Gastroparesis
Work up and Management

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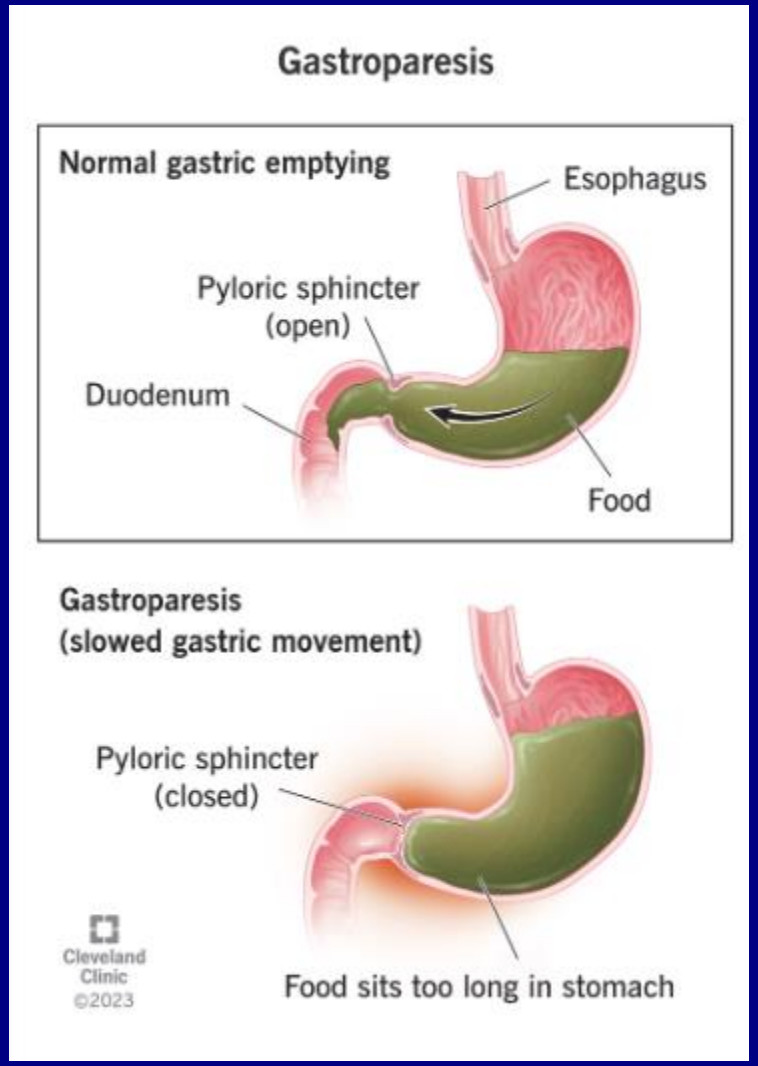
Toronto, June 2024

Disclosures

- No relevant commercial disclosures


Gastroparesis
Normal gastric emptying
Esophagus
Pyloric sphincter
(open)
Duodenum
Food
Gastroparesis
(slowed gastric movement)
Pyloric sphincter
(closed)
Food sits too long in stomach
Cleveland
Clinic
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Gastroparesis

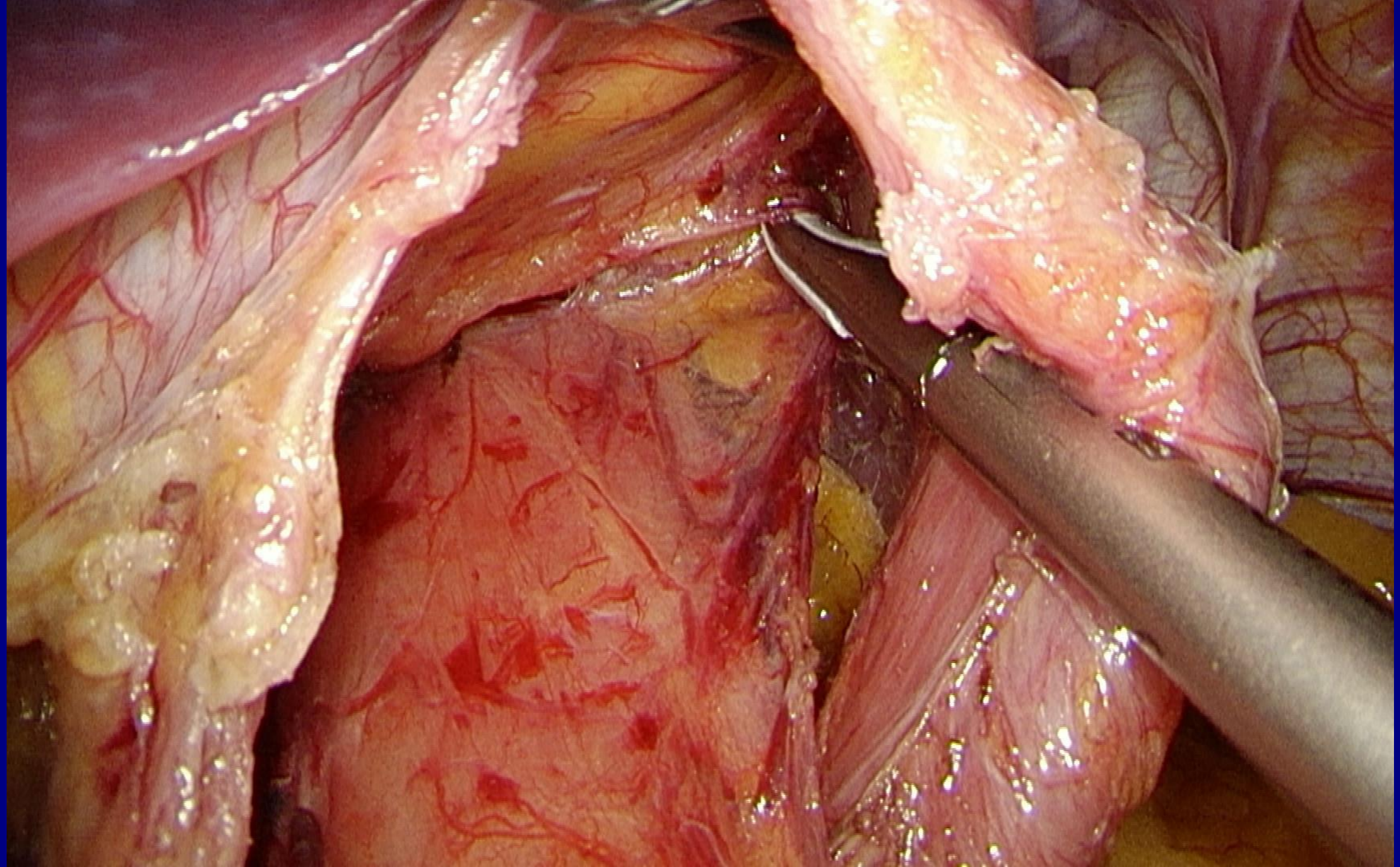
- Abnormal neuromuscular activity of the stomach
- Antral hypomotility and disorganized contractions
- Delayed emptying in the absence of mechanical obstruction
- Liquids may only be minimally affected.
- Etiology
  - Diabetic
  - Post-surgical
  - idiopathic

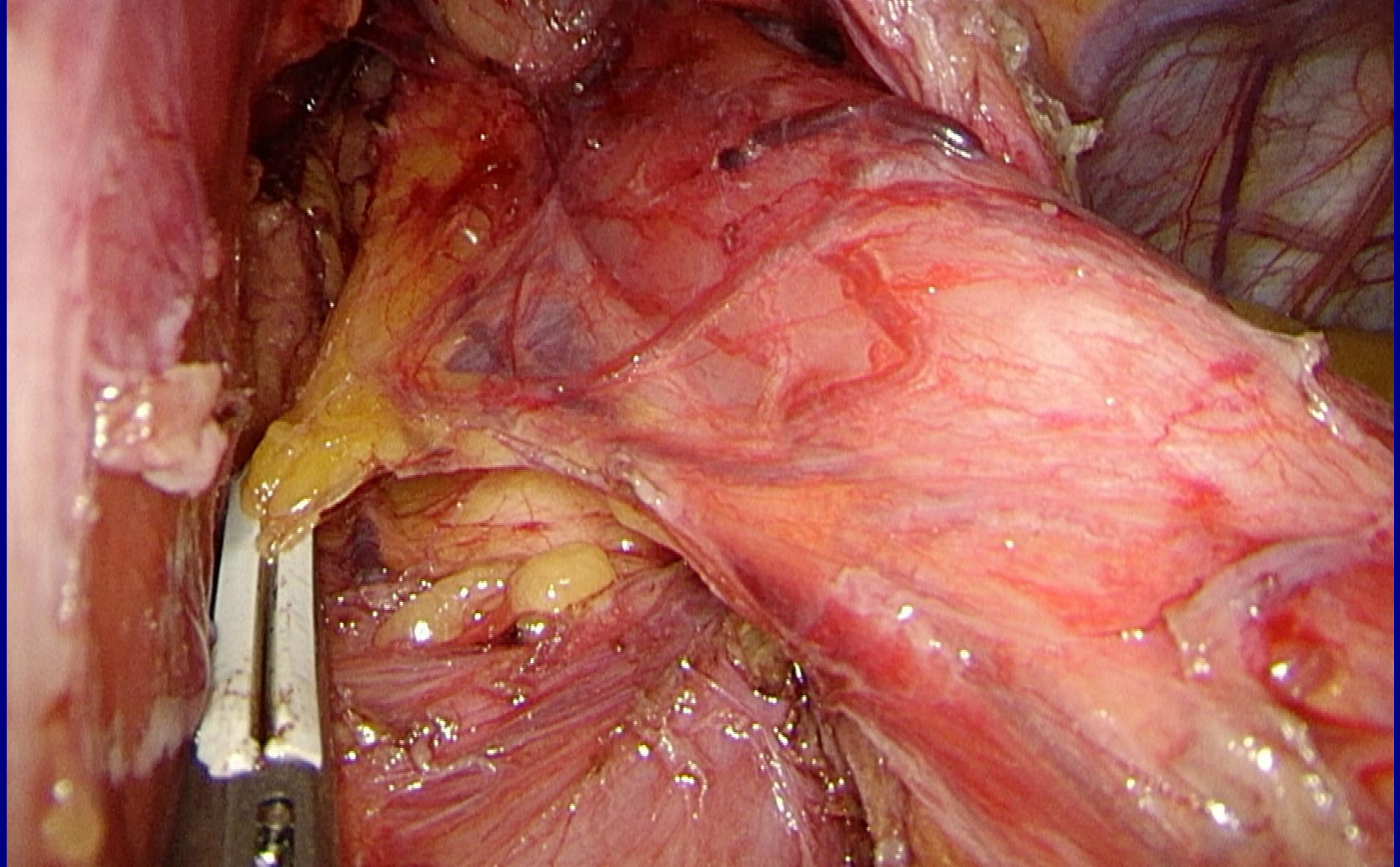
Gastroparesis: Symptoms

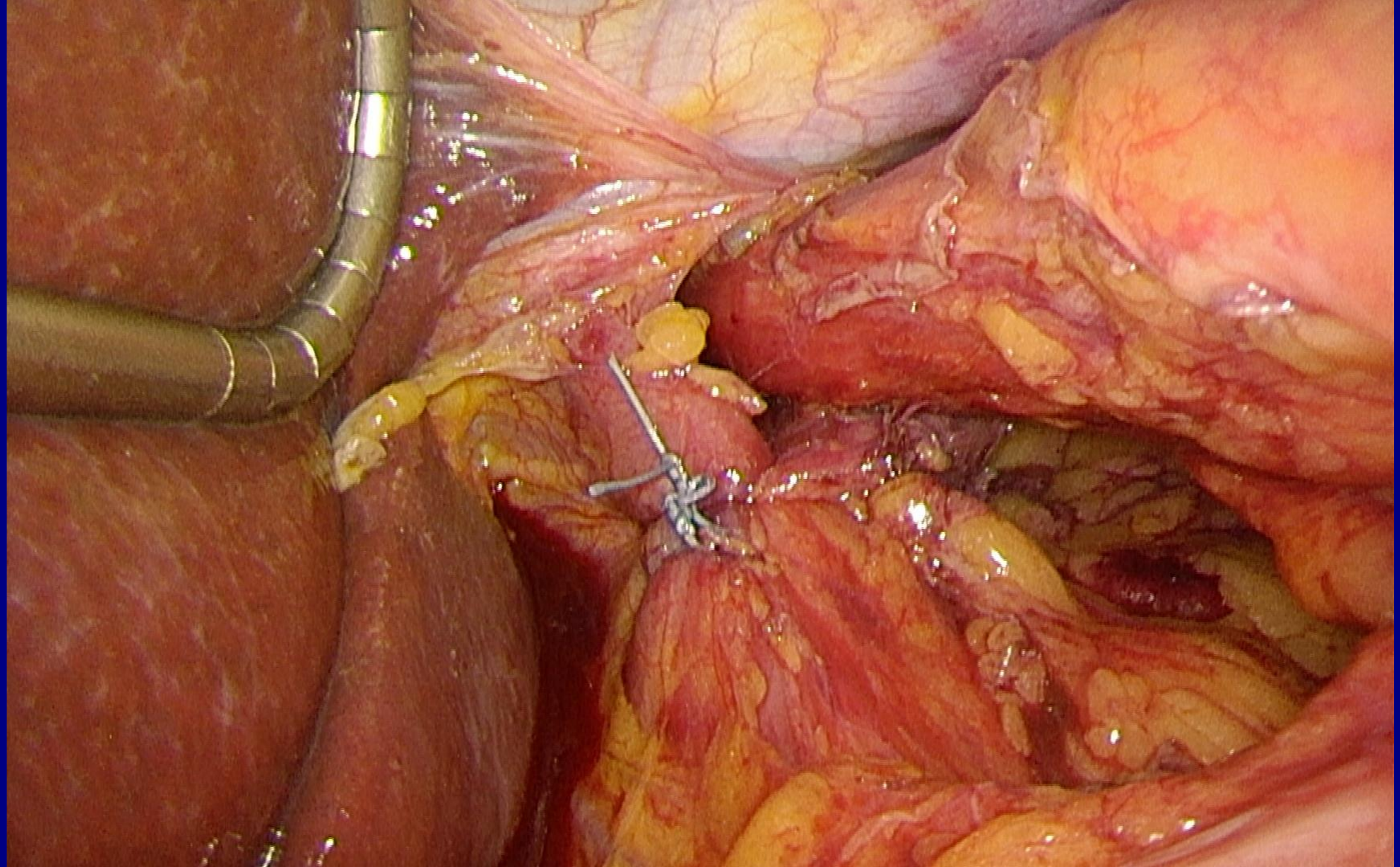
- Abdominal Fullness
- Abdominal pain
- Early satiety
- Heartburn
- Nausea
- Vomiting

Complications of Gastroparesis

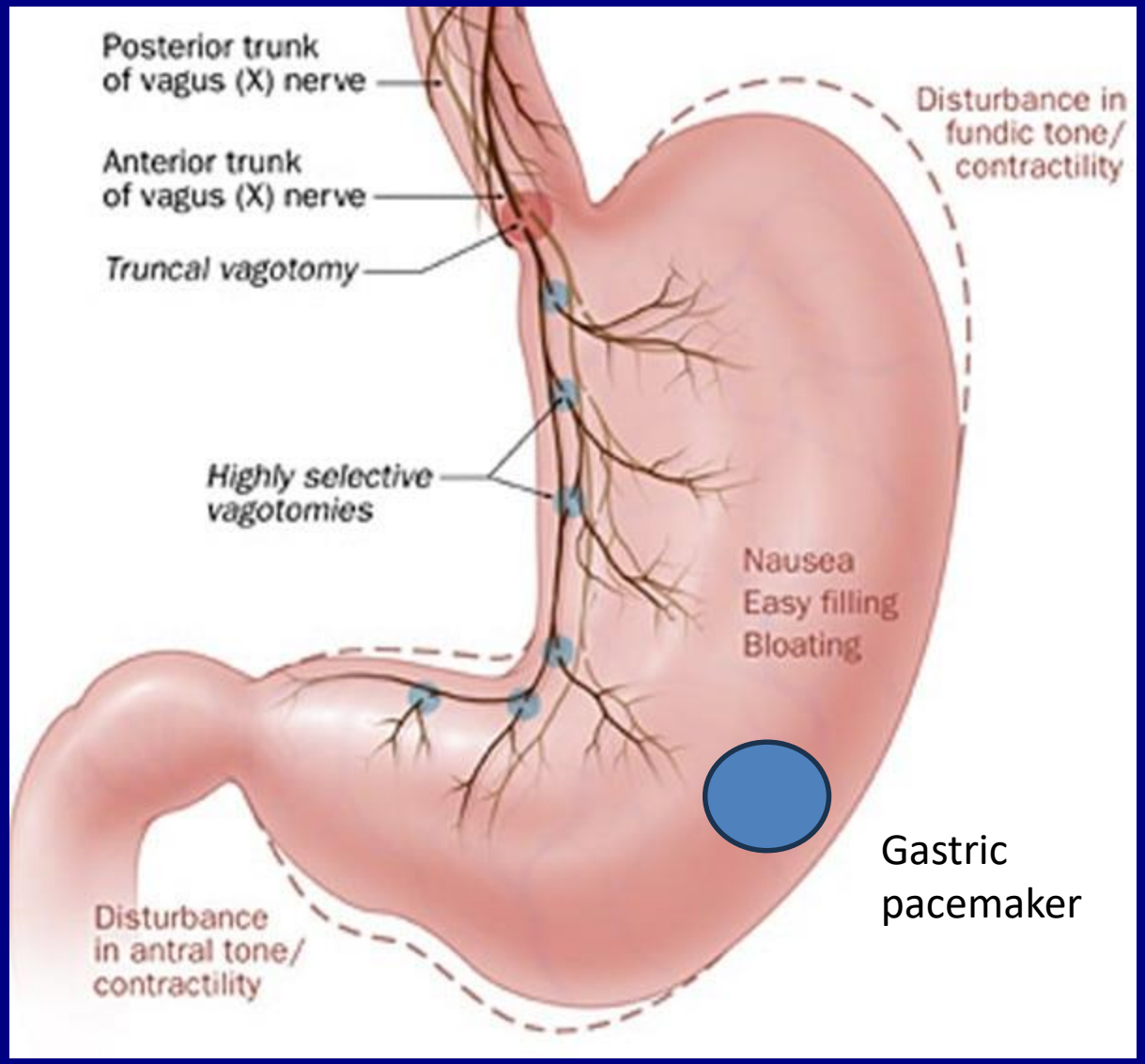
- Dehydration
- Malnutrition
- Poor glycemic control
- Significant weight loss
- Inability to perform ADLs
- Life threatening electrolyte abnormalities







The function of the vagus nerve is to stimulate smooth muscle contraction and glandular secretions in these organs. For example, in the stomach, the vagus nerve increases the rate of gastric emptying, and stimulates acid production.


Posterior trunk of vagus (X) nerve
Anterior trunk of vagus (X) nerve
Truncal vagotomy
Highly selective vagotomies
Disturbance in fundic tone/ contractility
Nausea
Easy filling
Bloating
Disturbance in antral tone/ contractility
Gastric pacemaker

J Gastrointest Surg (2008) 12:1155–1162
DOI 10.1007/s11605-008-0520-0

Vagotomy During Hiatal Hernia Repair: A Benign Esophageal Lengthening Procedure

Brant K. Oelschlager · Kyle Yamamoto · Todd Woltman · Carlos Pellegrini

J Gastrointest Surg (2008) 12:1155–1162

Table 1 Postoperative Symptom Severity

Symptom	No vagotomy (n=72)	Vagotomy (n=30)	p-value
Heartburn	2.1±3.0	1.7±1.3	.652
Regurgitation	1.0±2.2	0.8±1.0	.408
Abdominal pain	1.7±3.0	1.8±2.8	.749
Dysphagia	1.3±2.4	1.6±2.3	.212
Chest pain	0.8±1.8	0.6±1.6	.607
Bloating	2.2±3.1	2.7±3.3	.481
Nausea	2.1±3.3	1.5±3.1	.483
Diarrhea	2.3±3.6	3.1±3.7	.129
Early satiety	2.0±2.9	2.6±3.4	.313
Dumping	25%	33%	.467
>1/week	21%	30%	.320

J Gastrointest Surg (2008) 12:1155–1162

Table 5 Postoperative Symptom Severity

Symptom	Bilateral vagotomy (n=4)	Unilateral Vagotomy (n=26)	p-value
Heartburn	1.3±2.5	1.8±2.8	.671
Regurgitation	0±0	1.0±2.7	.409
Abdominal pain	2.3±3.3	1.7±2.8	.560
Dysphagia	3.0±2.5	1.4±2.3	.137
Chest pain	1.3±2.5	0.7±1.7	.438
Bloating	4.3±4.2	2.4±3.1	.281
Nausea	0.8±1.5	1.7±3.3	.845
Diarrhea	6.0±4.0	1.7±2.9	.192
Early satiety	4.5±3.3	2.4±3.4	.202
Dumping	100%	8%	.002
>1/week	100%	4%	.001

Visual analog scale 1–10 (1 = no symptoms; 10 = most severe). Dumping indicated by percentage of patients who experienced symptoms

J Gastrointest Surg (2008) 12:1155–1162

Work up for Gastroparesis

NM gastric emptying study

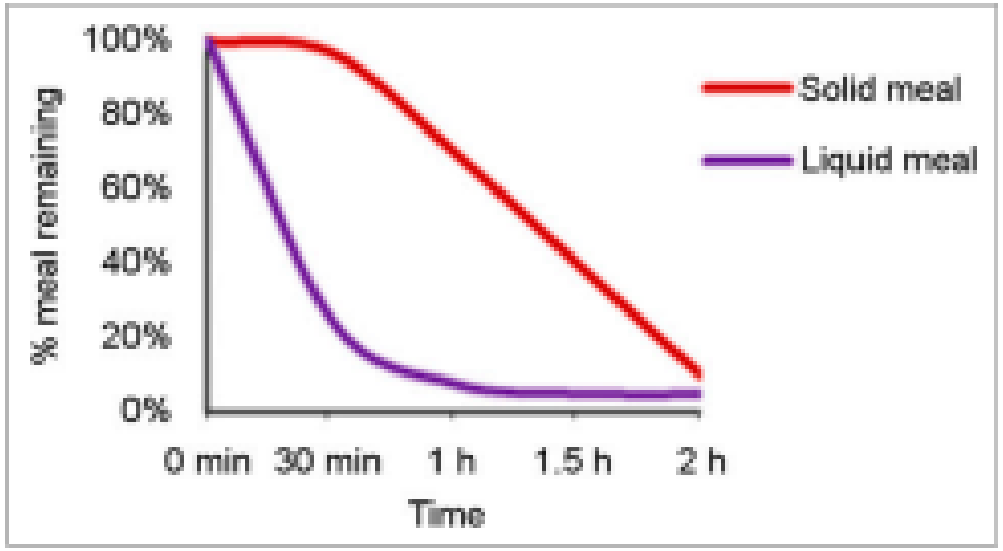


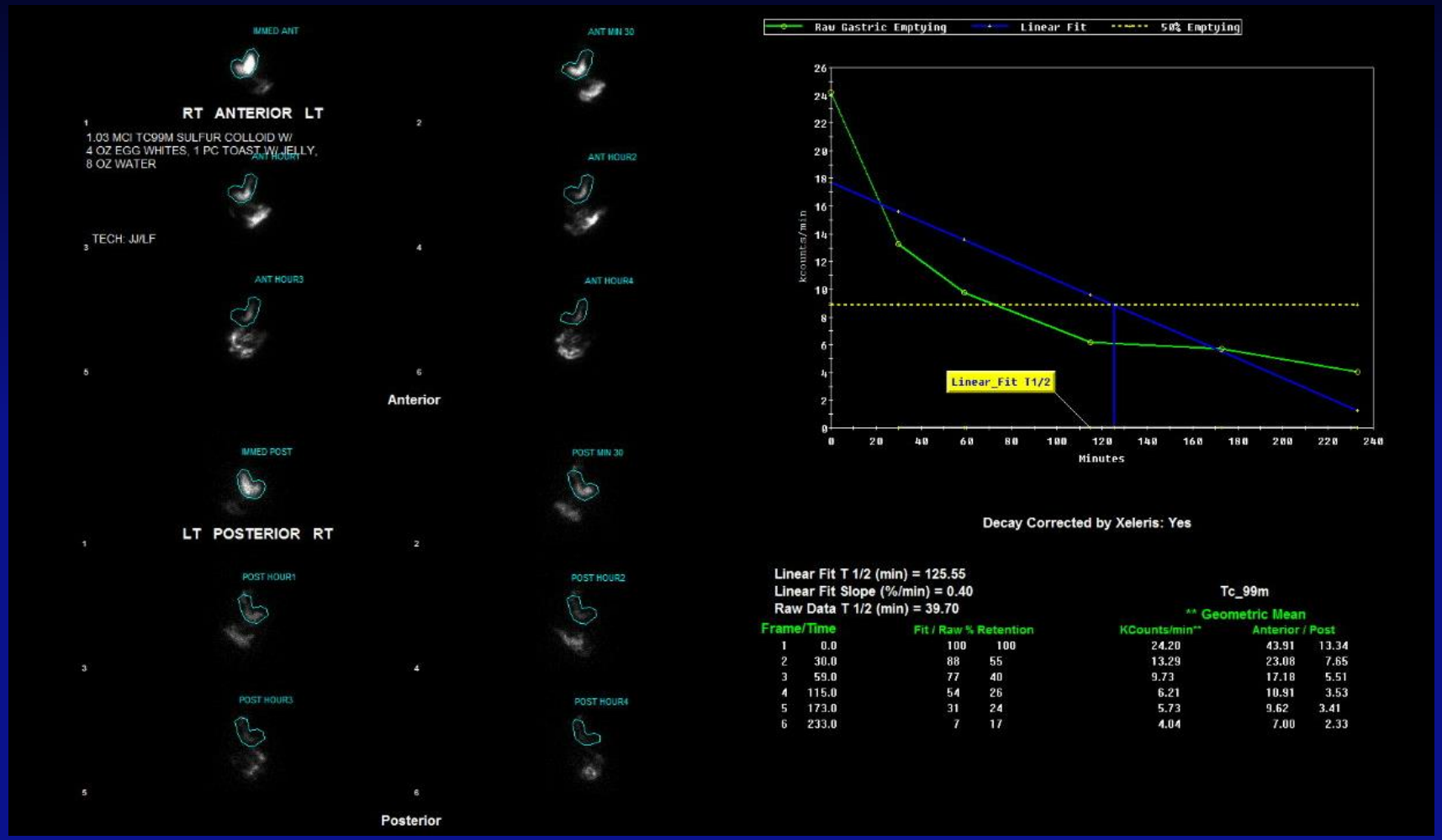
FIGURE 5. Normal gastric emptying curves. For solid meal (red), there is an initial 20-30 m lag period as the antrum reduces meal particle size and mixes with gastric acid. After the lag period, the solid material empties from the stomach in a linear fashion. The liquid meal (purple) immediately begins to leave the stomach and empties in an exponential pattern.

NM gastric emptying study

TABLE 3
Normal Solid Gastric Emptying Values

Imaging Time	Lower Normal Limit*	Upper Normal Limit*
0 minutes		
0.5 hours	70%	
1 hour	30%	90%
2 hours		60%
3 hours		30%
4 hours		10%

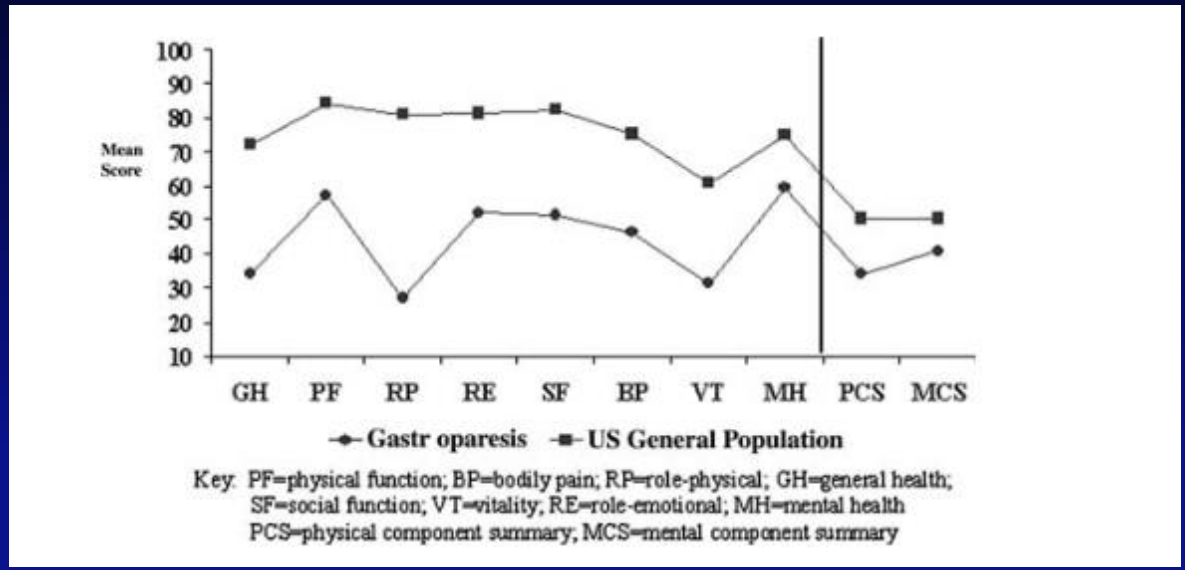
NM 4-hour GET



17% at 4 hours

Gastroparesis Cardinal Symptom Index GCSI

Item
Stomach fullness
Loss of appetite
Not able to finish meal
Feeling excessively full after meal
Bloating
Stomach or belly feels larger
Nausea
Retching
Vomiting



A 6-point Likert-type response scale, ranging from 0 (none) to 5 (very severe) was used for rating the severity of each symptom item

Quality of Life Research 13: 833–844, 2004

Gas Bloat and Gastroparesis

- Most get better in 3-6 months post-op
- Use pro-motility agents (metoclopramide, domperidone) in the short term
- Botox to the pylorus can be diagnostic and therapeutic

Gas Bloat and Gastroparesis

- Decompressive G tube and feeding J tube
- Gastric electrical stimulation
  - Does not work in with a vagotomy
- Pyloroplasty
- Pyloromyotomy (surgical vs endoscopic)
- Gastrectomy (partial vs total)

Gastric Electrical Stimulation

An Alternative Surgical Therapy for Patients With Gastroparesis

Rodney J. Mason, PhD, MD; John Lipham, MD; Gordon Eckerling, MD; Alan Schwartz, MD; Tom R. DeMeester, MD

Arch Surg. 2005;140:841-848

Gastric Electrical Stimulation (GES)

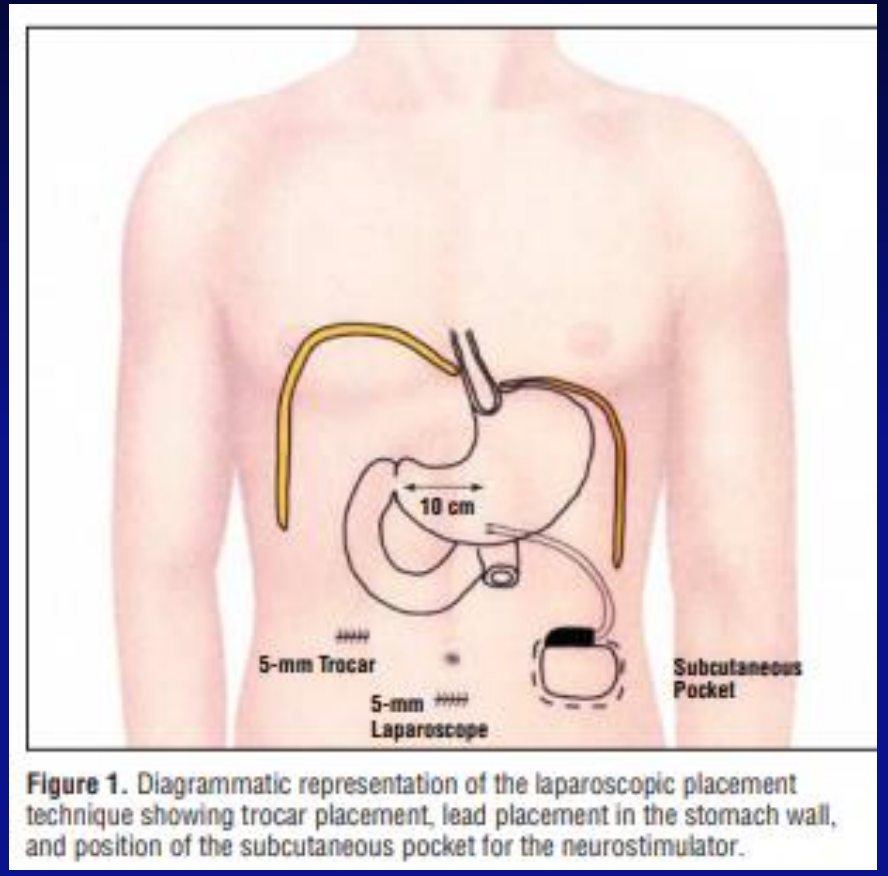


Figure 1. Diagrammatic representation of the laparoscopic placement technique showing trocar placement, lead placement in the stomach wall, and position of the subcutaneous pocket for the neurostimulator.

Arch Surg. 2005;140:841-848

Gastric Electrical Stimulation (GES)

Table 2. Use of Supplemental Nutrition During Follow-up Period

Nutrition Type	Patients With Type 1 Diabetic Gastroparesis, No. (%) (n = 24)		Patients With Idiopathic Gastroparesis, No. (%) (n = 5)	
	Preoperatively	Postoperatively	Preoperatively	Postoperatively
Total parenteral nutrition	9 (38)	0 (0)	3 (60)	0 (0)
Enteral nutrition	3 (13)	0 (0)	0 (0)	0 (0)
Both enteral and total parenteral nutrition	3 (13)	0 (0)	1 (20)	0 (0)

Arch Surg. 2005;140:841-848

Per-oral Pyloromyotomy (POP) for Medically Refractory Gastroparesis

Short Term Results From the First 100 Patients at a High Volume Center

John Rodriguez, MD,† Andrew T. Strong, MD,*† Ivy N. Haskins, MD,‡ Joshua P. Landreneau, MD, MSc,* Matthew T. Allemang, MD,* Kevin El-Hayek, MD, FACS,*†§ James Villamere, MD,* Chao Tu, MS,¶ Michael S. Cline, DO,†|| Matthew Kroh, MD, FACS, FASMBS, FASGE,*†** and Jeffrey L. Ponsky, MD, FACS*†*

Ann Surg 2018;268:421–430

G-POEM

TABLE 2. Gastroparesis Characteristics

Factor	Statistics
Cause of gastroparesis	
Idiopathic	56 (56.0)
Diabetes	21 (21.0)
Postsurgical	19 (19.0)
Autoimmune	1 (1.0)
Multifactorial	3 (3.0)
Prior interventions for gastroparesis	67 (67.0)
PEG	5 (5.0)
PEG-JET	7 (7.0)
Jejunostomy tube	25 (25.0)
Partial gastrectomy	1 (1.0)
Gastric Electrical Stimulator	20 (20.0)
Intrapyloric Botulinum Toxin Injection	46 (46.0)
Other*	2 (2.0)

Ann Surg 2018;268:421–430

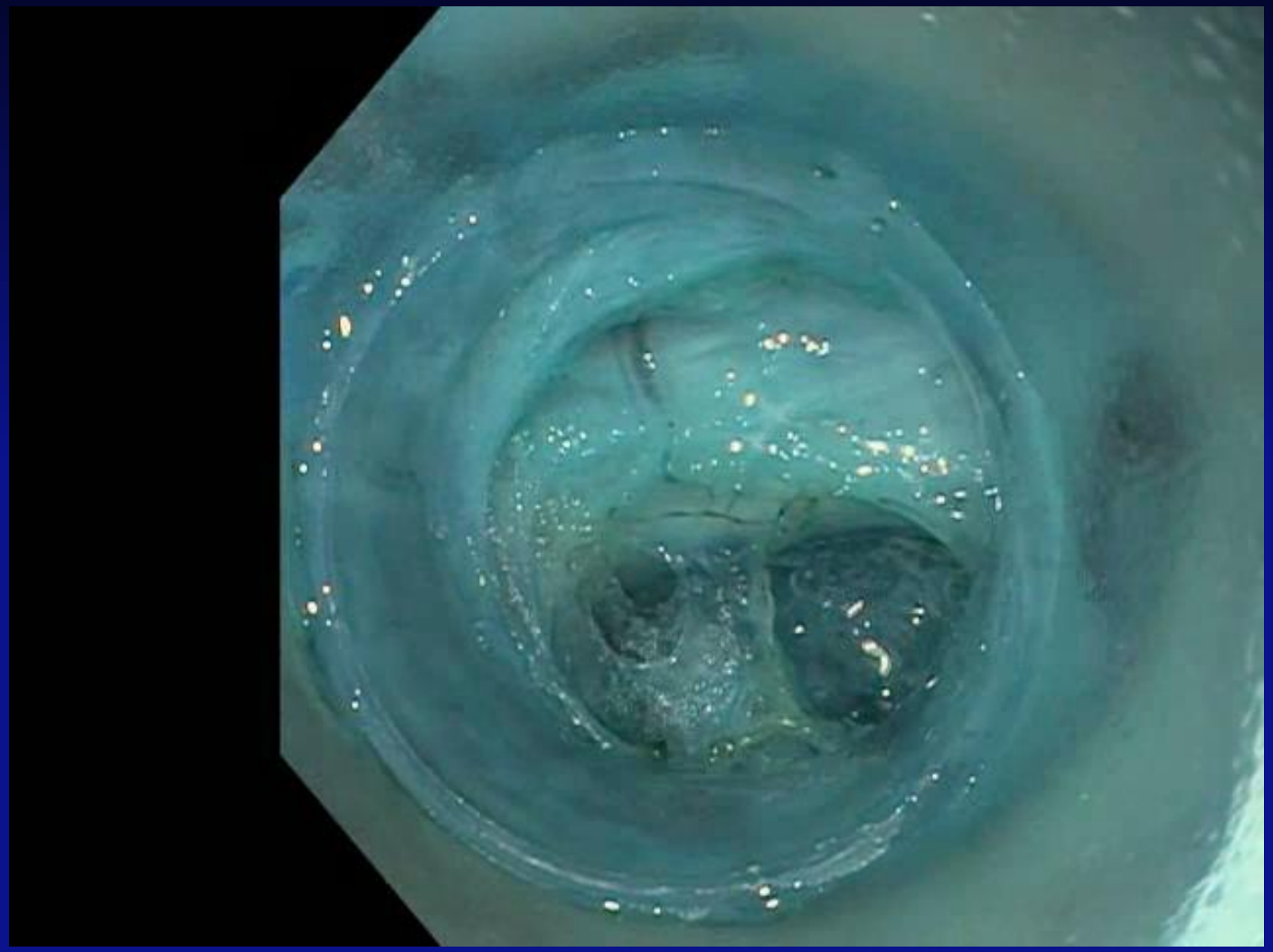
G-POEM

TABLE 5. Improvement in Gastric Emptying and Gastroparesis Symptoms Stratified by Gastroparesis Etiology

	BMI	Emptying	GCSI			
Gastroparesis Etiology and Factor	BMI (kg/m^2)	% Retention at 4 h	Overall Mean Score	Mean Fullness/Early Satiety Subscore	Mean Nausea/ Vomiting Subscore	Bloating Subscore
Idiopathic						
Pre-POP	24.5 ± 5.9	32.1 ± 23.9%	3.8 ± 0.92	3.4 ± 1.3	4.3 ± 0.91	3.8 ± 1.5
Post-POP	25.1 ± 6.9	13.5 ± 17.8%	2.7 ± 1.2	2.2 ± 1.6	3.2 ± 1.4	2.6 ± 1.6
P value	0.61*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*
% who improved	–	50.0%†	85.7%‡	73.2%‡	80.4%‡	71.4%‡
Diabetic						
Pre-POP	25.4 ± 5.2	46.5 ± 26.1%	3.5 ± 0.91	3.5 ± 1.3	3.6 ± 0.96	3.4 ± 1.5
Post-POP	26.7 ± 5.3	20.2 ± 22.8%	1.7 ± 1.3	1.0 ± 1.3	2.2 ± 1.6	1.8 ± 1.7
P value	0.49*	0.040*	<0.001*	<0.001*	0.005*	0.006*
% who improved	–	28.5%§	66.7%¶	71.4%¶	71.4%¶	71.4%¶
Postsurgical						
Pre-POP	28.3 ± 4.9	56.0 ± 27.8%	3.8 ± 0.70	3.0 ± 1.3	3.9 ± 0.99	4.4 ± 0.86
Post-POP	27.8 ± 6.0	29.7 ± 30.4%	2.3 ± 1.2	1.5 ± 1.5	2.6 ± 1.4	2.9 ± 1.8
P value	0.78*	0.045*	<0.001*	0.004*	0.003*	0.002*
% who improved	–	33.3%‖	89.5%**	84.2%**	73.7%**	73.7%**

Ann Surg 2018;268:421–430

Third Space Endoscopy
G-POEM/POP



Gastroparesis After Lung Transplantation

- Up to 40% of post lung transplant patients
- Increases the risk of gastro-esophageal reflux, pulmonary infections and malnutrition

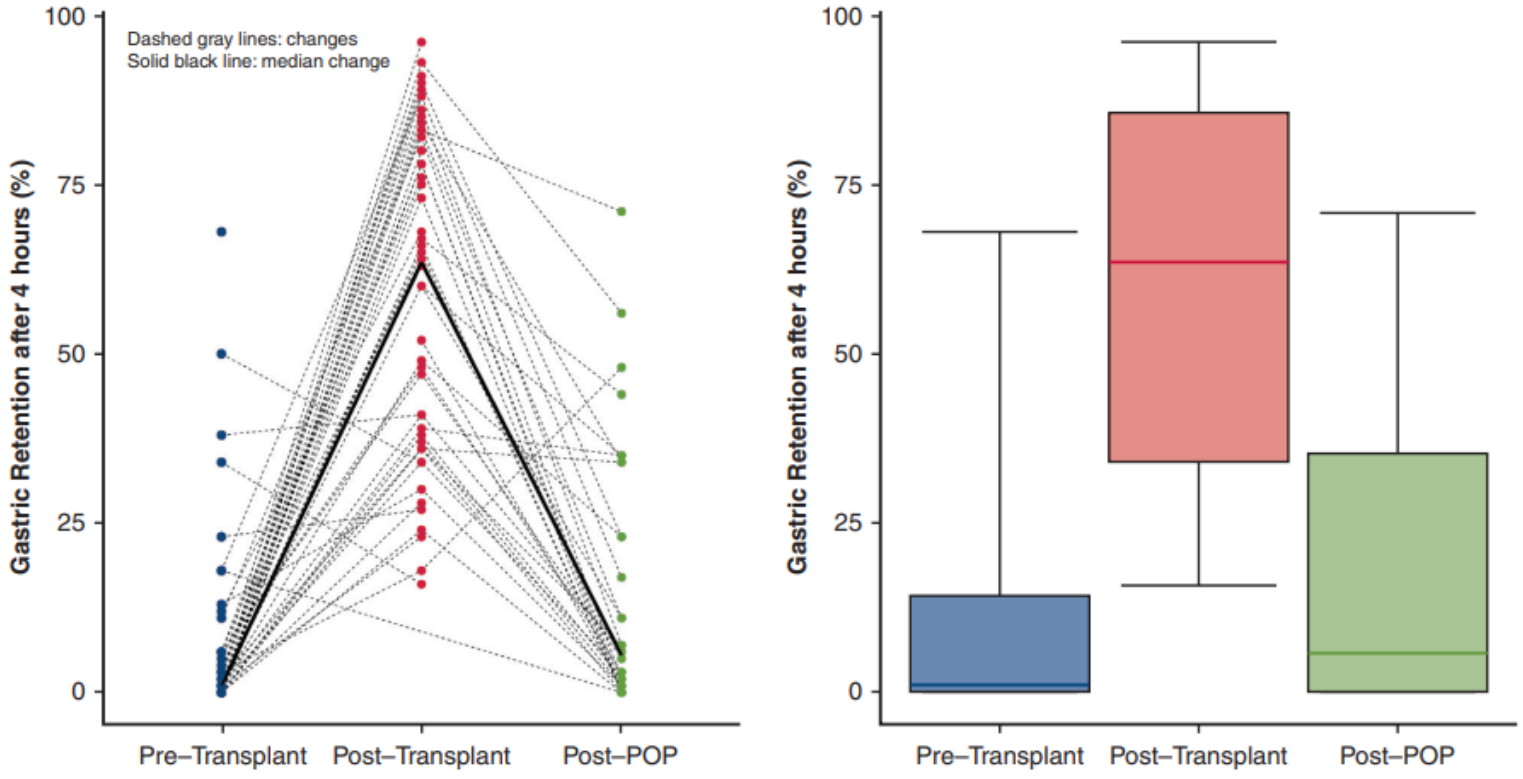
- Traditional management strategy
  - Jejunal feeding tubes to bypass the stomach
  - Surgical pyloromyotomy/pyloroplasty → high risk for complications

- Extrapolating from our other endoscopic experience
  - Endoscopic pyloromyotomy
  - Relaxation of pylorus → improved gastric emptying

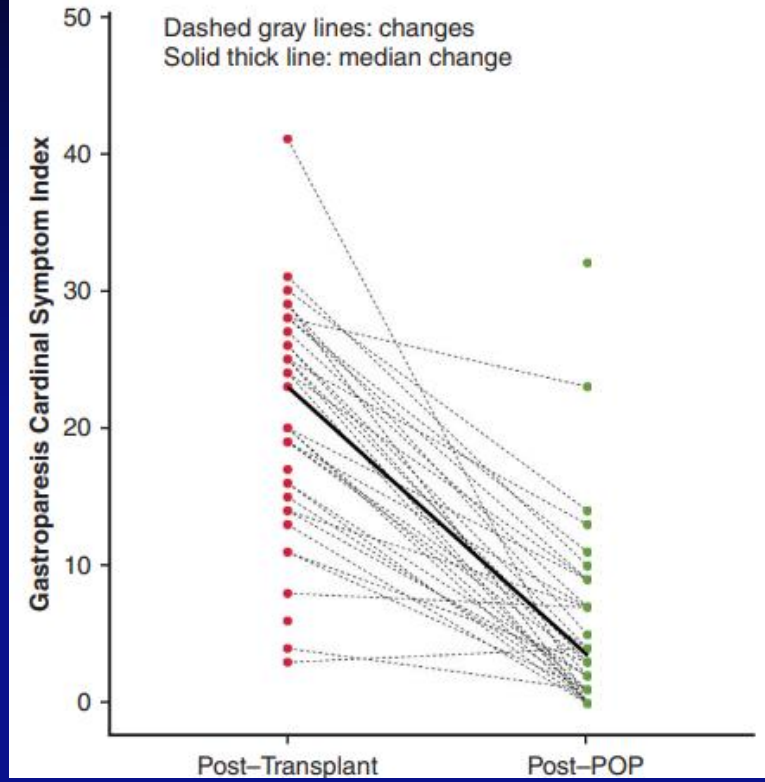
Endoscopic pyloromyotomy is feasible and effective in improving post–lung transplant gastroparesis

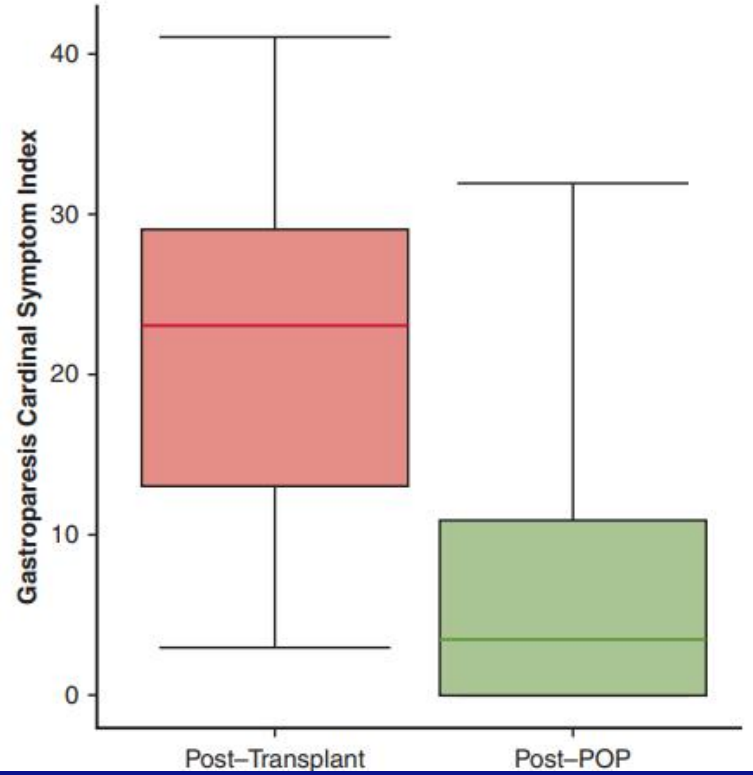
Jesse M. P. Rappaport, MD,[a] Siva Raja, MD, PhD,[a] Scott Gabbard, MD,[b] Lucy Thuita, MS,[c] Madhusudhan R. Sanaka, MD,[b] Eugene H. Blackstone, MD,[a,c] and Usman Ahmad, MD,[a,d] for the Cleveland Clinic Lung Transplantation Center

J Thorac Cardiovasc Surg 2022;164:711-9

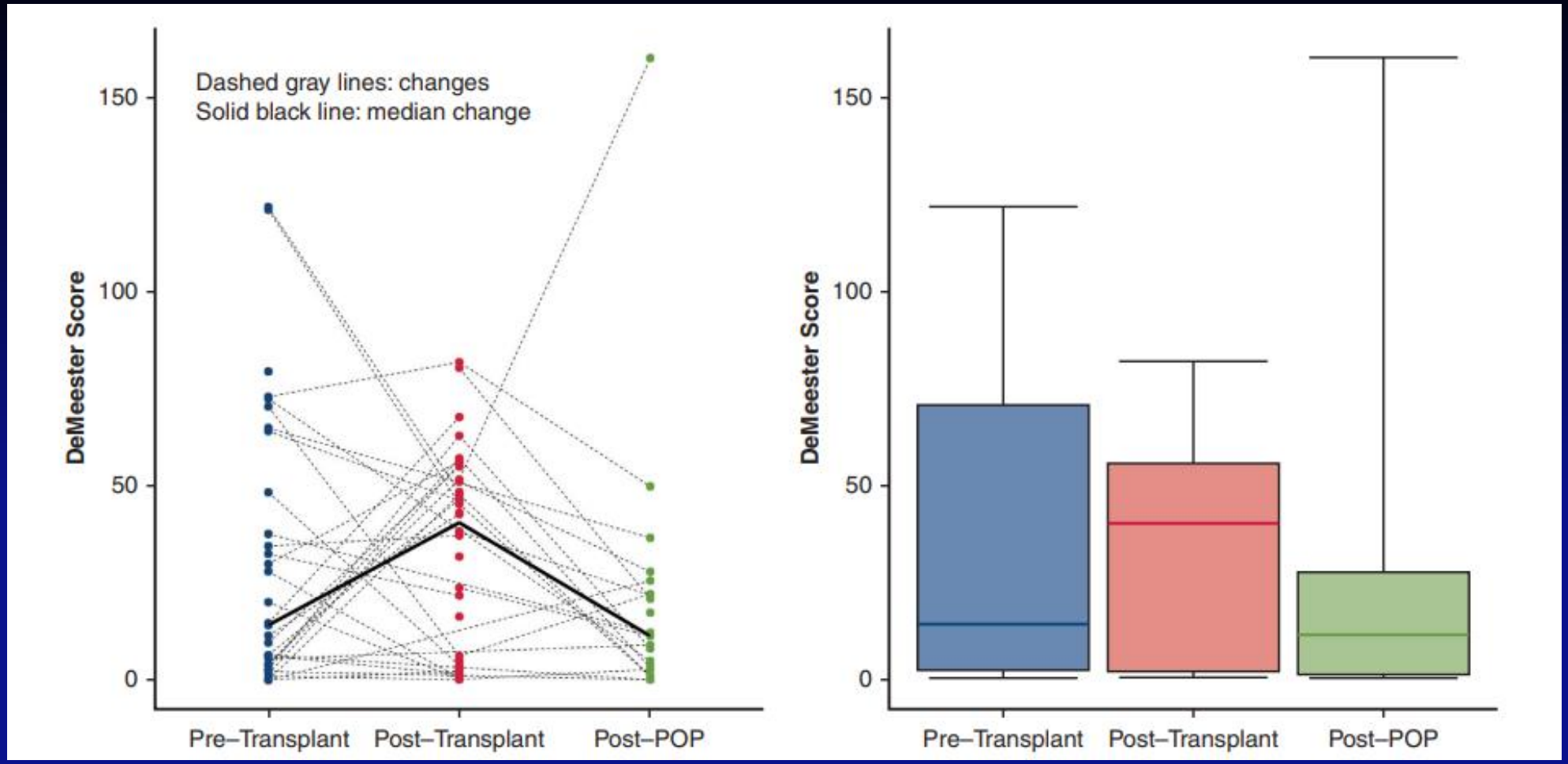


J Thorac Cardiovasc Surg 2022;164:711-9





J Thorac Cardiovasc Surg 2022;164:711-9



J Thorac Cardiovasc Surg 2022;164:711-9

Endoscopic Pyloromyotomy Is Feasible and Effective in Improving Post–Lung Transplant Gastroparesis

Gastroparesis
Lung Transplant Recipients
20%-90%

Complications

Malnutrition
Aspiration
Increased Reflux

52 Lung Transplant Recipients
Refractory Gastroparesis

Endoscopic Pyloromyotomy
June 2018 - March 2021

Pre and Post Testing:

Gastric
Emptying Test

Gastroparesis
Cardinal Symptom
Index

Longitudinal
Spirometry

Effective Treatment

Improved Emptying
89% Patients

Decreased Symptoms
100% Patients

Safe
Procedure

Stable
Allograft Function

Implication: Endoscopic pyloromyotomy can be performed safely with stable allograft function, is effective in treating post–lung transplant gastroparesis, and may reduce gastroesophageal reflux

J Thorac Cardiovasc Surg 2022;164:711-9

Gastric peroral endoscopic pyloromyotomy (G-POEM) in patients with refractory gastroparesis: a review

Grace Ann McCurdy, Tonia Gooden, Francesca Weis, Maryam Mubashir, Shazia Rashid, Syed Musa Raza, James Morris and Qiang Cai

Ther Adv Gastroenterol 2023, Vol. 16: 1–13

Short-term outcomes of G-POEM in recent systematic review and meta-analysis studies.

Reference	3	4	5	6	7	8	9
Publication year	2019	2020	2020	2020	2020	2021	2022
Number of patients	196	292	281	235	375	272	482
Number of studies (prospective studies)	7 (2)	10 (2)	10 (4)	9 (2)	11 (1)	8 (3)	10 (3)
Mean procedure time (minutes)	69.7	62.4	51.0	55.6	63.8	70.9	N/A
Mean length of hospital stay (days)	1.96	3.4	2.32	3	3.3	3.1	N/A
Mean follow-up (months)	1–18	7.8	7.5	5.4	7	7.2	17.5
Procedure success rate (%)	100	100	100	100	N/A	100	N/A
Clinical success rate (%)	82	83.9	71	GCSI—81.5; GES—55	GCSI—75.8; GES—85	84	81
Mean value of GES decreased (%)	22.3	Significantly	26.3	23.8	24.7	25.4	28.8
Adverse events (%)	6	6.8	18	12	11	12	8

Safety and Feasibility of Per-Oral Pyloromyotomy as Augmentative Therapy after Prior Gastric Electrical Stimulation for Gastroparesis

Andrew T Strong, MD, John Rodriguez, MD, FACS, Matthew Kroh, MD, FACS, FASGE, FASMBS, Jeffrey Ponsky, MD, FACS, Michael Cline, DO, Kevin El-Hayek, MD, FACS

J Am Coll Surg 2019;229:589e595

G-POEM

Table 2. Gastroparesis Characteristics

Factor	Data
Cause of gastroparesis	
Idiopathic	13 (61.9)
Diabetes	9 (39.1)
Previous intervention for gastroparesis (apart from GES)	
Gastrostomy tube	4 (18.1)
Jejunostomy tube	9 (39.1)
Intrapyloric botulinum toxin injection	8 (36.1)
Previous need for parenteral nutrition	5 (22.7)
Time since GES inserted, mo, median (IQR)	36.3 (23.0–51.4)

GES, gastric electrical stimulator/stimulation; IQR, interquartile range.

J Am Coll Surg 2019;229:589e595

G-POEM

Table 4. Ninety-Day Outcomes for Gastric Emptying and Gastroparesis Symptoms

Factor	Pre-POP	Post-POP	p Value
Mean BMI, kg/m^2	25.4	26.8	0.27
Mean 4-hour scintigraphic retention, %*	50.1	4	0.0011
GCSI, mean ± SD			
Fullness/early satiety sub-score	4.06 ± 0.95	2.57 ± 1.74	0.0012
Nausea/vomiting sub-score	3.44 ± 1.24	1.72 ± 1.71	0.0003
Bloating sub-score	3.61 ± 1.69	2.18 ± 1.87	0.024
Overall GSCI score	3.70 ± 0.90	2.07 ± 1.61	0.002

J Am Coll Surg 2019;229:589e595

Summary

- Gastroparesis is not uncommon
- Work up involves 4 hours NM GET
- Symptoms are best followed with a GCSI
- Multi-disciplinary clinics with GI and Surgery are ideal for the management of this complex patient population
- Pyloric drainage (surgical or endoscopic) are effective therapies.