Esophageal Disease

Advances in the Diagnosis and Management of

Gastroesophageal Reflux Disease (GERD)

Pierre Blais, MD

November 15, 2025

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Disclosures

- *I have nothing to disclose, no financial interests, nor other potential conflicts of interests.*

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Objectives

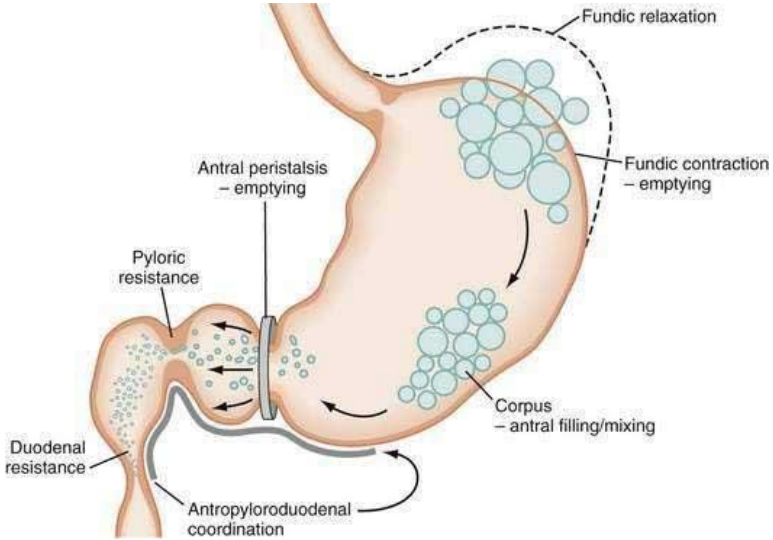
- Develop a basic understanding of pathophysiology and how to segregate symptom and disease
- Approach the evaluation and management of gastroesophageal reflux disease (GERD) on the basis of pre-test probability
- Be familiar with the situations in which to refer a patient to a gastroenterologist
- Gain perspective on the GI clinic discussion with patients about definitive reflux management options—laparoscopic fundoplication, transoral incisionless fundoplication (TIF), gastric bypass

Background

Upper GI Physiology

Functions of gastric components:

- Volume control – gastric fundus
- Mixing – gastric body (corpus)
- Controlled emptying – gastric antrum and pyloric sphincter
- Containment and release valve – lower esophageal sphincter



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Gastroesophageal reflux is a “normal” phenomenon

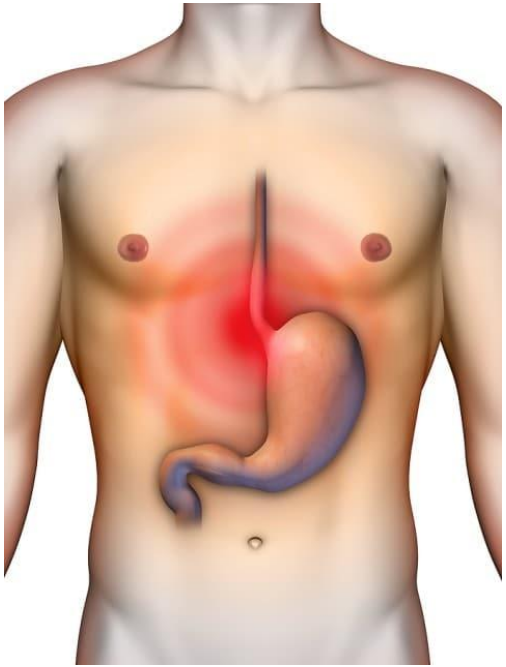
GERD

- "A condition which develops when the reflux of stomach contents causes troublesome symptoms and/or complications."

-- Montreal Classification
Vakil N et al, Am J Gastroenterol 2006

- Estimated prevalence: 8-33% of all adults worldwide

El-Serag et al, Gut 2014



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https://www.washingtonpost.com/national/health-science/heartburn-may-signal-a-chronic-condition-gastroesophageal-reflux-disease-or-gerd/2012/08/27/b56ddfb4-b63b-11e1-9e4c-5a6a137d65e1_story.html

GERD Pathophysiology

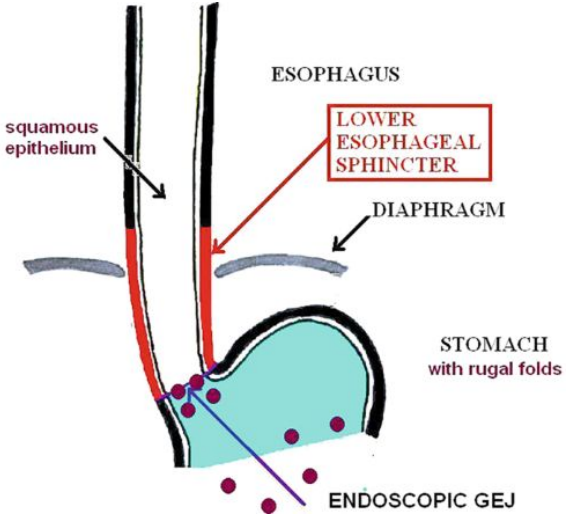
In *most patients*, the vast majority of acid reflux events are caused by:

A) Impaired esophageal clearance of acidic contents

B) Transient lower esophageal sphincter relaxation

C) Increased intra-abdominal pressure

D) Hiatus hernia



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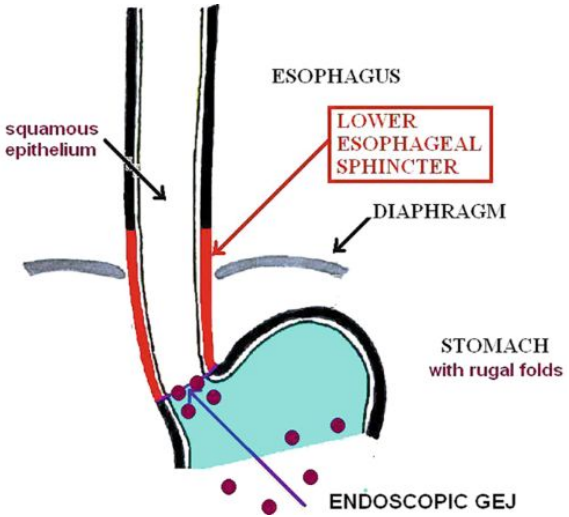
Mittal RK et al, Gastroenterology 1988



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Transient Lower Esophageal Sphincter Relaxations (TLESR's)

- Thought to underpin nearly all physiologic reflux events, and two-thirds of reflux episodes in pathologic GERD.
- The majority of patients with reflux symptoms have a *normal* anatomy.

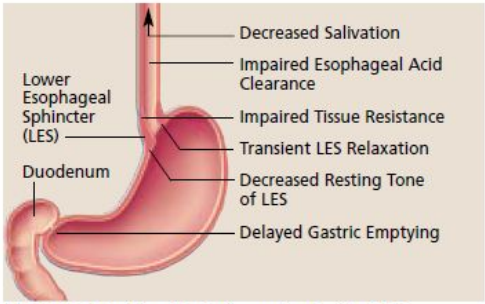

FIGURE 2. Possible etiologic factors involved in GERD.

TABLE 1
Mechanisms of gastroesophageal reflux in normal volunteers and in patients with GERD

Type	Normal volunteers	Patients with GERD
Transient lower esophageal sphincter relaxations (TLESRs)	94%	65%
Transient increase in intra-abdominal pressure	5%	17%
Spontaneous free reflux	1%	18%

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Kahrilas PJ 2003
https://www.health.harvard.edu/diseases-and-conditions/gastroesophageal-reflux-disease-gerd-a-to-z

Physiologic Reflux

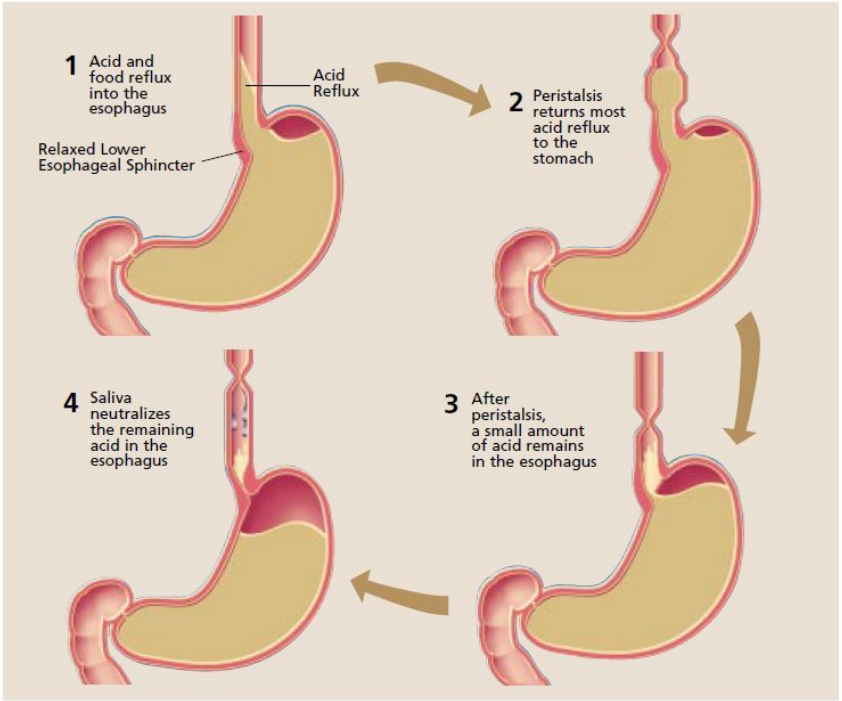
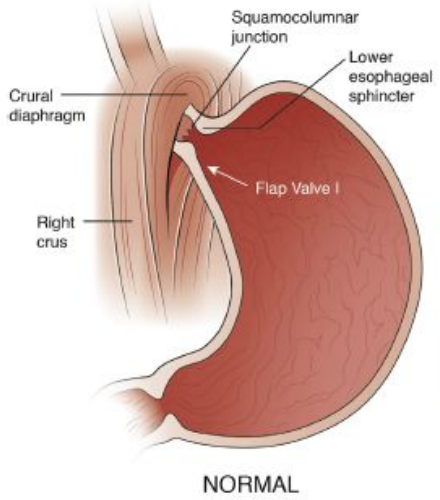


FIGURE 1. What happens during nonpathologic reflux.



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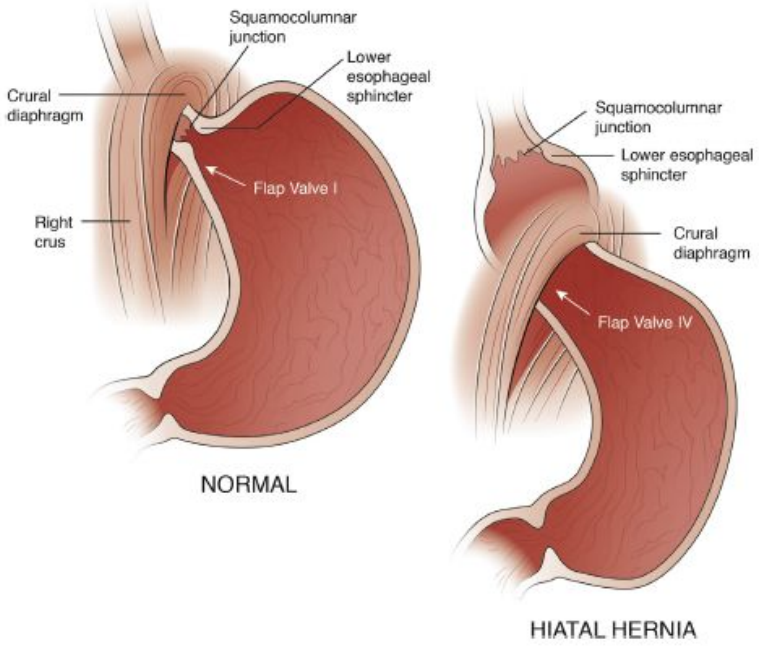
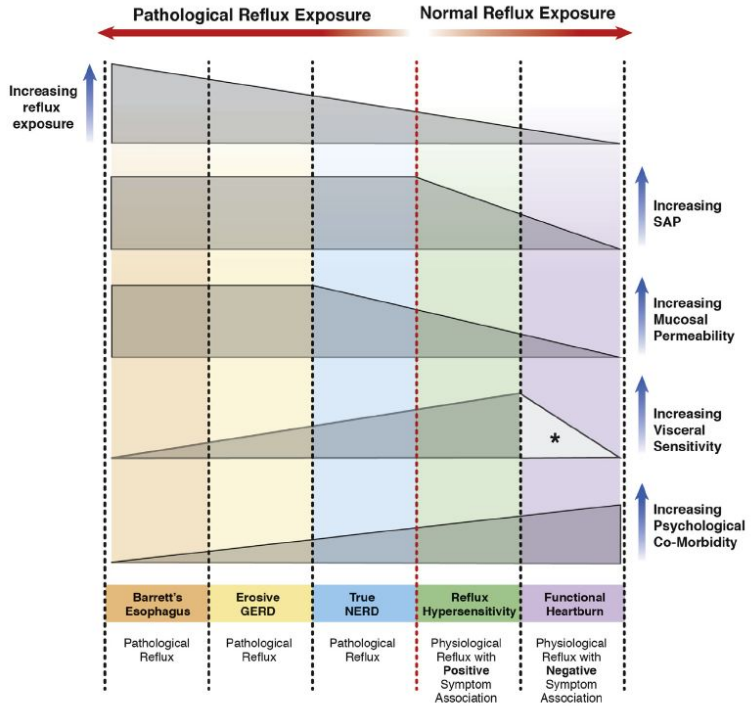
Kahrilas PJ, Clev Clin J Med 2003
Tack J, Pandolfino PJ, Gastroenterology 2018

Structure vs Function – Divergent Pathways





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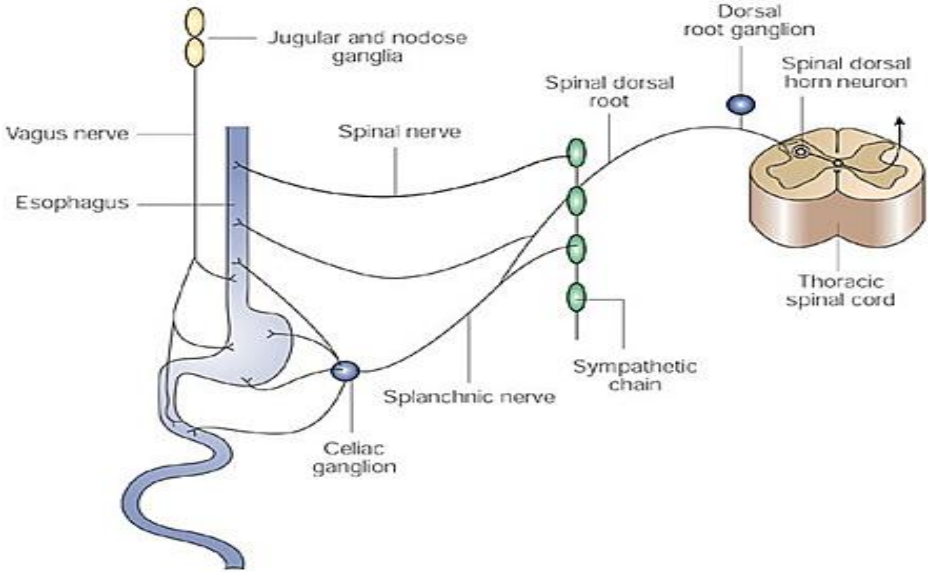
Visceral Afferent Signaling Pathways

Acid reflux is the most common cause of referred *pain* from the esophagus

Classic symptoms of GERD
- Heartburn
- Regurgitation

Atypical symptoms of GERD
- Chest pain
- Water brash
- Hoarseness
- Globus sensation
- Cough
- Wheezing/asthma



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Sengupta et al, GI Motiliy Online 2006

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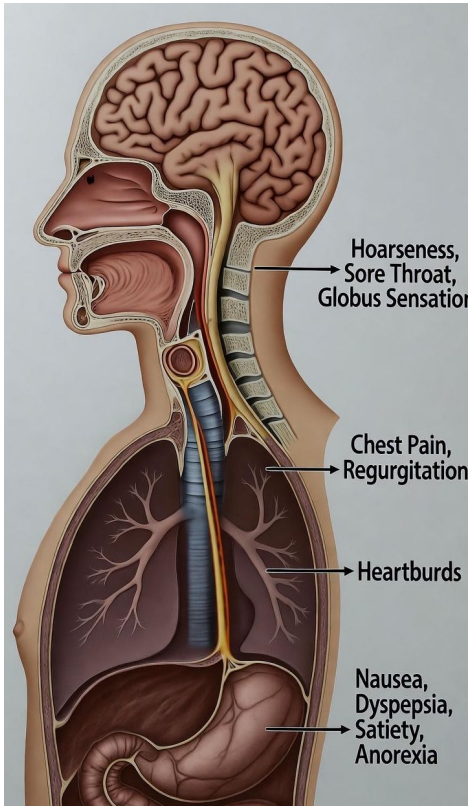

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Acid Suppression Effectiveness

Table 1. Responses of GERD Symptoms and Esophagitis to Acid Suppression in Randomized Controlled Trials

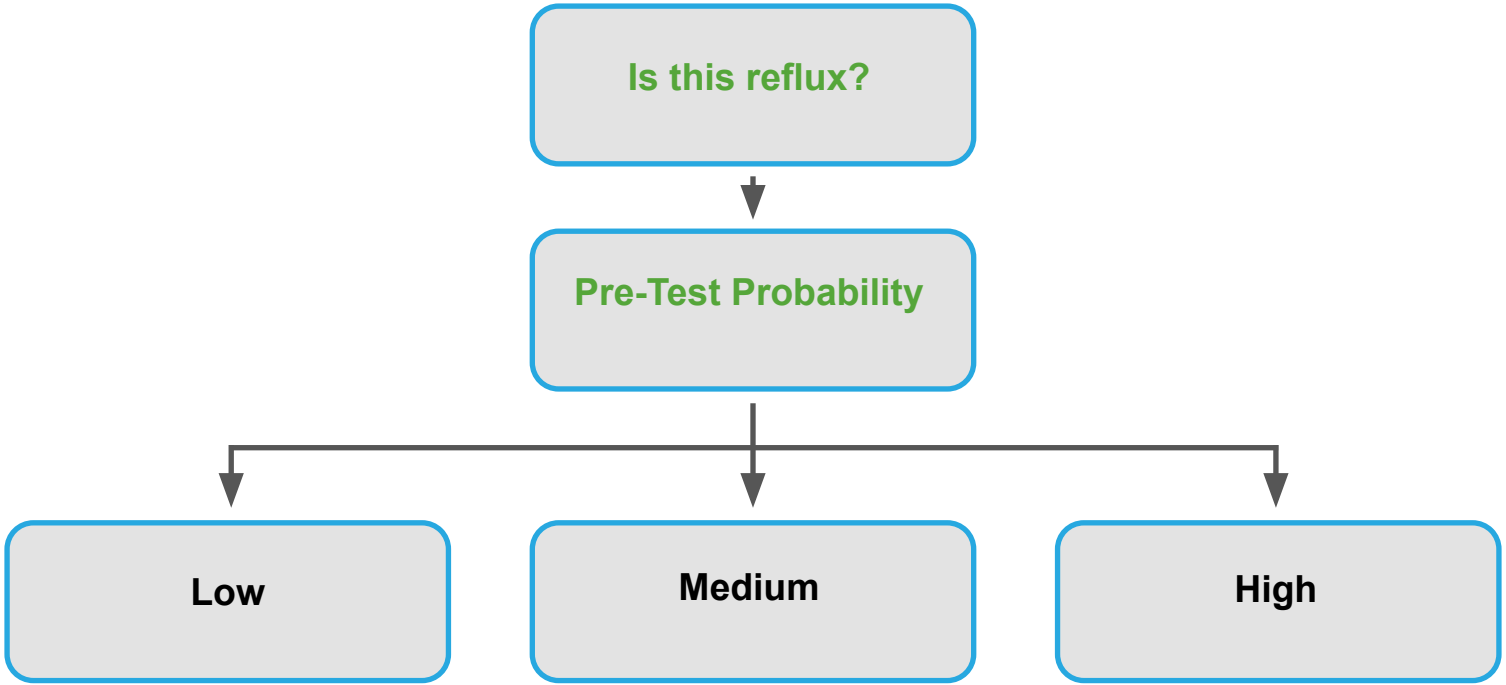
	Response to treatment, %	Response to placebo, %	Risk ratio for response (95% confidence interval)	Number needed to treat
Proton pump inhibitors				
Uninvestigated heartburn[55]	70.3	25.1	2.80 (2.25–3.50)	2.2
Heartburn without esophagitis[55]	39.7	12.6	3.15 (2.71–3.67)	3.7
Heartburn with esophagitis[53]	55.5	7.5	6.93 (3.55–13.52)	2.1
Erosive esophagitis[50]	85.6	28.3	2.96 (2.14–4.11)	1.8
Regurgitation[56]	64.0	46.4	1.40 (1.29–1.47)	5.7
Noncardiac chest pain, positive GERD testing[58]	74.5	17.2	4.33 (3.04–6.18)	1.7
Noncardiac chest pain, negative GERD testing[58]	23.6	28.2	0.84 (0.54–1.31)	22.0
Chronic cough[61]	18.1	9.3	1.94 (0.87–4.34)	11.4
Laryngeal symptoms[62]	14.7	16	0.92 (0.41–2.05)	79.2
Histamine-2 Receptor Antagonists				
Uninvestigated heartburn[55]	54.6	40.6	1.34 (1.18–1.53)	7.1
Heartburn without esophagitis[55]	35.4	22.0	1.61 (1.15–2.26)	7.5
Erosive esophagitis[50]	41.0	20.3	2.10 (1.30–3.24)	4.8

Gyawali et al, Gastroenterology 2018

Conditions that GI manages

	Symptoms	No Symptoms
Pathologic Reflux	GERD	“Silent reflux” (still GERD!)
No Reflux	Functional heartburn / Reflux hypersensitivity	

Primary Care Heuristic for Reflux Symptoms



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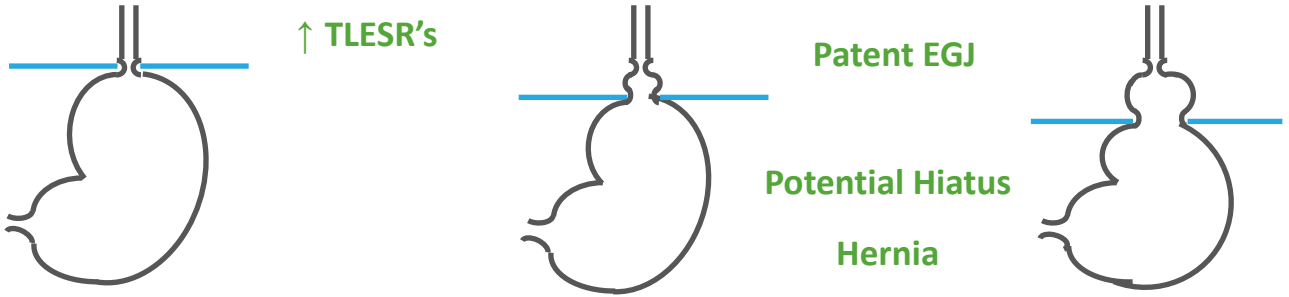
Primary Care Heuristic for Reflux Symptoms

Pre-Test: Low | Medium | High

Pathophysiology:



Risk Factors:

↑ Age

↑ BMI

Management:

Diet / Lifestyle → Medical → Definitive

↑ Symptom Duration

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Clinical Scenarios

Scenario 1: Moderate Pre-test Probability

Patient A is a 32yo Caucasian male with intermittent heartburn in the past, particularly mornings after binge alcohol use, now more confluent in recent months. He acknowledges a slow weight gain of 20lbs over the past 10 years since college, with increased stress from work and family obligations making it difficult to observe a healthy diet with regular exercise. Intermittent Tums has helped in the past but is slowly losing effectiveness. Timing remains postprandial in the evenings and mornings after notorious dinners.

Scenario 1: Moderate Pre-test Probability

What would you do?

A. Counsel him on diet and lifestyle modifications to minimize reflux

B. Place him on a trial of PPI

C. Refer the patient to GI clinic

D. Refer for an EGD

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intra-abdominal pressure

somatization

favorable clinical components

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Scenario 1: Moderate Pre-test Probability

What would you do?

A. Counsel him on diet and lifestyle modifications to minimize reflux 👍👍👍

B. Place him on a trial of PPI 👍

C. Refer the patient to GI clinic 🤔

D. Refer for an EGD 👎

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GERD Initial Recommendations

Lifestyle Modifications

- Elevate the head of bed (wedge pillow)
- Avoidance of late night meals
- Left lateral decubitus positional sleep
- Weight loss

Dietary Modifications – Abstaining from foods that:

- Weaken LES tone
- Delay gastric emptying
- Contain acid themselves

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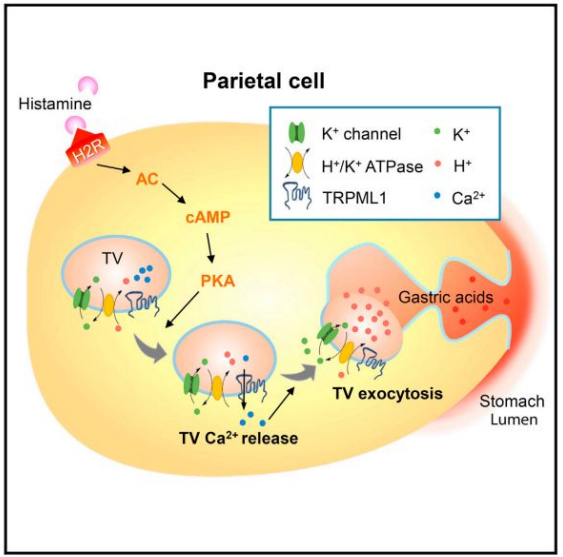
Q: When should patients consider daily acid suppressive medications to control their reflux symptoms?

A: There is no golden rule! Gauge patients' needs based on frequency (2 or more episodes per week) and severity (imposition on quality of life)

GERD Initial Recommendations

Trial of proton pump inhibitors (PPI's):

- Parietal cell H^+/K^+-ATPase
  - Final common pathway of acid production
  - Stored in vesicles near apical lumen
  - Turned over ~20% overnight
- Irreversible inhibition Shin et al, *EJP* 2009
- Need to be taken 30min before meals
- Half-life ~1-2 hours
- Neutralizes gastric acidity and reduces volume of secretions
  - Does not prevent "weakly acidic" or "non-acid" reflux events



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Sahoo et al, Developmental Cell 2017
https://www.cell.com/developmental-cell/pdf/S1534-5807(17)30296-4.pdf

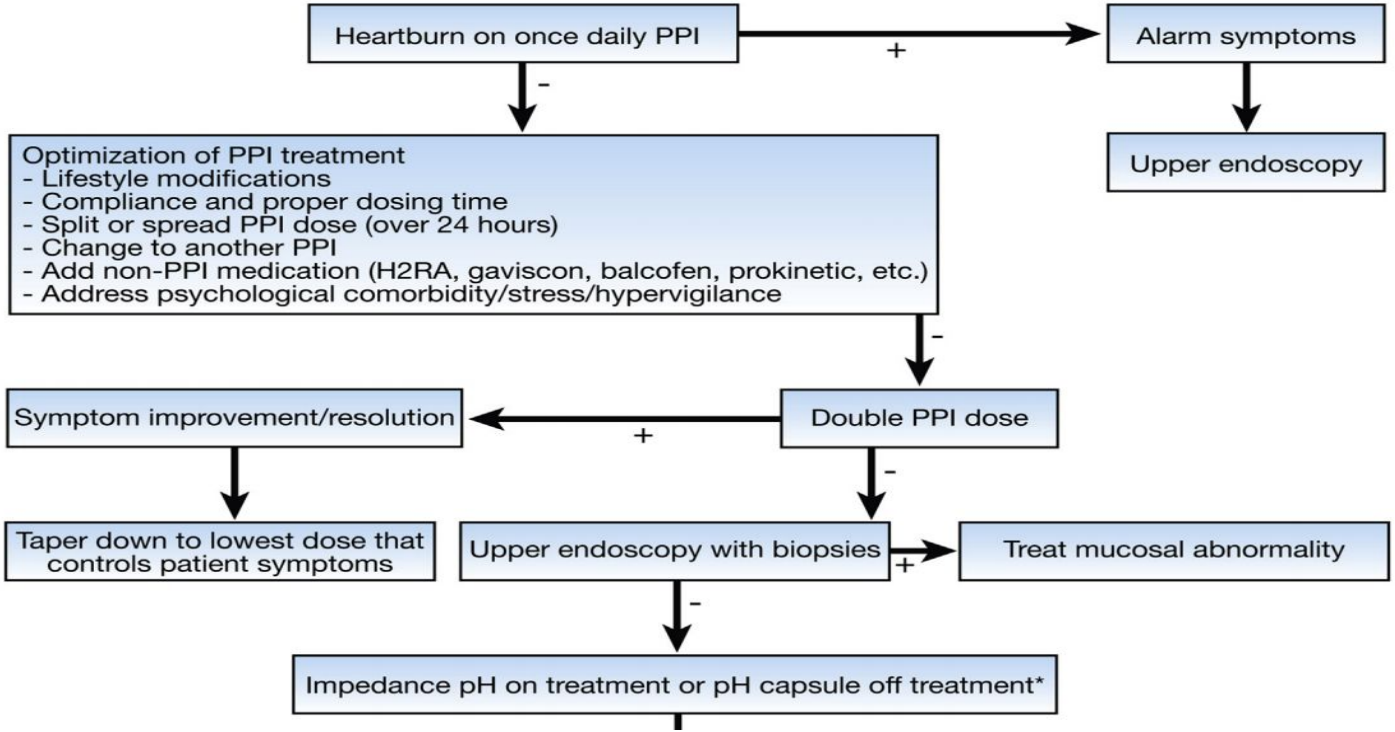
Benefits to PPI Use

- Maintains healing from erosive esophagitis (93%) — Gyawali et al, Gastroenterology 2018
  - Relieves heartburn in only 56-77%
- May induce regression of extent or incidence of Barrett's — Spechler SJ, Dig Dis. 2014
- Associated with reduced risk of dysplasia in Barrett's (RR 25%) — El-Serag et al, Am J Gastroenterol 2004
- Associated with reduced risk of esophageal adenocarcinoma in Barrett's (RR 29%)

  Singh et al, Gut 2014
- Cost-effective as a first trial, "step down" approach in management of chronic heartburn

  Habu et al, J Gastroenterol 2005

Guidelines



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Gyawali et al, Gastroenterology 2018

PPI Publicity

Original Investigation

Association of Proton Pump Inhibitors With Risk of Dementia
A Pharmacoepidemiological Claims Data Analysis

Willy Gomm, PhD; Klaus von Holt, MD, PhD; Friederike Thomé, MSc; Karl Broich, MD; Wolfgang Maier, MD; Anne Fink, MSc; Gabriele Doblhammer, PhD; Britta Haenisch, PhD

IMPORTANCE Medications that influence the risk of dementia in the elderly can be relevant for dementia prevention. Proton pump inhibitors (PPIs) are widely used for the treatment of gastrointestinal diseases but have also been shown to be potentially involved in cognitive

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Supplemental content at jamaneurology.com

Original Investigation

Proton Pump Inhibitor Use and the Risk of Chronic Kidney Disease

Benjamin Lazarus, MBBS; Yuan Chen, MS; Francis P. Wilson, MD, MS; Yingying Sang, MS; Alex R. Chang, MD, MS; Josef Coresh, MD, PhD; Morgan E. Grams, MD, PhD

IMPORTANCE Proton pump inhibitors (PPIs) are among the most commonly used drugs

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Long Term PPI Adverse Effects

Idiosyncratic Reactions (rare)

- Hypomagnesemia
- Acute interstitial nephritis
- Microscopic colitis

Potential Adverse Effect	Speculated *OR*
Osteoporosis	1.5 – 4.0
Gut dysbiosis (SIBO)	2.0 – 4.0
C. Difficile infection	2.0 – 3.0
Bacterial pneumonia	1.5 – 2.0
Chronic kidney disease	1.5
Dementia	1.4
Myocardial infarction	1.2

Gyawali et al, Gastroenterology 2018

Scenario 2: High Pre-test Probability

Patient B is a 52yo Caucasian male with chronic heartburn, well controlled on omeprazole 20mg daily for the past 7 years. Also has chronic cough and rare water brash which has not improved on PPI. Comorbidities include:

- Metabolic syndrome (BMI 33)
- Quit tobacco 10yrs ago
- Brother may have been diagnosed with Barrett's

He is worried about the long term consequences of PPI use and wonders what his other options are.

Scenario 2

What would you do?

A. Refer the patient for an EGD

B. Refer the patient for an EGD + pH study

C. Refer the patient to GI clinic

D. Switch the PPI to famotidine

Scenario 2: High Pre-test Probability

risk factor

more likely to be GERD

Patient B is a 52yo Caucasian male with chronic heartburn, well controlled on omeprazole 20mg daily for the past 7 years. Also has chronic cough and rare water brash which has not improved on PPI. Comorbidities include:

breakthrough symptoms, ?hiatus hernia

risk factor

- Metabolic syndrome (BMI 33)

risk factor

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talk to GI

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Scenario 2

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D. Switch the PPI to famotidine 👎

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Q: When should patients be referred for endoscopy?

Scenario 2: When to Refer for Endoscopy

- Alarm Symptoms
  - Dysphagia, nausea/vomiting, hematemesis, iron deficiency anemia, unintentional weight loss, *new onset ≥60yo*, *sudden resolution of symptoms*
- Barrett's screening
  - No chronic reflux symptoms in 40% of newly diagnosed esophageal adenocarcinoma patients!
  - Not cost effective to screen everybody with GERD symptoms. AGA, Gastroenterology 2011
  - Society recommendation: Screen patients with multiple risk factors for Barrett's esophagus

Esophageal Adenocarcinoma

- Incidence:
  - 18,000+ cases per year in USA
  - Six-fold increase from 1975-2001
  - Caucasian women: 0.7/100,000/yr
  - Caucasian men: 4.9/100,000/yr

- Risk factors:
  - *Uncontrolled* chronic reflux, Barrett's, Caucasian race, male gender, tobacco use, obesity
  - Alcohol only by virtue of GERD risk

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https://www.cancer.org/cancer/esophagus-cancer/causes-risks-prevention/risk-factors.html
https://bestpractice.bmj.com/topics/en-gb/1029

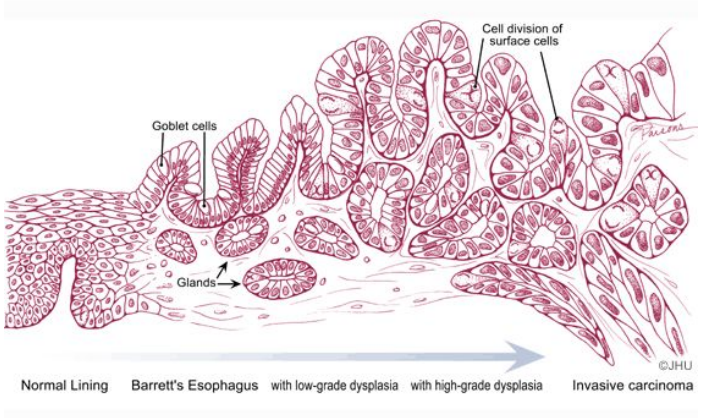
Barrett's Esophagus

- "Esophageal intestinal metaplasia"

- Prevalence:
  - 1.6% in total US population
  - 10-15% in patients with chronic GERD

- Quoted rate of transformation to adenocarcinoma:
  - 0.05%/yr – all patients
  - 0.5%/yr – low grade dysplasia (LGD)
  - 5-8%/yr – high grade dysplasia (HGD)
  - 10-25%/yr – LGD to HGD or cancer

Shaheen NJ et al, Am J Gastroenterol 2016



- Risk models in favor of lengthening surveillance interval
  - Cancer incidence plummets after first year following Barrett's diagnosis

Gaddam S et al, Gastroenterology 2013

http://pathology.jhu.edu/beweb/understanding.cfm

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Scenario 3: High Pre-test Probability

Patient C is a 52yo Caucasian male with only rare reflux symptoms. Not on any regular acid suppressive medications. Comorbidities include:

- Metabolic syndrome (BMI 33)
- Quit tobacco 10yrs ago
- Brother may have been diagnosed with Barrett's

Answer: *Refer for EGD*

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Scenario 4: Moderate Pre-test Probability

Patient D is a 40yo male presenting for months of progressive heartburn and regurgitation without atypical reflux symptoms. His BMI is 29. Symptoms have been steadily picking up, particularly since March.

Efforts at lifestyle modification including dietary changes, eating earlier, and reducing his dinner volumes have not helped much. A 6wk trial of PPI was partially beneficial but certainly hasn't relieved all symptoms. He is taking it 30min before breakfast without exception, just as you had told him to.

Scenario 4

What would you do?

A. Add a PM dose to the PPI

B. Refer the patient to GI clinic

C. Attempt adjunctive famotidine in the evening

D. Refer the patient for an EGD

Scenario 4: Moderate Pre-test Probability

typical symptoms

Patient D is a 40yo male presenting for months of progressive heartburn and regurgitation without atypical reflux symptoms. His BMI is 29. Symptoms have been steadily picking up, particularly since March 2020.

why now? weight gain? stress?

lowered pre-test probability

Efforts at lifestyle modification including dietary changes, eating earlier, and reducing his dinner volumes have not helped much. A 6wk trial of PPI was partially beneficial but certainly hasn't relieved all symptoms. He is taking it 30min before breakfast without exception, just as you had told him to.

taking PPI correctly

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Scenario 4

What would you do?

A. Add a PM dose to the PPI 👍
B. Refer the patient to GI clinic 👍👍👍
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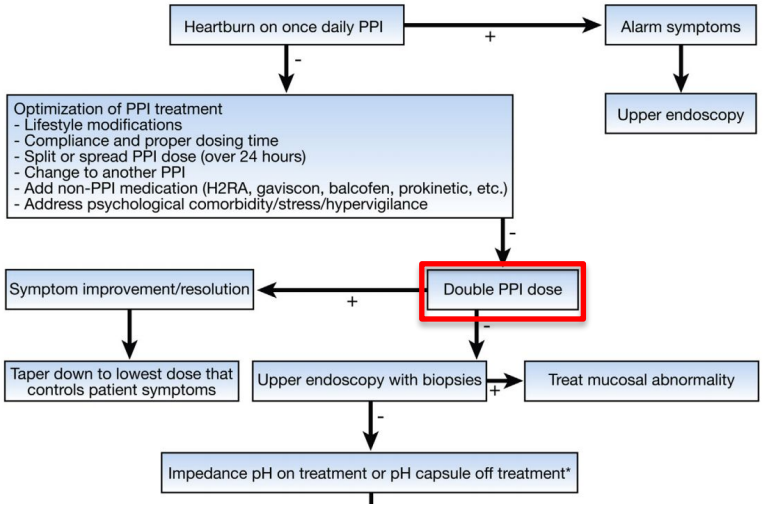
Utility of Twice Daily PPI



- Healing of erosive esophagitis: NNT = 10
- Heartburn control where once daily PPI failed: NNT = 22

Zhang N et al, Gastroenterol Rev Pract 2017

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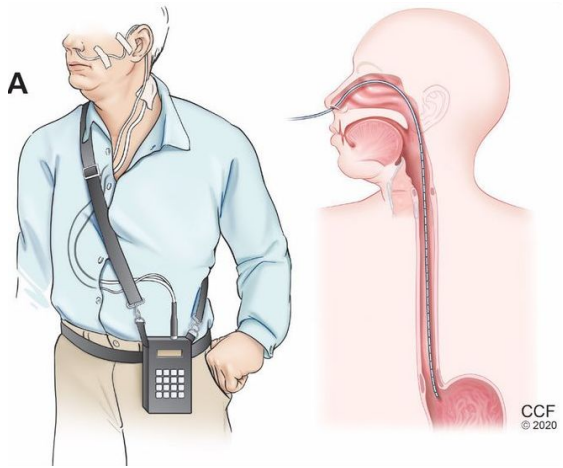
Ambulatory pH Testing

- 24hrs, catheter based probe with two pH sensors, esophageal (5cm above the LES) and gastric, and six proximal esophageal impedance sensors
- Require either an EGD or manometry for optimal placement of the catheter from the nares
- Patient wears a recorder on a belt and pushes buttons to report symptoms, meal times, and supine positioning



- Considered gold standard for GERD diagnosis:
  Acid exposure time (AET) >6%, equivocal if 4-6%, DeMeester score tiebreaker

https://www.ccjm.org/content/87/4/223

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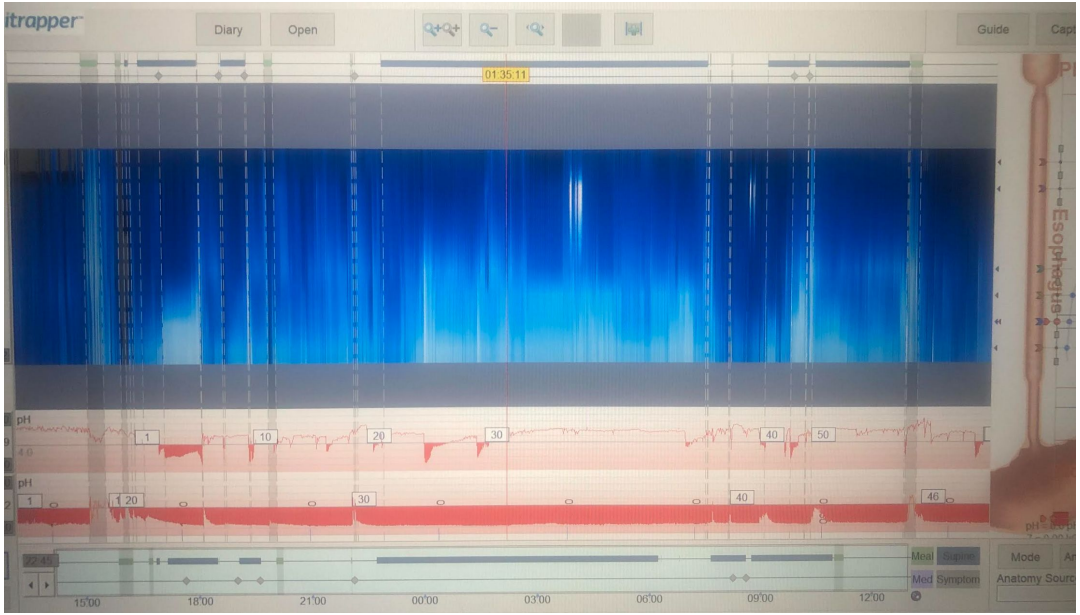
pH-Impedance Tracings



Positive GERD, symptom reflux association, hiatus hernia with supine predominant reflux

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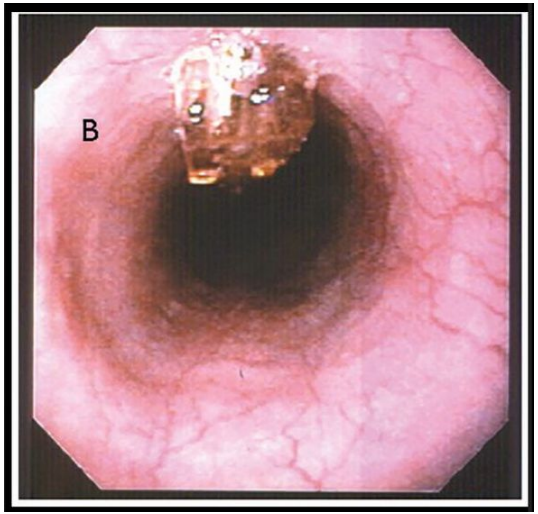
Bravo pH monitoring

- Placed 6cm proximal to the LES
- Still requires EGD or HRM
- Better tolerated, no catheter
  - (Patients with visceral hypersensitivity may still report pain)
- 48hr study vs 24hrs
- No gastric pH monitoring
- Heavily reliant on patient report
- Susceptible to patient manipulation



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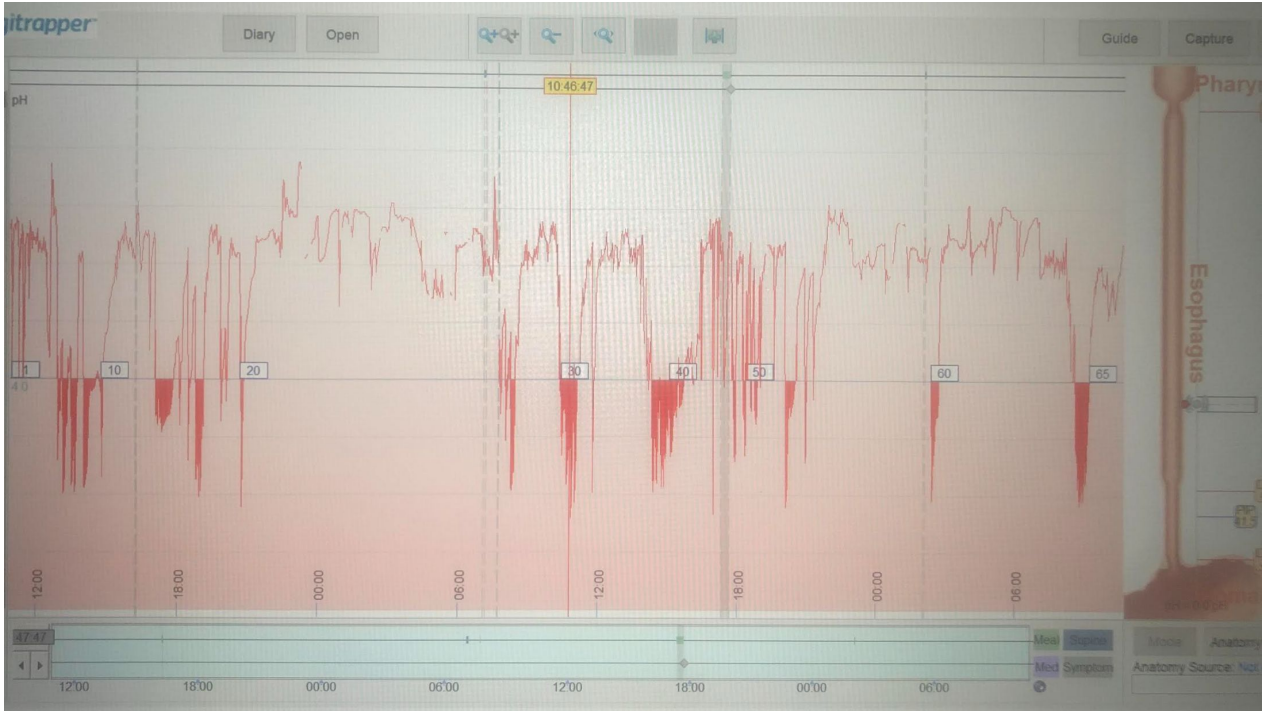
Bravo Tracing



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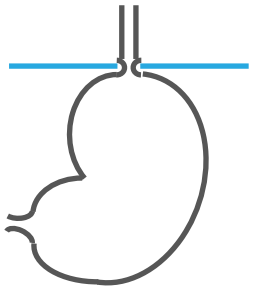
Primary Care Heuristic for Reflux Symptoms

Pre-Test: Low | Medium | High

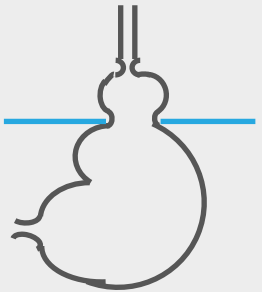
Pathophysiology:



↑ TLESR's

Patent EGJ

Potential Hiatus Hernia



Risk Factors:

↑ Age

↑ BMI

Management:

Diet / Lifestyle → Medical → Definitive

↑ Symptom Duration

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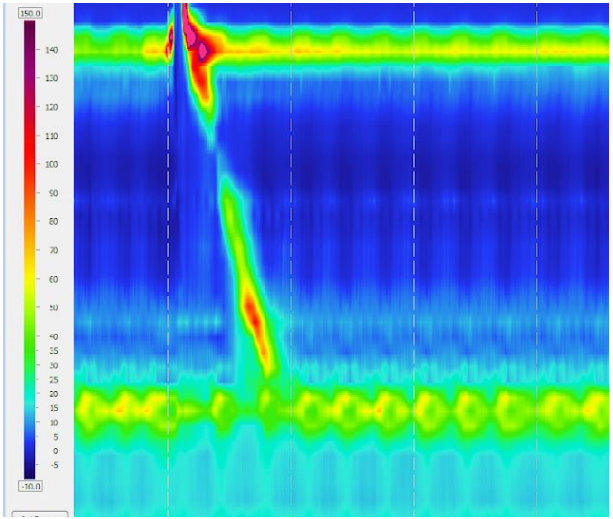
Definitive Reflux Treatment Options

Fundoplication (open vs laparoscopic)

Transoral incisionless fundoplication

Magnetic sphincter augmentation

Pre-operative evaluation: Manometry



- Peristaltic function of the esophageal body predicts post-operative course
- In patients with diminished peristaltic function (IEM), dysphagia is more likely to occur following a full 360° (Nissen) fundoplication

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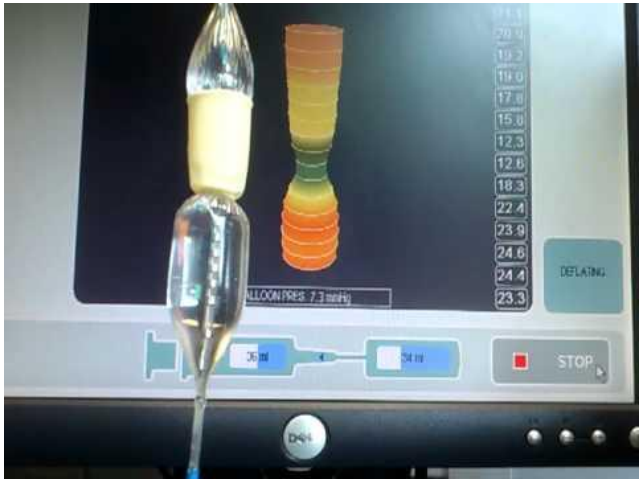
Peri-operative testing: EndoFLIP

- Intraoperative endoscopic testing modality to measure real-time diameter and compliance of the esophagogastric junction
- Distensibility index found on multiple studies to correlate with post-operative outcome in fundoplication



Smeets et al, NGM 2015

Su et al, Surg Endosc 2020

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https://i.ytimg.com/vi/YJpl94uranU/hqdefault.jpg

Scenario 5: Low Pre-test Probability

Patient E is a 31yo female presenting for months of progressive heartburn and regurgitation without atypical reflux symptoms. Multiple trials of acid suppressive medications have been wholly ineffective at relieving symptoms. Heartburn occurs throughout the day without postprandial worsening or obvious food triggers. The heartburn had been present in waves on and off over the past few years but in recent weeks has become unbearable and detracts from her ability to work. She is also complaining of a swallowing difficulty which has not resulted in any impaction or regurgitation episodes and seems to improve while eating, worst in between meals, causing her to drink a lot of water and clear her throat with no relief.

Scenario 5

What would you do?

A. Refer the patient to GI clinic

B. Refer the patient for an EGD

C. Start alginate and hydrochloric acid supplements

D. Tell the patient that “it’s all in her head”

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Scenario 5

What would you do?

A. Refer the patient to GI clinic 👍👍👍

B. Refer the patient for an EGD 👍

C. Start alginate and hydrochloric acid supplements 🤔

D. Tell the patient that “it’s all in her head” 👎

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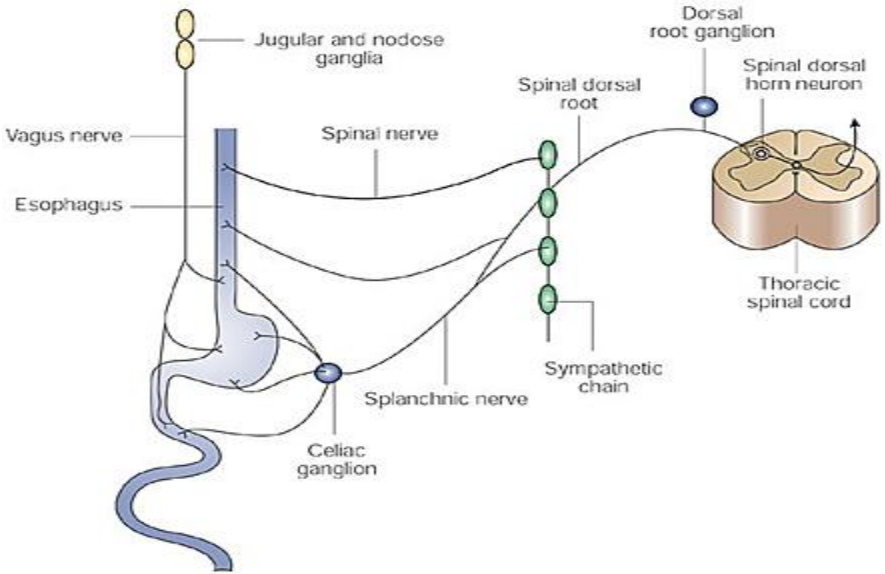
Visceral Afferent Signaling Pathways

- 30-40% of heartburn symptoms find no relief with regular PPI use
- Just because acid reflux has been excluded in certain conditions of esophageal *pain*, that does not mean that there is no neuropathology that would be amenable to pharmacotherapy



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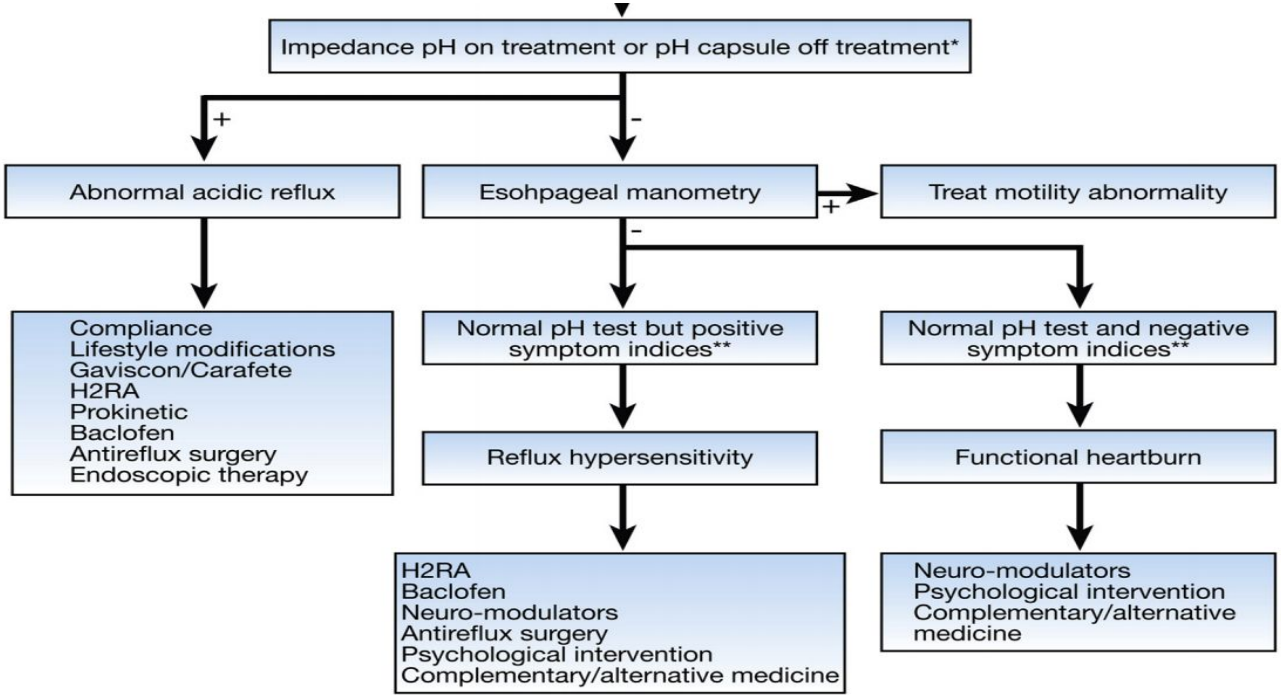
Sengupta et al, GI Motiliy Online 2006

Functional Heartburn



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Pharmacotherapy Options

Table 3. Neuromodulators Studied in Randomized-Controlled Trials of Patients With Functional or Nonfunctional Esophageal Disorders

Name	Class of drugs	Disorder	Dose	Response rate	Side effects
Imipramine[161]	TCAs	NCCP	50 mg/d	52%	QT prolongation
Imipramine[162]	TCAs	NCCP	50 mg/d	Significant	Dry mouth, dizziness
Imipramine[163]	TCAs	FH, RH	25 mg/d	37.2%	Constipation
Amitriptyline[164,165]	TCAs	NCCP, globus	10,25 mg/d	52%, significant	Excessive sleeping, dizziness
Sertraline[166]	SSRIs	NCCP	50–200 mg/d	57%	Nausea, restlessness
Sertraline[167]	SSRIs	NCCP	50–200 mg/d	Modest	Dry mouth, diarrhea
Paroxetine[168]	SSRIs	NCCP	10–50 mg/d	Modest	Fatigue, dizziness
Paroxetine[169]	SSRIs	NCCP	10–50 mg/d	21.7%	None
Citalopram[170]	SSRIs	RH	20 mg/d	Significant	None
Fluoxetine[171]	SSRIs	FH/RH	20 mg/d	Significant	Headache, dry mouth
Trazodone[160]	SRIs	Dysmotility	100–150 mg/d	29%–41%	Dry mouth, dizziness
Venlafaxine[172]	SNRIs	NCCP	75 mg/d	52%	Sleep disturbances
Ranitidine[176]	H2RAs	FH	300 mg/d	Significant	None
Theophylline[173]	Adenosine antagonists	NCCP	200 mg twice per d	58%	Nausea, insomnia, tremor
Gabapentin[174]	GABA analog	Globus	300 mg 3 times per d	66%	None

FH, functional heartburn; GABA, gamma-aminobutyric acid; NCCP, noncardiac chest pain; RH, reflux hypersensitivity; SNRIs, serotonin-norepinephrine reuptake inhibitors; SRIs, serotonin reuptake inhibitors; SSRIs, selective serotonin reuptake inhibitors; TCAs, tricyclic antidepressants.

Venlafaxine for non-cardiac chest pain

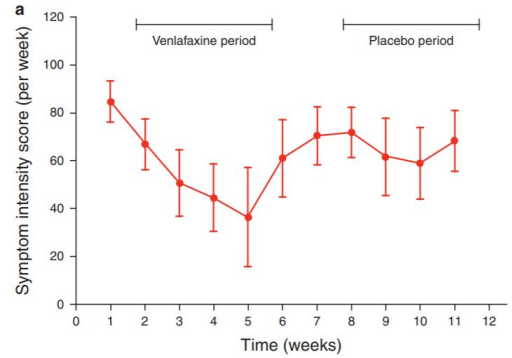
1504 ORIGINAL CONTRIBUTIONS nature publishing group

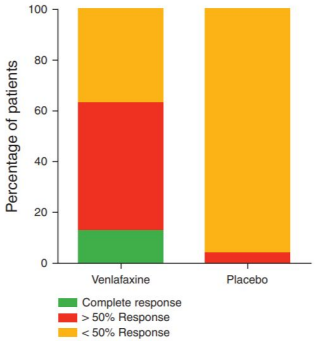
ESOPHAGUS

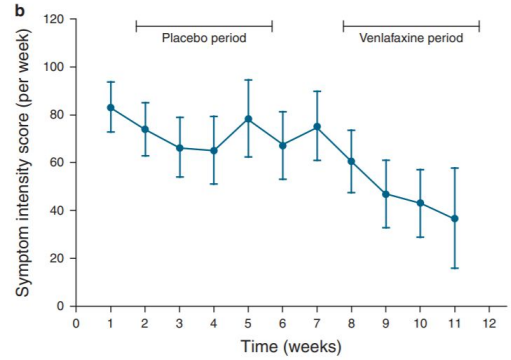
see related editorial on page 1513

Efficacy of Venlafaxine for Symptomatic Relief in Young Adult Patients With Functional Chest Pain: A Randomized, Double-Blind, Placebo-Controlled, Crossover Trial

Hyuk Lee, MD[1,2,6], Jeong Hwan Kim, MD[3,4,6], Byung-Hoon Min, MD[1], Jun Haeng Lee, MD[1], Hee Jung Son, MD[1], Jae J. Kim, MD[1], Jong Chul Rhee, MD[1], Young Ju Suh, PhD[5], Seonwoo Kim, PhD[5] and Poong-Lyul Rhee, MD[1]







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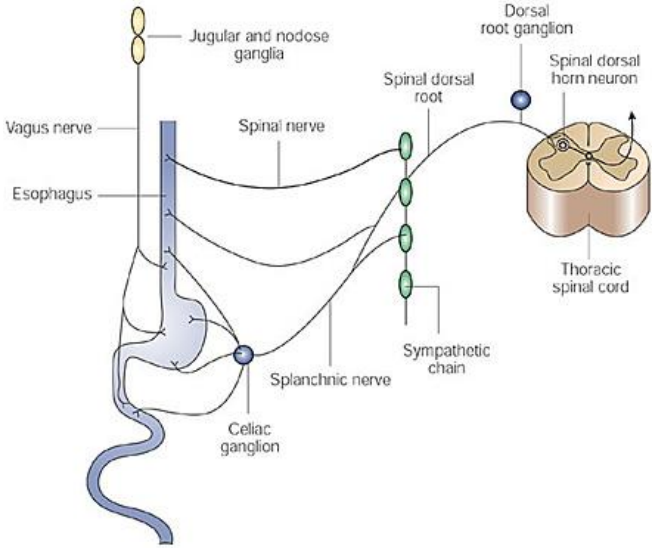
Globus sensation

- Latin for “ball”
- Denotes visceral hypersensitivity of the upper esophagus or lower pharynx
- May indicate referred pain from GERD with proximal reflux events, or even rarely gastritis which has been treated with PPI
- Associated with inlet patch on endoscopy, restricted UES relaxation on manometry
- Treatments: distracting techniques, diaphragmatic breathing, speech therapy, meditation, baclofen

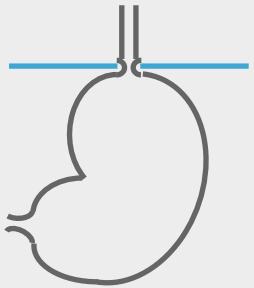


Primary Care Heuristic for Reflux Symptoms

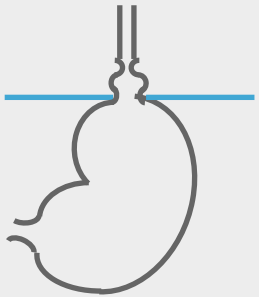
Pre-Test:

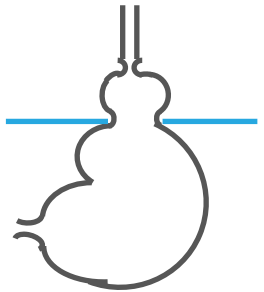
Low	Medium	High

Pathophysiology:



↑ TLESR's





Risk Factors:

↑ Visceral Hypersensitivity

↑ Age

↑ BMI

Management:

Diet / Lifestyle — Medical — Definitive

↑ Symptom Severity or Duration

Neuromodulation

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Take Home Points – GERD

Heartburn is one of the most common symptoms for patients to present to both a primary care provider and a GI specialist.

Management should be tailored to the pre-test probability and quality of life impact.

For patients with PPI dependence over a prolonged duration of time, increasingly consider counseling patients on definitive reflux management options.

In any case of uncertainty, please refer to GI!

Thank you


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Minimally Invasive Paraesophageal Hernia Repair

Thomas “TJ” Templin, MD, MBA, FACS

November 15, 2025

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Objectives

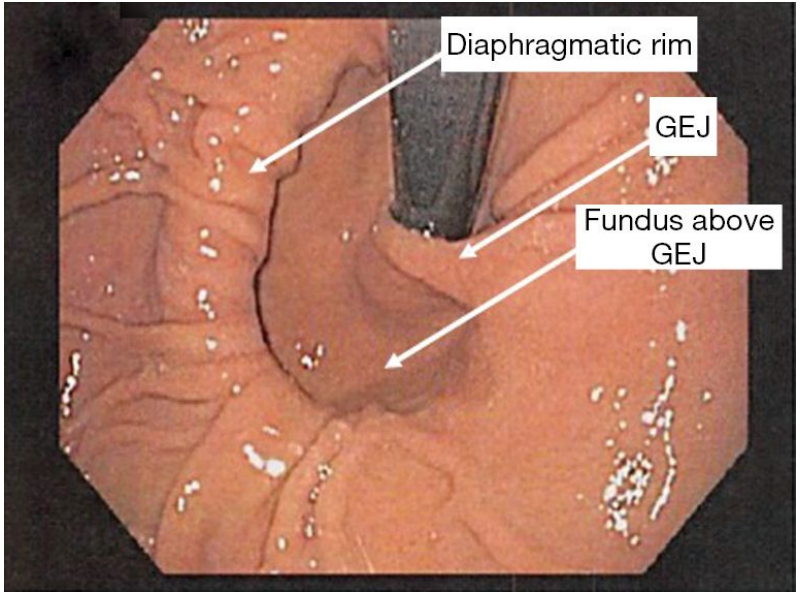
Define types of paraesophageal hernia

Indications for repair

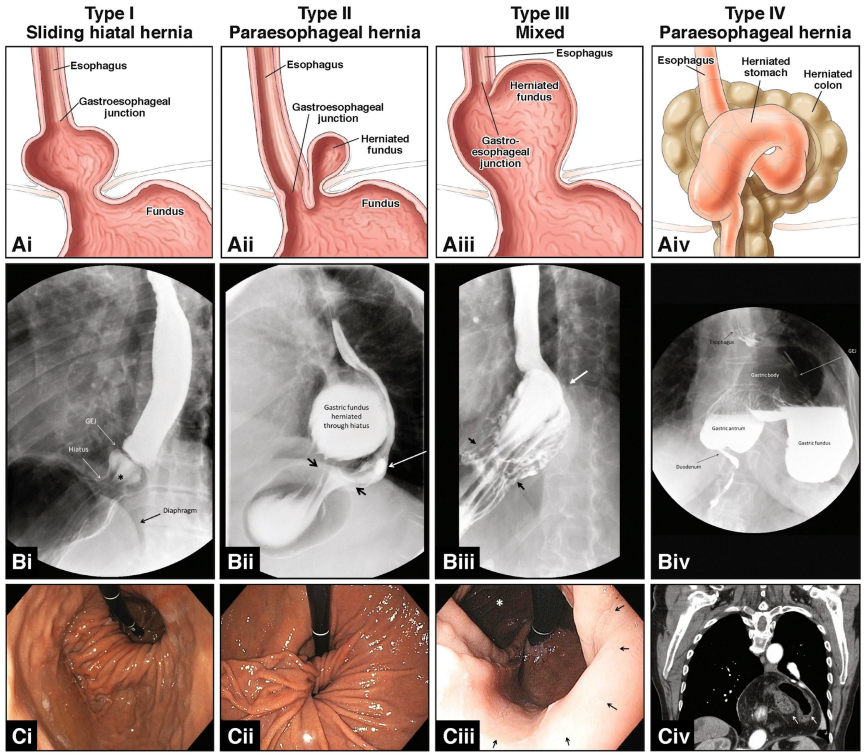
Diagnostics/workup

Minimally invasive repair and techniques

Outcomes



Hennig A, Kurian AA. Flexible endoscopy and hiatal hernias. Ann Laparosc Endosc Surg 2021;6:45.



Types of Paraesophageal Hernias

- **Type I:** Sliding type hernia with the gastroesophageal junction and part of the stomach moving into the chest.
- **Type II:** Herniation of the gastric fundus while the gastroesophageal junction remains normal.
- **Type III:** Combination of sliding and paraesophageal components, with both the junction and fundus herniated.
- **Type IV:** Herniation of other abdominal organs, like the colon or spleen, into the thoracic cavity.

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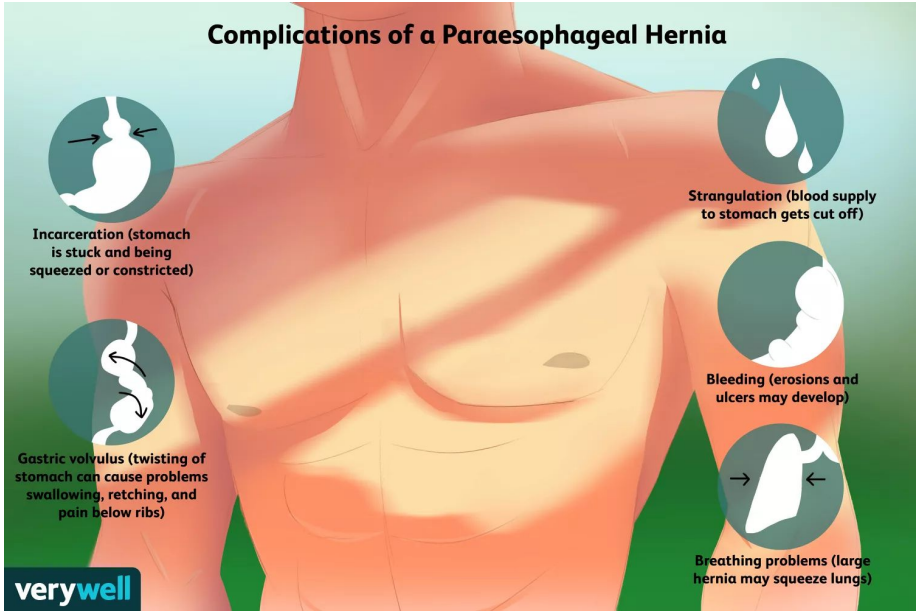
Callaway, James P. et al. Hiatal and Paraesophageal Hernias. Clinical Gastroenterology and Hepatology, Volume 16, Issue 6, 810 - 813

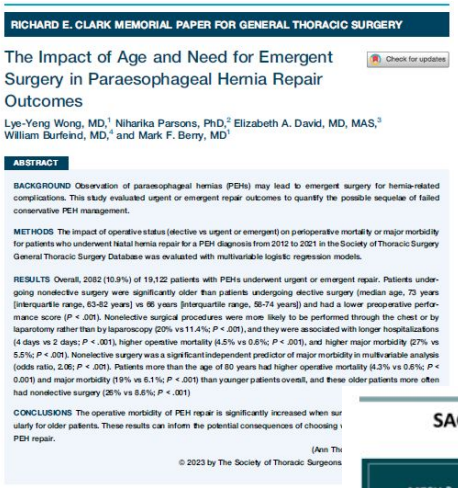
Symptoms of Paraesophageal Hernia

- Pain after eating: chest or upper abdominal discomfort, especially after meals.
- Difficulty swallowing: hernia pressure can cause dysphagia.
- Heartburn and regurgitation: stomach contents flow back into the esophagus.
- Shortness of breath: hernia may affect lung or stomach function.
- Iron deficiency anemia: from Cameron's erosions due to ischemic gastric mucosa at the hiatus.



Verywell / Laura Porter

Guidelines for Paraesophageal Hernia Repair



RICHARD E. CLARK MEMORIAL PAPER FOR GENERAL THORACIC SURGERY

The Impact of Age and Need for Emergent Surgery in Paraesophageal Hernia Repair Outcomes

Check for updates

Lye-Yeng Wong, MD,[1] Niharika Parsons, PhD,[2] Elizabeth A. David, MD, MAS,[3] William Burfeind, MD,[4] and Mark F. Berry, MD[1]

ABSTRACT

BACKGROUND Observation of paraesophageal hernias (PEHs) may lead to emergent surgery for hernia-related complications. This study evaluated urgent or emergent repair outcomes to quantify the possible sequelae of failed conservative PEH management.

METHODS The impact of operative status (elective vs urgent or emergent) on perioperative mortality or major morbidity for patients who underwent hiatal hernia repair for a PEH diagnosis from 2012 to 2021 in the Society of Thoracic Surgery General Thoracic Surgery Database was evaluated with multivariable logistic regression models.

RESULTS Overall, 2082 (10.9%) of 19,122 patients with PEHs underwent urgent or emergent repair. Patients undergoing nonelective surgery were significantly older than patients undergoing elective surgery (median age, 73 years [interquartile range, 63-82 years] vs 66 years [interquartile range, 56-74 years]) and had a lower preoperative performance score ($P < .001$). Nonelective surgical procedures were more likely to be performed through the chest or by laparotomy rather than by laparoscopy (20% vs 11.4%; $P < .001$), and they were associated with longer hospitalizations (4 days vs 2 days; $P < .001$), higher operative mortality (4.5% vs 0.6%; $P < .001$), and higher major morbidity (27% vs 5.5%; $P < .001$). Nonelective surgery was a significant independent predictor of major morbidity in multivariable analysis (odds ratio, 2.06; $P < .001$). Patients more than the age of 80 years had higher operative mortality (4.3% vs 0.6%; $P < 0.001$) and major morbidity (19% vs 6.1%; $P < .001$) than younger patients overall, and these older patients more often had nonelective surgery (25% vs 8.6%; $P < .001$)

CONCLUSIONS The operative morbidity of PEH repair is significantly increased when sur
ularly for older patients. These results can inform the potential consequences of choosing
PEH repair.

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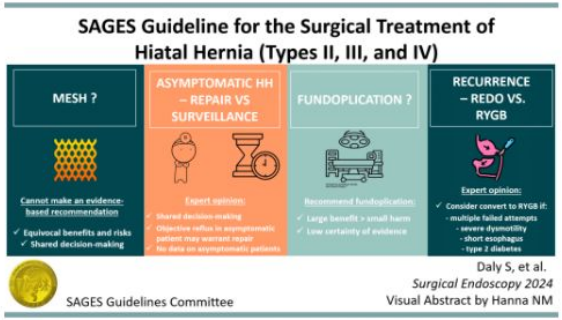


Symptomatic Patients

- Surgery for symptoms like chest pain, dysphagia, or reflux.
- Urgent surgery for obstruction, strangulation, or perforation carries higher risks; elective surgery is preferred post-stabilization.

Asymptomatic Patients

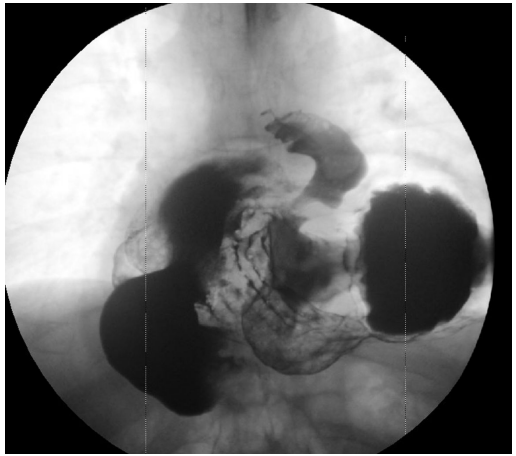
- Surgery considered to reduce sudden complication risk.

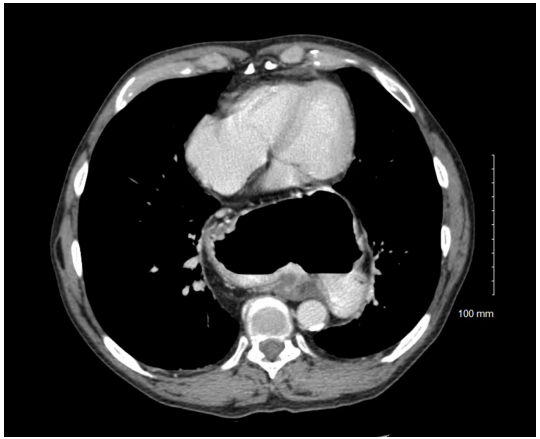
Watchful Waiting vs Elective Surgery

- **Watchful Waiting**
  - The 2017 article by Jung et al. found that watchful waiting is better than elective surgery until the mortality rate for elective repair reaches 0.5%.
- **Progress in Minimally Invasive Surgery**
  - Damani et al. (2022) analyzed the ACS-NSQIP database and found a mortality rate of 0.5% for elective paraesophageal hernia repair in patients over 65.
  - Findings indicate minimally invasive surgery may be preferable to watchful waiting.

Damani, T., Ray, J.J., Farag, M. *et al.* Elective paraesophageal hernia repair in elderly patients: an analysis of ACS-NSQIP database for contemporary morbidity and mortality. *Surg Endosc* **36**, 1407–1413 (2022).

Jung, J.J., Naimark, D.M., Behman, R. *et al.* Approach to asymptomatic paraesophageal hernia: watchful waiting or elective laparoscopic hernia repair?. *Surg Endosc* **32**, 864–871 (2018).





Paraesophageal Hernia: Diagnostics

- **Barium Swallow:** Visualizes anatomical details and hernia type, guiding surgical planning.
- **Upper Endoscopy:** Detects mucosal injury or Barrett's esophagus for crucial management information.
- **Esophageal Manometry:** Measures motility to identify functional issues impacting surgical decisions.
- **Additional Imaging:** CT scans or other imaging for complex hernias to provide comprehensive anatomical overview.

Minimally Invasive Repair

Benefits of Minimally Invasive Repair

- Lower perioperative morbidity and mortality
- Shorter recovery time and hospital stay
- Similar long-term outcomes to open repair

Laparoscopic Paraesophageal Hernia Repair

- Preferred procedure in SAGES 2024 Guidelines

Robotic Paraesophageal Hernia Repair

- Increasingly preferred

Robotic Paraesophageal Hernia Repair

Advantages of Robotic Platform:

- Enhanced visualization & superior maneuverability.
- Early data show higher costs but reduced hospital stay & complications.
- Bassir et al 2025 (STS Database 2018-2021) found robotic repair associated with superior immediate and 1-year postoperative outcomes for hernia recurrence and endoscopic interventions.

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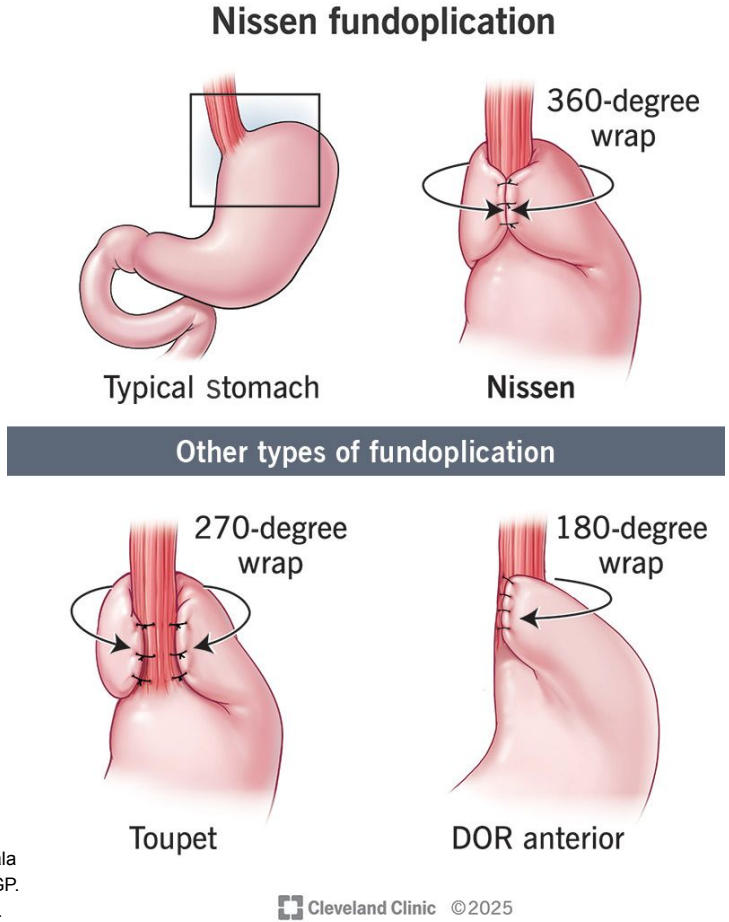
Aria Bassiri, Omkar S. Pawar, Christina Boutros, Boxiang Jiang, Jillian Sinopoli, Leonidas Tapias, Philip Linden, Christopher Towe, Robotic vs Laparoscopic Hiatal Hernia Repair: A Comparative Study of Short- and Long-Term Surgical Outcomes. The Annals of Thoracic Surgery. 2025; 120:(5) 947-56.

Key Techniques:
Minimally Invasive Paraesophageal Hernia Repair

- Hernia Sac Reduction and Nerve Preservation
  - Reduce hernia sac carefully, preserving vagus nerve to prevent complications.
- Mediastinal Mobilization
  - Thorough mediastinal dissection ensures excellent esophageal mobilization, ample intra-abdominal length.
  - Collis gastroplasty is an option if more length is needed.
- Crural Closure Techniques
  - Crural closure with sutures, sometimes mesh-reinforced
- Fundoplication or Gastropexy
  - Fundoplication prevents reflux; mediastinal dissection ensures sufficient esophageal mobilization and intra-abdominal length.
  - Gastropexy, using two fixation points, is for patients with insufficient esophageal length or high dysphagia risk.

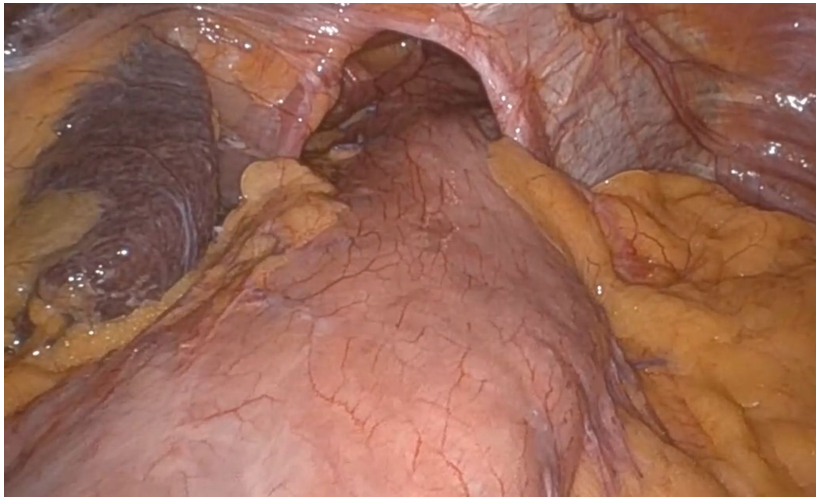
Fundoplication

- Complete vs partial
- Address GERD symptoms
- SAGE 2024 guidelines found patients undergoing PEH may benefit from fundoplication
    - Partial fundoplication may be a better option based on GERD studies

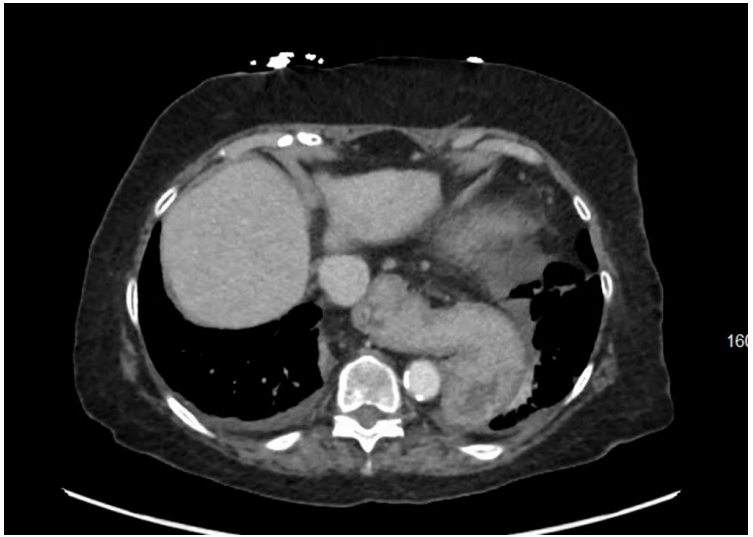


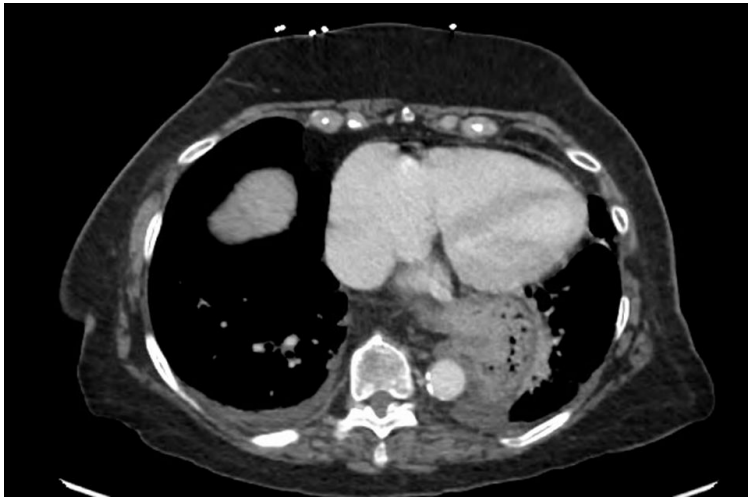
Daly S, Kumar SS, Collings AT, Hanna NM, Pandya YK, Kurtz J, Kooragayala K, Barber MW, Paranyak M, Kurian M, Chiu J, Ansari MT, Slater BJ, Kohn GP. SAGES guidelines for the surgical treatment of hiatal hernias. Surg Endosc. 2024 Sep;38(9):4765-4775.

Type III Paraesophageal



81 yo female presenting with obstructive symptoms and known hiatal hernia.





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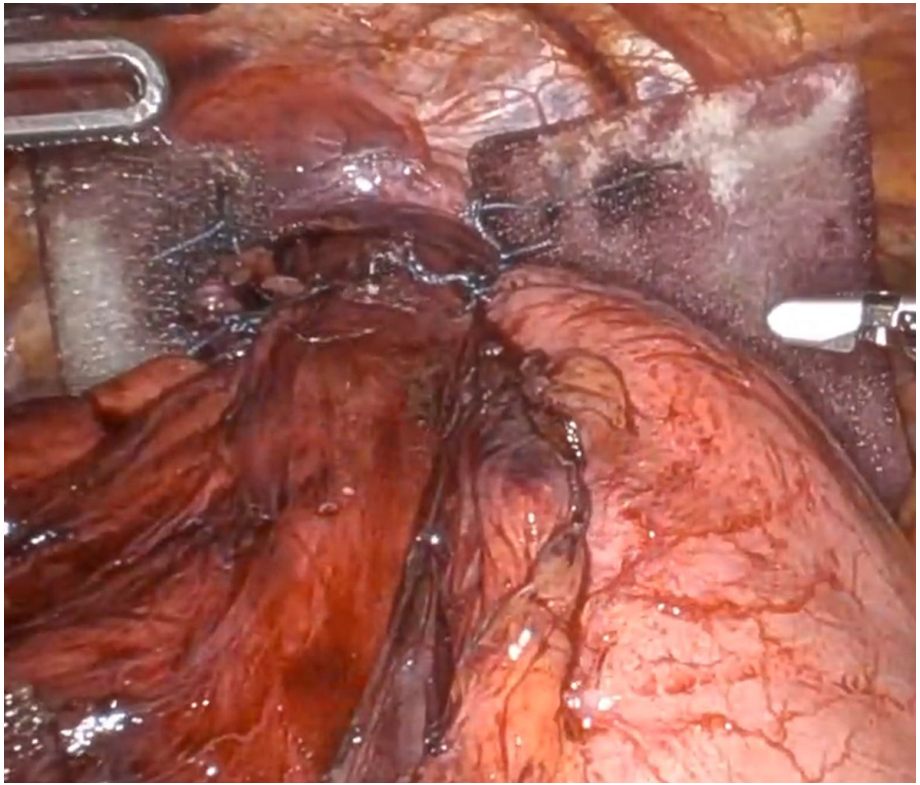
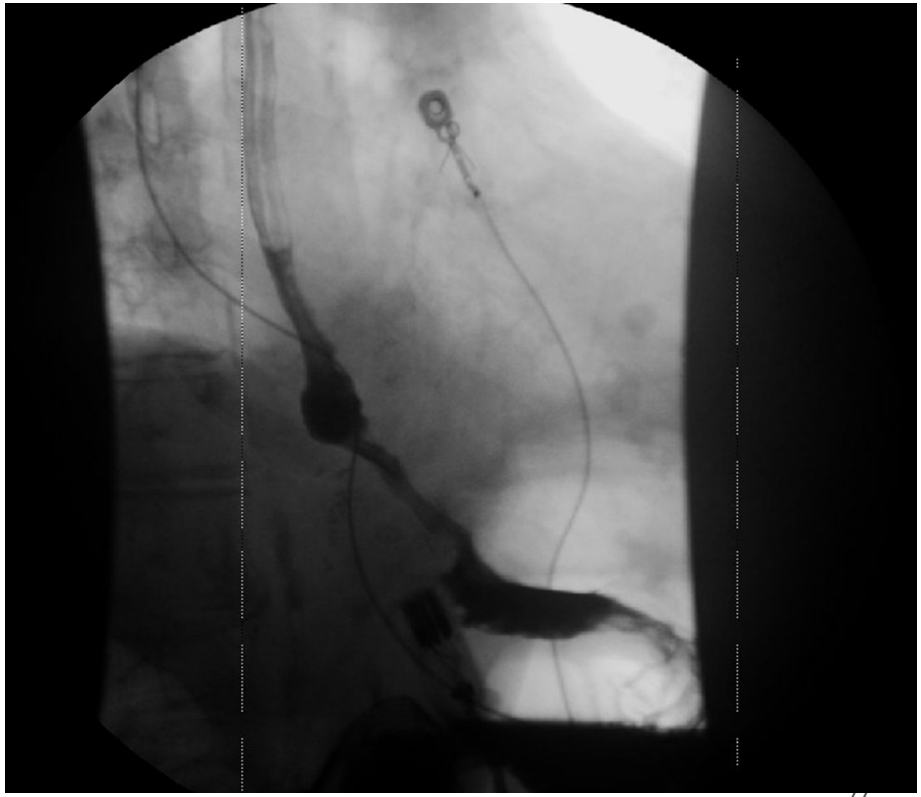


Fundoplication



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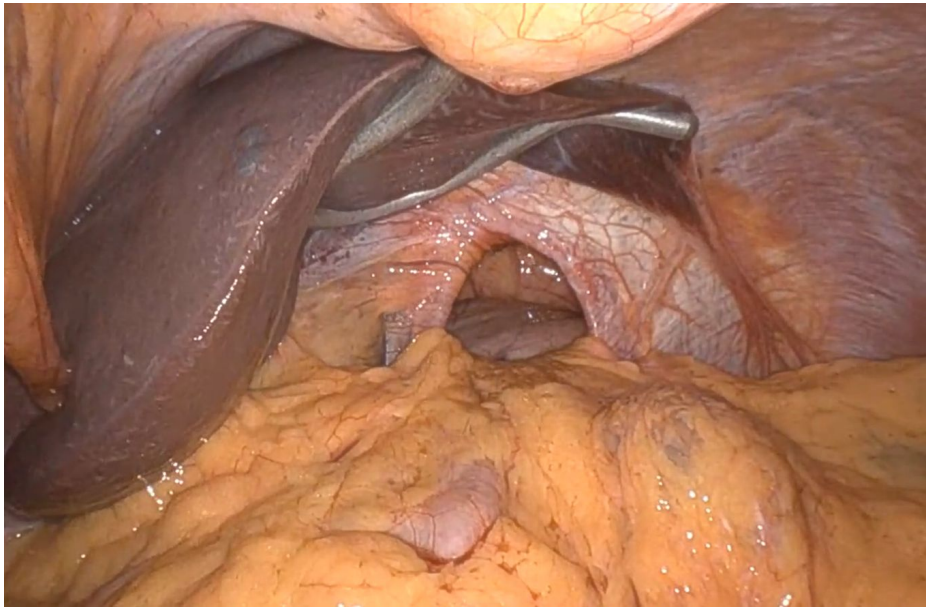
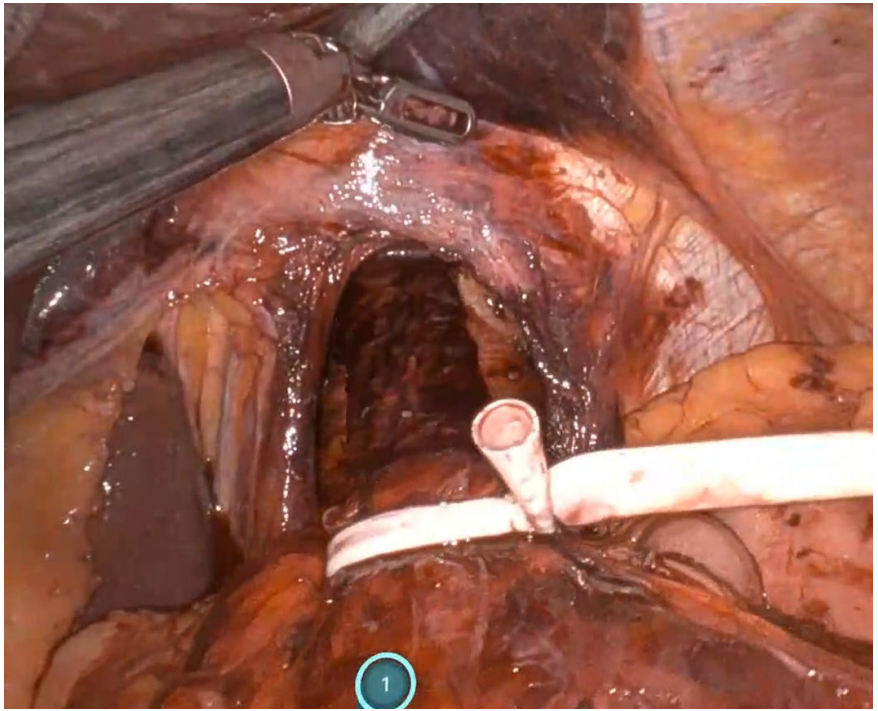


Paraesophageal Hernia with Volvulus



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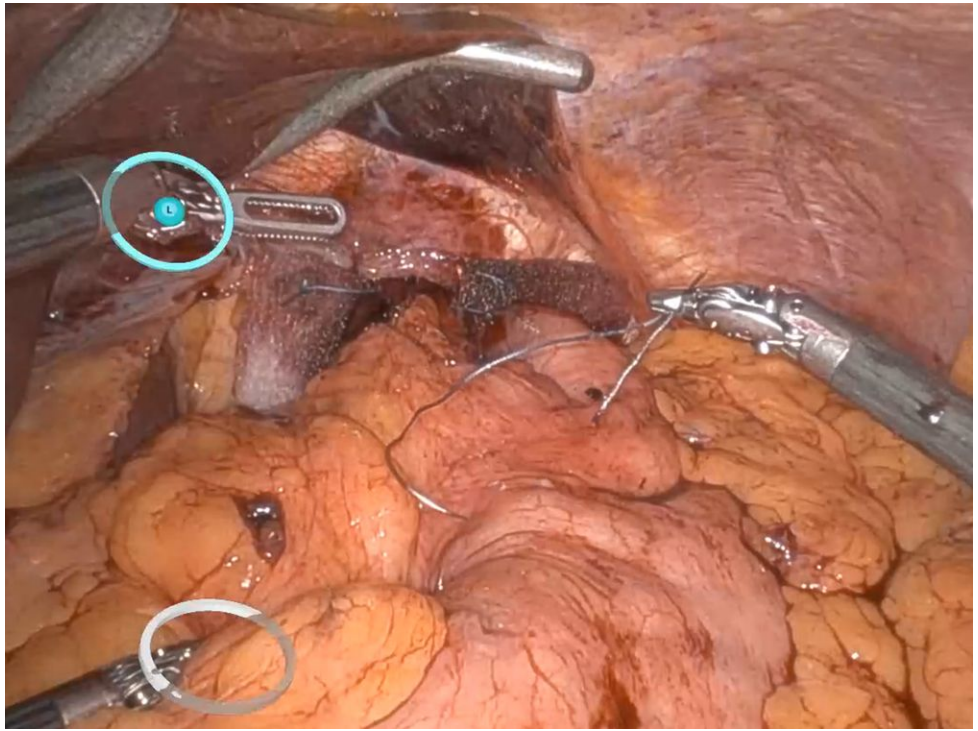
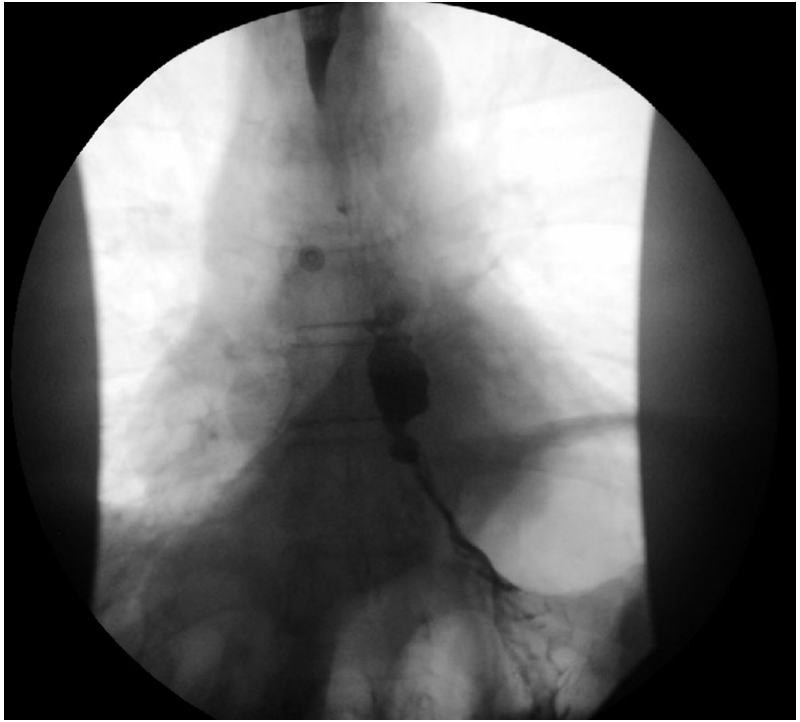


Gastropexy without Fundoplication



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Paraesophageal Hernia Repair with or without Mesh

Primary Suture Repair Advantages

- Primary suture repair avoids mesh-related complications but may have higher short-term recurrence rates.

Mesh Reinforcement Benefits and Risks

- Permanent mesh should never be used around the esophagus. Bioabsorbable mesh may reduce short-term recurrence rates.
- A study by Oelschlager et al. (2011) found no significant difference in recurrence rates after a five-year follow-up between the primary suture repair and mesh groups.

SAGES Guidelines 2024

- Not enough evidence either for or against the use of mesh to make a recommendation.

Patient Selections and Surgical Experience

- Our practice supports using mesh for large paraesophageal hernias, in males, and in patients with a BMI greater than 32.
- Elderly patients with poor tissue quality or those receiving cural repairs that show signs of tension also benefit from mesh reinforcement.

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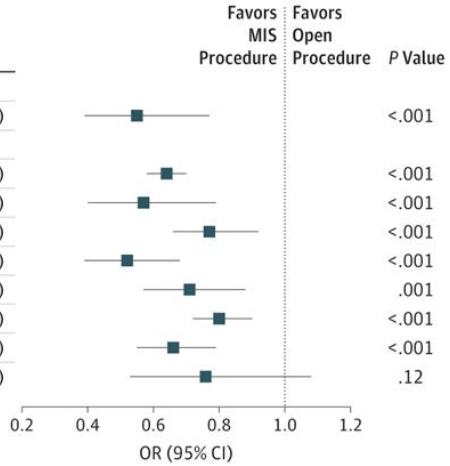
Daly S, Kumar SS, Collings AT, Hanna NM, Pandya YK, Kurtz J, Kooragayala K, Barber MW, Paranyak M, Kurian M, Chiu J, Ansari MT, Slater BJ, Kohn GP. SAGES guidelines for the surgical treatment of hiatal hernias. Surg Endosc. 2024 Sep;38(9):4765-4775.

Oelschlager BK, Pellegrini CA, Hunter JG, Brunt ML, Soper NJ, Sheppard BC, Polissar NL, Neradilek MB, Mitsumori LM, Rohrmann CA, Swanstrom LL. Biologic prosthesis to prevent recurrence after laparoscopic paraesophageal hernia repair: long-term follow-up from a multicenter, prospective, randomized trial. J Am Coll Surg. 2011 Oct;213(4):461-8

Long-Term Outcomes:
Minimally Invasive Paraesophageal Hernia Repair

Source	MIS vs Open, %	OR (95% CI)	P Value
Mortality classification			
In-hospital mortality	0.6 vs 3.0	0.55 (0.39-0.77)	<.001
Morbidity classifications			
Wound complications	0.4 vs 2.9	0.64 (0.58-0.70)	<.001
Bleeding complications	0.6 vs 1.8	0.57 (0.40-0.79)	<.001
Urinary complications	2.6 vs 6.6	0.77 (0.66-0.92)	<.001
Septic complications	0.9 vs 3.9	0.52 (0.39-0.68)	<.001
Respiratory complications	1.8 vs 3.6	0.71 (0.57-0.88)	.001
Cardiac complications	7.7 vs 16.6	0.80 (0.72-0.90)	<.001
Intraoperative injury	2.5 vs 6.1	0.66 (0.55-0.79)	<.001
Thromboembolic complications	0.6 vs 1.5	0.76 (0.53-1.08)	.12



- Durable Symptom Relief
  - Most patients experience lasting symptom relief, significantly improving their overall quality of life after surgery.
  - Lazar et al (2017) reported dysphagia, reflux, and regurgitation symptoms improved in 95% of patients, 90% pleased with surgery
- Low Complication Rate
  - Complications following surgery are infrequent, making this technique safe and preferred for suitable patients. (McLaren et al., 2017)

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Lazar DJ, Birkett DH, Brams DM, Ford HA, Williamson C, Nepomnayshy D. Long-Term Patient-Reported Outcomes of Paraesophageal Hernia Repair. JSLS. 2017 Oct-Dec;21(4)

McLaren PJ, Hart KD, Hunter JG, Dolan JP. Paraesophageal Hernia Repair Outcomes Using Minimally Invasive Approaches. JAMA Surg. 2017;152(12):1176–1178.

Paraesophageal Recurrence

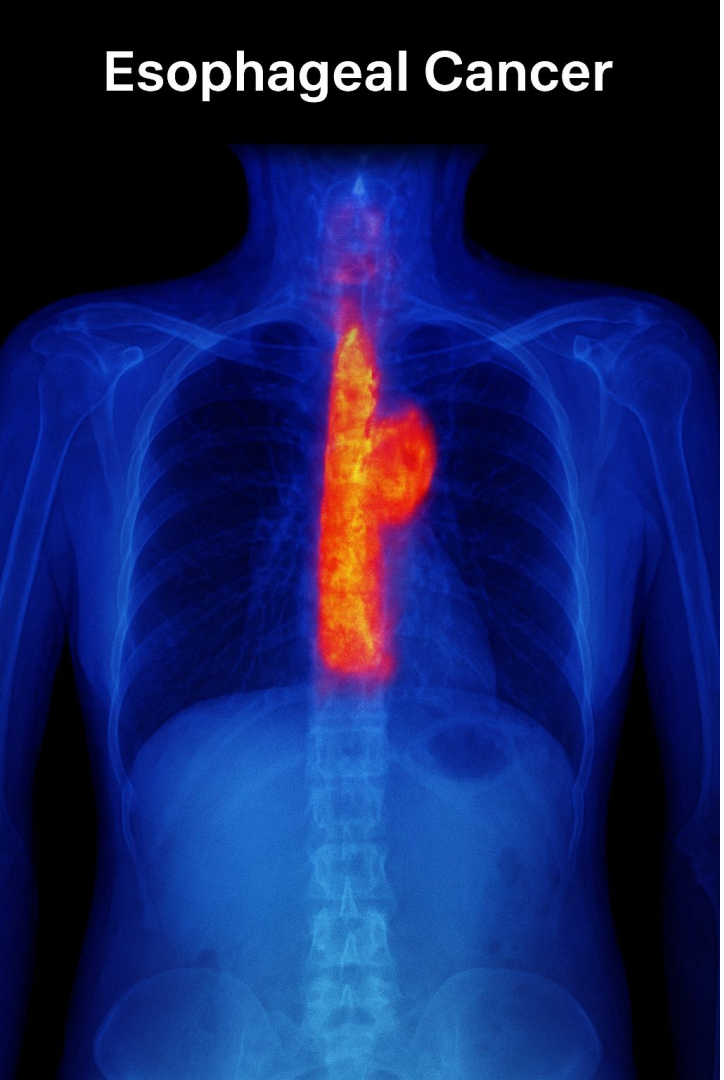
- Recurrence:
  - Defined as a 2 cm fundus measurement or 10% stomach size increase above the hiatus.
  - Rates vary (25-50%), but most are well tolerated.
  - Lazar et al. (2017) found 54% of patients needed medication for symptoms after 6.6 years.
- Reoperation:
  - Though recurrence is high, reoperation rates are low, decided case-by-case, often for younger patients.

Bhargava A, Andrade R. Giant paraesophageal hernia: What do we really know? JTCVS Tech. 2020 Aug 13;3:367-372

Lazar DJ, Birkett DH, Brams DM, Ford HA, Williamson C, Nepomnayshy D. Long-Term Patient-Reported Outcomes of Paraesophageal Hernia Repair. JSLS. 2017 Oct-Dec;21(4)

Final Thoughts

- Minimally invasive paraesophageal hernia repair improves quality of life and reduces serious complications.
- Robotic repairs are increasing; further research is needed to confirm their superiority over laparoscopic surgery.
- Recurrences are better tolerated as compared to initial hernia itself



Diagnosis and Treatment in 2025/26

Michal (Misho) Hubka, MD
Section Head Thoracic Surgery
Executive Medical Director
Center for Digestive Health
Virginia Mason Franciscan Health

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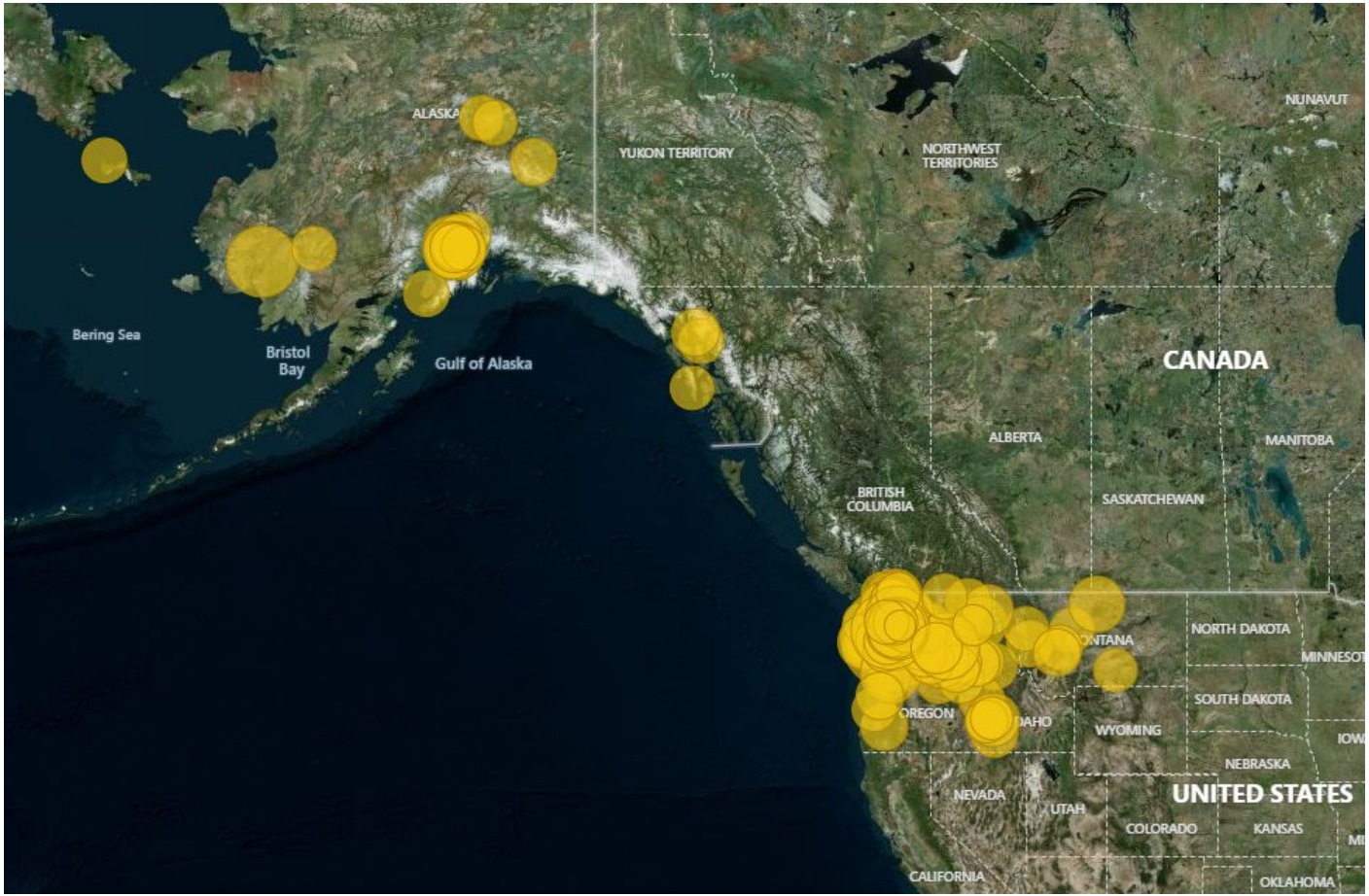

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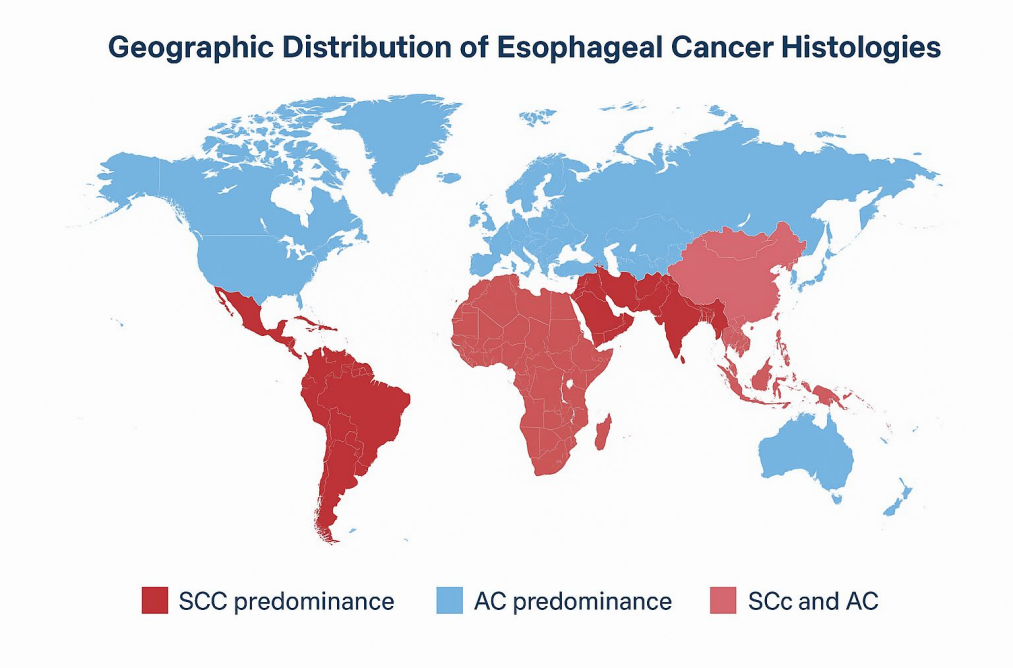
Epidemiology and Risk Factors

- Two main histologies: squamous cell carcinoma (SCC) and adenocarcinoma
- Risk factors for SCC: smoking, alcohol, caustic injury, achalasia
- Risk factors for adenocarcinoma: Barrett's esophagus, GERD, obesity

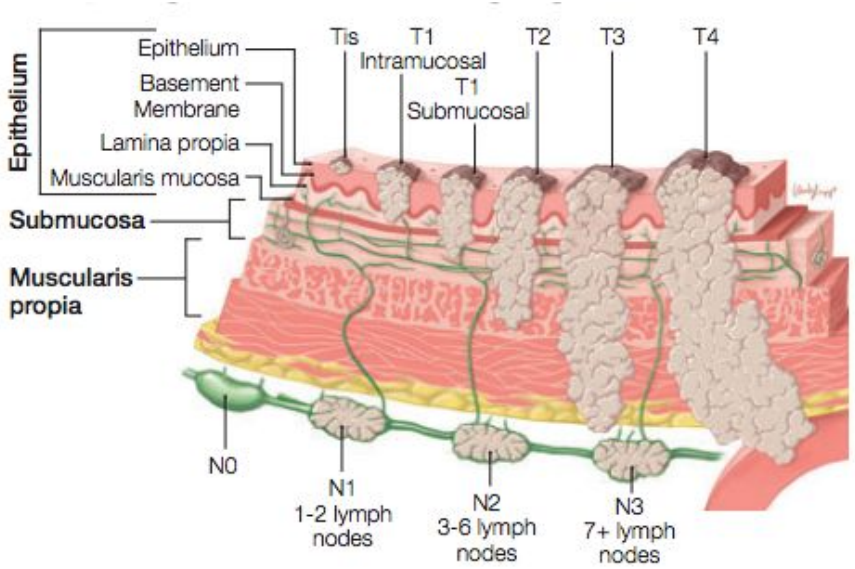


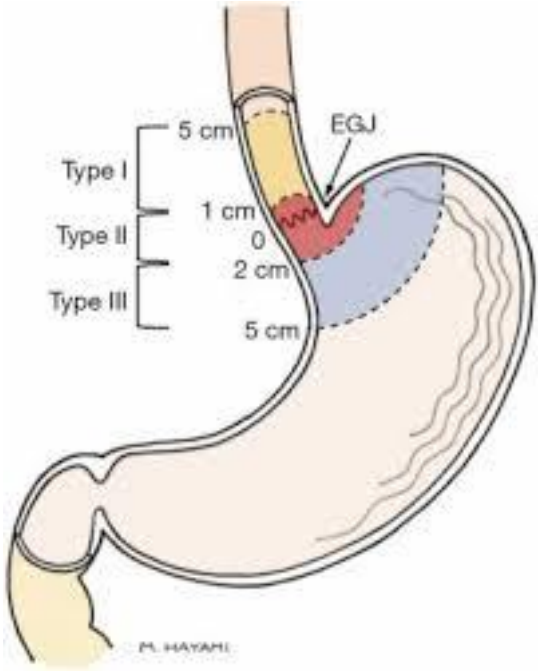
Clinical Presentation

- Progressive dysphagia and weight loss are common
- Odynophagia, chest pain, regurgitation
- Advanced cases may present with aspiration or hoarseness (recurrent laryngeal nerve involvement)

Staging Systems

- TNM staging (AJCC 8th edition)
- Siewert classification for EGJ tumors (I–III)
- Defines resectability and treatment intent





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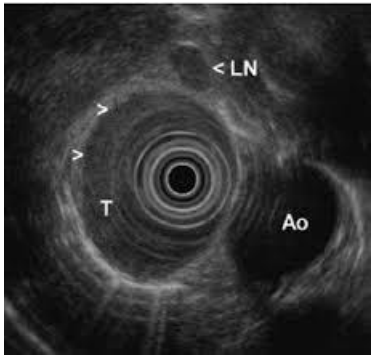
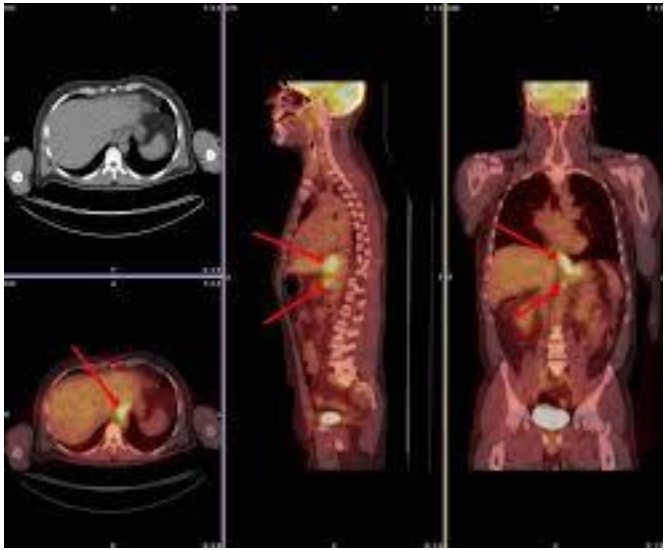
Diagnostic Workup

- Esophagogastroduodenoscopy (EGD) with biopsy for histologic confirmation
- Endoscopic ultrasound (EUS) for local staging
- Contrast-enhanced CT of chest/abdomen ± pelvis
- PET/CT for metastatic assessment
- Bronchoscopy if tumor near carina (SCC

- Universal biomarker testing recommended:
- – HER2 for adenocarcinoma
- – PD-L1 expression (IHC))





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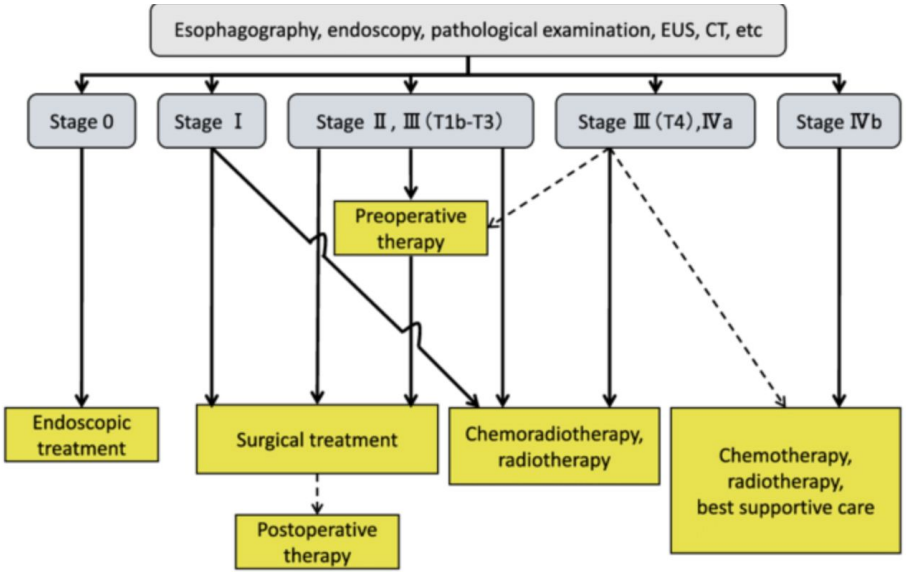
Multidisciplinary Management

- Optimal management requires input from:
  - Gastroenterology
  - Medical, surgical, and radiation oncology
  - Pathology and radiology
- Nutritional and psychosocial support essential (J tube)
- Discuss all cases in tumor board settings



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Neoadjuvant Therapy for Stage III Disease

Feature	CROSS Trial (Chemoradiotherapy)	FLOT Therapy Trial (Perioperative Chemotherapy)
Regimen	Neoadjuvant: Carboplatin (AUC 2) + Paclitaxel (50 mg/m²) weekly × 5 + 41.4 Gy radiotherapy	Perioperative: 4 cycles pre- and 4 cycles post-op FLOT (5-FU, Leucovorin, Oxaliplatin, Docetaxel)
Pathologic Complete Response	23% (adenocarcinoma: 23%, SCC: 49%)	16.7% (ESOPEC); 15.6% (FLOT4-AIO)
R0 Resection Rate	92%	85%
Median Overall Survival	37 months (ESOPEC, adenocarcinoma only)	66 months (ESOPEC, adenocarcinoma only)
Recurrence Pattern	Higher distant recurrence (47.2% at 3 years)	Lower distant recurrence (31.5% at 3 years)
Locoregional Control	Similar to FLOT (17.4% vs. 20.2% 3-year cumulative incidence)	Similar to CROSS
Treatment Completion	Higher (92% completed as planned)	Lower (40–50% completed all cycles)
Major Toxicity	More postoperative respiratory/cardiac complications; 90-day mortality 5.6% (ESOPEC)	More hematologic toxicity; 90-day mortality 3.1% (ESOPEC)
Key Takeaway	Superior locoregional response, higher pCR, but more distant failures and higher periop risk	Superior overall survival, better systemic control, but lower pCR and compliance

Surgical Principles

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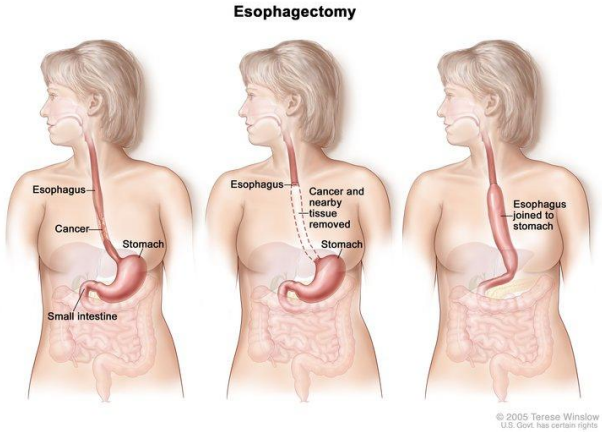
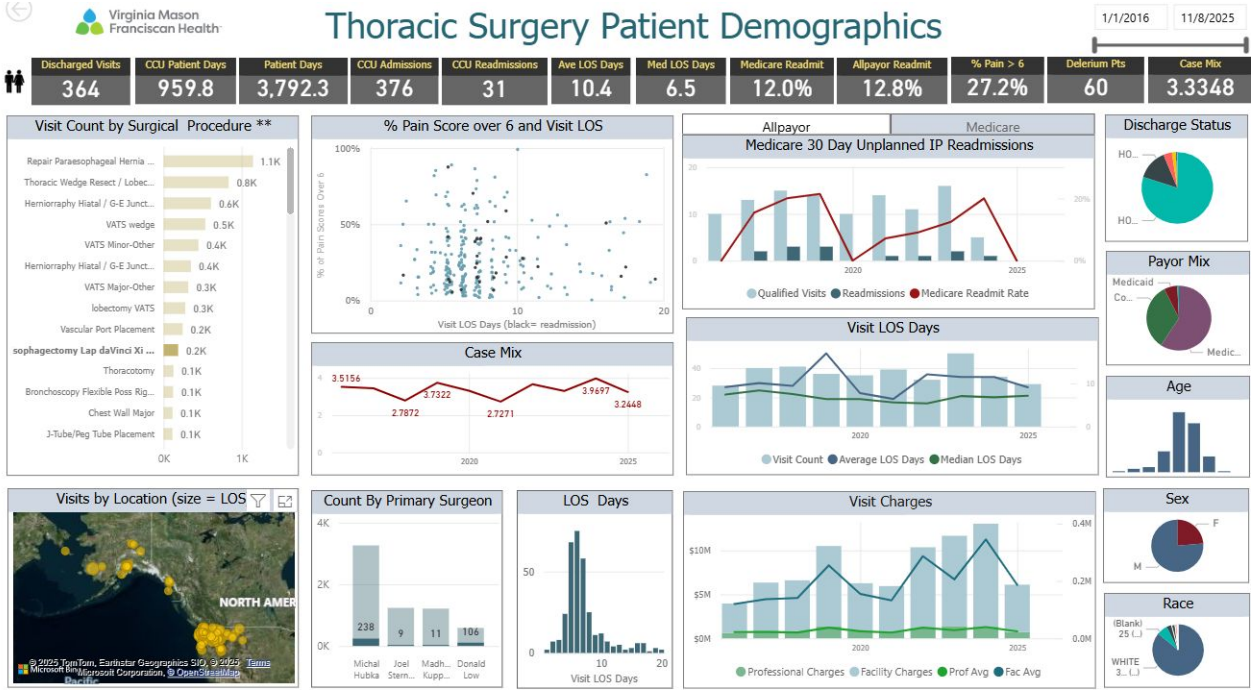
- Esophagectomy (transthoracic, transhiatal, or minimally invasive/RAMIE)
- En bloc lymphadenectomy
- Gastric conduit reconstruction/Jejunostomy feeding tube





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Thoracic Surgery Patient Demographics

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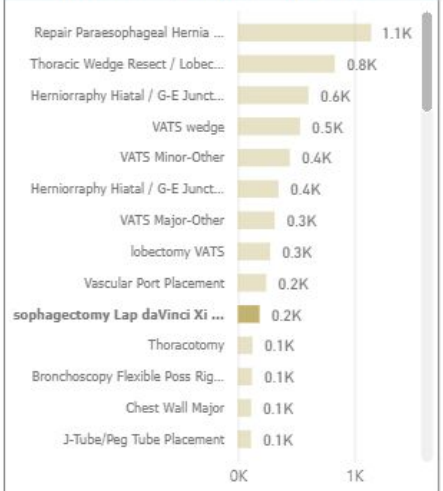
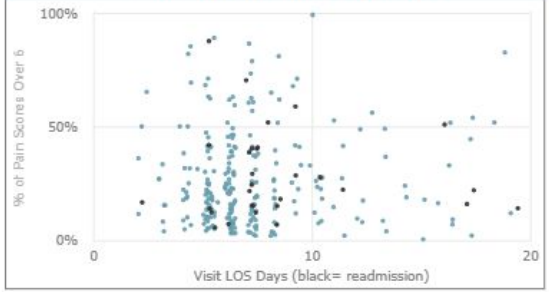
1/1/2016 – 11/8/2025

Discharged Visits	CCU Patient Days	Patient Days	CCU Admissions	CCU Readmissions	Ave LOS Days	Med LOS Days	Medicare Readmit	Allpayor Readmit	% Pain > 6	Delerium Pts	Case Mix
364	959.8	3,792.3	376	31	10.4	6.5	12.0%	12.8%	27.2%	60	3.3348

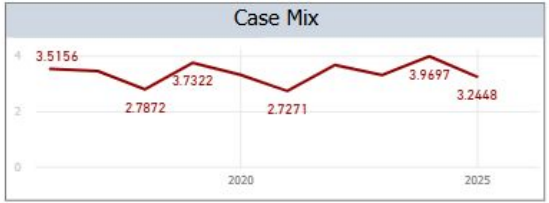
Visit Count by Surgical Procedure **



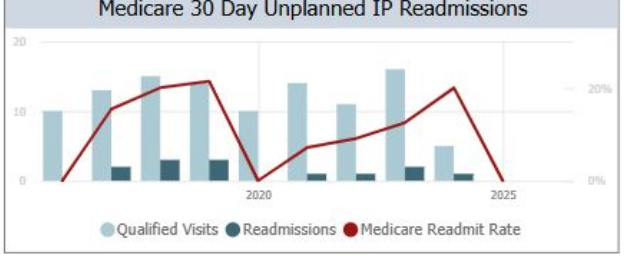
% Pain Score over 6 and Visit LOS



Case Mix

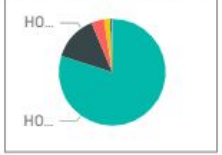


Allpayor / Medicare — Medicare 30 Day Unplanned IP Readmissions

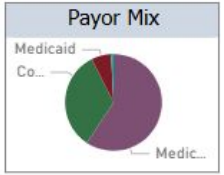


Visit LOS Days

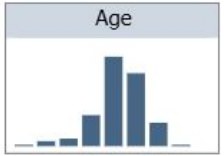
Discharge Status



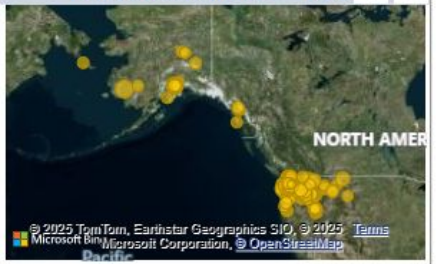
Payor Mix



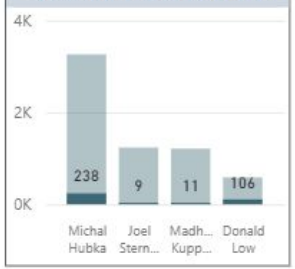
Age



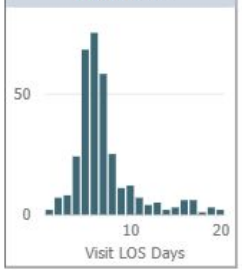
Visits by Location (size = LOS



Count By Primary Surgeon

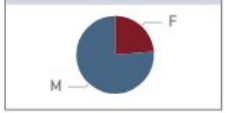


LOS Days

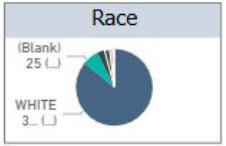


Visit Charges

Sex

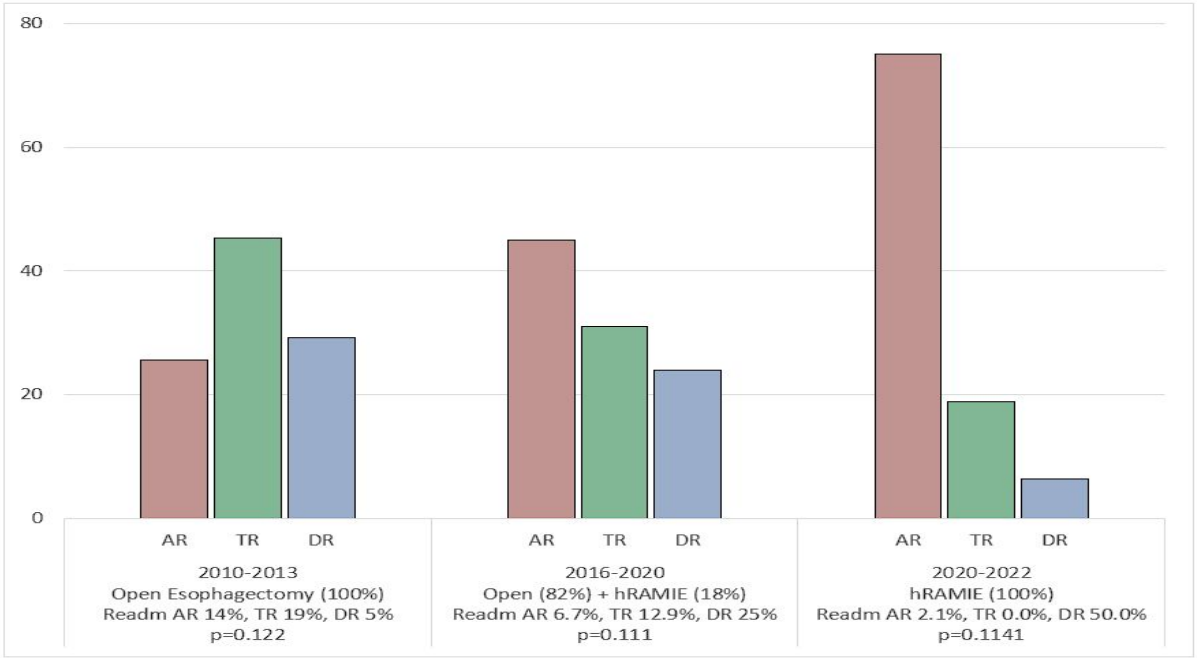


Race



Clinical Outcomes Overtime – from Open to hRAMIE

Figure 1. Percent Length of Stay by Esophagectomy Group Over Time



Since 2010, as our group transitioned to fully robotic esophagectomy, our proportion of patients discharging prior to day 7 has nearly tripled without increases in 30-day readmission.

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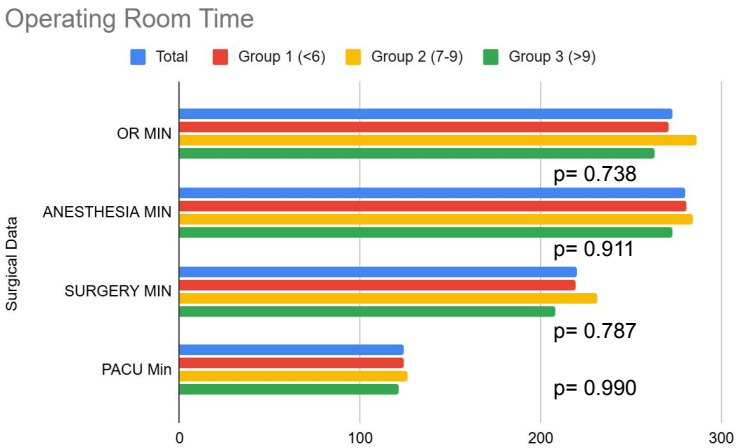
AR: Accelerated Recovery, less than or equal to 6-day hospitalization
TR: Targeted Recovery, 7-8 day hospitalization
DR: Delayed Recovery, greater than or equal to 9-day hospitalization
Readm: Readmit rate by group
hRAMIE: Hybrid Robotic Assisted Minimally Invasive Esophagectomy

ERAS Pathway Measures

ERAS Variable	Total	Accelerated (<6)	Targeted (7-9)	Delayed (>9)	p_value
Chest tube removal (hours)	151.67 ± 134	98.64 ± 18.34	128.28 ± 30.45	372.48 ± 205.23*	**<0.001***
Transition to oral med (hours)	92.08 ± 101.75	55.61 ± 31.43	99.79 ± 33.69	230.61 ± 192.48*	**<0.001***
CCU length of stay (hours)	51.34 ± 76.54	33.32 ± 18.58	41.54 ± 31.36	132.80 ± 162.06*	**<0.001***
Pain Score Average	3.67 ± 1.74	3.62 ± 1.58	4.36 ± 2.08	3.07 ± 1.70	0.119
1st chair (hours)	17.83 ± 10.33	18.73 ± 12.14	14.79 ± 3.75	17.91 ± 7.11	0.227
1st RD Assessment (hours)	21.76 ± 8.45	20.93 ± 6.00	21.82 ± 8.56	24.93 ± 14.42	0.434
1st ambulate (hours)	30.52 ± 21.28	30.54 ± 22.76	31.90 ± 16.05	28.80 ± 21.86	0.497
1st SW consult (hours)	47.97 ± 30.23	45.93 ± 28.46	55.52 ± 36.25	46.86 ± 29.66	0.662
Return of bowel function (hours)	44.05 ± 36.90	45.87 ± 37.19	42.75 ± 38.15	38.49 ± 35.85	0.753
2nd ambulate (hours)	55.49 ± 40.79	49.54 ± 24.35	51.70 ± 21.06	79.10 ± 78.22	0.807



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Continuum of Care

ERAS Accelerated Pathway

Postoperative Day 0	Postoperative Day 2	Postoperative Day 4-6	Postoperative Day 6-9
Admit to ICU Epidural J tube in place, not used Nasogastric tube to low continuous wall suction Chest tube to water seal Foley catheter in place	Remove foley catheter Inpatient esophagram Jejunostomy tube contrast study Abdominal XR at 1hr and 4 hrs Remove nasogastric tube Oral protocol (15ccx4hr, 30cc) Remove chest tube once	Transition off epidural Start jejunostomy tube multimodal pain control PPI for lifetime HOB > 30 degrees for lifetime Home tube feeds Discharge	Outpatient esophagram Outpatient chest x-ray Follow up clinic visit

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inpatient | outpatient

Outcomes: Accelerated Group Outpatient visits

Positive leak on outpatient esophagram	POD at discharge	POD at esophagram	CT confirms leak	Endoscopic management	Antibiotic management	Tachycardia or abnormal vital signs	Symptoms or physical exam findings
1	5	7	+	0	0	N/A	N/A
2	4	8	N/A	+	0	0	0
3	6	10	+	+	+	0	0
4	6	8	+	0	+	0	0
5	6	9	-	0	0	0	0

Leak confirmation:

4 confirmed ALs

2 were classified as Type I

2 were classified as Type II

0 abnormal vital signs or clinical findings

Management:

2 patients required dietary restriction

2 patients required antibiotic treatment

2 patients were treated endoscopically

Readmission rates after accelerated discharge:

0 readmissions for leak found on outpatient esophagram

2 readmissions total in accelerated group

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In the accelerated group, the calculated number needed to scan (NNS) to identify one patient requiring any form of intervention was 14.

For all groups combined, the NNS was 9.

Compared with targeted and delayed groups, the accelerated group had reduced interventions by 10.9% (8% vs 18.9%); **NNT=8**.

Normal esophagrams in 61 patients (92.4%).

Anastomotic leaks identified in 5 patients (7.58%), **all of whom were asymptomatic** at the time of follow-up.

5 out of 66 required intervention in accelerated group

7 out of 37 required intervention in the targeted and delayed groups

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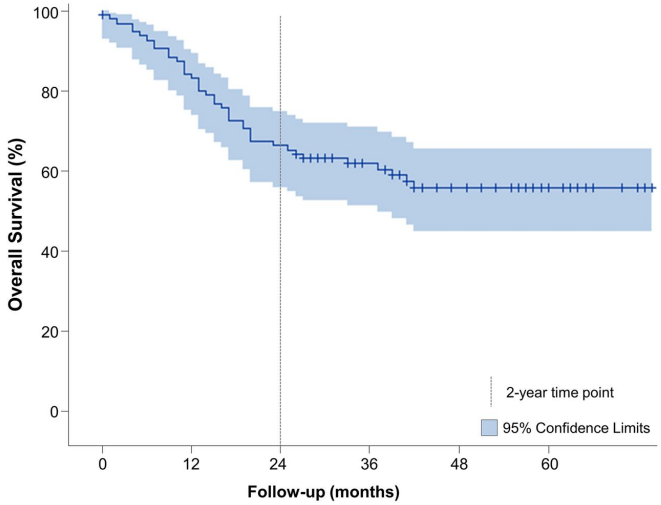
Surveillance and Recurrence

- Initial monthly esophagram, dilations prn, remove feeding jejunostomy at 2-3 months
- CT and endoscopy annually
- Manage recurrence with systemic therapy, resection, or palliative care



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Pather, K., Mobley, E.M., Guerrier, C. *et al.* Long-term survival outcomes of esophageal cancer after minimally invasive Ivor Lewis esophagectomy. *World J Surg Onc* **20**, 50 (2022).

Summary: Treatment of Esophageal Cancer & Importance of Multidisciplinary Care

• Treatment is stage-dependent:
  - Early-stage (T1a): Endoscopic resection (EMR/ESD)
  - Locally advanced (T1b–T3): Esophagectomy ± neoadjuvant therapy
  - Advanced/metastatic: Systemic and palliative therapies

• Therapeutic Modalities:
  - Surgery: Cornerstone for curative intent
  - Chemoradiotherapy: Enhances resectability and survival in locally advanced disease
  - Endoscopic therapy: Organ-sparing in select early lesions
  - Immunotherapy and targeted therapy: Expanding options in advanced settings

• Multidisciplinary Coordination Is Essential:
  - Collaboration between surgical oncology, gastroenterology, medical oncology, radiation oncology, pathology, radiology, and nutrition/palliative care teams
  - Enables individualized, evidence-based, and patient-centered care

Take-Home Message:

Multimodal, multidisciplinary management maximizes survival, minimizes morbidity, and ensures holistic care for patients with esophageal cancer.

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Question & Answer

Live Audience: Please raise your hand and a mic will come to you.
Virtual Attendees: Please click on the Q&A button to enter your question.

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Break and Exhibits