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# Indications and Preoperative Workup for Peroral Endoscopic Myotomy

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## Peroral Endoscopic Myotomy

The Per Oral Endoscopic Myotomy (POEM) technique popular today and first described by Inoue et al. in 2008 [1] was preceded by nearly 30 years via a simple albeit blunt approach. The first flexible endoscopic myotomy for the treatment of esophageal motility disorders was described by Ortega in 1980 using a 3 mm thick and 1 cm long esophagotomy technique in a blinded fashion [2]. This technique was not widely adopted at the time due to concerns of both safety and efficacy. However, the enthusiasm generated by the potential of NOTES in the mid-2000s and advancements in the field of flexible endoscopy facilitated an interest in endoscopic myotomy using mucosal tunneling techniques. The technique of performing a POEM is addressed in accompanying chapters, however briefly; it involves creating a distal esophageal mucosotomy, longitudinal submucosal tunneling across the gastroesophageal junction, esophageal myotomy, and closure of the mucosal defect. Both anterior and posterior myotomies have been described as primary procedures. However, most commonly, anterior myotomy is employed for patients who have not undergone a prior myotomy, while posterior myotomy is reserved for revising patients who have undergone a prior Heller myotomy or indeed a prior POEM. Patients are usually discharged home on postoperative day 1.

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## Achalasia

Esophageal achalasia is the most common surgically treated primary esophageal motility disorder. It is characterized by the absence of esophageal peristalsis and impaired relaxation of the lower esophageal sphincter (LES) on swallowing.

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The term achalasia originates from the Greek language meaning “nonrelaxing.” This results in esophageal outflow obstruction, presenting as dysphagia, regurgitation, aspiration and pulmonary complications, chest pain, heartburn, and weight loss.

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## **Symptom Evaluation**

### **Dysphagia**

Dysphagia is the most common presenting symptom, with most patients reporting difficulty with swallowing both solids and liquids. Patients often gradually alter their diet to accommodate for this issue.

### **Regurgitation**

Regurgitation is the second most common symptom of achalasia. Again, due to changes in dietary habits, most patients learn to swallow while minimizing regurgitation. Regurgitation is often associated with aspiration and subsequent laryngeal and pulmonary complications.

### **Chest Pain**

Approximately 50% of patients with achalasia will report chest pain which usually occurs postprandially. The etiology of chest pain is poorly understood. This symptom does improve after myotomy suggesting that it is likely multimodal in its etiology including the pathophysiology of esophageal stasis and fermentation.

### **Heartburn**

Heartburn is a fairly common confounding symptom and is seen in about 40% of patients with achalasia. Heartburn often leads to an evaluation for gastroesophageal reflux disease (GERD). The heartburn described by achalasia patients possibly again is partly due to stasis and fermentation.

### **Weight Loss**

Weight loss is fortunately an uncommon occurrence in achalasia patients. Diet modification, emphasizing soft and liquid foods, is utilized to achieve adequate caloric intake. Weight loss usually suggests severe disease. Significant and rapid weight loss should be thoroughly evaluated to address the risk of pseudoachalasia secondary to an obstructing malignancy.

**Table 4.1** Scoring system to determine Eckardt Score

Score	Dysphagia	Regurgitation	Retrosternal pain	Weight loss (kg)
0	None	None	None	None
1	Occasional	Occasional	Occasional	<5
2	Daily	Daily	Daily	5–10
3	Each meal	Each meal	Each meal	>10

## Symptom Scores

Various symptom scores have been devised for achalasia; however, the Eckardt scoring system is the most commonly used. It is the sum of the four cardinal symptoms of achalasia—dysphagia, regurgitation, chest pain, and weight loss. Total scores range from 0 to 12 (Table 4.1). A postoperative Eckardt score > 3 is consistent with disease recurrence. The Eckardt score has been shown to correlate with objective testing such as a timed barium swallow in the evaluation of postoperative outcomes [3].

## Past Medical History

A detailed past medical history is important in the preoperative workup of a POEM patient. Knowledge of prior endoscopic treatments of achalasia such as Botulinum toxin injection or pneumatic dilation is important in determining the relative hostility of the submucosal plane during dissection. A prior esophageal perforation at the time of pneumatic dilation may effectively obliterate the submucosal plane. Prior exposure to mediastinal radiation also results in fibrosis of the esophageal layers. Cardiovascular or pulmonary comorbidities must also be considered during preoperative planning.

## Diagnostic Evaluation

All patients, in whom POEM is being considered should undergo the following diagnostic tests to confirm the diagnosis, aid in patient selection as well as operative planning.

### Upper Endoscopy

An upper endoscopy is usually the first test that was performed in the evaluation of a patient with dysphagia. Upper endoscopy might reveal a tortuous, dilated, sigmoid esophagus with retained saliva, fluid, or even food. Esophagitis might be seen due to stasis, especially of pills. Stasis might lead to esophageal candidiasis, commonly presenting with signs of esophagitis and overlying white exudate. Biopsies should always be performed to confirm *Candida* esophagitis in order to facilitate preoperative antifungal treatment.

Although rare, a preoperative upper endoscopy is essential to rule out a diagnosis of pseudoachalasia in which an infiltrating gastroesophageal junction tumor causes

esophageal outflow obstruction mimicking achalasia. A high index of suspicion for pseudoachalasia should be maintained for patients older than 60 with a rapid progression of symptoms and excessive weight loss. Another rare but serious condition which can be detected endoscopically is the presence of esophageal varices. Computerized tomography or endoscopic ultrasound are helpful adjuncts to help confirm the diagnosis of pseudoachalasia and/or varices when suspected. The presence of either pseudoachalasia or esophageal varices is a contraindication to POEM and likely the completion of esophageal myotomy regardless of approach.

## Contrast Esophagram

Although an esophagram can be normal in patients with early stages of achalasia, classically it reveals a tight narrowing at the gastroesophageal junction with a *bird beak* appearance, impaired LES relaxation, esophageal dilation, esophageal tertiary contractions, and poor esophageal emptying. A Timed Barium Swallow (TBS) provides information not only on esophageal anatomy but also on emptying. The TBS includes spot images that are performed at 1 min, 2 min, and 5 min after a barium bolus of 200 cm<sup>3</sup>. The contrast column height and width reported in centimeters indicate the relative severity of the esophagogastric outlet obstruction. This test is also useful to evaluate postoperative improvements in esophageal emptying.

A sigmoid esophagus (dilated and tortuous with a sigmoid shape) that suggests difficulty with navigation through the submucosal tunnel during POEM can be expected. Although some practitioners have published outcomes in patients with end-stage achalasia/sigmoid esophagus, they suggest that these patients should ideally be approached after the learning curve of this procedure has been surmounted [4]. Outcomes in these patients are less predictable due to their end-stage disease when compared with patients who present with early achalasia.

Associated pathology such as a hiatal hernia or an epiphrenic diverticulum can also be detected on barium swallow. An unaddressed hiatal hernia will likely result in excessive gastroesophageal reflux following POEM. Hence, these patients are more appropriately approached laparoscopically with a hiatal hernia repair, myotomy, and partial fundoplication. A coexistent epiphrenic diverticulum will need to be excised or involuted to prevent postoperative stasis, dysphagia, and regurgitation. These patients are also best approached laparoscopically.

## Esophageal Manometry

High-resolution manometry is the confirmatory test and serves as the goal standard for the diagnosis of achalasia. The advent of high-resolution impedance manometry, compared with standard resolution manometry, has enabled a classification of achalasia variants. High-resolution impedance manometry (HRIM) is performed with a solid-state catheter and has supplanted the use of water perfusion catheters. Thirty-two circumferential sensors spaced 1 cm apart give high-definition information of

esophageal motility. Information on LES relaxation is obtained as long as passage through the LES and into the stomach is achieved. This has resulted in the Chicago classification basing the definition of achalasia on LES relaxation. Once impaired LES relaxation is identified on HRIM, three subtypes of achalasia are defined based on peristaltic data in the esophageal body.

Type 1 achalasia is associated with minimal esophageal body pressurization; type 2 achalasia with pan-esophageal pressurization, and type 3 is the spastic variant (Fig. 4.1). POEM is considered to have a significant advantage over either laparoscopic cardiomyotomy or pneumatic dilation for type 3 patients. The spastic variant may benefit from a long myotomy encompassing the entire length of the high-pressure zone which is often 10–15 cm [5]. As the proximal extent of the myotomy is not limited in POEM by the esophageal hiatus, as compared with a laparoscopic myotomy, POEM is rapidly becoming the procedure of choice in spastic achalasia patients.

## Ambulatory pH Monitoring

Esophageal pH monitoring is performed either with catheter-based or wireless capsule-based Bravo pH testing systems. The pH tracing in achalasia shows a gradual downward slide in pH consistent with esophageal outflow obstruction and fermentation as compared with the intermittent drops of pH with normalization as seen in GERD.

Patients with nonrelaxing LES with esophageal peristalsis and prolonged episodic reflux events have a combination of both esophageal outflow obstruction and gastroesophageal reflux disease (GERD). These patients are not ideal POEM candidates, but should be treated with laparoscopic myotomy and fundoplication to address both issues.

Ambulatory pH testing is also useful in the postoperative period to diagnose GERD resulting from the myotomy. It is important to objectively look for GERD, as symptoms of heartburn and regurgitation are often not present in these patients due to compromised sensory innervation of the involved anatomy.

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## Expanded Indications

POEM has been utilized in the management of nonachalasia hypercontractility disorders of the esophagus. These disorders can be categorized into nonrelaxing LES disorders and esophageal body spastic disorders. The spastic disorders such as nutcracker esophagus and diffuse esophageal spasm are generally treated with extended myotomy akin to type 3 achalasia. The nonrelaxing LES disorders are approached like type 1 and type 2 achalasia by performing a 6–8 cm myotomy of the LES (2–4 cm) with a 2 cm margin proximally and distally as long as the condition treated is not associated with a mixed GERD/esophageal outflow presentation as mentioned above.

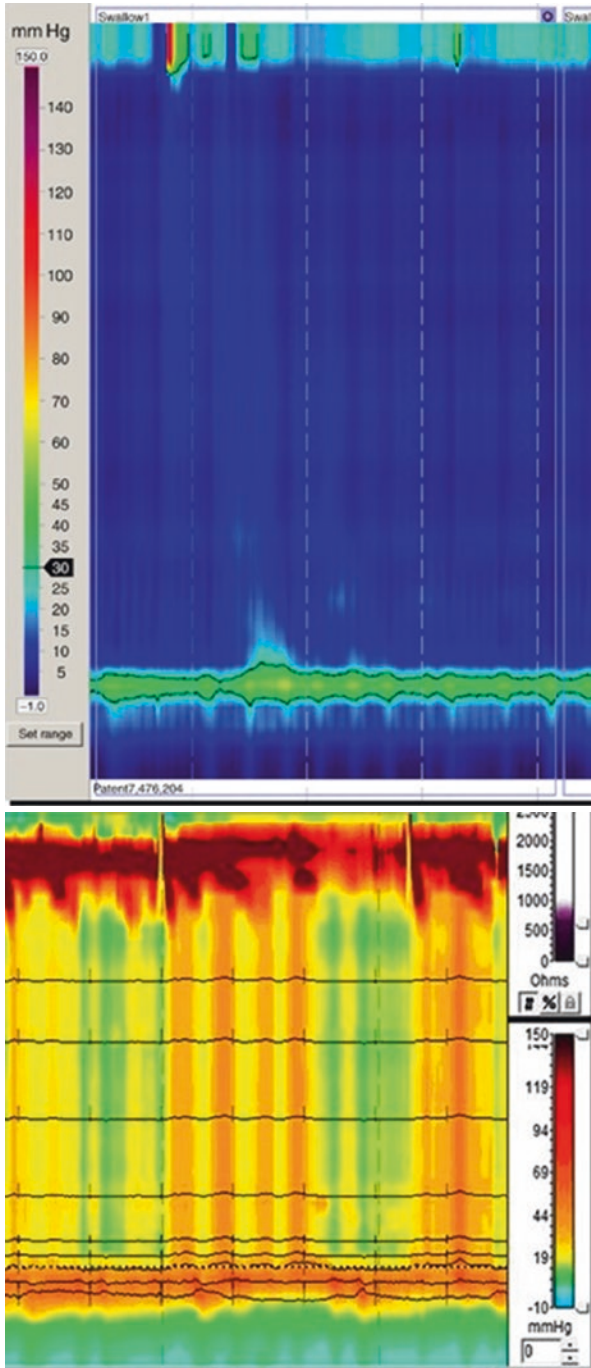
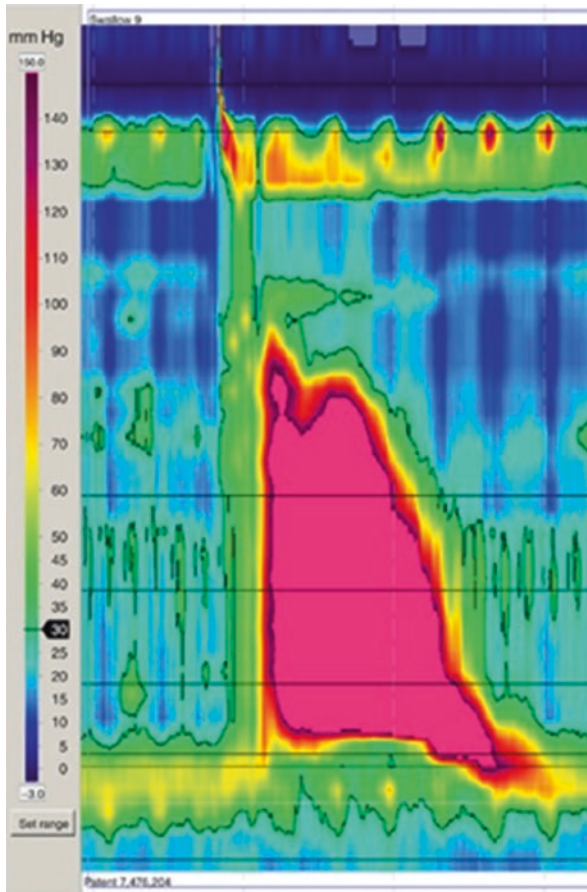


Fig. 4.1 Manometric topography of achalasia types 1, 2, and 3



**Fig. 4.1** (continued)

## References

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