Management of Gastroesophageal Reflux Disease

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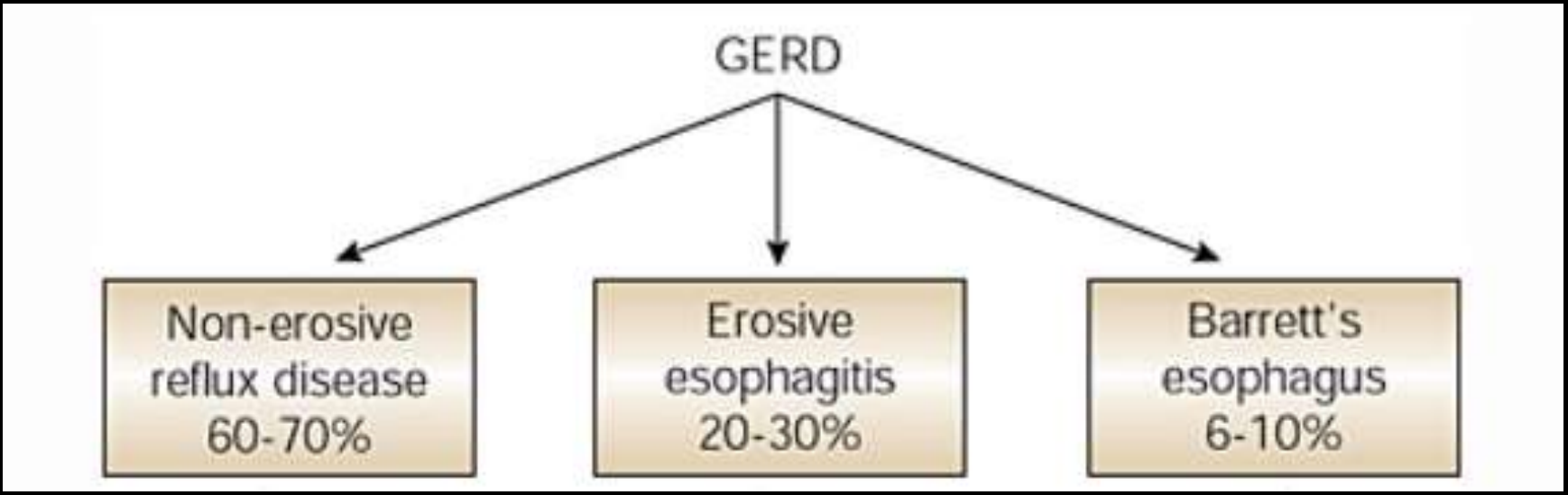
Definition

- Chronic gastrointestinal disorder characterized by a recurrent retrograde flow of gastric

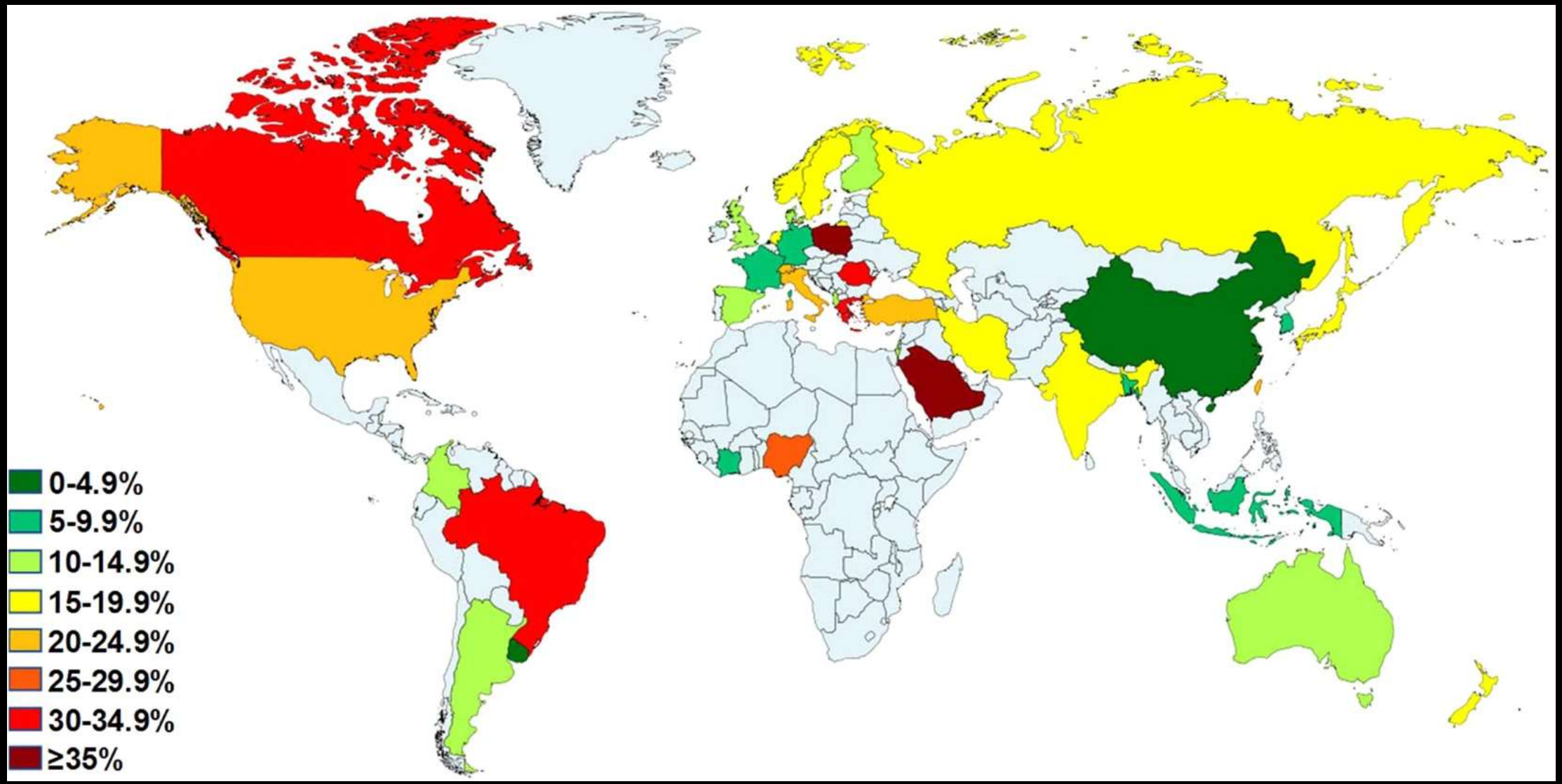
  contents into the esophagus, and sometimes into the oropharynx.



Chen, J.; Brady, P. Gastroenterol. Nurs. 2019, 42, 20–28

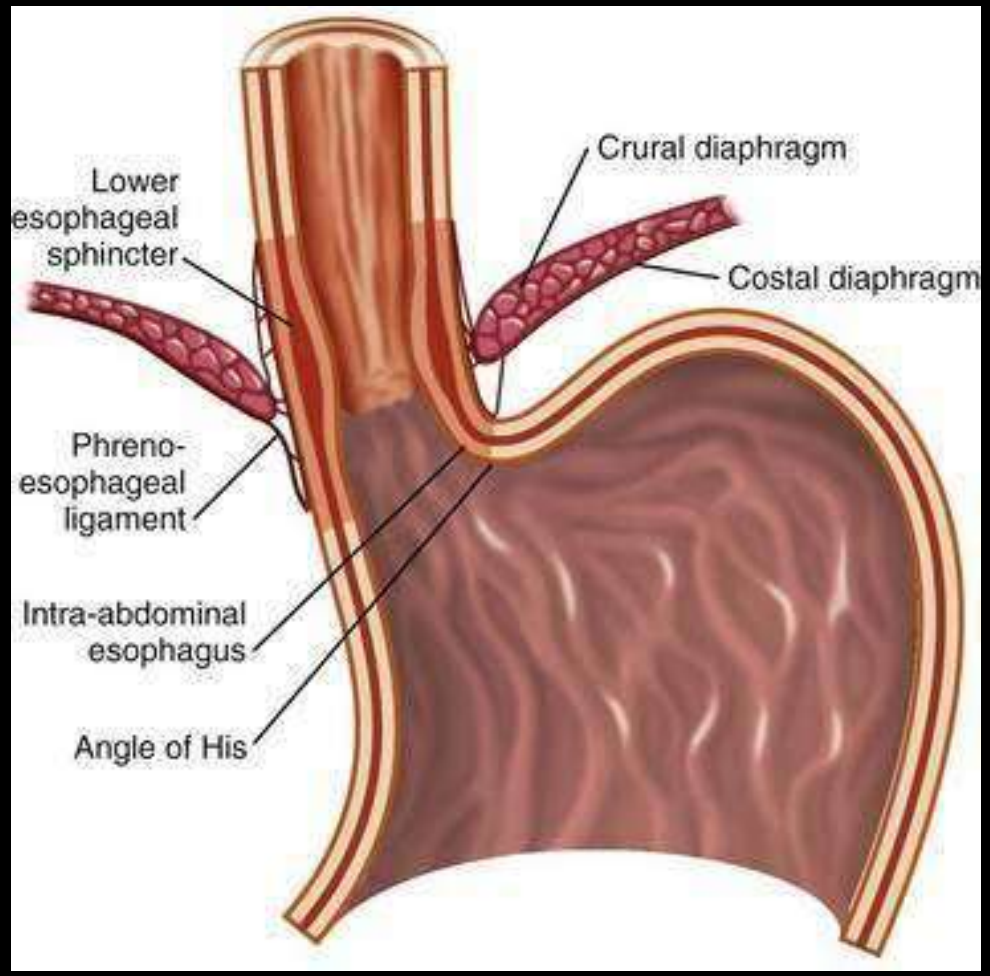
Ronnie Fass and Ram Dickman. GI Motility online (2006)

Distribution of GERD prevalence according to country



Nirwan, J.S et al. *Sci Rep* **10**, 5814 (2020)

Anatomical Structures which protect against gastroesophageal Reflux



Sleisenger and Fordtran's Gastrointestinal and Liver Disease

Physiologic mechanisms which protect against gastroesophageal reflux

- Esophageal motility
- Saliva production
- Esophageal epithelial protection

Gutschow Caet al. Ger Med Sci. 2011;9:Doc22.

Diagnosis of GERD

- usually symptom-based

- confirmed by upper gastrointestinal endoscopy or
  combined multichannel intraluminal impedance and pH monitoring (MII-pH)

Wickramasinghe N *et al*. *World J Gastrointest Pharmacol Ther* 2025 March 5; 16(1): 97918

Diagnosis - Symptoms

Classical Symptoms

- Heartburn
- Regurgitation
- Chest pain

Atypical or extra-esophageal symptoms

- Chronic cough
- Hoarseness
- Sensation of a lump in the throat (The globus sensation)

Higher Sensitivity and Specificity for Dx of GERD

Bucan, J.I. Gastrointest. Disord. **2025**, 7, 33

Vakil N et al. *Am J Gastroenterol* 2006; **101**: 1900-20; quiz 1943

Diagnosis – Many Questionnaires

GERD Questionnaire (GerdQ)

Table 1: GERDQ self-assessment questionnaire.

Symptoms (in previous week)	Symptom presence			
Question	**0 days**	**1 day**	**2-3 days**	**4-7 days**
How often did you have a burning feeling behind your breastbone?	0	1	2	3
How often did you have stomach contents moving upwards to your throat or mouth?	0	1	2	3
How often did you have a pain in the center of the upper stomach?	3	2	1	0
How often did you have nausea?	3	2	1	0
How often did you have difficulty getting a good night's sleep because of your heartburn and/or regurgitation?	0	1	2	3
How often did you take additional medication for your heartburn and/or regurgitation other than what the physician told you to take (such as Maalox)?	0	1	2	3

Reflux Disease Questionnaire

		Frequency over prior seven days						Severity over prior seven days					
GERD domain – Heartburn	Burning behind breastbone	0	1	2	3	4	5	0	1	2	3	4	5
GERD domain – Heartburn	Pain behind breastbone	0	1	2	3	4	5	0	1	2	3	4	5
GERD domain – Regurgitation	Acid taste in mouth	0	1	2	3	4	5	0	1	2	3	4	5
GERD domain – Regurgitation	Sensation of contents coming up from stomach	0	1	2	3	4	5	0	1	2	3	4	5
Dyspepsia	Burning in center of upper stomach	0	1	2	3	4	5	0	1	2	3	4	5
Dyspepsia	Pain in center of upper stomach	0	1	2	3	4	5	0	1	2	3	4	5

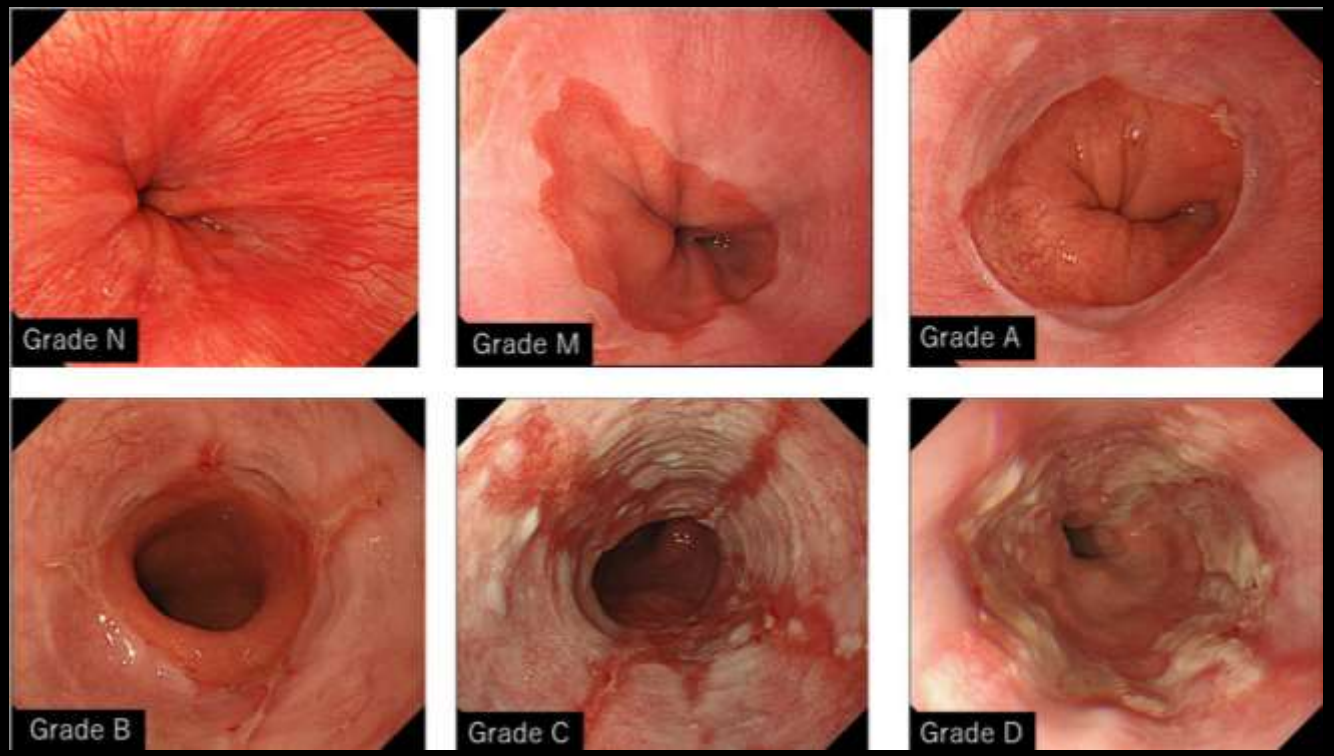
-Even a history taken by an expert (*e.g.*, a gastroenterologist)
sensitivity - 70%
specificity - 67%

Vakil N et al. *Am J Gastroenterol* 2006; **101**: 1900-20; quiz 1943

Diagnosis - Confirmatory tests for GERD

1. Endoscopy

- Erosive esophagitis – only in 3%-16% of patients



Modified Los Angeles classification system

Mostly - No visible mucosal lesions

Negative result on endoscopy

↓ are recommended to undergo

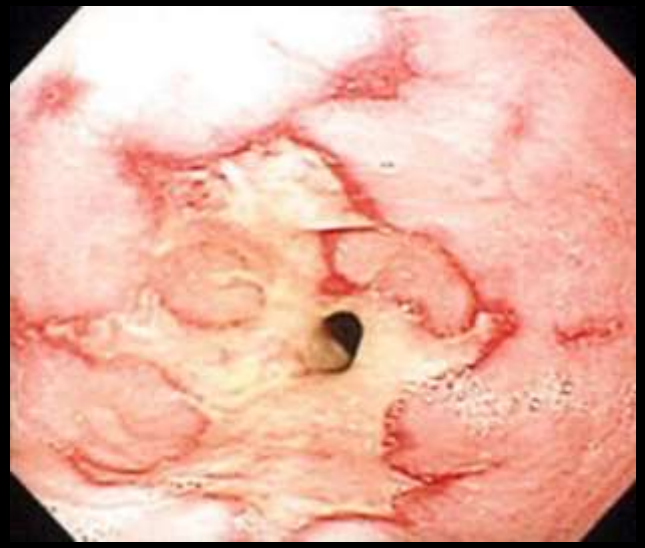
pH impedance testing
to confirm the diagnosis of NERD

Wickramasinghe N *et al*. *World J Gastrointest Pharmacol Ther* 2025 March 5; 16(1): 97918

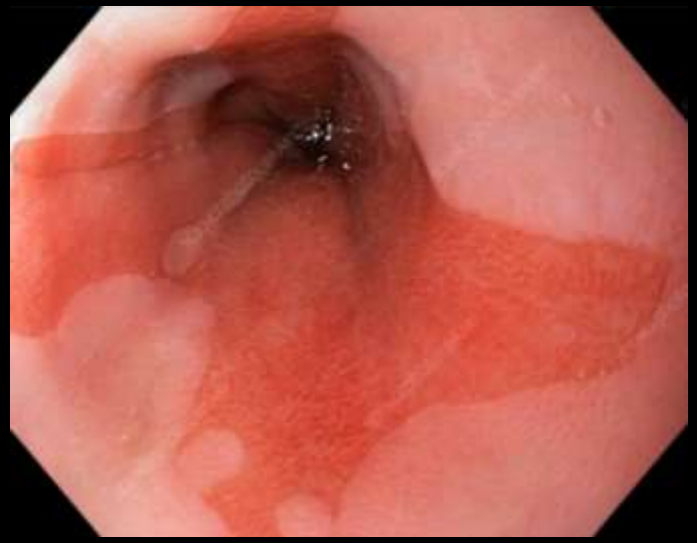
Diagnosis - Confirmatory tests for GERD

1. **Endoscopy**

- Can detect complications of GERD



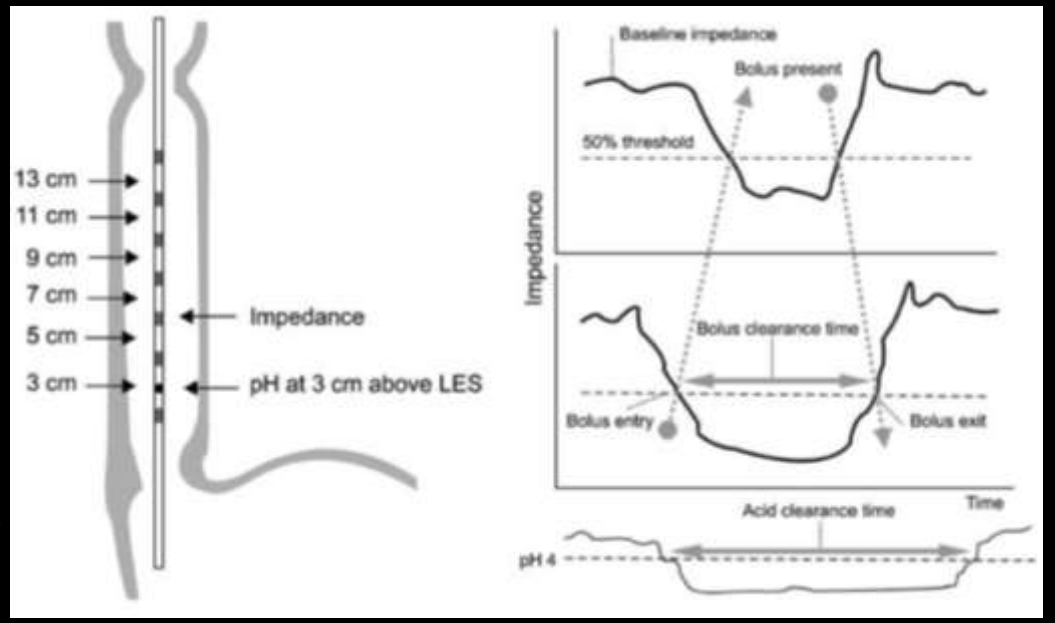
Esophageal strictures



Barrett’s esophagus
(precursor to Esophageal Adenocarcinoma)

Diagnosis - Confirmatory tests for GERD

2. **24-hour pH impedance:** MII-pH
- Retrograde bolus movement
- Number of reflux events
- Total reflux time
- Association between symptoms and reflux episodes
- Acidic, weakly acidic, and alkaline refluxes



- **Most sensitive and specific investigation in diagnosing GERD**
- **can also differentiate GERD from FH and RH**

Bredenoord AJ et al. *Am J Gastroenterol* 2006; 101: 453-459

Reflux hypersensitivity (RH)
Functional heartburn (FH)

Diagnosis - Confirmatory tests for GERD

2. 24-hour pH impedance (Cont:) - many controversies

Lyon consensus in 2018

Acid Exposure Time (for 24 hrs)

< 4% – Normal
4 – 6% – Recommended for adjunctive measure to prove GERD
6% – GERD

Reflux episodes lasting 24 hours

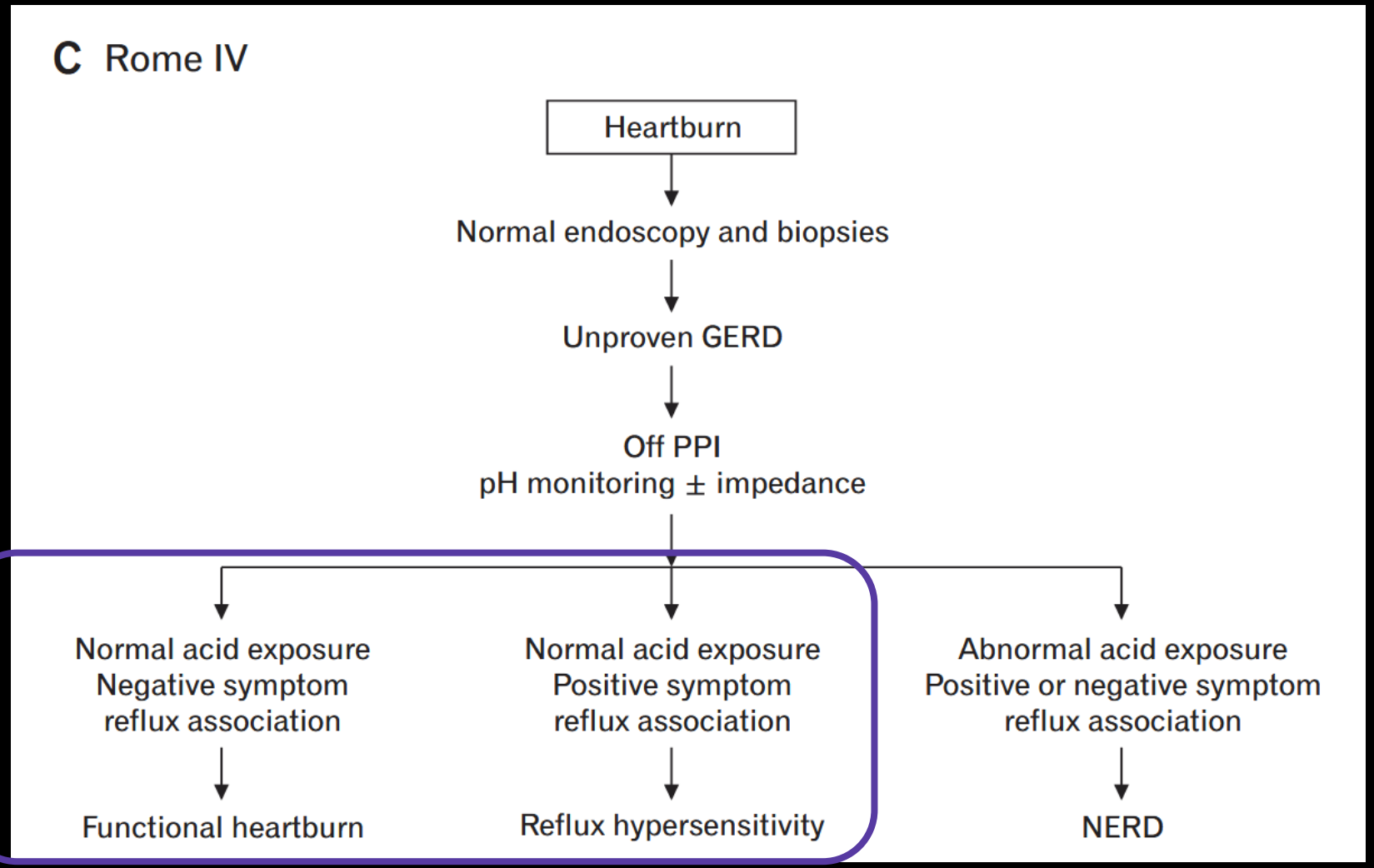
> 80 – abnormal
< 40 – normal

Gyawali CP et al. Modern diagnosis of GERD: the Lyon Consensus. *Gut* 2018; **67**: 1351-1362

Diagnosis - Confirmatory tests for GERD

2. 24-hour pH impedance (Cont:)

- can exclude functional esophageal disorders

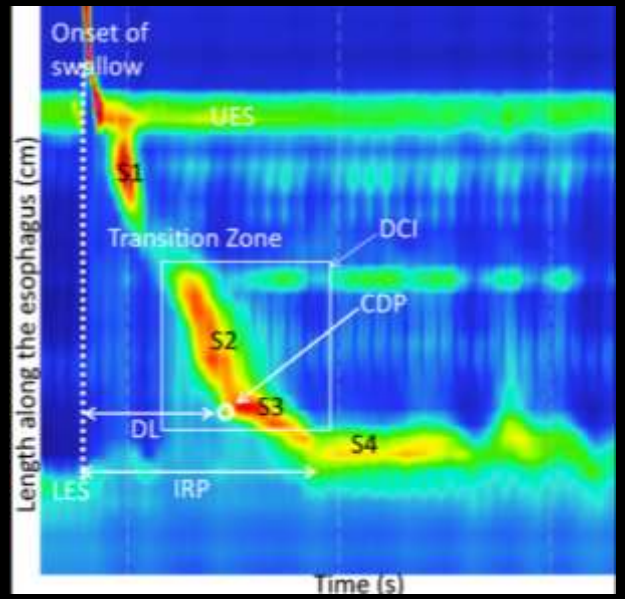


Takahisa Yamasaki, and Ronnie Fass. Journal of Neurogastroenterology and Motility 2017; 23(4): 495-503

Diagnosis - Confirmatory tests for GERD

3. High-resolution manometry (HRM) of the esophagus

- **N**ot a diagnostic test for GERD
- Most GERD patients have a normal manometric study



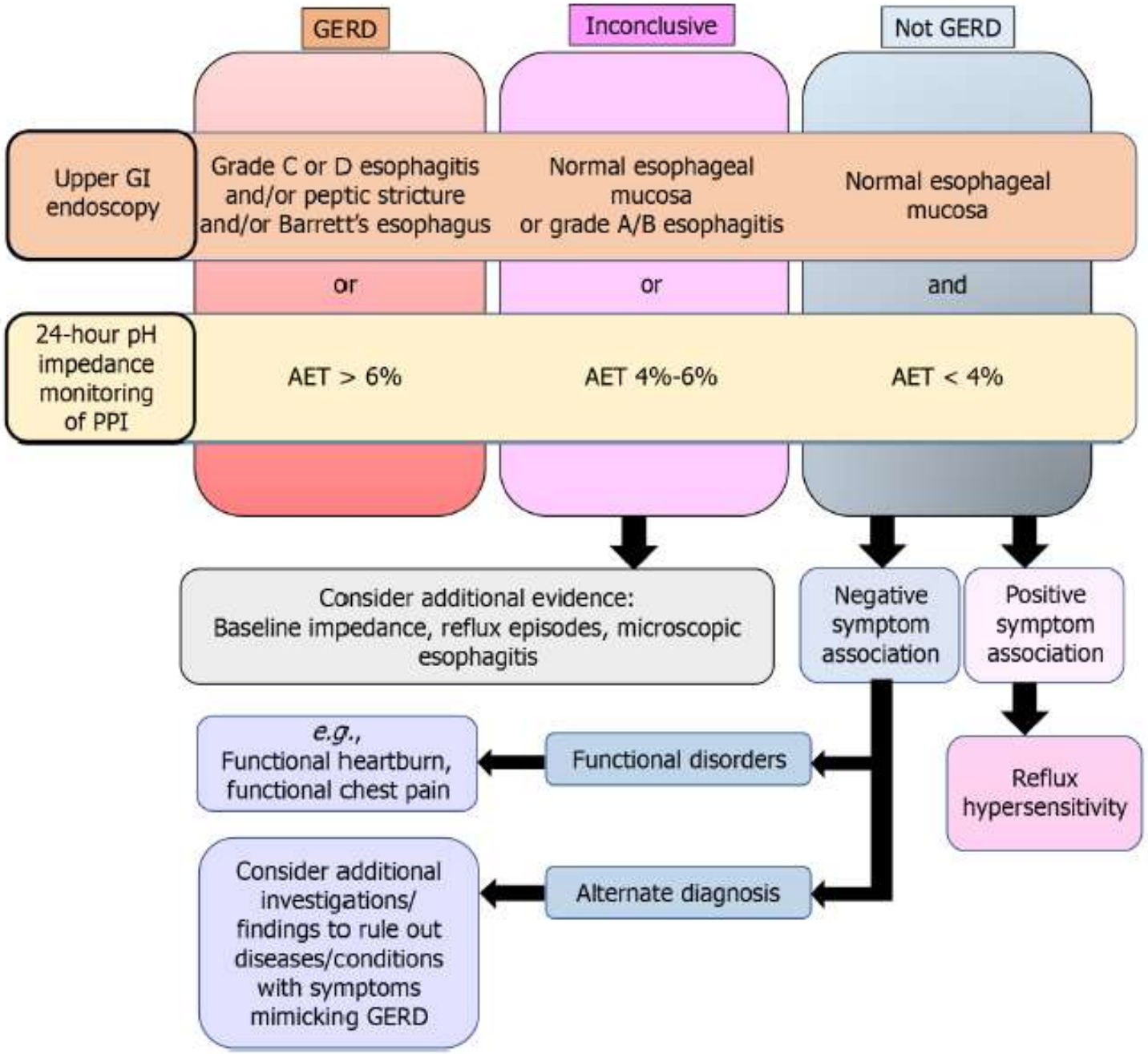
Recommended in treatment-resistant GERD

- To exclude achalasia
  hiatal hernia
  abnormal LES pressures
  esophageal dysmotility

To identify the exact location of the LES, which helps with the accurate placement of pH sensors

Combined impedance and HRM can also differentiate GERD from rumination

Chen X, Wang F. London: IntechOpen, 2019
Martos Vizcaino E et al. *J Neurogastroenterol Motil* 2018; 24: 503-505



Updates to consensus in diagnosis of GERD

Lyon consensus

+

Porto consensus

+

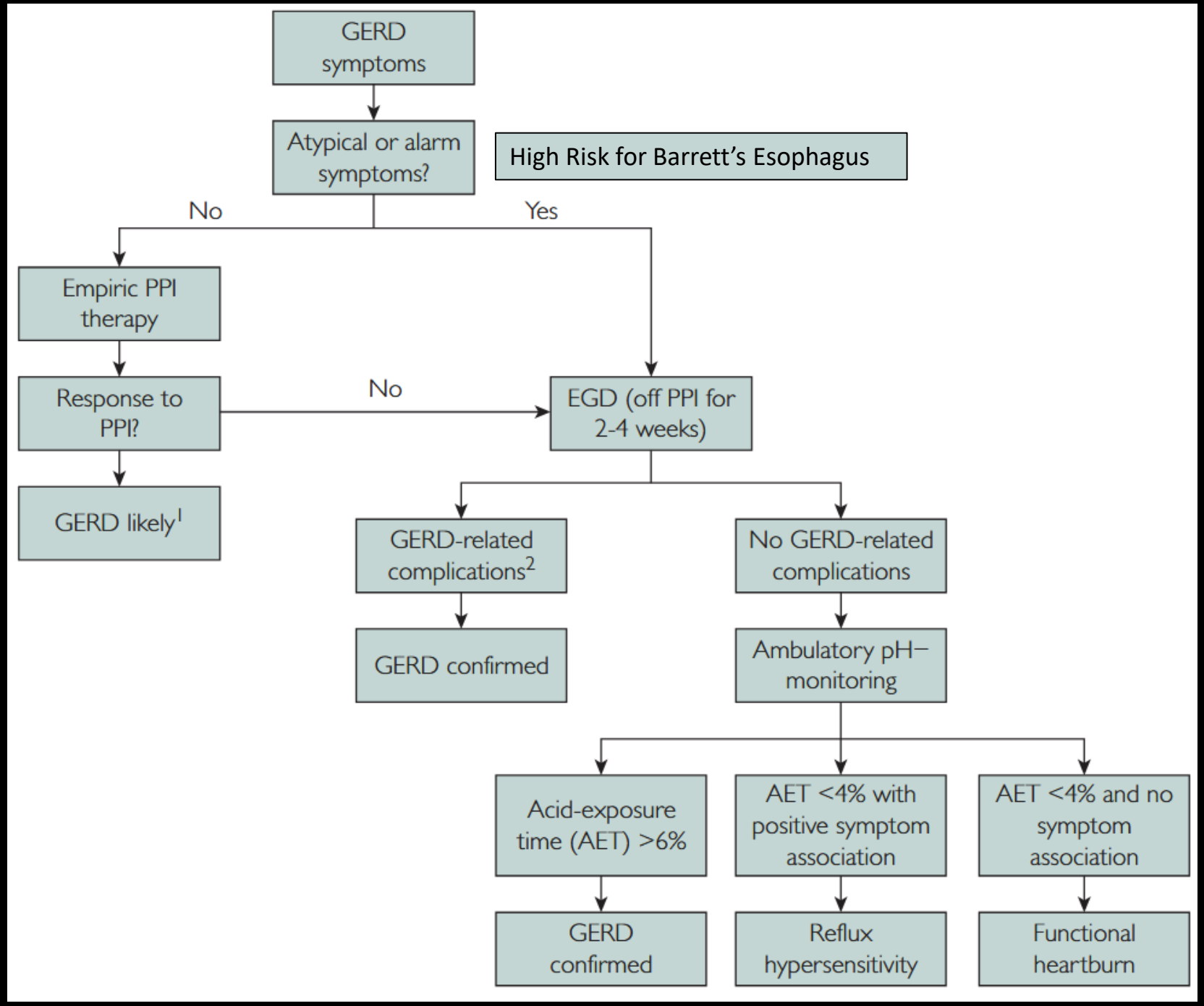
British society of Gastroenterology guideleines

+

American College of Gastroenterology guidelines

Wickramasinghe N *et al*. *World J Gastrointest Pharmacol Ther* 2025 March 5; 16(1): 97918

- Are all these investigations required for diagnosis of GERD ?



Alarm symptoms
- Dysphagia
- Odynophagia
- Anemia
- Bleeding
- Weight loss

High Risk for Barrett's Esophagus
- Chronic and/or Frequent Symptoms
- Age > 50 years
- Caucasian Race
- Central Obesity

Phillips, Hannah R. et al. Mayo Clinic Proceedings, Volume 100, Issue 5, 882 - 889

Treatment

Aim

- To relieve symptoms, heal any damage to the esophagus, and prevent complications

- Lifestyle Modification

- Pharmacological Treatment

- Endoscopic Treatment

- Surgery

Lifestyle Modification

1. Weight Management and Obesity

- reduction in BMI of 2 kg/m2 or more - 32% increase in symptom improvement

Park, S.K et al. Neurogastroenterol. Motil. **2017**, 29, e13009

2. Meal Timing and Eating Behaviors

- To avoid meals within 3 h of bedtime
- To eat smaller, more frequent meals rather than large, heavy ones
- To remain upright for several hours after eating, avoiding immediate recumbency
- To eat slowly and stop before feeling completely full

Katz, P.O et al. ACG Clinical Guideline for the Diagnosis and Management of Gastroesophageal Reflux Disease. Am. J. Gastroenterol. **2022**, 117, 27–56.

Lifestyle Modification

3. Dietary Triggers and Individualized Food Avoidance

- Spicy and acidic food, caffeine, chocolate, fatty meals, peppermint, and carbonated beverages.

- Blanket dietary restrictions may be unnecessarily burdensome and, in some cases, ineffective

MY REFLUX SYMPTOM DIARY

Keeping a diary of your diet, lifestyle activities and symptoms can be very useful for diagnosing and managing a health condition with your GP. Include any medication or action you take.

DAY 1

TIME OF DAY	FOOD / DRINK / ACTIVITY	SYMPTOMS	MEDICATION
9am	Bacon Sandwich with ketchup	Heartburn	Gaviscon
11am	Gardening	Coughing	None

DAY 2

TIME OF DAY	FOOD / DRINK / ACTIVITY	SYMPTOMS	MEDICATION

Patient symptom diaries or structured elimination-rechallenge protocols, allowing clinicians to help patients avoid unnecessary dietary restrictions while still managing symptoms effectively.

Piesman, M. et al. Am. J. Gastroenterol. **2007**, 102, 2128–2134.

Lifestyle Modification

4. Alcohol

- Meta-analysis of 30 observational studies
- Alcohol consumers - 1.5-times higher odds of developing GERD than non- or occasional drinkers ($p < 0.001$).
- If a person drinks alcohol more than 3–5 times a week, there is almost double the chance of developing acid reflux conditions.

Pan, J et al. Alcohol Alcohol. **2019**, 54, 62–69.

5. Smoking Cessation

- Cigarette smoke is composed of nicotine and other things, which reduce the pressure on LES.

Lakananurak, N. et al. Nutrients **2024**, 16, 464.

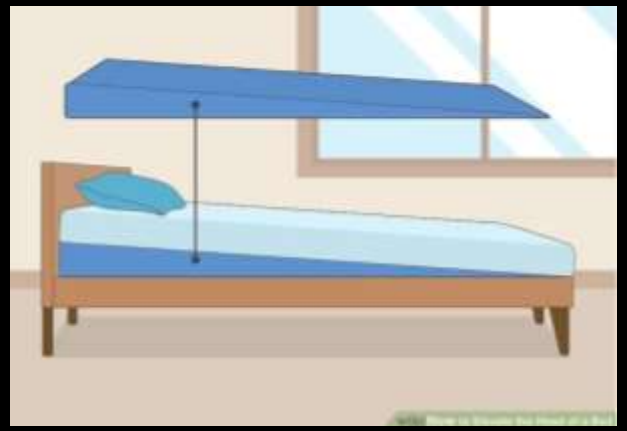
Lifestyle Modification

6. Bed Elevation and Sleeping Positions

- For any patient whose GERD symptoms are worse at night or upon awakening

  Head-of-bed elevation of approximately 30◦ and possibly left-side-sleeping position to reduce reflux.

Katz, P.O et al. Am. J. Gastroenterol. **2022**, 117, 27–56.



Treatment

Aim

- To relieve symptoms, heal any damage to the esophagus, and prevent complications

- Lifestyle Modification

- Pharmacological Treatment

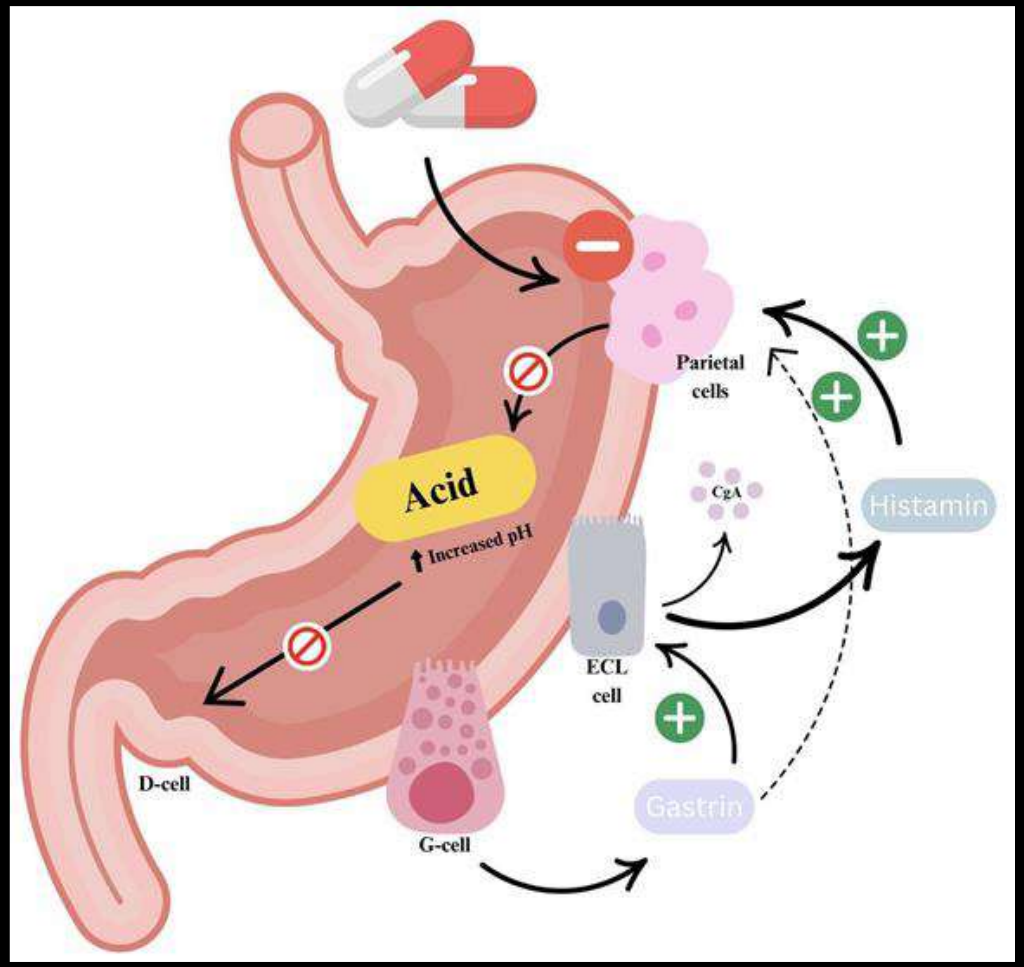
- Endoscopic Treatment

- Surgery

Pharmacological Treatment

- Proton Pump Inhibitors
- Histamine-2 receptor antagonists (H2RAs)
- Potassium-competitive acid blockers (P-CABs)
- Mucosal-protective agents such as sucralfate and alginate
- Prokinetics

Proton Pump Inhibitors - Mechanism



Sustained acid suppression
by
irreversibly inhibiting the H+/K+-ATPase enzyme
in parietal cells, the final step in gastric acid secretion

Wolfe, M.M et al. Gastroenterology **2000**, 118 (Suppl. 1), S9–S31.

Proton Pump Inhibitors – Side Effect

PPIs

↓

Sustained increase in intragastric pH

↓ reduces

Somatostatin-mediated inhibition of gastrin release

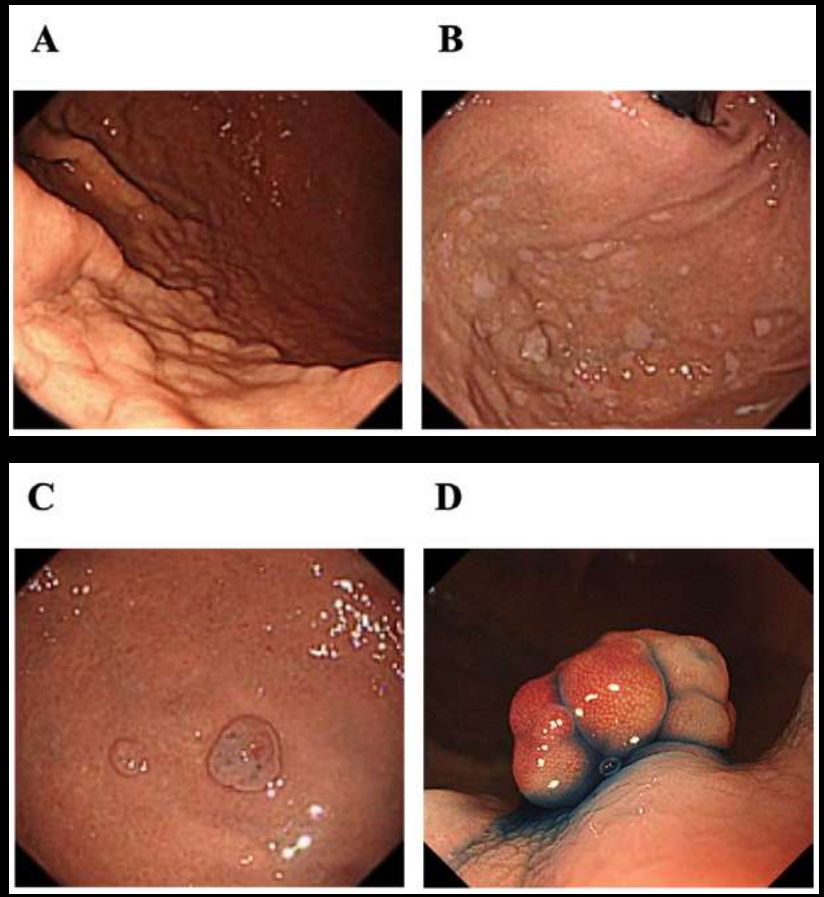
↓

Hypergastrinemia

↓ promotes

Gastric mucosal proliferation,

including enterochromaffin-like (ECL)



PPI-related endoscopic images:
(A) cracked and cobblestone-like mucosa;
(B) multiple white and flat elevated lesions;
(C) fundic gland polyps and black spots;
(D) hyperplastic polyps

Wickramasinghe N *et al*. *World J Gastrointest Pharmacol Ther* 2025 March 5; 16(1): 97918

Suda, H et al. Diagnostics 2024, 14, 2540.

Proton Pump Inhibitors – Cornerstone of GERD treatment

- Despite these physiological changes

  Due to strong acid suppression and proven clinical efficacy

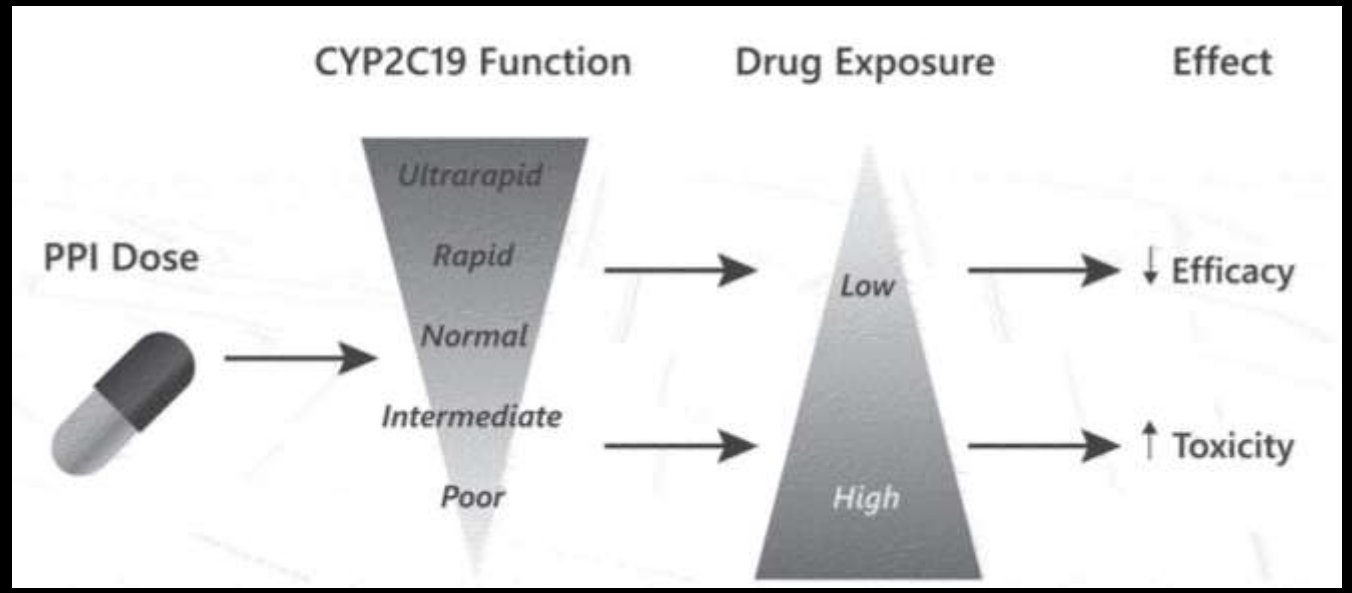
PPIs heal 80–90% of erosive esophagitis within 8 weeks and provide significant symptom relief in the majority of GERD patients

Weijenborg, P.W et al. Neurogastroenterol. Motil. **2012**, 24, 747–757, e350

Proton Pump Inhibitors – Generation of PPI

- Efficacy and metabolism of PPI are influenced by genetic variability, notably in the CYP2C19 enzyme,

  which metabolizes many PPIs.



Proton pump inhibitor (PPI)	Cytochrome P450 metabolism
Omeprazole	Major: CYP2C19 Minor: CYP3A4
Esomeprazole	Major: CYP2C19 Minor: CYP3A4
Pantoprazole	Major: CYP2C19 Minor: CYP3A4
Lansoprazole	CYP2C19 CYP3A4
Rabeprazole	Major: Non-enzymatic Minor: CYP2C19 Minor: CYP3A4

Rabeprazole is mainly metabolized through non-enzymatic pathways, making it potentially preferable in CYP2C19 variant carriers

Jeong, S.H. et al. Biomedicines **2023**, 11, 3021.

Scott, Stuart & Owusu Obeng, Aniwaa & Hulot, Jean-Sebastien. (2013). Expert opinion on drug metabolism & toxicology. 10. 10.

Proton Pump Inhibitors – Timing, Dosing

- should be taken 30–60 min before breakfast, when proton pump activation is highest

- Once-daily dosing controls symptoms in most patients
- Those with refractory or nocturnal symptoms may benefit from twice-daily dosing

Zhao, X et al. Front. Pharmacol. **2022**, 13, 938419

Kaartinen, T.J.K et al. Clin. Pharmacol. Ther. **2020**, 108, 1254–1264

Proton Pump Inhibitors – Duration

Initial 4–8-week course - aimed at healing and symptom control

Uncomplicated cases

Step-down approach

- **Dose reduction**
- **Transition to on-demand**
- **Intermittent therapy**
- **Switching to H2RAs**

Los Angeles (LA) grade C or D esophagitis
Peptic strictures
Barrett's esophagus
Rapid relapse after PPI withdrawal

Long-term maintenance therapy

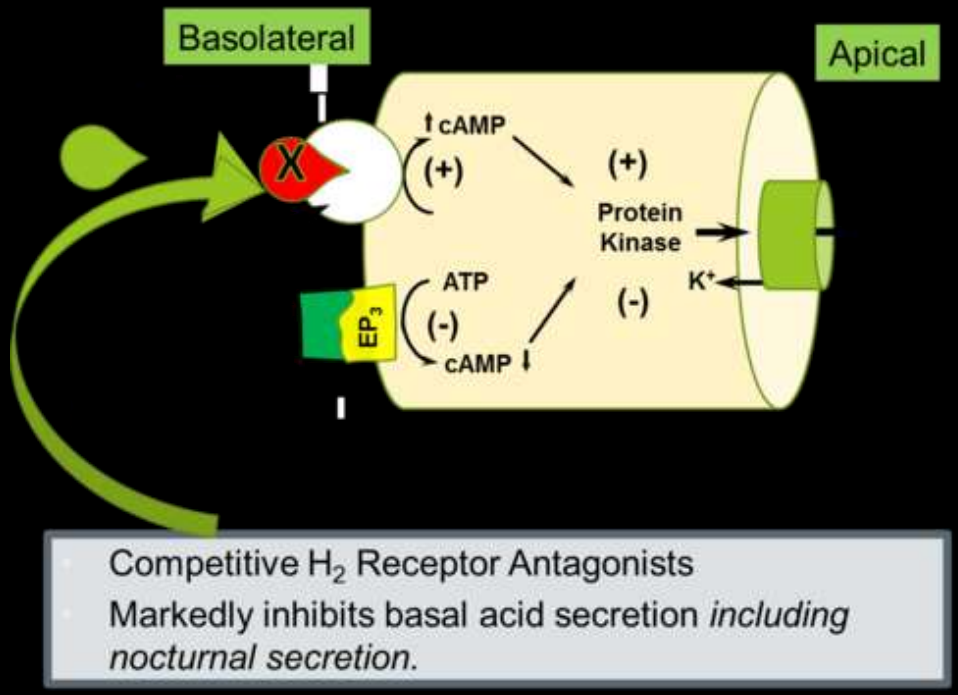
Chen, J.W et al. Clin. Gastroenterol. Hepatol. **2023**, 21, 1414–1421.e3

Histamine H2-Receptor Antagonist

- H2RAs inhibit acid secretion by blocking histamine H2 receptors on gastric parietal cells, thereby reducing cyclic AMP-mediated stimulation of the proton pump

- Standard doses of H2RAs heal approximately 40% of erosive esophagitis cases over 4–12 weeks

- SE : Tachyphylaxis



Zhao, F.; Wang, S.; Liu, L.; Wang, Y. Int. J. Clin. Pharmacol. Ther. **2016**, 54, 761–770.

Histamine H2-Receptor Antagonist

- Histamine is an important driver of nocturnal acid secretion

	Nocturnal acid breakthrough (NAB)	P valvue
PPI BD	64%	< 0.001
PPI BD + H2RA Hs	17%	

	Percent Time intagastric pH<4			
	Upright	Recumbent	Entire period	P value
PPI BD	29.1	33.5	31.5	< 0.001
PPI BD + H2RA Hs	18.3	12.5	18	

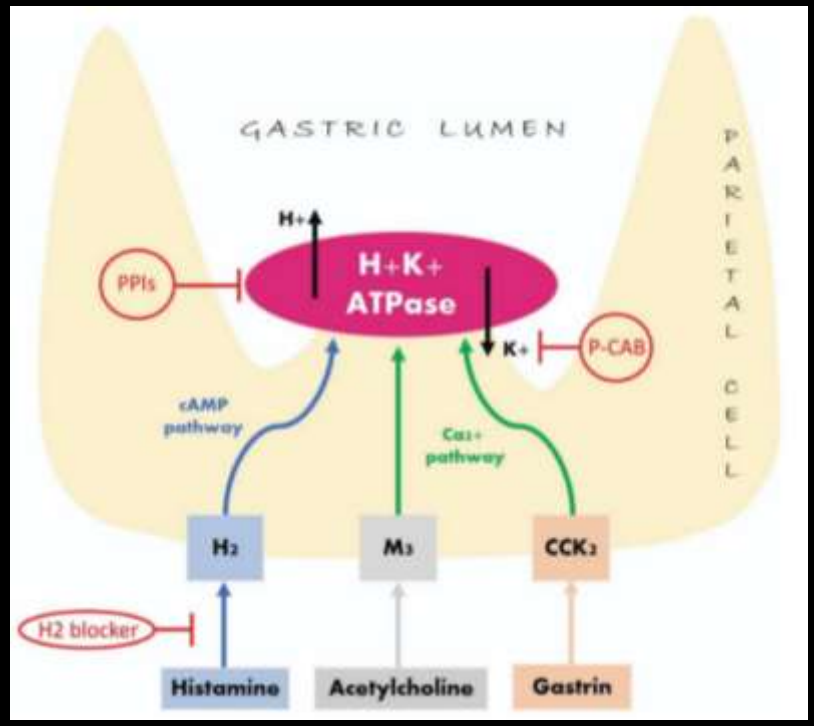
Mainie I et al. J. Clin Gastroenterol. (2008) 42:676–9. doi: 10.1097/MCG.0b013e31814a4e5c

Potassium-Competitive Acid Blockers (P-CAB)

- Vonoprazan, Tegoprazan, Fexuprazan, Keverprazan Revaprazan

(Vonoprazan - being the most extensively studied and widely used)

- P-CAB works by competitively blocking potassium ions from binding to the H+/K+ ATPase, thereby preventing gastric acid secretion in a reversible manner



P – CAB vs PPI

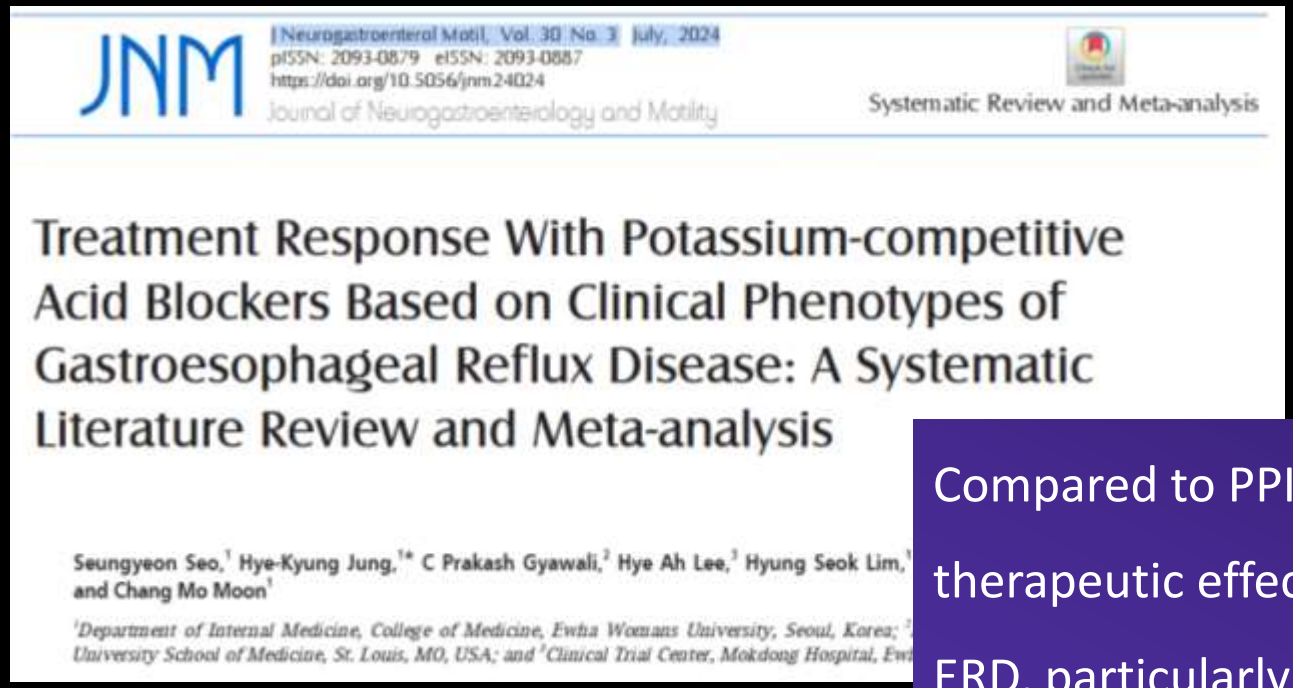
Pharmacologic Feature	PPI	P-CAB [x]
Chemical structure	Substituted benzimidazoles	Revaprazan Vonoprazan Tegoprazan
Steady state after oral dosing	3–5 days	1 day
Plasma half-life	2 h	8–17 h
CYP2C19 polymorphism	Differential influence	No influence
Proton pump activation	Necessary	Not necessary
24 h intragastric pH > 4	46–58%	82.9–85.9%
Acid suppression at night % (pH > 4 HTR)	12.9 ± 10.9 (ESO), 15.3–13.3 (R)	67.9 ± 28.3.
Effect on *H. pylori*	Urease inhibition	Urease inhibition
Effect on urea breath test	Reduction of DOB‰, may result in a false negative test	Reduction of DOB‰, may result in a false negative test
Influence of meal	Reduced effect after meal	No influence
Short-term side effects	Headache, rush, dizziness, constipation, diarrhoea, flatulence, abdominal pain	Diarrhoea, constipation, eczema, upper respiratory tract inflammation in <5% of cases
Long-term side effects [xx]	Fundic polyps, B_{12} vitamin and micronutrient deficiency, liver disease, hypomagnesemia, kidney disease	Under investigation

Buzás, György & Birinyi, Péter. (2023). Antibiotics. 12. 946. 10.3390/antibiotics12060946.

Potassium-Competitive Acid Blockers (P-CAB) – Efficacy in GERD

Systematic reviews and randomized trials show that vonoprazan 20 mg/d is overall non-inferior to conventional PPIs, while conferring a clear healing advantage in patients with severe erosive esophagitis (LA C/D)

Potassium-Competitive Acid Blockers (P-CAB) – Efficacy in GERD



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Journal of Neurogastroenterology and Motility

Systematic Review and Meta-analysis

Treatment Response With Potassium-competitive Acid Blockers Based on Clinical Phenotypes of Gastroesophageal Reflux Disease: A Systematic Literature Review and Meta-analysis

Seungyeon Seo,[1] Hye-Kyung Jung,[1]* C Prakash Gyawali,[2] Hye Ah Lee,[3] Hyung Seok Lim,[1] and Chang Mo Moon[1]

[1]Department of Internal Medicine, College of Medicine, Ewha Womans University, Seoul, Korea; [2]... University School of Medicine, St. Louis, MO, USA; and [3]Clinical Trial Center, Mokdong Hospital, Ew...

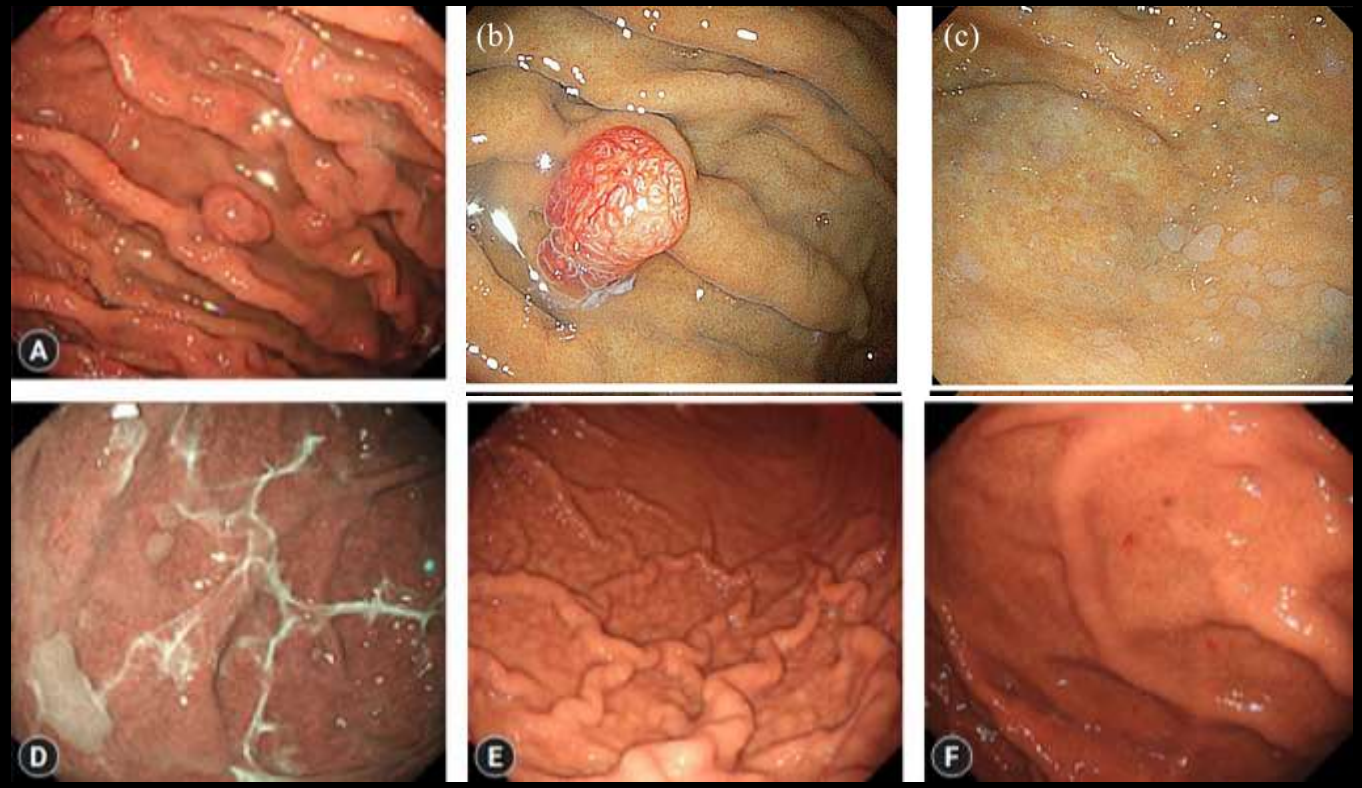
Compared to PPIs, PCABs have superior efficacy and faster therapeutic effect in the initial and maintenance therapy of ERD, particularly severe ERD.

While PCABs may be an alternative treatment option in NERD and PPI-resistant GERD, findings were inconclusive in patients with night-time heartburn.

Potassium-Competitive Acid Blockers (P-CAB) – Side Effect

P-CAB-related gastric mucosal lesions

- Fundic gland polyps
- Hyperplastic polyps
- Multiple white and flat elevated lesions
- Cobblestone-like mucosa
- Black spots
- Web like Mucous



Kubo et al. P-CAB-associated gastropathies

Shinozaki et al. DEN Open. 2025;5:e400.

Mucosal-protective agents

- do not significantly alter gastric acid secretion
- form physical barriers over the mucosa and enhance endogenous defense mechanisms such as

mucus and bicarbonate secretion, thereby protecting the esophageal lining from acid-induced

injury

➡ Sucralfate – suitable for specific populations (PPI intolerance, Pregnancy)

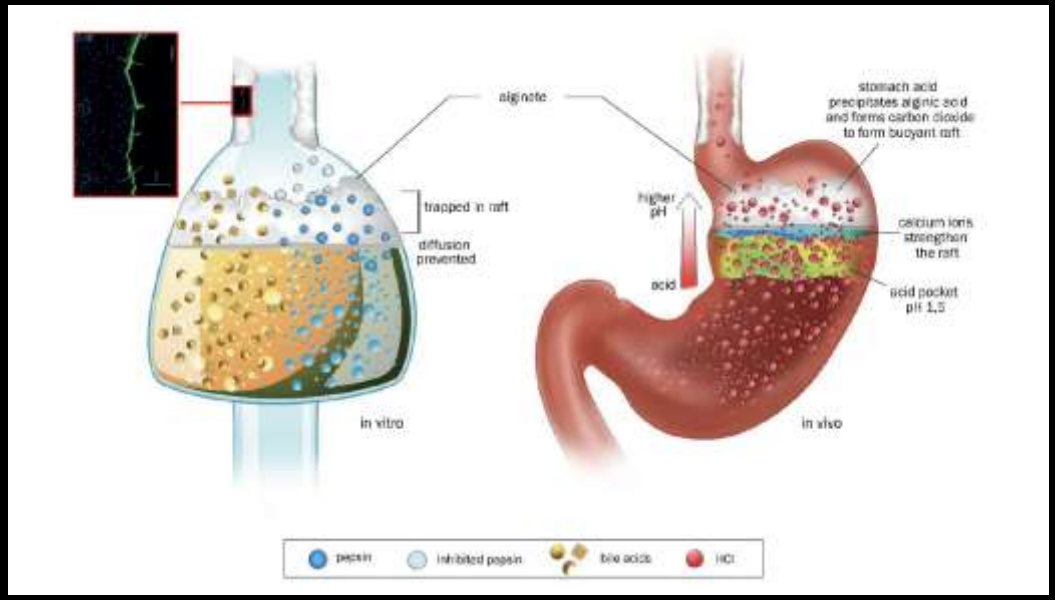
➡ Alginate – suited for residual regurgitation or postprandial symptoms despite acid suppression

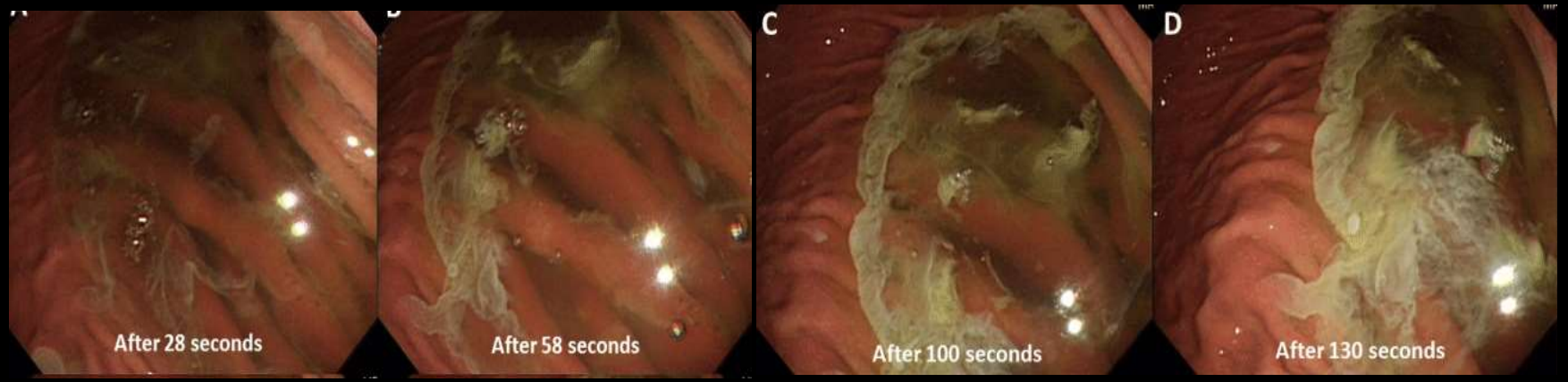
Weberg, R.; Berstad, A. Symptomatic effect of a low-dose antacid regimen in reflux oesophagitis. Scand. J. Gastroenterol. **1989**, 24, 401–406.

Mucosal Protective Agents - Alginate

- precipitate into a viscous gel that may create a physical barrier to the so-called “acid pocket,” which may not be completely eliminated by PPIs

- decrease the severity and frequency of heartburn when used **postprandially** as **add-on therapy** to PPIs

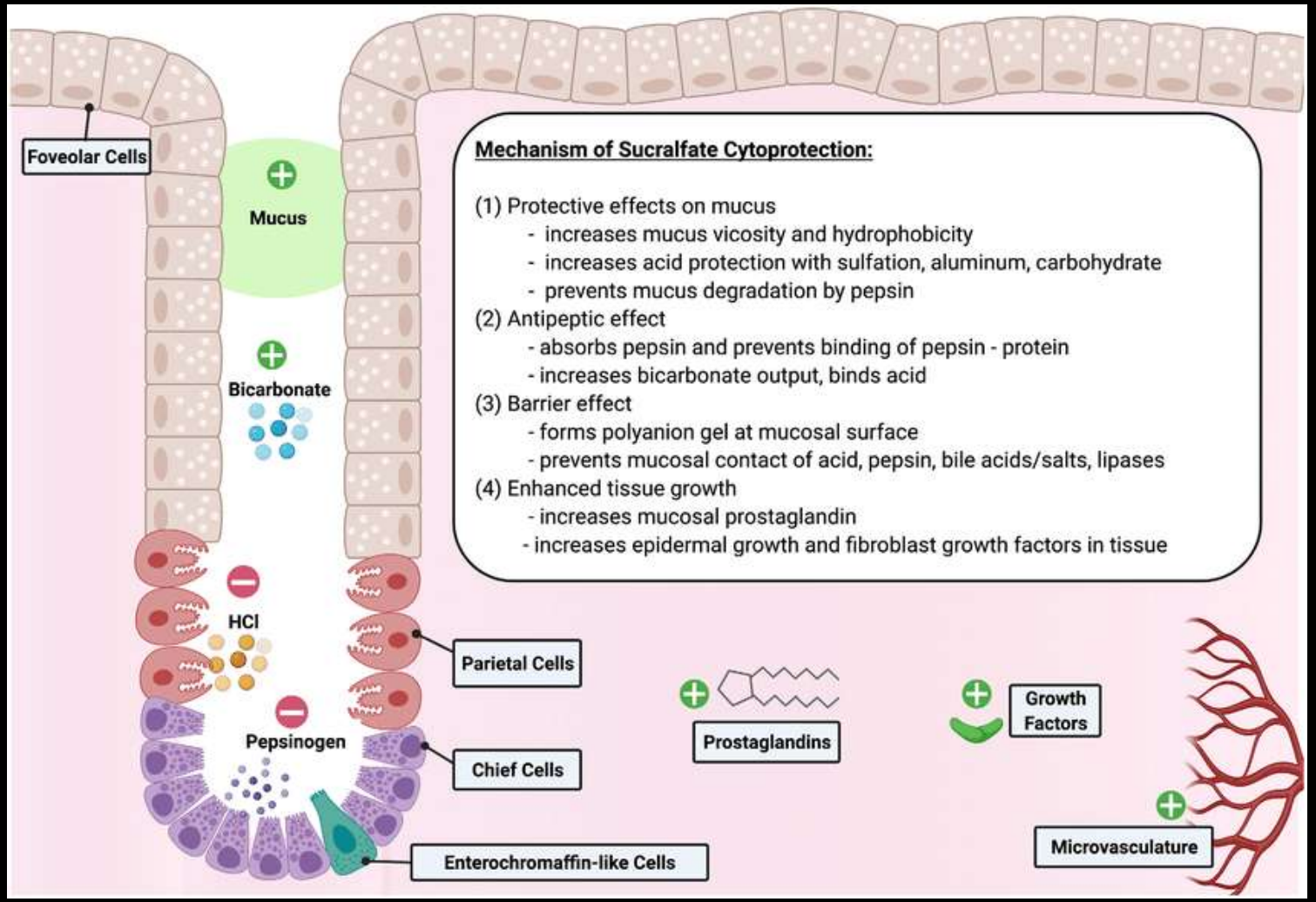




Rettura F et al. Front. Med. 8:765061.

Mucosal Protective Agents - Sucralfate

- Improving mucosal healing of erosive mild grade esophagitis
- Due to the ability of binding bile salts, it could be of help also in WAR and/or WalkR



Rettura F et al. Front. Med. 8:765061. doi: 10.3389/fmed.2021.765061

Prokinetics

- Approximately 40% of patients with FD have impaired gastric accommodation causing LES relaxations resulting in GERD-FD overlap.

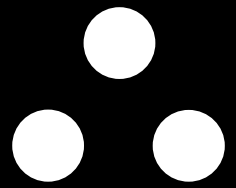
Chaudhuri S. Int J Res Med Sci. 2023 Oct;11(10):3937-3944

Meta-analysis in 2020

- Global prevalence of FD-GERD overlap - 7.4%
- Significant symptom overlap with 41.2% of FD symptoms in GERD patients
- Significant symptom overlap with 31.3% of GERD symptoms in the FD patients

Geeraerts A et al. Am J Gastroenterol. 2020;115(8):1167-82.

Prokinetics



- Metoclopramide
- Clebopride
- Domperidone
- Erythromycin
- Mosapride
- Itopride
- Prucalopride
- Tegaserod
- Acotiamide

- Increase lower esophageal sphincter pressure (LESP)
- Enhance esophageal peristalsis
- Augment gastric emptying

Several meta-analyses

Prokinetics + PPI > PPI Monotherapy

- Significant improvement in symptom response
- Greater symptom relief
- Improvement in quality of life

Flook NW, Wiklund I. Int J Clin Pract 2007;61: 2071–8.

- What can we do if GERD symptoms are refractory?

To confirm the Dx of GERD

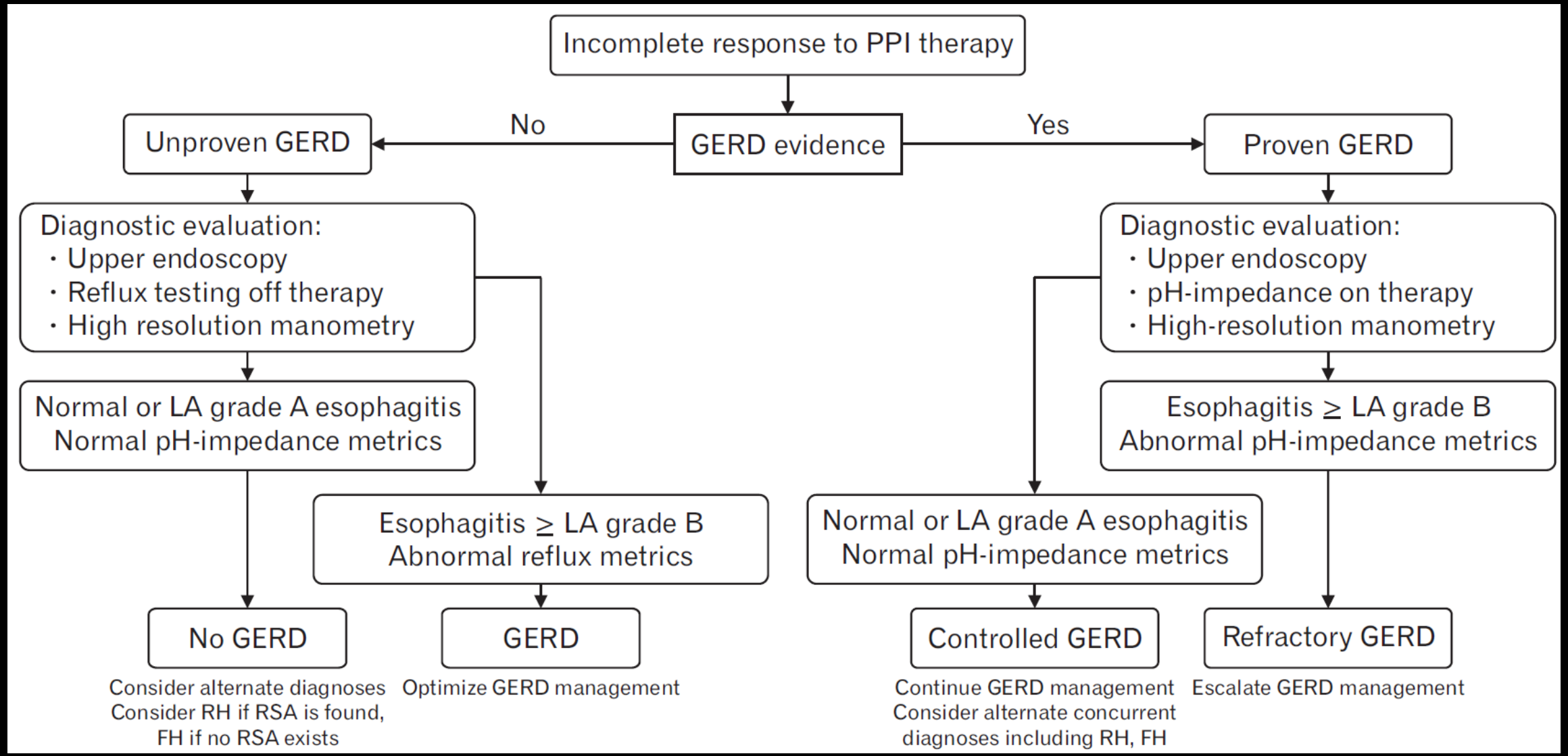
To optimize medication

To consider additional or alternative treatment plan

To exclude differential diagnosis

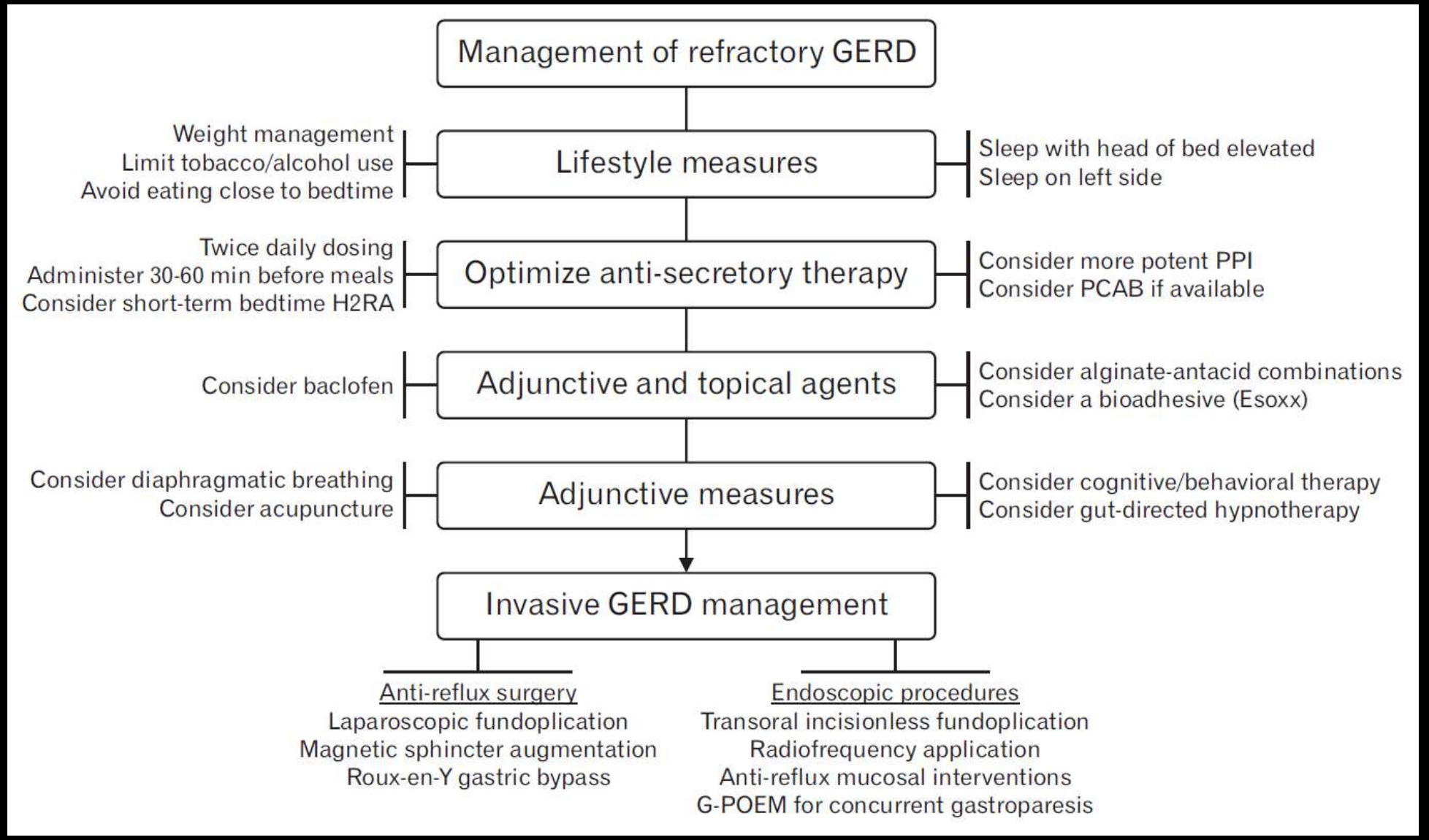
(eosinophilic esophagitis, delayed gastric emptying, and functional esophageal disorders)

Refractory GERD symptoms



Trevor A Davis and C Prakash Gyawali. J Neurogastroenterol Motil, Vol. 30 No. 1 January, 2024

Refractory GERD



Trevor A Davis and C Prakash Gyawali. J Neurogastroenterol Motil, Vol. 30 No. 1 January, 2024

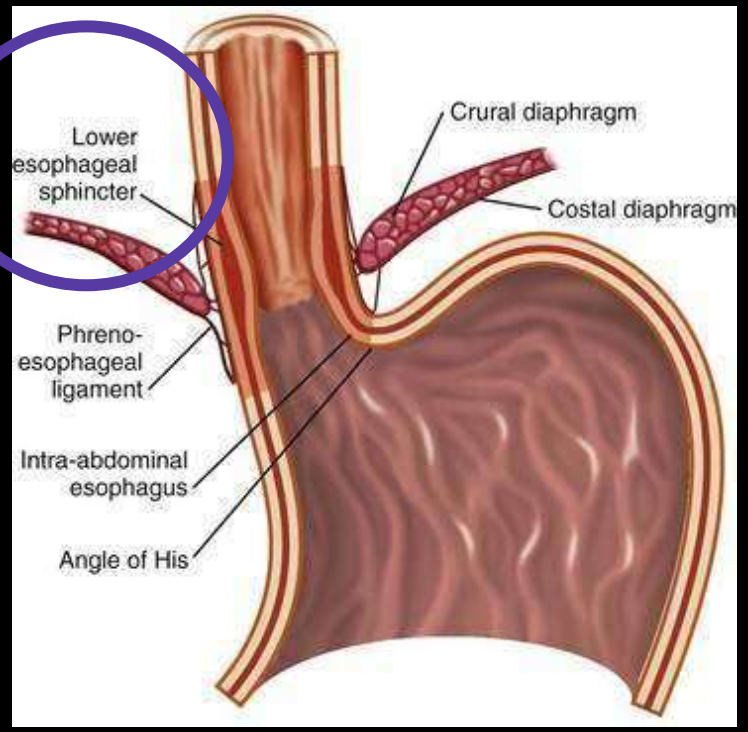
Adjunctive agents
Gamma Aminobutyric Acid-B Receptor Agonists (GABA-B) - Baclofen

TLESRs - primary mechanism of gastroesophageal reflux

Baclofen - reduces frequency of TLESRs

SE : sedation, lightheadedness, CNS depression, Short half-life

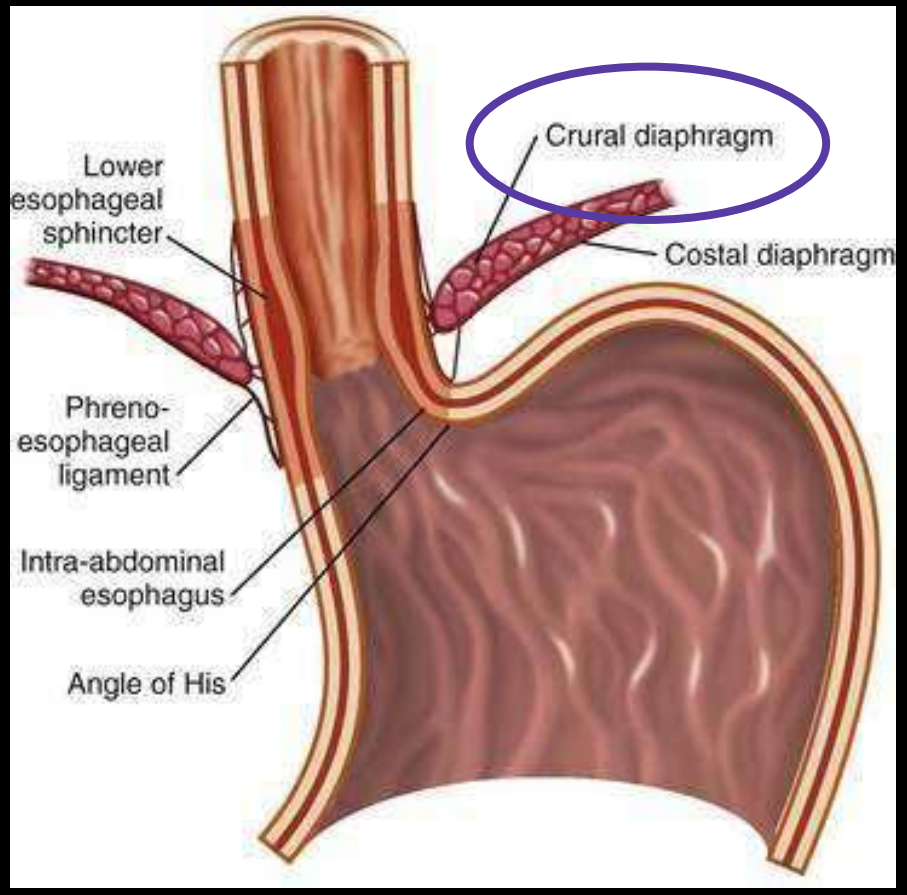
Unfortunately,
No reflux-specific GABA-B agonist is currently available



Li S et al. Gastroenterol Res Pract 2014;2014:307805

Trevor A Davis and C Prakash Gyawali. J Neurogastroenterol Motil, Vol. 30 No. 1 January, 2024

Adjunctive Measure - Diaphragmatic breathing



Published in final edited form as:
Dysphagia. 2023 April ; 38(2): 609–621. doi:10.1007/s00455-022-10494-6.

Breathing Exercises in Gastroesophageal Reflux Disease: A Systematic Review

Lucie Zdrhova[1,2], Petr Bitnar[3], Karel Balihar[1], Pavel Kolar[2,3], Katerina Madle[2], Milan Martinek[4], John Erik Pandolfino[5], Jan Martinek[6]

Eleven eligible studies (including RCTs)

DBT should be part of the therapeutic approach for all GERD phenotypes, including patients with varying degrees of hiatus hernia.

Adjunctive Measure - Diaphragmatic breathing

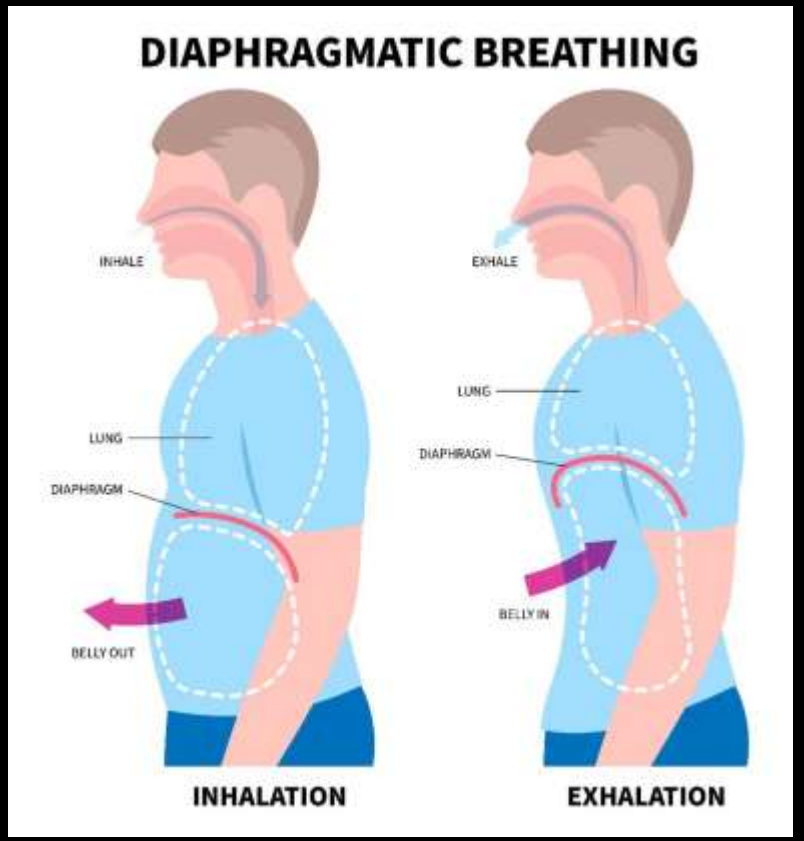
Find a comfortable position: You can lie on your back with your knees bent or sit upright in a chair.

•**Place your hands:** Place one hand on your chest and the other on your belly, just below your rib cage.

•**Inhale slowly:** Breathe in slowly through your nose, feeling your belly rise as your diaphragm contracts and moves downward. Your chest should remain relatively still.

•**Exhale slowly:** Breathe out slowly through your mouth, allowing your belly to fall as your diaphragm relaxes and returns to its resting position.

•**Repeat:** Continue breathing deeply and slowly for several minute



Adjunctive Measure – Esophageal Directed Hypnotherapy

Neurogastroenterology & Motility

ORIGINAL ARTICLE

The clinical value of psycho-gastroenterological interventions for functional esophageal symptoms

Edward Hurtte, Benjamin D. Rogers, Cheryl Richards, C. Prakash Gyawali

First published: 07 January 2022 | https://doi.org/10.1111/nmo.14315 | Citations: 2

Behavioral interventions, including CBT and hypnotherapy, have shown promise in patients with symptoms exacerbated by stress, anxiety, or esophageal hypervigilance.

ORIGINAL ARTICLE | FUNCTIONAL DISORDERS · Volume 22, Issue 8, P1709-1718.E3, August 2024

Behavioral Therapy for Functional Heartburn: Recommendation Statements

Livia Guadagnoli [1] · Rena Yadlapati [2] · John Pandolfino [3] · ... · Madison Simons [10] · Kathryn N. Tomasino [5] · Tiffany Taft [5] ...

Show more

These therapies aim to reduce the psychological burden of GERD and improve coping mechanisms, leading to better symptom control and quality of life.

Adjunctive Measure – Esophageal Directed Hypnotherapy

- comfortable position in the relaxation chair
- focus on the psychologist's voice and the subject's bodily sensations,
- inducing passive muscle relaxation

  using mindfulness based strategies

  using numerical counting method with a visual metaphor (i.e. going down a staircase),

  using visual imagery to induce comfort and relaxation localized to the esophagus and chest,

  and re-alerting by counting back from 20 to 1 and achieving a state of full alertness.
- Daily at home (approximately 5 times per week)

Riehl ME et al. Dis Esoph. (2016) 29:490–6. doi: 10.1111/dote.12353

Adjunctive Measure – Neuromodulation

Published in final edited form as:
J Transl Gastroenterol. 2023 ; 1(1): 47–56.

Neuromodulation for Gastroesophageal Reflux Disease: A Systematic Review

Jia Yi Woo[1,*], Victor Pikov[2], Jiande D.Z. Chen[3,*]

1. LES electrical stimulation using an implantable electrical stimulator
2. Transcutaneous electrical acustimulation
3. Manual acupuncture

- Electrical stimulation significantly increased LES pressure.

- Transcutaneous electrical acustimulation significantly improved esophageal motility, gastric motility,
and parasympathetic activity.

- None of the evaluated neuromodulation methods produced severe adverse effects.

Adjunctive Measure – Neuromodulation (Acupuncture)

Table 2: Changes of esophageal motility after intervention between the acupuncture group and the control group.

	Acupuncture group ($n = 33$)			Control group ($n = 35$)		
	Before	After	P-value	Before	After	P-value
LES length (cm)	3.10 ± 1.08	3.78 ± 1.01	≤0.01*	3.45 ± 0.90	3.63 ± 0.87	0.109
Intra-abdominal LES length (cm)	2.14 ± 1.05	2.75 ± 1.16	0.002*	2.27 ± 1.01	2.35 ± 1.33	0.202
LESP (mmHg)	22.02 ± 10.03	25.06 ± 11.48	0.014*	23.71 ± 9.92	22.63 ± 9.21	0.393
IRP (mmHg)	11.06 ± 6.86	12.38 ± 9.33	0.114	10.94 ± 4.59	11.45 ± 4.79	0.412

Results. After acupuncture,

Significant increase in the length of lower esophageal sphincter

length of intra-abdominal lower esophageal sphincter

mean basal pressure of lower esophageal sphincter

Decrease in numbers of fragmented contraction and ineffective contraction

GerdQ score

Table 3: Esophageal pressure topography scoring of individual swallows in the acupuncture group and the control group.

		Acupuncture group (swallow = 330)			Control group (swallow = 350)		
		Before	After	P-value	Before	After	P-value
Contraction vigor	Ineffective	43	18	0.001*	36	24	0.104
	Normal	280	308	0.06	313	325	0.231
	Hypercontractile	7	4	0.362	1	1	1.000
	Premature	5	0	0.025*	6	4	0.524
Contraction pattern	Fragmented	36	12	<0.001*	37	31	0.247
	Intact	289	318	0.023*	307	315	0.198

*$p < 0.05$.

Tang et al. Gastroenterology Research and Practice Volume 2023, Article ID 4645715, 8 pages

Treatment

Aim

- To relieve symptoms, heal any damage to the esophagus, and prevent complications

- Lifestyle Modification

- Pharmacological Treatment

- Endoscopic Treatment

- Surgery

Patients with GERD who are candidates for endoscopic therapy

- those with typical GERD symptoms (heartburn and regurgitation)
- those with mild/moderate EE (LA grade A/B) or NERD
- those with hiatal hernia <3 cm
- those with complete or partial response to PPI treatment
- those who are not suitable for or not willing to undergo anti-reflux surgery
- those who are not willing to take long-term medical treatment

Endoscopic Treatment

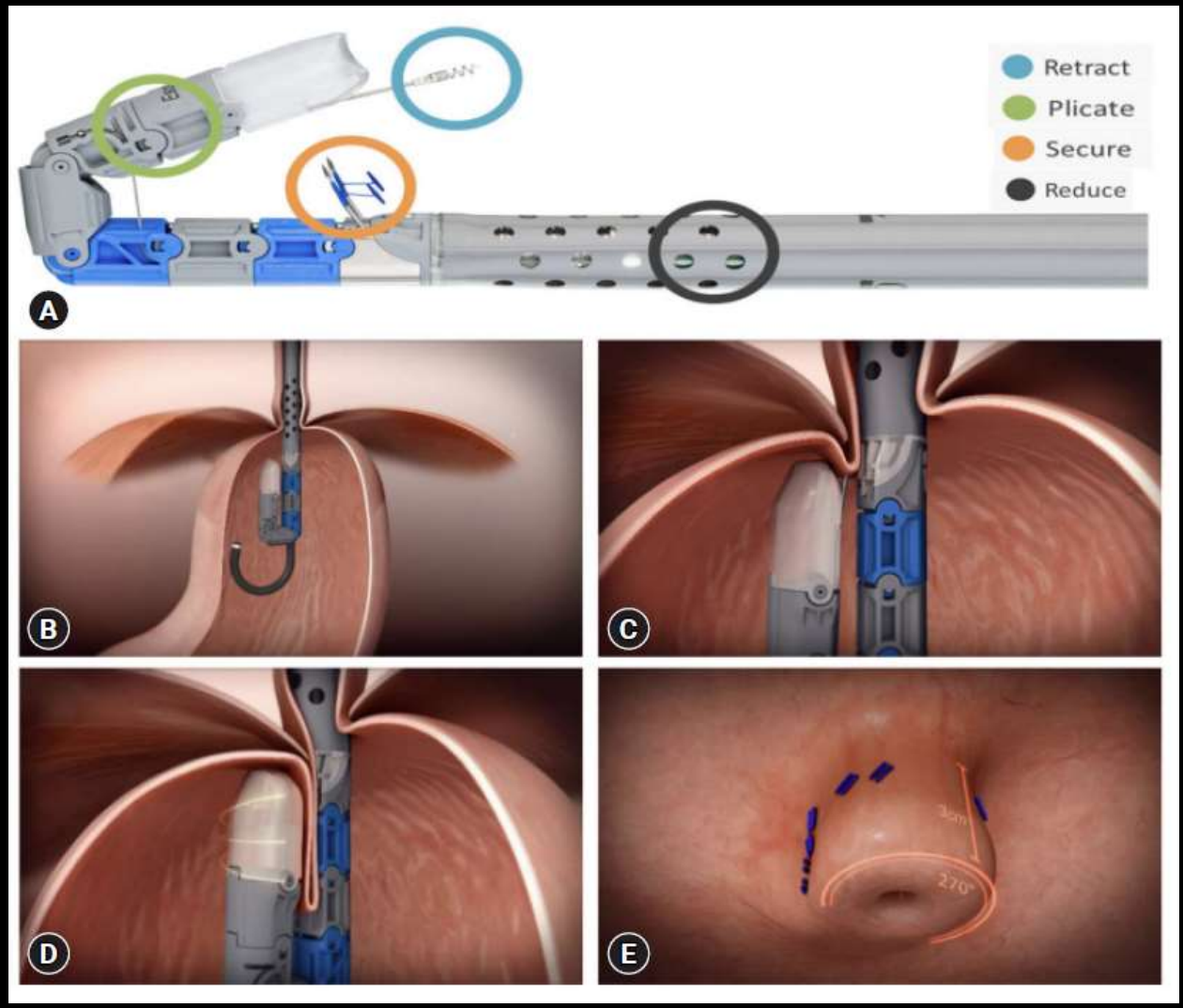
Transoral incisionless fundoplication

- TIF (EsophyX2 device) is a technique that

  reconstructs the lower esophageal sphincter

  to restore the angle of His and thus augments

  the gastroesophageal flap valve

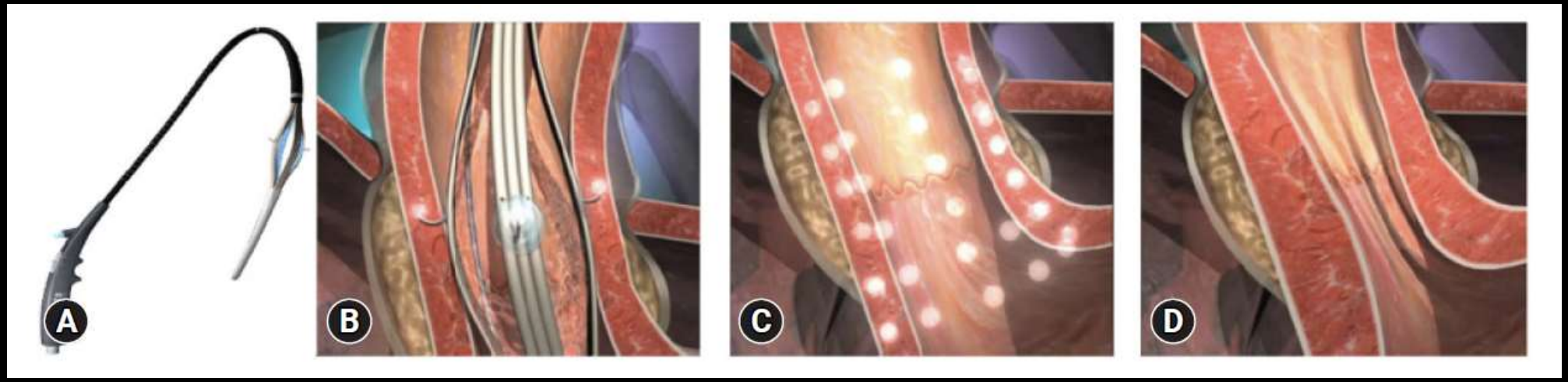


Shibli and Fass. Curr Treat Options Gastro 2021;19:399–420.

Endoscopic Treatment

Endoscopic radiofrequency/Stretta procedure

Stretta works by delivering low-power, temperature-controlled radiofrequency energy
to the EGJ region and cardia
Consequently, there is an increase in EGJ thickness due to the remodulation of the local musculature.
The procedure reduces the transient lower esophageal sphincter relaxation rate,
bolsters the EGJ,
prevents proximal migration of gastroesophageal reflux in the esophagus.



Shibli and Fass. Curr Treat Options Gastro 2021;19:399–420

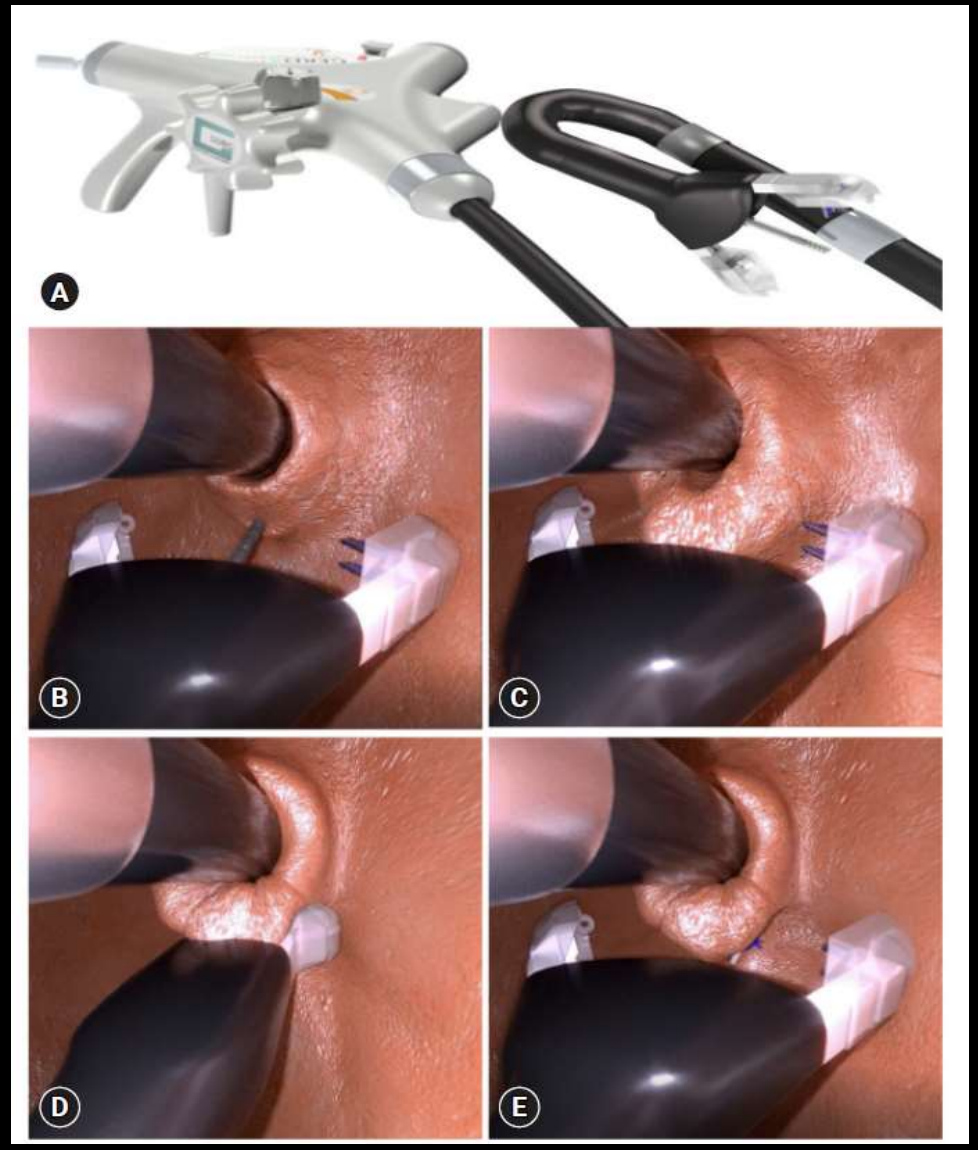
Endoscopic Treatment

GERD-X

- GERD-X (G-SURG GmbH) allows full-thickness plication,

  which is known as the endoscopic full-thickness

  fundoplication technique



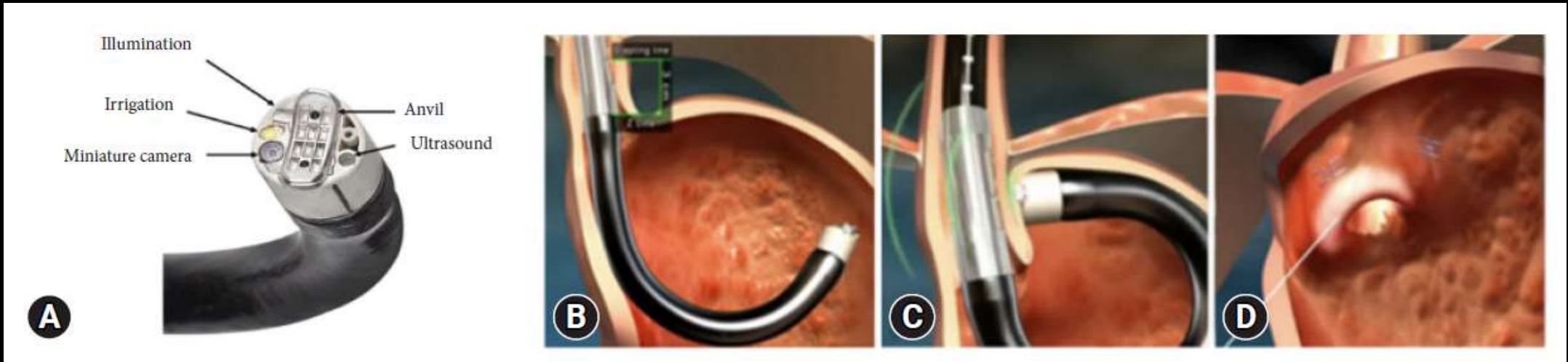
Shibli and Fass. Curr Treat Options Gastro 2021;19:399–420

Endoscopic Treatment

Medigus ultrasonic surgical endostapler (MUSE)

- transoral device that utilizes ultrasound guidance to staple the gastric fundus to create

  an anterior fundoplication

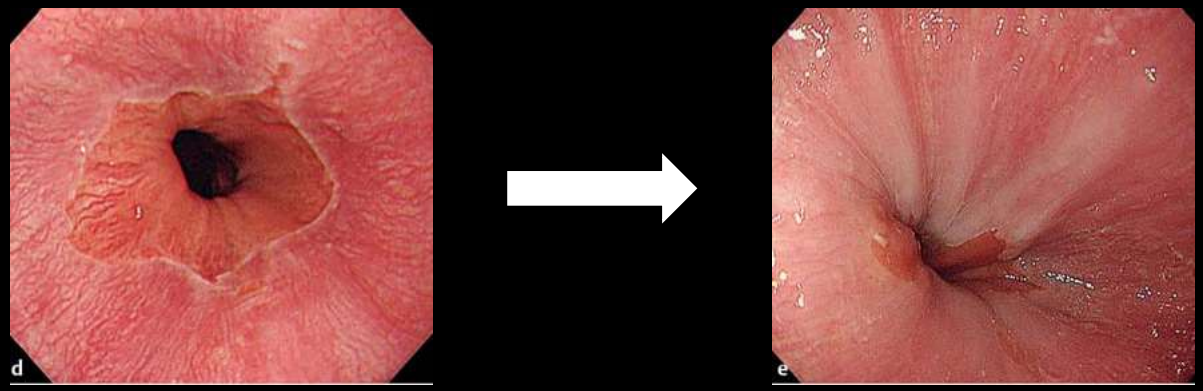


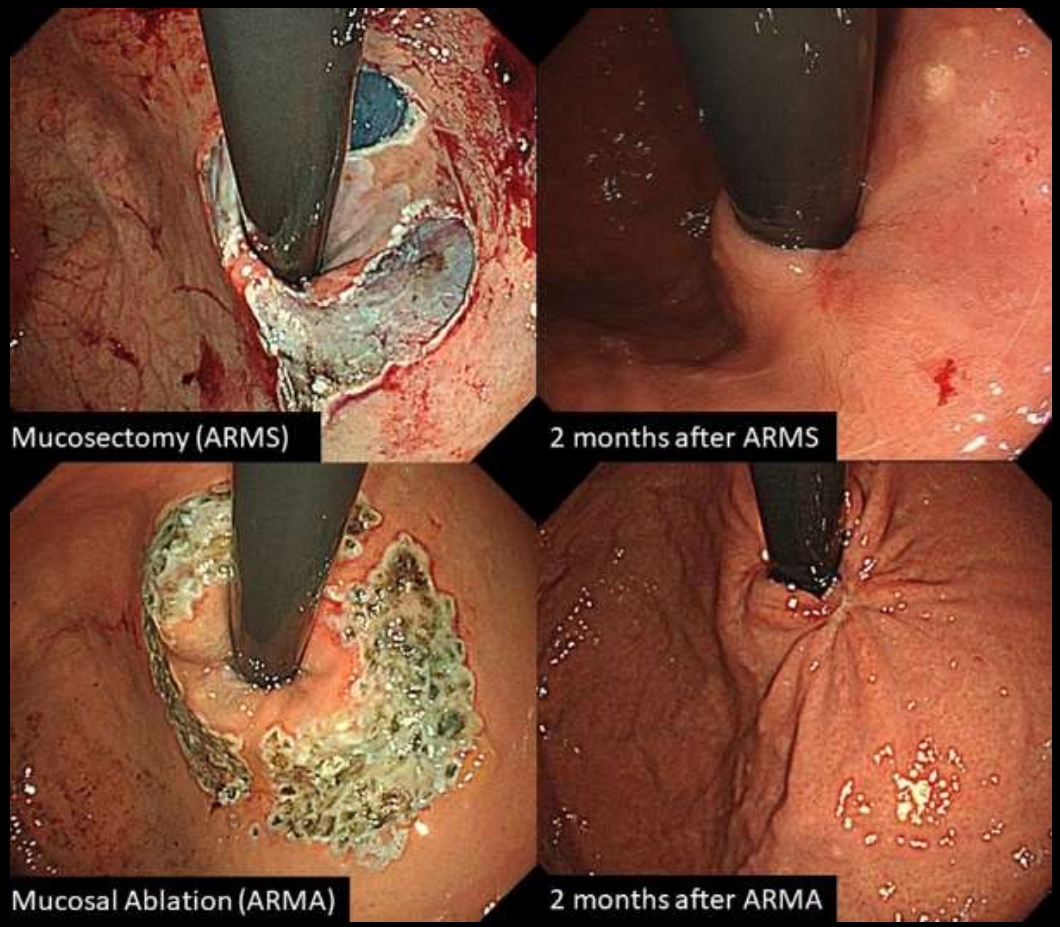
Shibli and Fass. Curr Treat Options Gastro 2021;19:399–420

Other endoscopic anti-reflux therapies

1) **Anti-reflux mucosectomy (ARMS)**
2) **Anti-reflux mucosal ablation (ARMA)**

- create mucosal defects in approximately 2/3 to 4/5 of the circumference on the lesser curvature of the cardiac mucosa, leading to scarring and, consequently, narrowing of the EGJ opening.





Other endoscopic anti-reflux therapies

3) Peroral endoscopic cardial constriction (PECC)

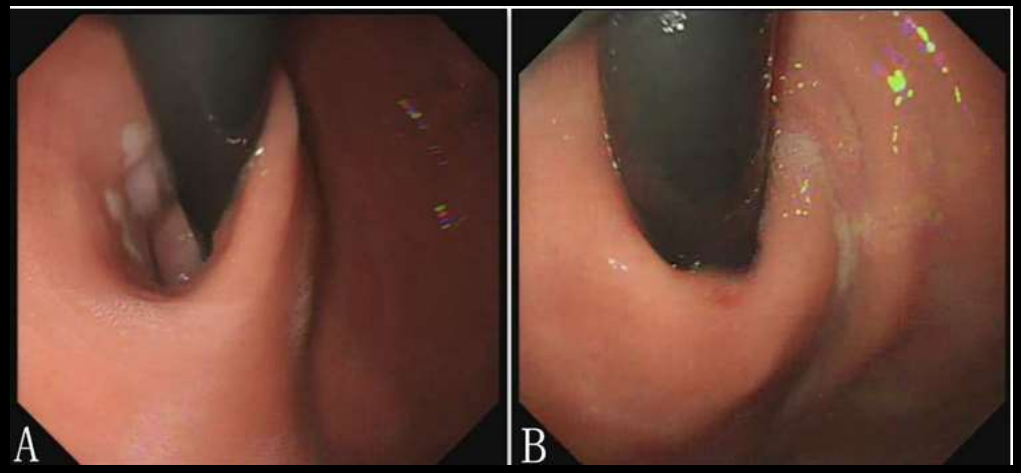
- aims to narrow the cardia and increase lower

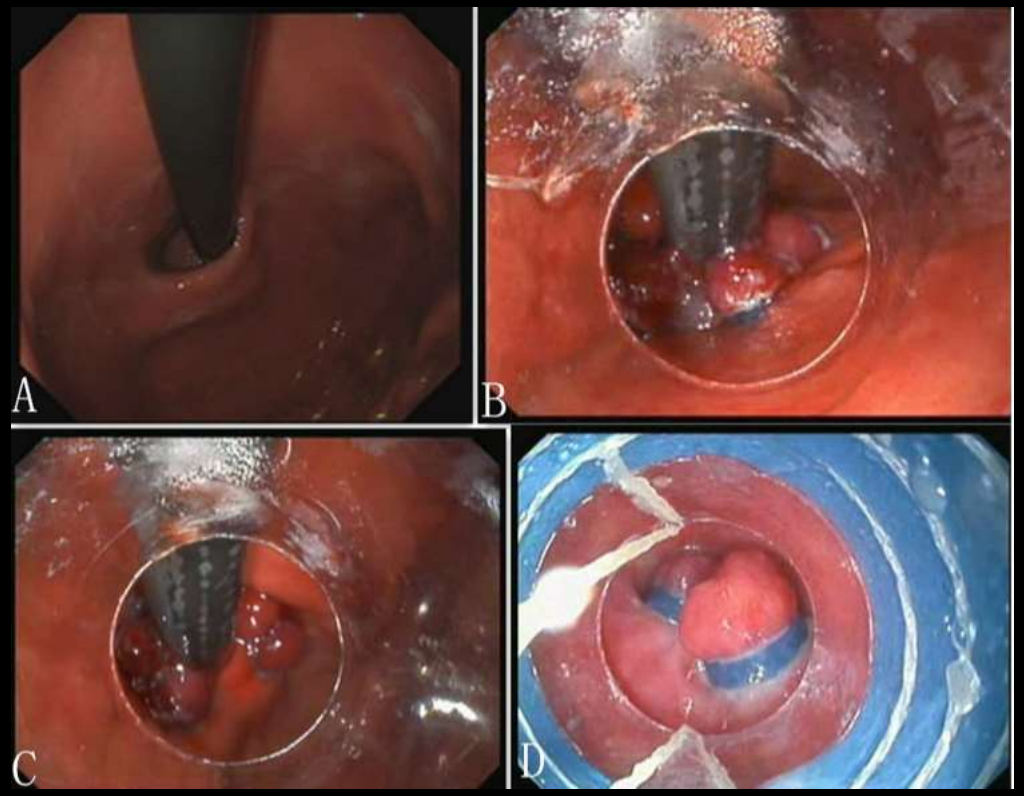
  esophageal sphincter pressure.

- this technique works by ligating the mucosa and part of

  the muscularis mucosa, which induces necrosis and scarring

  of the lower esophageal sphincter.





Surgical Endoscopy (2021) 35:4035–4041

Treatment

Aim

- To relieve symptoms, heal any damage to the esophagus, and prevent complications

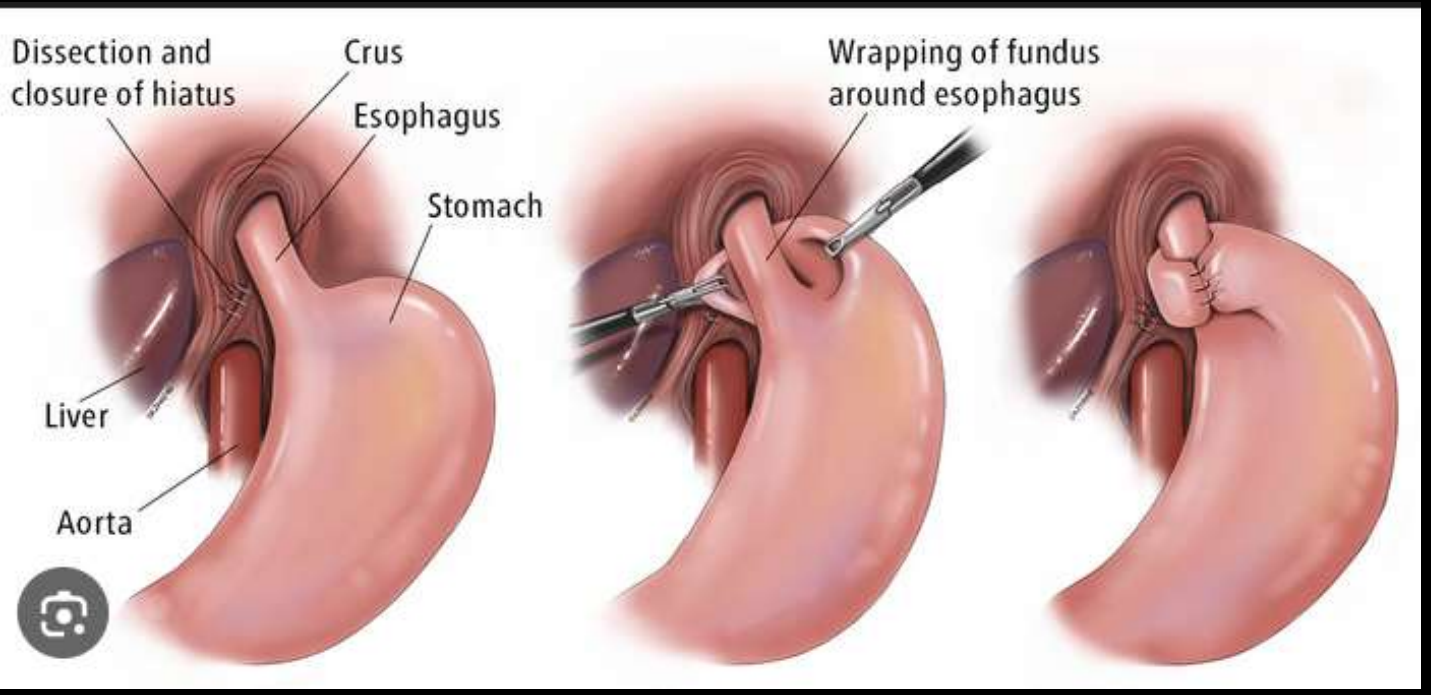
- Lifestyle Modification

- Pharmacological Treatment

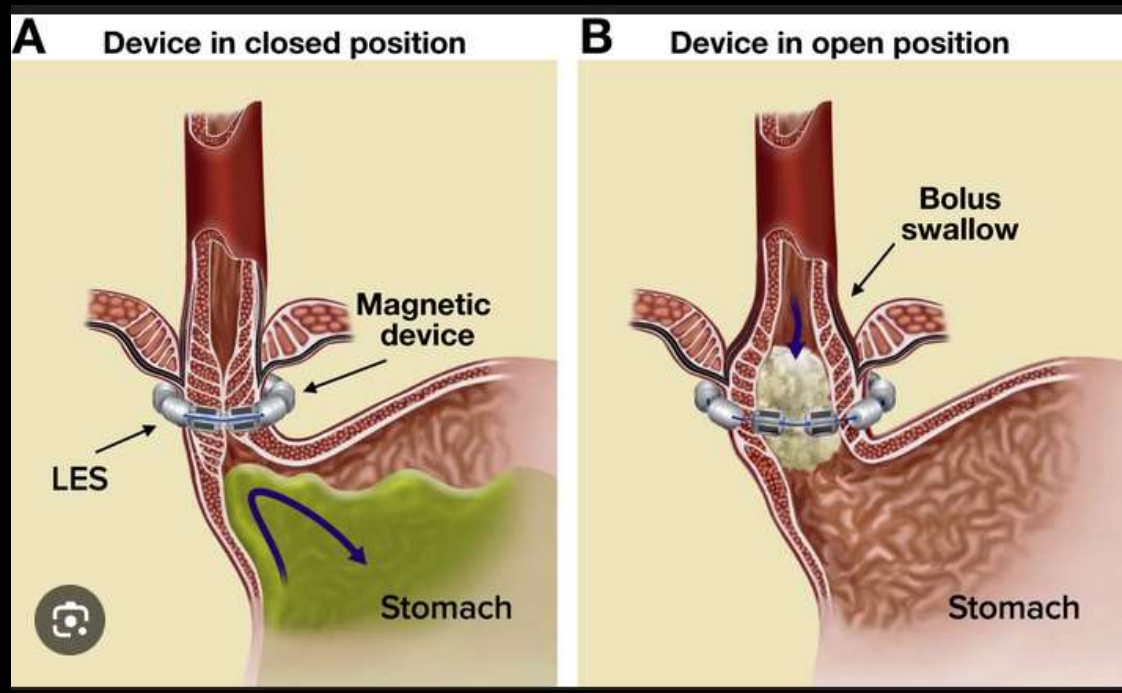
- Endoscopic Treatment

- Surgery

Anti-reflux Surgery

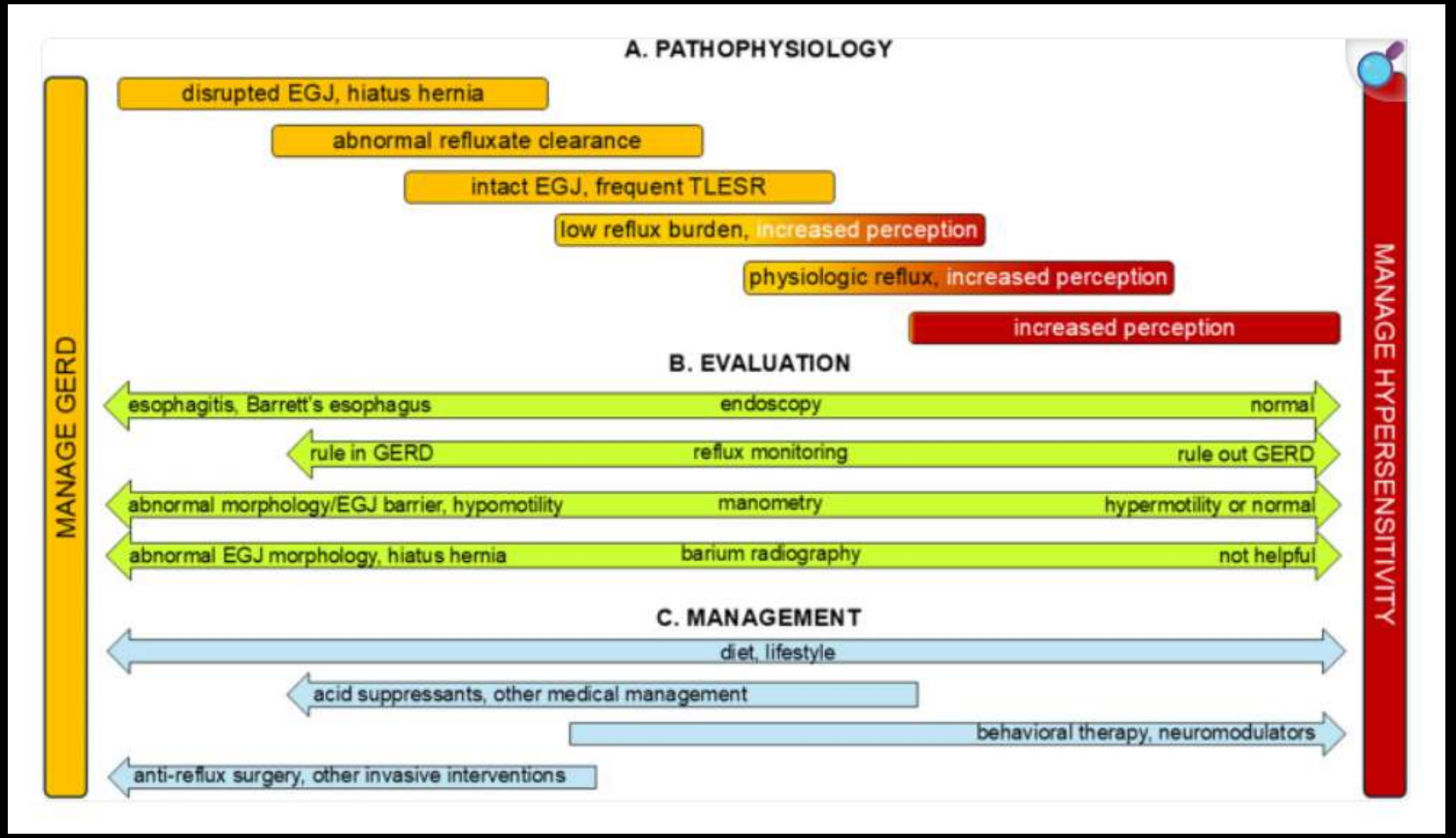


Laproscopic Fundoplication



Magnetic Sphincter Augmentation

Take Home Message



THANK YOU !!!