Surgical therapy of esophageal motility disorders

Fernando A. M. Herbella[1]^, Rafael C. Katayama[1], Francisco Schlottmann[2], Marco G. Patti[3]

[1]Department of Surgery, Escola Paulista de Medicina, Federal University of Sao Paulo, Sao Paulo, Brazil; [2]Department of Surgery, German Hospital, Buenos Aires, Argentina; [3]Department of Surgery, University of Virginia, Charlottesville, Virginia, USA

Correspondence to: Fernando A. M. Herbella, MD, PhD. Department of Surgery, Escola Paulista de Medicina, Federal University of Sao Paulo, Rua Diogo de Faria 1087 cj 301, Sao Paulo, SP 04037-003, Brazil. Email: herbella.dcir@epm.br.

Keywords: Esophageal manometry; esophageal motility disorders; achalasia; Heller's myotomy; peroral endoscopic myotomy (POEM)

Received: 21 December 2022; Accepted: 21 April 2023; Published online: 15 May 2023.

doi: 10.21037/asj-22-42

View this article at: https://dx.doi.org/10.21037/asj-22-42

Introduction

Primary esophageal motility disorders (PEMD) were diagnosed in the past by barium esophagram (1), but modernly they are defined by specific manometric patterns that evolved with time and are currently defined by the Chicago 4 Classification (2). The concept of 'primary' assumes that the dysmotility is not secondary to a predetermined etiology with gastroesophageal reflux disease (GERD) as the most common of them, but also including systemic diseases, medications, eosinophilic esophagitis, etc. (3). Based on this assumption, surgeons have always emphasized the need for objective GERD evaluation in patients with suspected PEMD (4), but this was only acknowledged by the last Chicago Classification (5). Also, the new classification acknowledged that manometric findings are not clinically significant unless symptoms are present and sometimes a second test (e.g., barium swallow) confirms the diagnosis (2). There is important implication in this distinction as treatment should be directed towards GERD in secondary motility disorders not on the dysmotility *per se* (4).

Surgery is frequently not the first therapeutic option in patients with PEMD, except for achalasia, but good outcomes can be expected if surgery is well indicated (6). Initial enthusiastic results and the modern appeal to technology raised endoscopic therapy for PEMD as the primary alternative for several authors. New technology is also available to diagnostics. Functional luminal imaging probe is a catheter-based measurement of the complacency of the distal esophagus with the purpose of assessing esophagogastric junction opening dynamics and the stiffness of the esophageal wall (7). This tool has been enthusiastically used to evaluate physiology before an operation and to guide myotomy adequacy during the operation; however, high-quality data are still scarce and conflicting results are present when compared to esophageal manometry (8).

We aimed to review current evidence on the value of surgery for PEMD.

Achalasia

Achalasia is defined by abnormal peristalsis and a defective relaxation of the lower esophageal sphincter or, in manometric parameters, an abnormal median integrated relaxation pressure (IRP) and 100% failed peristalsis (2).

Achalasia (*Figure 1*) is certainly the most understood PEMD. While there are several procedures described to treat achalasia, from medications to endoscopic to surgical, pneumatic forceful dilatation of the cardia, laparoscopic Heller's myotomy (LHM) associated to a partial fundoplication and peroral endoscopic myotomy (POEM) are certainly the most used and probably the best treatments for achalasia (9). Endoscopic dilatation, once the main choice for primary treatment, lost position for LHM (10).

^ ORCID: 0000-0003-3594-5744.

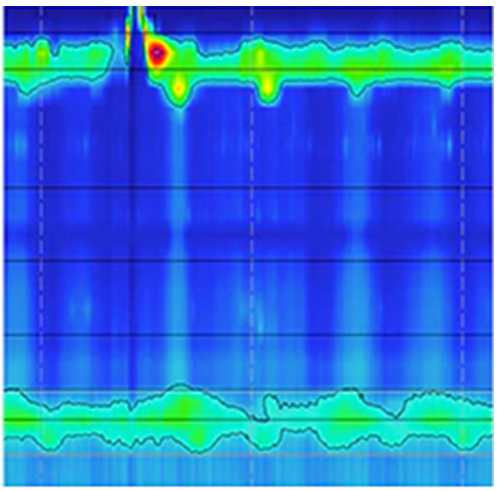

Figure 1 Manometric pattern for achalasia. Aperistalsis and defective relaxation of the lower esophageal sphincter. Example shows achalasia type I.

Even though both procedures bring excellent dysphagia relief, GERD is a critical issue for endoscopic therapy since lower esophageal sphincter defunctionalization is not followed by an antireflux procedure. Similarly, POEM relieves dysphagia, but it does not specifically prevent GERD although some argue that the privileged view of the muscles may allow preservation of the sling fibers of the sphincter (11). Nowadays, LHM and POEM are competing as the primary procedure for achalasia (12).

There are several recent meta-analyese in the last 3 years on the outcomes of different therapies for achalasia (*Table 1*). In general, POEM and LHM bring similar symptomatic relief with PD with lower efficacy. GERD is more incident in POEM.

Achalasia type III (*Figure 2*) deserves special considerations. Most authors believe that treatment should not be aimed towards the lower esophageal sphincter only but also to the esophageal body where the spastic contractions are generated. Thus, a long myotomy is necessary. Endoscopists argued that POEM should be the ideal therapy in these cases since the proximal extension of the myotomy can be easily stretched with the intraluminal approach (20). In fact, a meta-analysis showed superior outcomes for POEM versus LHM in these patients (21). However, a long myotomy can be done through laparoscopy (22). A careful analysis of the aforementioned meta-analysis show that a single study unfavored LHM for achalasia type III while the other did show superior or comparable results to POEM. This unique study is the only one included that did not tailored myotomy's length based on the type. Thus, LHM is certainly an excellent alternative to type III as well.

Distal esophageal spasm

Distal spasm is defined by normal median IRP and ≥20% swallows with premature/spastic contraction, i.e., short distal latency in the presence of symptoms and absence of GERD (2).

Distal esophageal spasm (*Figure 3*) comprises around 40% of the PEMD according to the most updated classification (23). It must be emphasized again that GERD must be excluded in the presence of this manometric pattern as almost half of the patients that fill criteria for distal spas have GERD (21).

Primary treatment is usually based on medications that decrease the lower esophageal tonus or decrease peristalsis (24). Endoscopic or surgical therapy are usually left as rescue treatment.

There are no studies on LHM for distal esophageal spasm based on the new classification (25). Experience from older classifications (that probably incorporates most of the patients by the new classification) show symptomatic improvement superior to 85% (6). Some case reports and small series of POEM for distal spasm have been reported with promising results (25,26). A more challenging procedure due to reactive hyperactive spastic contractions during POEM has been reported (27). A meta-analysis of results was not possible since most studies did not report outcomes separately according to the PEMD (28).

Hypercontractile esophagus

Hypercontractile esophagus (previous nutcracker and jackhammer) is defined by normal median IRP and ≥20% hypercontractile swallows, i.e., high distal contractility integral (DCI) in the presence of symptoms and absence of GERD (2).

Hypercontractile esophagus (*Figure 4*) comprises less than 1% of the PEMD diagnosed in a series of manometry (23).

Similar to the distal spam, primary treatment is usually based on medications and endoscopic or surgical therapy are usually left as rescue treatment. Also, there are no studies on LHM for distal esophageal spasm based on the new classification (25). Experience from older classifications

Table 1 Meta-analysis from 2020 to 2023 comparing outcomes for different therapies for achalasia in adults.

Author, year	Number of studies included	Number of patients included	Outcomes for dysphagia relieve	Outcomes for gastroesophageal reflux disease
Gong 2023 (13)	27	2,278	POEM > LHM > PD	LHM > POEM > PD
Shiu *et al.* 2022 (14)	24	1,987	LHM = POEM > PD	LHM = POEM > PD
Dirks *et al.* 2021 (15)	28	2,368	LHM = POEM > PD	Not stated
Mundre *et al.* 2021 (16)	9	911	LHM = POEM > PD	LHM = POEM = PD
Facciorusso *et al.* 2021 (17)	6	745	LHM = POEM > PD	PD > LHM > POEM
Martins *et al.* 2020 (18)	12	893	LHM = POEM	LHM = POEM
Aiolfi *et al.* 2020 (19)	19	4,407	POEM > LHM = PD	LHM = PD > POEM

POEM, peroral endoscopic myotomy; LHM, laparoscopic Heller's myotomy; PD, pneumatic dilatation.

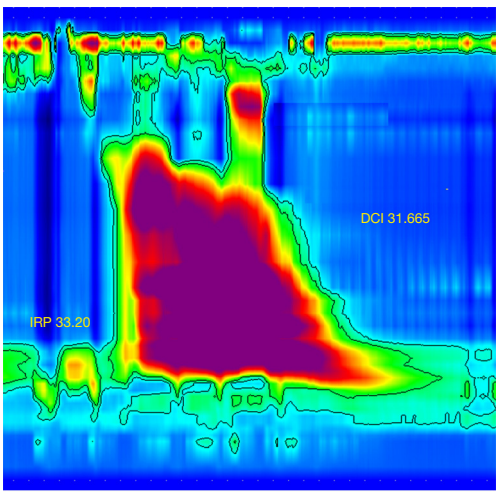

Figure 2 Manometric pattern for achalasia type III. Premature/spastic contraction and no evidence of peristalsis. DCI, distal contractile integral; IRP, integrated relaxation pressure.

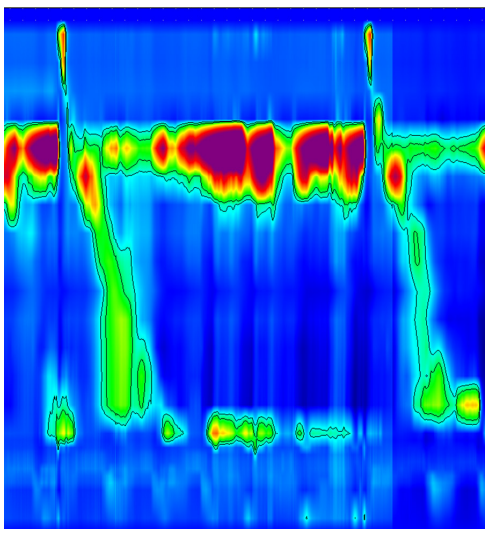

Figure 3 Manometric pattern for distal esophageal spasm. Premature waves in more than 20% of the swallows.

show symptomatic improvement superior to 80% and better outcomes in the presence of obstructive symptoms and elevated lower esophageal sphincter resting pressure or poor relaxation (6). Two recent systematic reviews compiling small series showed a clinical success of superior to 80% (28,29).

Esophagogastric junction outflow obstruction (EGJOO)

EGJOO is defined by normal peristalsis and a defective relaxation of the lower esophageal sphincter or, in manometric parameters, an abnormal (IRP) (supine and upright) with ≥20% elevated intrabolus pressure (supine), and not meeting criteria for achalasia (2).

Most cases of EGJOO (*Figure 5*) are asymptomatic, self-limited, or associated to mechanical obstruction especially after operations in the area (e.g., hiatal hernia, mediastinal mass, etc.). Few cases are considered PEMD.

Treatment should be cautiously indicated (30). Expectant management is recommended for patients with mild or atypical symptoms and there seems to be a limited role for medical treatment (31). LHM may be used in case of conservative treatment failure and in selected cases with

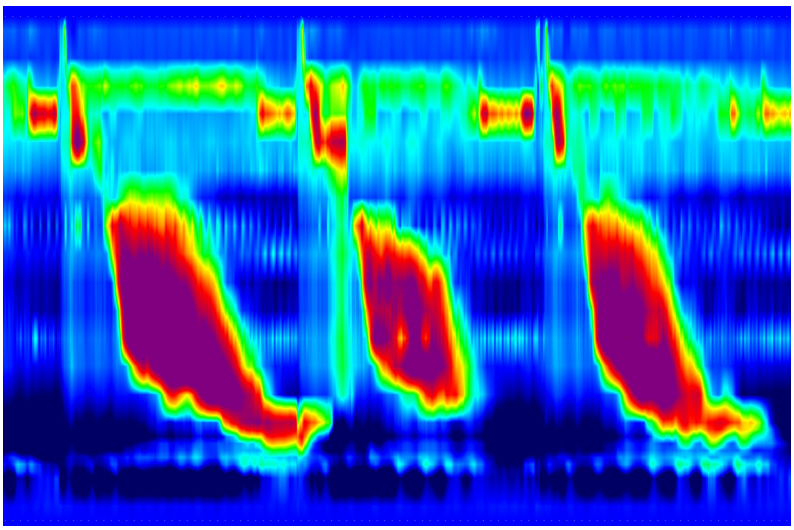

Figure 4 Manometric pattern for hypercontractile esophagus. Twenty percent or more of swallows with a DCI >8,000 mmHg·cm·s. DCI, distal contractile integral.

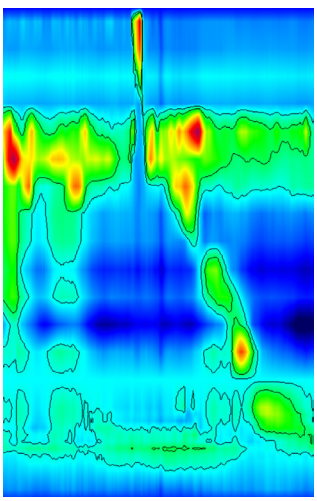

Figure 5 Manometric pattern for esophagogastric junction outflow obstruction. Normal peristalsis and a defective relaxation of the lower esophageal sphincter.

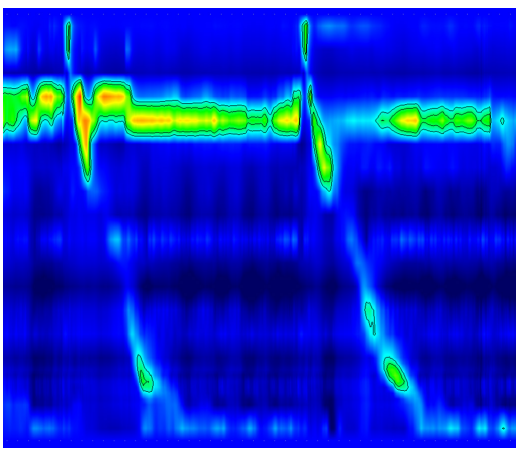

Figure 6 Manometric pattern for ineffective esophageal motility. Fifty percent or more of failed peristalsis or 70% or more of weak peristalsis.

excellent results, comparable to achalasia (32). Small POEM series, including a prospective trial (n=15) and a multicenter study (n=15) show good outcomes (25,33,34).

Ineffective esophageal motility

Ineffective esophageal motility is defined by normal median IRP, with >70% ineffective swallows or ≥50% failed peristalsis (2).

Ineffective esophageal motility (*Figure 6*) is the most common PEMD and the pattern most associated to GERD (21).

The treatment of hypotensive motility disorders is disappointing and relies mainly on dietary and lifestyle changes (35). Surgeons can rarely, if ever, act on this condition.

Conclusions

Surgery is frequently not the first therapeutic option in patients with PEMD, except for achalasia, but good outcomes can be expected if surgery is well indicated. We reviewed current evidence on the value of surgery for PEMD in cases of achalasia, distal esophageal spasm, hypercontractile esophagus, and EGJOO. Proper selection of patients is linked to good outcomes with low morbidity, which makes surgical therapy an adequate therapeutic option. If surgical therapy is not indicated, pharmacological therapy may be helpful even though results are not always good, side effects are common and medicine posology is usually inconvenient (36). Speech therapy rehabilitation may be helpful as well.

Achalasia, even type III, is best treated by LHM or POEM, although POEM is linked to a high incidence of GERD. LHM and POEM are competing as the primary procedure for other PMED; however, good-quality data are still elusive since classification recently changed, POEM is a relatively recent technology, and these diseases are not common.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *AME Surgical Journal*. The article has undergone external peer review.

Peer Review File: Available at https://asj.amegroups.com/article/view/10.21037/asj-22-42/prf

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://asj.amegroups.com/article/view/10.21037/asj-22-42/coif). FAMH serves as an unpaid editorial board member of *AME Surgical Journal* from February 2023 to January 2025. The other authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

1. Ott DJ. Motility disorders of the esophagus. Radiol Clin North Am 1994;32:1117-34.
2. Yadlapati R, Kahrilas PJ, Fox MR, et al. Esophageal motility disorders on high-resolution manometry: Chicago classification version 4.0. Neurogastroenterol Motil 2021;33:33e14058.
3. Wilkinson JM, Halland M. Esophageal Motility Disorders. Am Fam Physician 2020;102:291-6.
4. Herbella FA, Raz DJ, Nipomnick I, et al. Primary versus secondary esophageal motility disorders: diagnosis and implications for treatment. J Laparoendosc Adv Surg Tech A 2009;19:195-8.
5. Herbella FAM, Patti MG. Chicago classification version 4.0© from surgeons' point of view. Neurogastroenterol Motil 2021;33:e14090.
6. Herbella FA, Tineli AC, Wilson JL Jr, et al. Surgical treatment of primary esophageal motility disorders. J Gastrointest Surg 2008;12:604-8.
7. Hirano I, Pandolfino JE, Boeckxstaens GE. Functional Lumen Imaging Probe for the Management of Esophageal Disorders: Expert Review From the Clinical Practice Updates Committee of the AGA Institute. Clin Gastroenterol Hepatol 2017;15:325-34.
8. Herbella FAM, Patti MG. Double-checking esophageal function tests. Comment on: Carlson et al. evaluating esophageal motility beyond primary peristalsis: assessing esophagogastric junction opening mechanics and secondary peristalsis in patients with normal manometry. Neurogastroenterol Motil 2022;34:e14293.
9. Schlottmann F, Herbella FAM, Patti MG. The Evolution of the Treatment of Esophageal Achalasia: From the Open to the Minimally Invasive Approach. World J Surg 2022;46:1522-6.
10. Orlow R, Herbella FA, Patti MG. Laparoscopic Heller

Myotomy with Dor Fundoplication: An Operation that has Withstood the Test of Time. World J Surg 2022;46:1531-4.
11. Lois AW, Oelschlager BK, Wright AS, et al. Use and Safety of Per-Oral Endoscopic Myotomy for Achalasia in the US. JAMA Surg 2022;157:490-7.
12. Chiu PWY. Reflux after per-oral endoscopic myotomy: Do we have a solution? J Gastroenterol Hepatol 2019;34:2055-6.
13. Gong F, Li Y, Ye S. Effectiveness and complication of achalasia treatment: A systematic review and network meta-analysis of randomized controlled trials. Asian J Surg 2023;46:24-34.
14. Shiu SI, Chang CH, Tu YK, et al. The comparisons of different therapeutic modalities for idiopathic achalasia: A systematic review and network meta-analysis. Medicine (Baltimore) 2022;101:e29441.
15. Dirks RC, Kohn GP, Slater B, et al. Is peroral endoscopic myotomy (POEM) more effective than pneumatic dilation and Heller myotomy? A systematic review and meta-analysis. Surg Endosc 2021;35:1949-62.
16. Mundre P, Black CJ, Mohammed N, et al. Efficacy of surgical or endoscopic treatment of idiopathic achalasia: a systematic review and network meta-analysis. Lancet Gastroenterol Hepatol 2021;6:30-8.
17. Facciorusso A, Singh S, Abbas Fehmi SM, et al. Comparative efficacy of first-line therapeutic interventions for achalasia: a systematic review and network meta-analysis. Surg Endosc 2021;35:4305-14.
18. Martins RK, Ribeiro IB, DE Moura DTH, et al. Peroral (POEM) or surgical myotomy for the treatment of achalasia: a systematic review and meta-analysis. Arq Gastroenterol 2020;57:79-86.
19. Aiolfi A, Bona D, Riva CG, et al. Systematic Review and Bayesian Network Meta-Analysis Comparing Laparoscopic Heller Myotomy, Pneumatic Dilatation, and Peroral Endoscopic Myotomy for Esophageal Achalasia. J Laparoendosc Adv Surg Tech A 2020;30:147-55.
20. Sudarshan M, Raja S, Adhikari S, et al. Peroral endoscopic myotomy provides effective palliation in type III achalasia. J Thorac Cardiovasc Surg 2022;163:512-519.e1.
21. Andolfi C, Fisichella PM. Meta-analysis of clinical outcome after treatment for achalasia based on manometric subtypes. Br J Surg 2019;106:332-41.
22. Salvador R, Provenzano L, Capovilla G, et al. Extending Myotomy Both Downward and Upward Improves the Final Outcome in Manometric Pattern III Achalasia Patients. J Laparoendosc Adv Surg Tech A 2020;30:97-102.
23. de Padua F, Herbella FAM, Patti MG. The prevalence of gastroesophageal reflux disease in named manometric patterns of dysmotility according to the Chicago Classification 4.0. Dis Esophagus 2022;35:doac023.
24. Gorti H, Samo S, Shahnavaz N, et al. Distal esophageal spasm: Update on diagnosis and management in the era of high-resolution manometry. World J Clin Cases 2020;8:1026-32.
25. Herbella FAM, Schlottmann F. Minimally invasive surgery for non-achalasia primary esophageal motility disorders is currently underused. Mini-invasive Surg 2019;3:24.
26. Feng J, Ali RW, Hao JY, et al. Peroral endoscopic myotomy for esophageal motility disorders. Esophagus 2020;17:11-8.
27. Ponds FA, Smout AJPM, Fockens P, et al. Challenges of peroral endoscopic myotomy in the treatment of distal esophageal spasm. Scand J Gastroenterol 2018;53:252-5.
28. Chandan S, Mohan BP, Chandan OC, et al. Clinical efficacy of per-oral endoscopic myotomy (POEM) for spastic esophageal disorders: a systematic review and meta-analysis. Surg Endosc 2020;34:707-18.
29. Wahba G, Bouin M. Jackhammer esophagus: A meta-analysis of patient demographics, disease presentation, high-resolution manometry data, and treatment outcomes. Neurogastroenterol Motil 2020;32:e13870.
30. Herbella FAM, Patti MG, Filho RM, et al. How Changes in Treatment Guidelines Affect the Standard of Care: Ethical Opinions Using the Chicago 4.0 Classification for Esophageal Motility Disorders as Example. Foregut. 2022;2:111-5.
31. Shahsavari D, Malik Z, Parkman HP. Management of the patient with esophagogastric junction outflow obstruction. Curr Opin Gastroenterol 2021;37:397-407.
32. Salvador R, Provenzano L, Nezi G, et al. Laparoscopic Heller-Dor Is an Effective Treatment for Esophageal-Gastric Junction Outflow Obstruction. J Gastrointest Surg 2021;25:2201-7.
33. Ichkhanian Y, Sanaei O, Canakis A, et al. Esophageal peroral endoscopic myotomy (POEM) for treatment of esophagogastric junction outflow obstruction: results from the first prospective trial. Endosc Int Open 2020;8:E1137-43.
34. Khashab MA, Familiari P, Draganov PV, et al. Peroral endoscopic myotomy is effective and safe in non-achalasia esophageal motility disorders: an international multicenter study. Endosc Int Open 2018;6:E1031-6.

35. Zerbib F, Roman S. Current Therapeutic Options for Esophageal Motor Disorders as Defined by the Chicago Classification. J Clin Gastroenterol 2015;49:451-60.
36. Patti MG, Pellegrini CA, Arcerito M, et al. Comparison of medical and minimally invasive surgical therapy for primary esophageal motility disorders. Arch Surg 1995;130:609-15; discussion 615-6.

doi: 10.21037/asj-22-42
Cite this article as: Herbella FAM, Katayama RC, Schlottmann F, Patti MG. Surgical therapy of esophageal motility disorders. AME Surg J 2023;3:32.