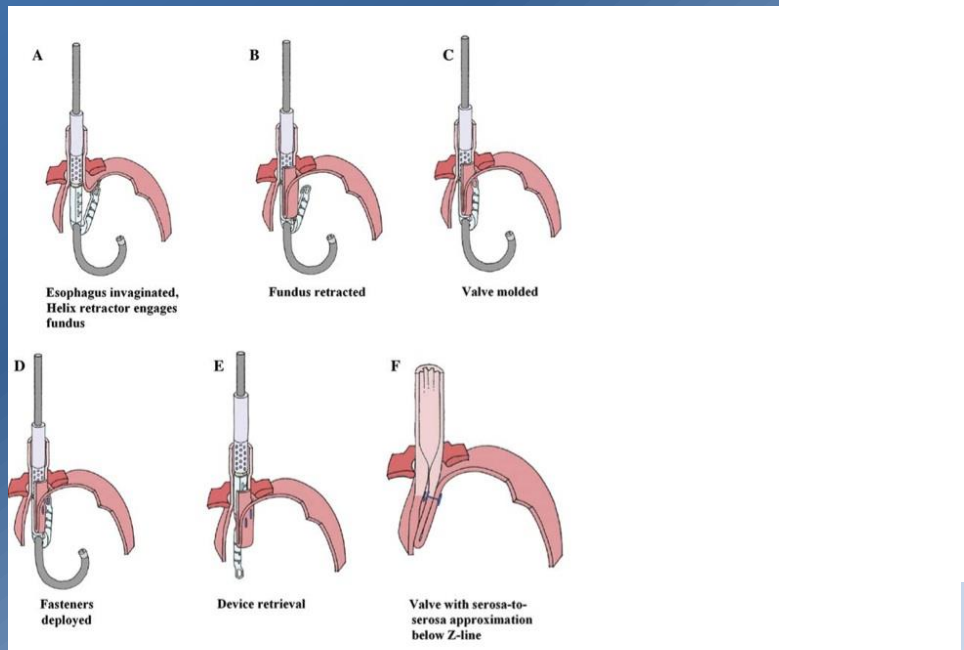
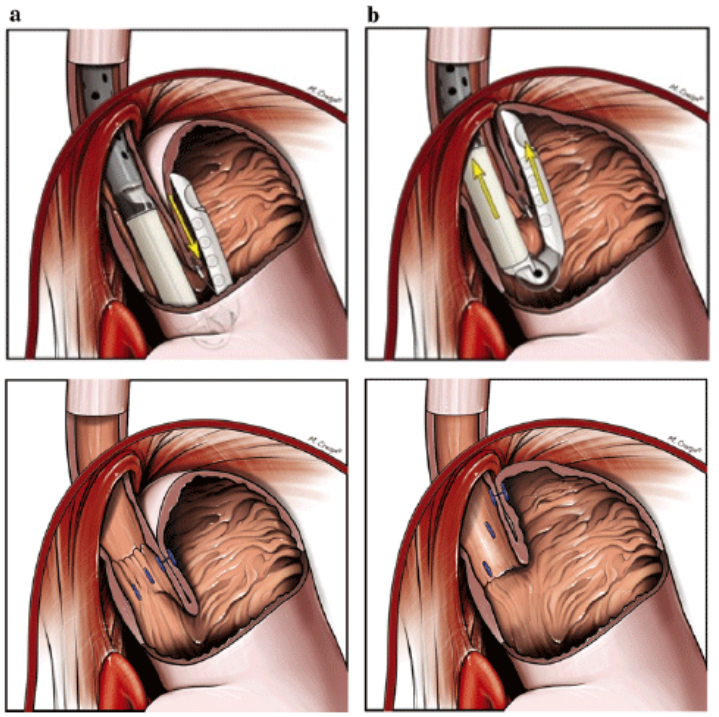


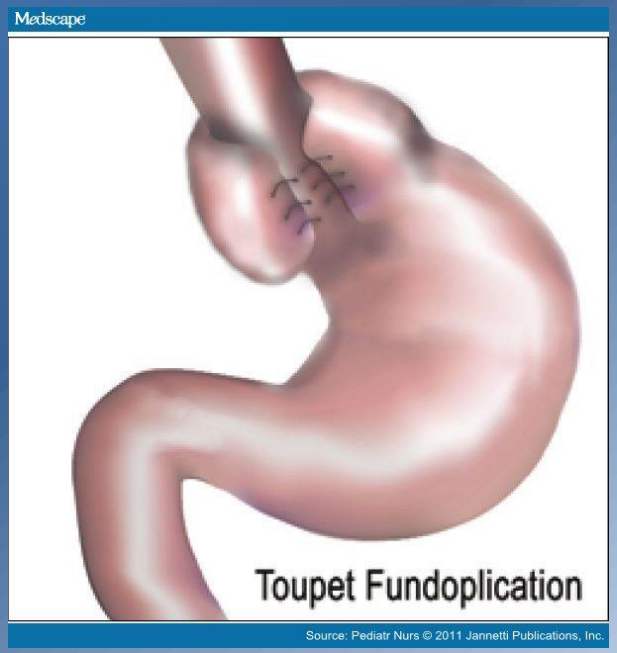
Figure 4. Schematic representation of the transoral incisionless fundoplication by EsophyX™.

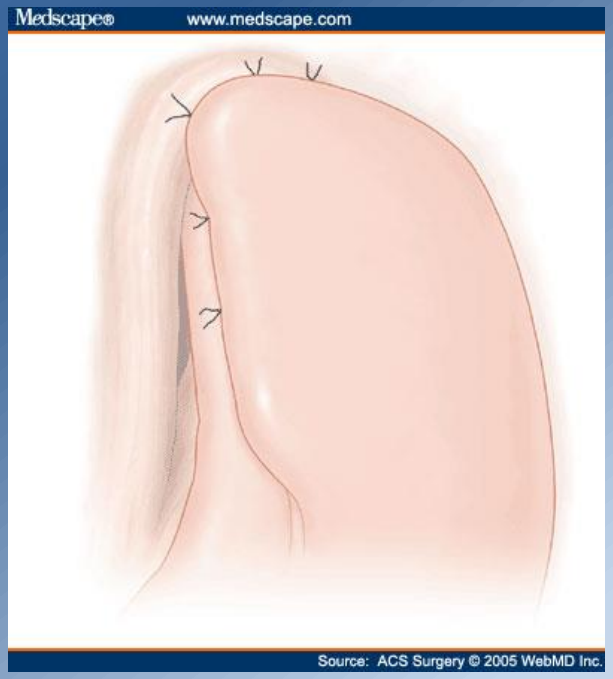
Fig. 2 A TIF 1 procedure with gastrogastric plications placed at the level of the Z-line. **B** TIF 2 technique creates an esophagogastric fundoplication proximal to the Z-line

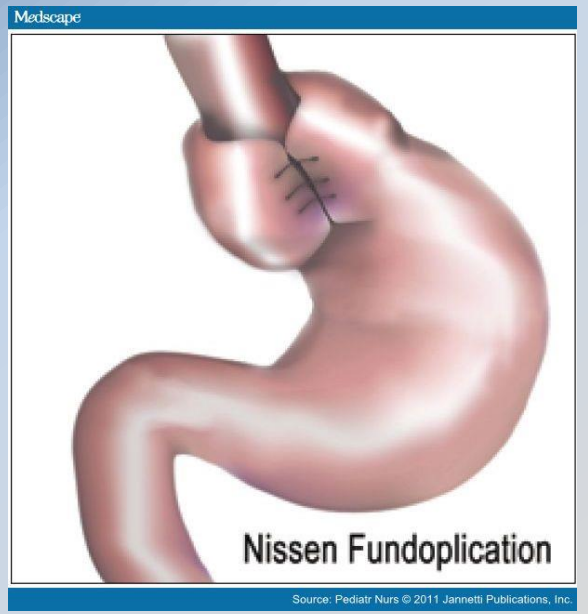


Surgical Management of GERD

- Fundoplication







Outcomes

- Excellent reduction in symptoms (>90% at 10 years)
- Complications -
  - Slipped wrap
  - Herniated wrap
  - Ruptured wrap
  - Wrap too tight – older complication

Video to follow the next section…

Hiatal and Paraesophageal Hernias

History

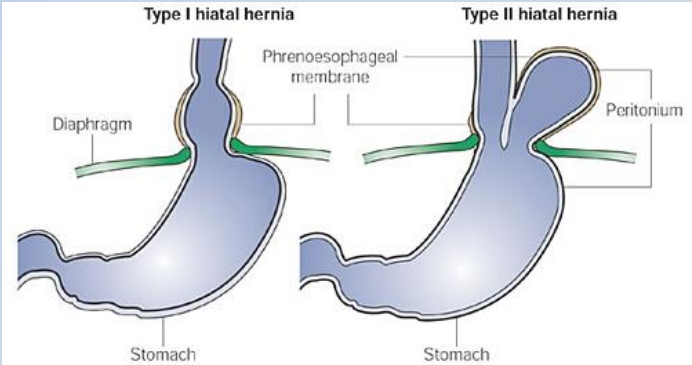
- Initially thought to be congenital diaphragmatic defect
- First description of paraesophageal hernia on postmortem exam (1903)
- Akerlund coined *hiatus hernia* and created classification
- Advances in imaging improved diagnosis and identification antemortem

Epidemiology of Paraesophageal Hernia

- Incidence of hiatal hernia 15-20% in US
  - < 40 yrs - 10%
  - > 70 yrs - 70%
- Paraesophageal defects make up 5% of all hiatal hernias
- More common in females
- More common in obese patients

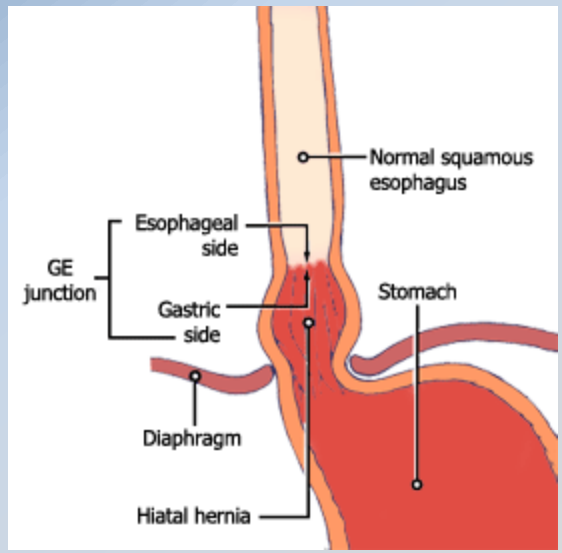
Types of Hiatal Hernia

- Type I - sliding hernia
- Type II - pure paraesophageal hernia
- Type III - mixed type
- Type IV - Paraesophageal hernia with add'l organs (spleen, transverse colon, pancreas)



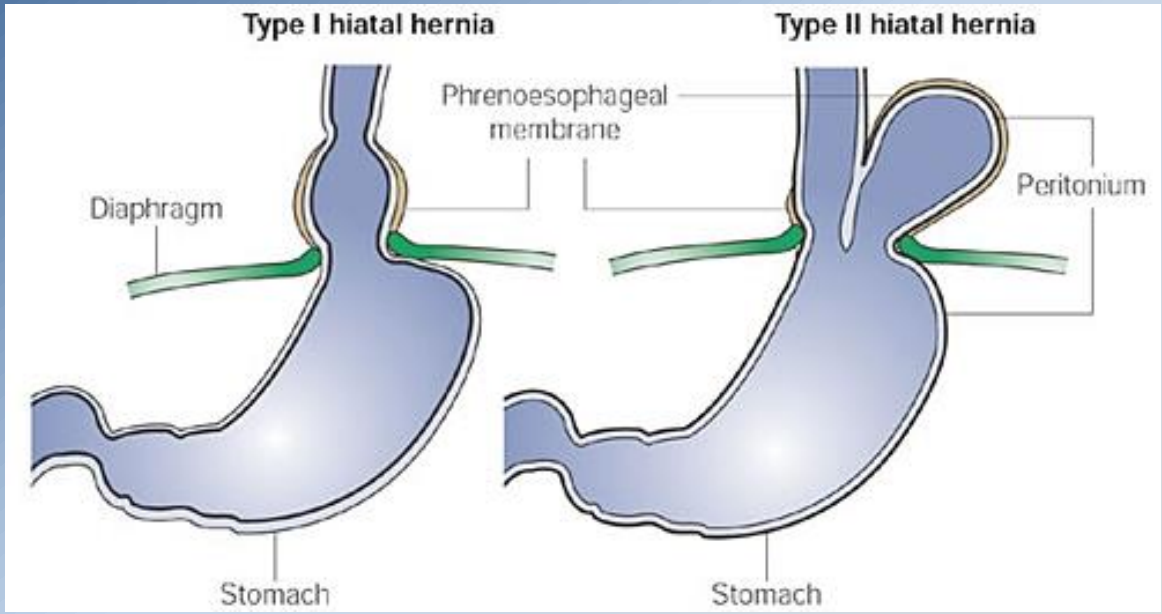
Types of PEH

- Type 1 – Hiatal Hernia
  - Defect at the diaphragmatic hiatus
  - Cephalad displacement of the lower esophagela sphincter above the level of the diaphragm
  - Phrenoesophageal membrane remains intact
  - “sliding” hernia
  - Most common (80%)



Types of PEH

- Type 2
  - GE junction (LES) in proper place
  - Stomach herniates adjacent to the GE junction through the phrenoesophageal membrane
  - Very rare



Types of PEH

- Type 3
  - Combined type (LES and stomach) herniated through the phrenoesophageal membrane
  - Concern for volvulus as entire stomach herniates
  - Most common PEH (15%)
  - Can pull other abdominal contents into the chest creating Type IV PEH

Types of PEH

- Type 4
  - Type 3 PLUS other abdominal contents pulled into the chest
  - Colon, spleen, liver, small intestine

Clinical Diagnosis

- Typically asymptomatic
- GERD
- Dysphagia
- Post-prandial LUQ pain
- Inability to vomit
- Unable to pass nasogastric tube
- Occult anemia

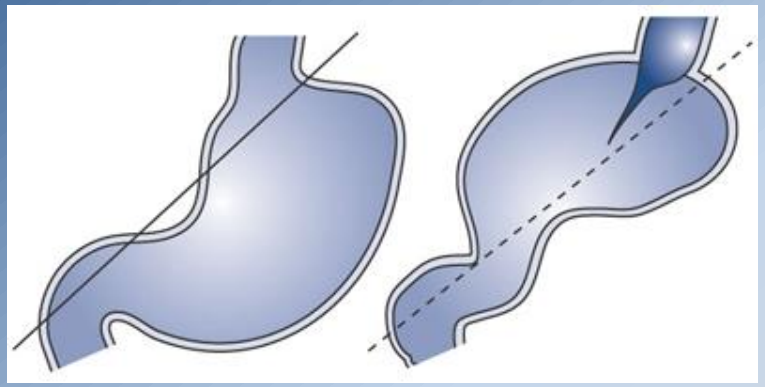
Borchardt's Triad

Cameron's Ulcers

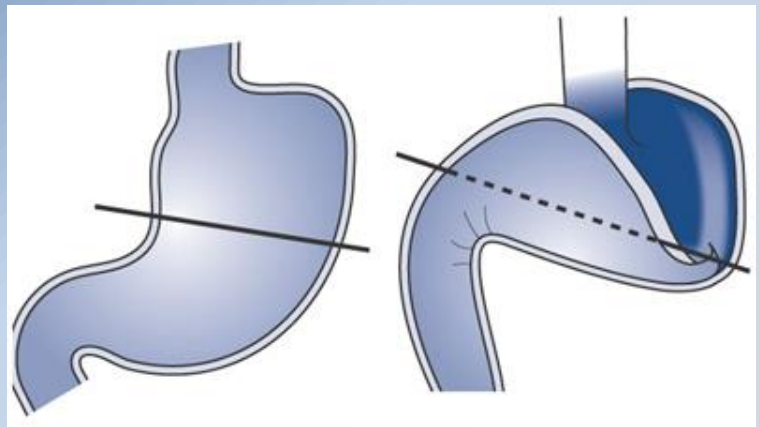
- Responsible for 10-20% incidence of anemia
- Occur ~ 20% of large paraesophageal defects
- Gastritis or ulceration within pouch
- Mechanical irritation at crura

Gastric Volvulus

- Organoaxial (longitudinal)
  - bad

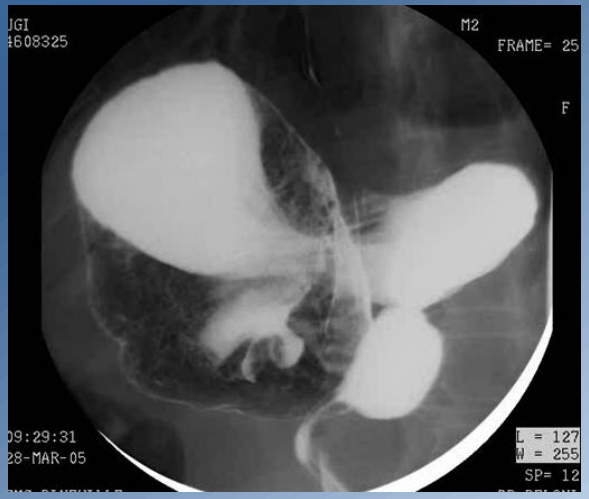


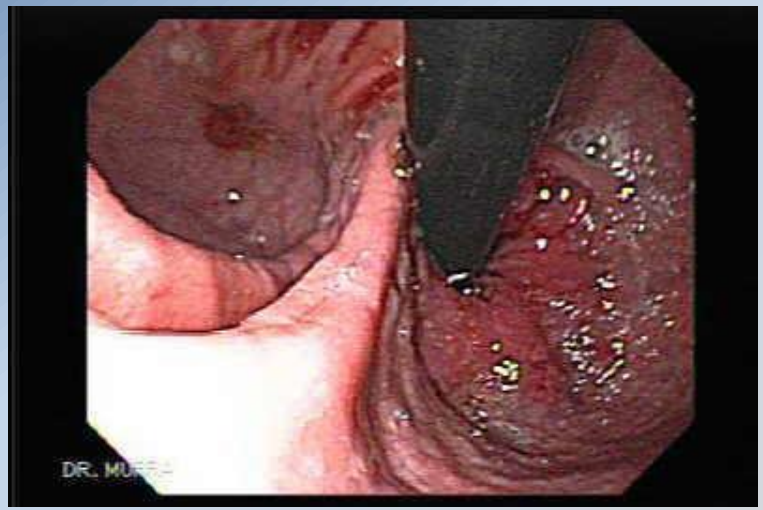
- Mesenteroaxial (transverse)
  - Less bad



Diagnosis

- Barium esophagram
- CT chest or abdomen
- Double lumen on endoscopic retroflexed view





Gastric Volvulus

- Can be surgical emergency
- Laparoscopic or open approach
- IF gastric ischemia then resection +/- gastropexy
- IF no ischemia then decision to repair
  - Formal Repair
  - Gastropexy
  - Double PEG gastropexy?

Excerpta Medica

The American Journal of Surgery

The American Journal of Surgery 182 (2001) 510–514

Scientific paper

Minimally invasive management of paraesophageal herniation in the high-risk surgical patient

Kent W. Kercher, M.D.[a], Brent D. Matthews, M.D.[a], Jeffrey L. Ponsky, M.D.[b], Sharon L. Goldstein, M.D.[a], Robert T. Yavorski, M.D.[a], Ronald F. Sing, D.O.[a], B. Todd Heniford, M.D.[a]*

[a]*Departments of General Surgery and Gastroenterology, Carolinas Medical Center, P.O. Box 32861, Charlotte, NC 28232, USA*
[b]*The Cleveland Clinic, Cleveland, OH, USA*

Manuscript received February 20, 2001; revised manuscript June 22, 2001

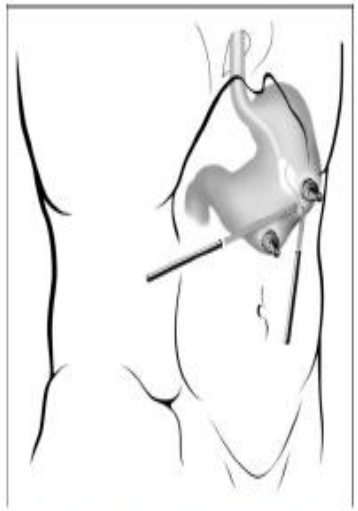


Fig. 1. Intracorporeal gastropexy sutures placed between percutaneous endoscopic gastrostomy (PEG) tubes provide additional points of fixation for the stomach.

Medical Management

Procedure: On an empty stomach, and when you know you will be on your feet for at least several hours, drink 2-4 glasses of water. The idea here is to place as much weight into the stomach as is possible and you can stand. Immediately after this, locate a stool, or stand on the second step from the bottom of a staircase. What you want to do is to step off of the small stool, or stairs, and land quite firmly on your feet. You DON'T want to absorb the shock of the landing with your legs or knees. You want the momentum of the downward motion of the stomach to continue on firmly after you land on the floor. This momentum will actually pull the stomach down in the abdominal cavity, repositioning it where it belongs.

To Repair or Not To Repair?

Watchful Waiting?

- “Surgical Management of Esophageal Reflux and Hiatus Hernia. Long-Term Results with 1,030 Patients”
  - *DB Skinner, RH Belsey (1967)*
- 6 of 21 patients with paraesophageal hernia treated medically died of complications of incarceration, perforation, and bleeding
- Elective surgical repair mandated

Natural History

- Review of Finnish administrative database
- From 1987-2001, 563 pts (operative repair) vs. 67 pts (watchful waiting)
- 3 deaths after elective repair
- 11/67 (16.4%) died after watchful waiting
- Causes of death:
  - Incarceration 75%
  - Complications from surgery 18.8%
  - GI bleed 6.2%

Sihvo EI, et al. *J Thorac Cardiovasc Surg*, 2009; 137:419

Nonoperative Management

- 23 asymptomatic patients w/ PEH
- Followed for median of 78 months
- Only 4 pts had progression of symptoms
- 3 cases of gastric strangulation in 735 patient years
- Only death due to aspiration during esophagram

Allen MS, et al. *J Thorac Cardiovasc Surg* 1993; 105:253

Operate or Observe?

- Statistical analysis of HCUP-NIS database
- Operative mortality in emergent repair only 5.4%
- Annual probability of requiring emergent surgery only 1.1%
- Watchful waiting was beneficial in 83% of patients, elective surgery only 17%

Stylopoulos N, Rattner DW. *Ann Surg* 2002;236:492

Outcomes

- Improvement in pulmonary complaints
  - Improvement in spirometry values
    - FEV1, FVC (14-16% improvement)
  - Dyspnea index
  - Pulmonary quality of life scores
- Improvement in Iron Deficiency anemia

Low D, Simchuk EJ. Annals of Thoracic Surgery, 2002.

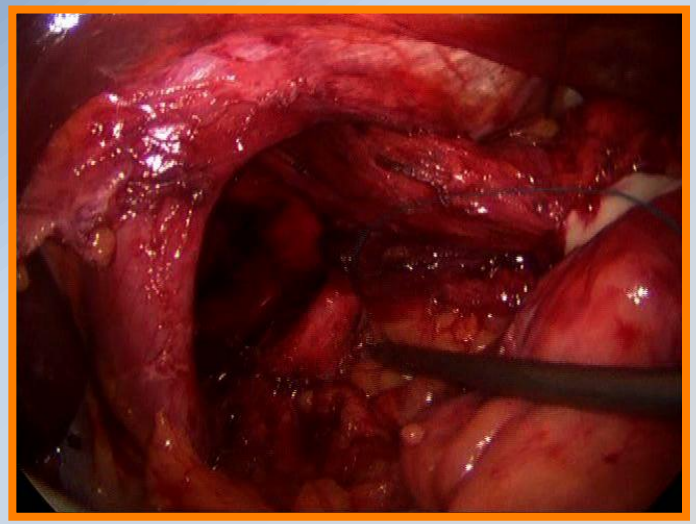
Lebenthal A, Waterford SD, Fisichella PM. Front Surg, 2015.

Management

- Type I
  - Treat underlying reflux symptoms
  - No indication for surgery when asymptomatic
- Types II - IV
  - Risk of gastric volvulus, strangulation
  - Surgery mandated for symptomatic pts
    - *Symptoms infrequently related to reflux

Surgical Repair

- 1) Reduction of herniated contents
- 2) Excision of hernia sac
- 3) Closure of crural defect
- 4) Anti-reflux procedure (+/-)
- 5) Gastropexy



Mesh Reinforcement of the Hiatus

Recurrence following Lap PEH Repair

- 38 consecutive patients
- Concomitant fundoplication (29 pts)
- Recurrence rate 6% based on symptoms
- Routine esophagram revealed 6 add'l recurrences
- Overall recurrence 22%

Wu, Dunnegan, Soper. Surg Endosc 1999

Recurrence following lap PEH repair

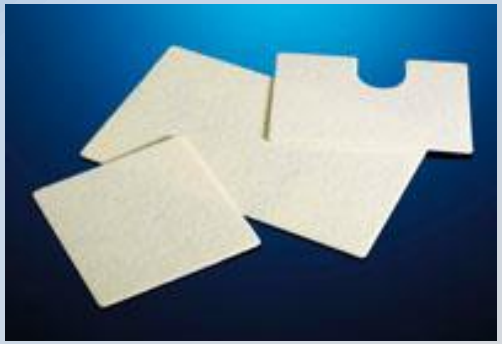
- Median 587 month follow up recurrence
  - No Mesh – 59%
  - Mesh – 54%
- However:
  - >95% satisfaction rate with symptom improvement
  - Only 3% reoperation on recurrences required

- Mesh is optional (recommended by SAGES)**

Oelschlager BK, Soper NJ, Pellegrini CA, et al. J Gastrointest Surg, 2012

Got Mesh?

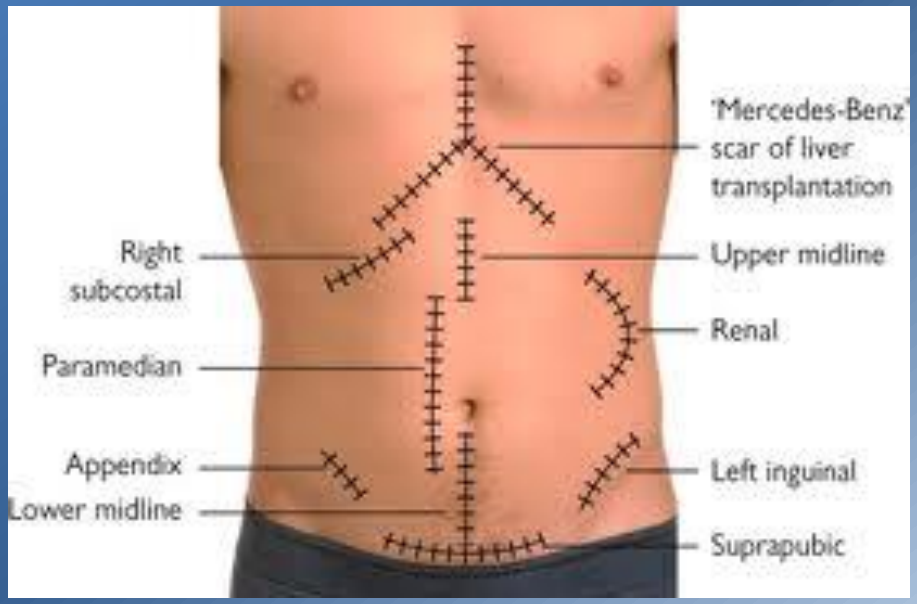
- Basis for tension-free repair everywhere else in abdomen
- Bridge defect or reinforce closure
- Concern for synthetics at hiatus



Minimally Invasive Options for Repair

Choices of Surgical Access

Open Surgery



Minimally Invasive and Robotic Surgery

Minimally Invasive Approach

Traditional (Open)

- Equal OP time
- Question of lower recurrence
- Longer Hospital LOS
- Higher Morbidity
- Increase pain scores
- Hernias, abdominal wall function

Minimally Invasive

- Equal operative time (or faster)
- Equal recurrence
- 24 hour LOS
- Improved QOL scores
- Decreased morbidity
- Decreased mortality **
- Can still convert if necessary

My personal results

- 23 repairs past 2 years
  - 22 robotic, one open
  - 2 conversion to open (bleeding, esophageal tear)
  - LOS total 1.6 days (excluding conversions 1.1 days)
  - Operative time down
  - Operative cost down

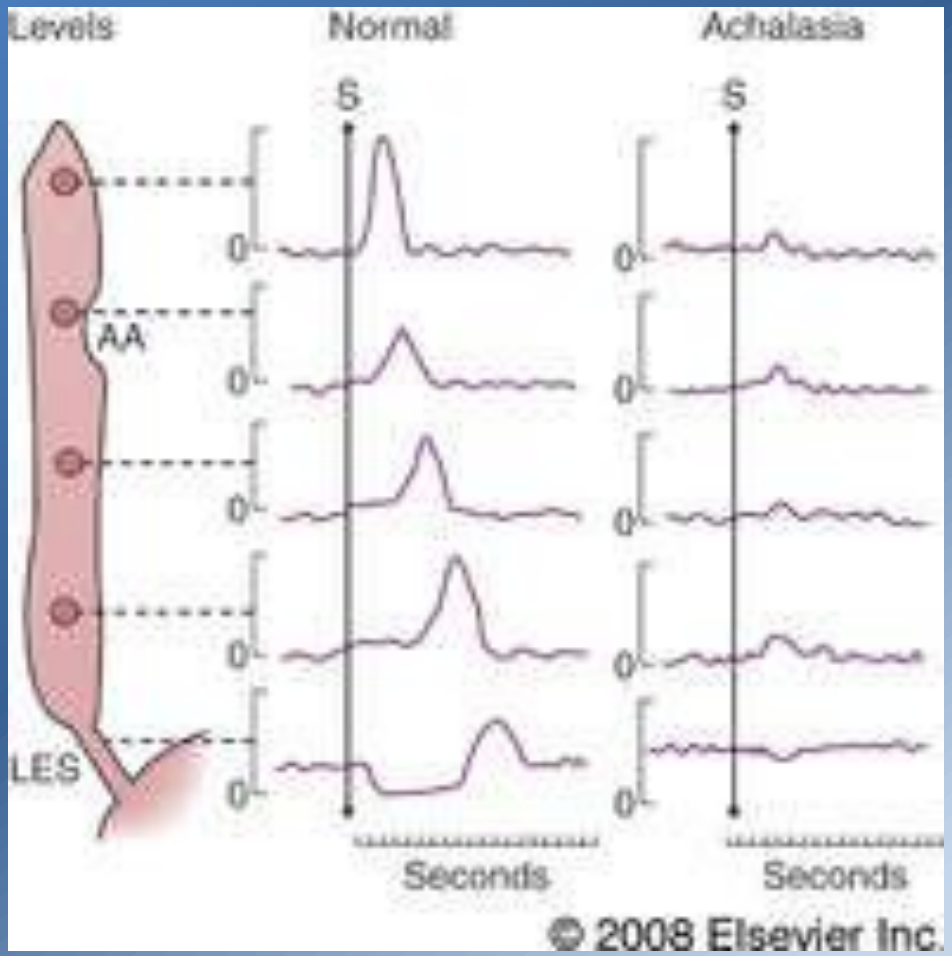
Achalasia

Achalasia

- Symptoms
  - Dysphagia, regurgitation, coughing (supine), weight loss, chest pain, aspiration
- Physiologic manifestatiion
  - Increased resting LES pressure
  - Failure of LES to Relax
  - MOST IMPORTANT FINDING : Aperistalsis

Achalasia

- Diagnosis:
  - Manometry
  - Barium Swallow “Bird Beak”
- Medical Management: Calcium channel blockers, nitrates, dilation, botox (3-6 months)
- Rare causes :
  - T. Cruzi
  - reduviid bug (Chagas disease)


Levels
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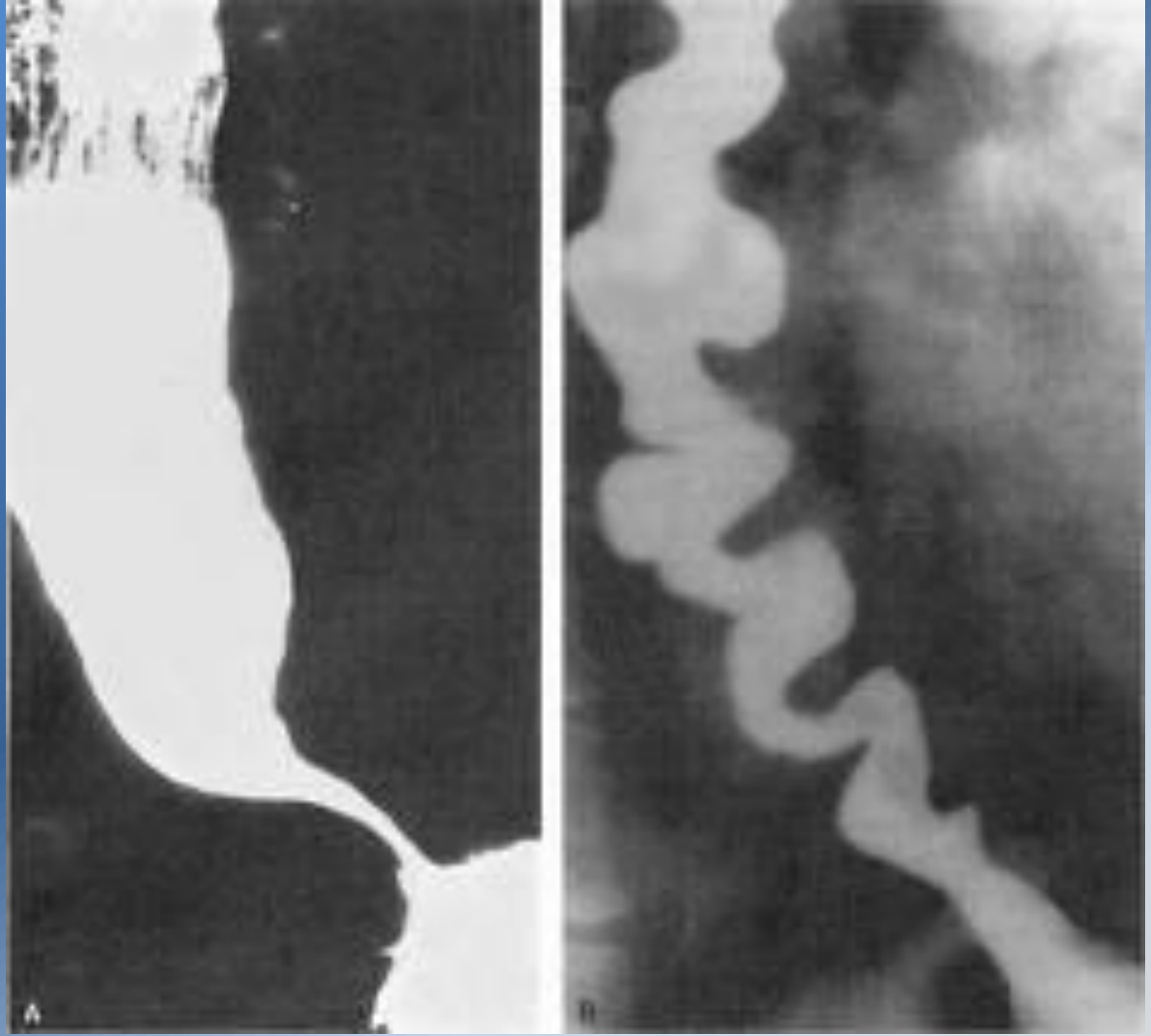
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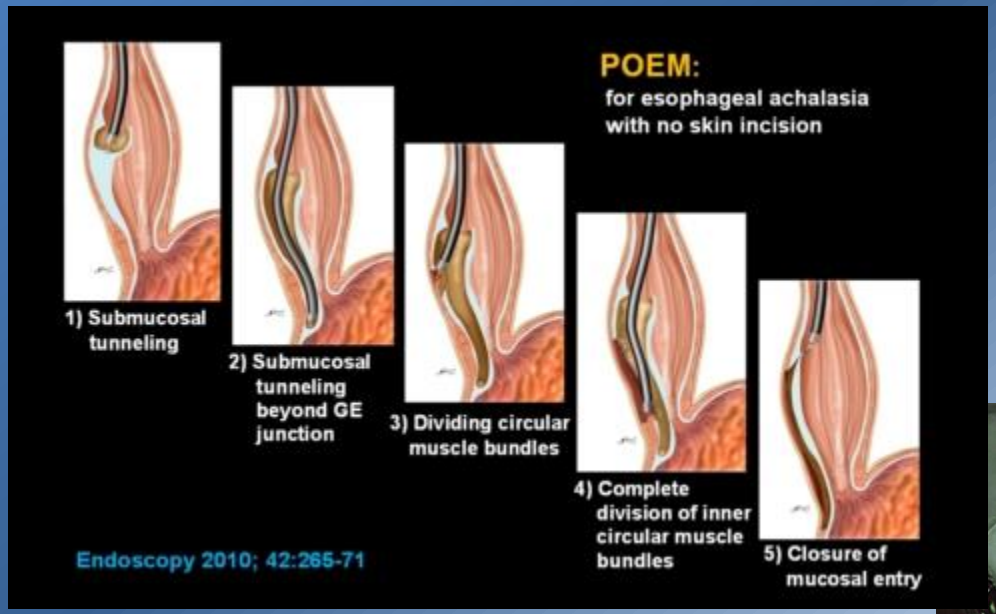
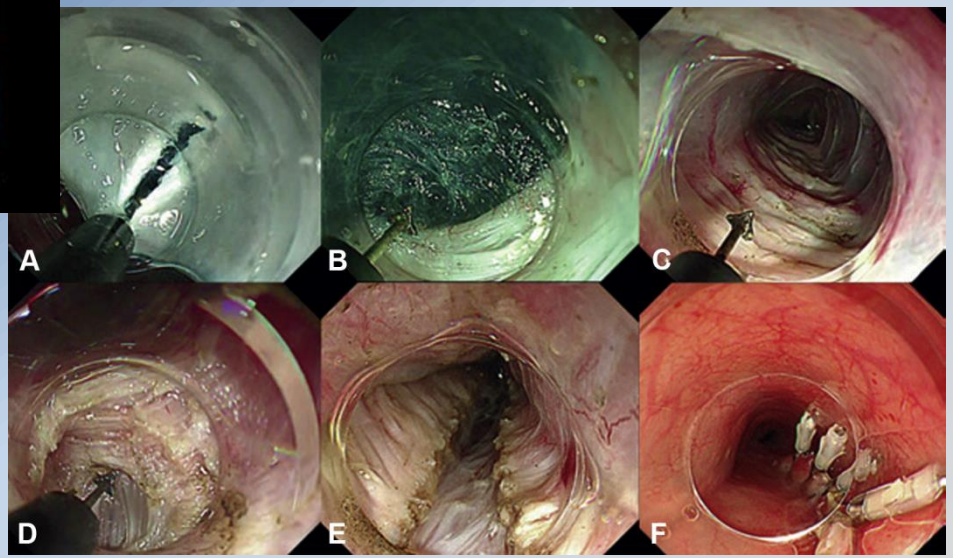
Other Esophageal Dysmotility

- DES
  - Unorganized, high amplitude contractions, LES is normal tone and relaxation
  - Rx: same as achalasia, only surgery if unresolved; complete esophageal myotomy of circular layer
- Nutcracker Esophagus
  - >180 mm HG high amplitude contractions, o/w nl
  - Rx: Calcium Channel blockers
- Hypertrophic LES
  - >45 mmHG resting tone of LES

Surgical Options

- Peroral Endoscopic Myotomy (POEM)





Surgical Options

- Heller Myotomy
  - MIS or open
  - Longitudinal incision of the circular muscle of the esophagus
  - Added fundoplication (reflux control)

Surgical Options

POEM

- Limited Availability
- Still requires general anesthesia
- Equal operating time
- Equal LOS
- **No incisions**
- Post procedural reflux

Minimally Invasive Heller Myotomy

- General Anesthesia
- OR time low
- Minimal instrumentation
- Equal LOS (24 hours or less)
- Do have incisions (4 or 5)
- Reflux control with fundoplication
- Equal long term (>90% symptom free 10 yrs)

Achalasia

- Take home message:
  - Minimally invasive options exist at Kettering Hospital Network
  - Less than 1 day stay
  - Excellent short term outcomes
  - No need to leave the region

Objectives

- Review pertinent anatomy of the foregut
- Discuss non-malignant foregut pathologies
- Review treatment options focusing on surgical intervention
- Explain benefits of minimally invasive approach to these conditions

Questions?