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Peroral endoscopic myotomy outcomes: Efficacy and gastroesophageal reflux disease☆

Ashwin A. Kurian, MD[a], Lee L. Swanström, MD[b,*]

[a] Providence Portland Cancer Center, Portland, Oregon
[b] Oregon Clinic GMIS Division, Oregon Health Sciences University, Portland, Oregon 97213

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ABSTRACT

Achalasia is a well-defined neuromuscular disorder of esophageal swallowing function characterized by a nonrelaxing lower esophageal sphincter (LES) and aperistalsis of the esophageal body. Peroral endoscopic myotomy (POEM) is a flexible endoscopic approach to perform a selective circular myotomy of the distal esophagus and proximal stomach. More than a thousand cases have been performed worldwide. Most early reports on POEM focus on its feasibility and safety. Emerging long-term series have reported excellent subjective and objective outcomes of dysphagia relief for achalasia. With increasing experience, centers are expanding indications to end-stage achalasia and nonachalasia neuromuscular disorders such as diffuse esophageal spasm and nonrelaxing LES with hypertensive esophageal body contractions. The postoperative gastroesophageal reflux post-POEM is an issue that requires close objective follow-up, as the correlation of subjective reflux symptoms and objective testing in this setting is poor. Few series have indeed reported on equivalent excellent outcomes post-POEM as compared with a laparoscopic myotomy. This early experience with POEM has demonstrated the validity of this new technique in the management of benign disorders of esophageal swallowing. Refinements in technique and decreases in gastroesophageal reflux disease may make this procedure even more desirable, and potentially the first-line therapy in the management of spastic disorders of the esophagus.

1. Introduction

Benign disorders of esophageal outflow classically present with progressive dysphagia to solids and liquids, chest pain, regurgitation, and sometimes weight loss [1,2]. Achalasia of the esophagus is the best described of these disorders. It is manometrically defined by a defect in lower esophageal sphincter (LES) relaxation and absence of peristalsis of the esophageal body. Achalasia is a rare disorder with an estimated incidence of 1 in 100,000, resulting in a prevalence rate of 10 in 100,000 [3]. All therapies are directed toward the forced disruption of the disordered LES, resulting in palliation of the swallowing function. The traditional endoscopic treatments include serial pneumatic dilations (>30 mm) and botulinum toxin injection. The advent of laparoscopy allowed a definitive myotomy of the LES to be performed in a minimally invasive fashion. The fact that such a myotomy results in a consistent and persistent improvement in dysphagia and is a single procedure with a low rate of morbidity, has made this a popular first choice, at least in North America [4].

Peroral Endoscopic Myotomy (POEM) is the latest treatment for esophageal achalasia. POEM reflects developments realized by the Natural Orifice Transluminal Endoscopic Surgery experience reviewed elsewhere in this issue. Since its first description in human subjects by Inoue in 2008, POEM has been performed in multiple centers worldwide, for achalasia and other spastic motility disorders [5]. To date, only a handful of clinical series have been published in peer-reviewed literature. Unfortunately, some of the largest series published do not include preoperative objective testing, thereby making stratification of outcomes based on disease diagnosis and subtypes difficult. These reports tend to focus on technique and immediate outcomes including dysphagia relief and complications. Even more lacking are long-term clinical outcomes and objective measurements of the effect of POEM. Nonetheless, more centers performing POEM worldwide are starting to report outcomes, which would allow us to better understand the mechanism of action of the approach as well as its relative place in the treatment of achalasia. We aim to summarize in the following review the peer-reviewed literature on POEM with an emphasis on its efficacy and outcomes.

2. Symptom relief

The principal outcome measure based on which POEM is compared with all other modalities for the treatment of achalasia

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* *Corresponding author.*
E-mail addresses: lswanstrom@aol.com, lswanstrom@orclinic.com (L.L. Swanström).

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Table 1
Eckardt score (range 0-12).

	0	1	2	3
Dysphagia	None	Occasional	Daily	Continuous
Regurgitation	None	Occasional	Daily	Continuous
Chest pain	None	Occasional	Daily	Continuous
Weight Loss	None	< 5 kg	5-10 kg	> 10 kg

Eckardt stages: I (0-1); II (2-3); III (4-6); IV (> 6).

is the return of swallowing function (dysphagia relief). Subjective postoperative improvements are being increasingly reported using the validated Eckardt Clinical Score [6]. This is a consolidated tally that includes a Likert-based score for dysphagia, chest pain, regurgitation, and weight loss (Table 1). Dysphagia, chest pain, and regurgitation are scored based on the frequency of the symptoms. The consolidated score enables the investigator to stage the severity of Achalasia and trend postoperative improvements in esophageal outflow obstruction. Objectively, swallowing function can be evaluated by means of a timed barium swallow [7]. The timed barium swallow has been validated to correspond to subjective improvements in swallowing function in contrast to postoperative manometric LES pressures, which is in itself a poor predictor of dysphagia relief, especially in the laparoscopic myotomy population [8].

With regard to improvements in swallowing function, POEM performs extremely well, with reports of > 90% short and intermediate subjective success in reported series [9-22]. These numbers compare well with the laparoscopic myotomy literature. Numerically, clinical success has been uniformly defined as a postoperative Eckardt score ≤3—corresponding to stage 1/2 achalasia. All reports using this metric demonstrate significant improvements in Eckardt scores (Table 2). In a series of 18 patients undergoing POEM for achalasia, all patients complained of either no dysphagia or rare dysphagia at 6-month follow-up. Only 1 patient had a postoperative Eckardt score > 1 (score of 2—"rare" dysphagia and "rare" regurgitation). These subjective improvements corresponded well to significant improvements in the timed barium swallow postoperatively (median preoperative emptying of 48%-100% postoperative) [19]. These objective results have been mirrored by the reports of Hungness et al. [20].

Chest pain appears to be a more difficult symptom to treat with POEM. In our series of 18 patients with achalasia treated with POEM, 12 patients complained of preoperative chest pain. Two patients (17%) continued to complain of intermittent chest pain at 6 months though intensity and frequency were markedly reduced [19].

3. Gastroesophageal reflux

One of the important secondary outcomes for achalasia treatment is postoperative gastroesophageal reflux disease (GERD) that results from the forced disruption of the LES. In essence, the more thorough the disruption of the LES, the more likely the incidence of gastroesophageal reflux (GER) after treatment would be. In the 70s, Ellis advocated that a limited thoracic myotomy, with minimal gastric extension, could provide dysphagia relief with a low rate of postoperative GERD [23,24]. However these results have been difficult to reproduce and are not generally accepted from fear of residual or recurrent dysphagia due to an "incomplete myotomy". In fact, a laparoscopic abdominal approach is now most widely used because of the ease with which one can extend the myotomy the recommended 2-3 cm onto the stomach and the ability to perform a fundoplication, resulting in improved outcomes [25,26]. The extension of the myotomy 2-3 cm on the anterior stomach has been shown to result in significant reductions in LES resting pressure. It does result however, in iatrogenic GER between 60% and 100% of the time. In general, the current surgical approach is to completely eradicate LES function with an aggressive myotomy, followed by the creation of a neo-antireflux mechanism via a partial fundoplication to counter GERD.

POEM does not include a fundoplication. However, POEM also differs from the laparoscopic myotomy in important ways. During the laparoscopic approach, the gastroesophageal junction is dissected so as to gain access to the anterior aspect of the distal esophagus. The phrenoesophageal ligaments are disrupted while performing this maneuver. POEM accesses the muscular layer of the distal esophagus and cardia without altering the extrasphincteric suspensory anatomy of the distal esophagus, thus maintaining many of the anatomic antireflux mechanisms. POEM also is a selective myotomy of the inner circular muscle fibers. Theoretically, leaving the longitudinal muscle layer and not disrupting the phrenoesophageal ligaments may provide sufficient antireflux mechanisms to limit postoperative GERD.

Table 2
Sites.

	Yokohama, Japan [13]	Portland, Oregon, USA [19]	Chicago, USA [20]	Hamburg and Frankfurt, Germany [12]	Hong Kong, China [21]	Mineola, New York, USA [17]	Rome, Italy [9]
N	236‖	18	18	16	16	45	11
Follow-up	11*	11*	6†	3	6†	9.2*	3
Post-POEM dysphagia relief							
% postoperative clinical success	99	100	89	94	100	95	91
Pre/post-dysphagia scores	6.36/1.4‡	6/0§	7/1§	8.8/1.4§	5.5/0§	7.8/0.4§	7.1/1.1§
Pre/post-LES resting pressure	26.8/12.6	45/16.8	19/9	27.2/11.8	43/29	45.4/15.2	45.1/16.9
Post-POEM GERD							
Symptoms	11%	27%	39%	0%	6%	20%	0%
Endoscopic	–	6%	27%	6.60%	–	43%	0
24-h pH study	–	46% (6 mo)	–	–	20% (3 mo)	36%	–

* Mean.
† Median.
‡ Non-Eckardt scoring.
§ Eckardt scoring.
‖ Data adapted from Ref. [18].