

Peroral Endoscopic Myotomy (POEM) for Non-Achalasia Esophageal Disorders



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INTRODUCTION

Peroral endoscopic myotomy (POEM) has emerged as an important treatment option for achalasia. While laparoscopic Heller myotomy and pneumatic dilation still have a role in achalasia management, the use of POEM has continued to increase since the first report of its use.^{1,2}

The POEM procedure utilizes submucosal tunneling in the so-called “third-space” and has been one of the important factors for the expansion of “Third Space Endoscopy.” POEM is done by making a submucosal entry point that is several centimeters above where the myotomy will begin. Next is creation of the submucosal tunnel by careful dissection down to a point generally 2cm beyond the lower esophageal sphincter (LES). After completion of the tunnel, cutting of the circular muscle of the esophagus is done, typically 3-4cm below the mucosal entry point. Finally, closure of the mucosal entry point is done, typically with through-the-scope clips, to assure that contamination of the tunnel and mediastinal structures does not occur.

Early in the POEM experience for achalasia, the circular myotomy was approximately 8cm in length, with 6-7cm being on the esophageal side and 2cm down onto the gastric cardia. More recently, shorter myotomy lengths have been advocated for achalasia; for example, 3-4 centimeters on the esophagus for a total myotomy length of 5-6 cm.³ An advantage of POEM over laparoscopic myotomy is that the length of the myotomy can be varied depending on the clinical situation and provides the opportunity to perform long myotomies. Longer myotomies are preferred when POEM is used for spastic esophageal disorders.

Achalasia is classified into 3 types, according to the Chicago diagnostic criteria.⁴ In all there is inadequate relaxation of the lower esophageal sphincter. Type I achalasia is characterized by minimal contractility in the body of the esophagus. In type II achalasia, there are intermittent periods of panesophageal pressurization. Type III achalasia is characterized by spastic contractions in the esophageal body in addition to the tight LES. For type III achalasia, longer myotomies are done to relieve painful spasms of the esophageal body in addition to relieving outflow obstruction at the LES.

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POEM is currently accepted as an effective treatment for achalasia. A review of 19 studies by Crespín et al. in 2016 included 1299 POEM procedures and found improvement in Eckhardt scores and LES pressure.⁵ Another meta-analysis by Barbieri et al. included 551 patients and also found POEM to be an effective, less invasive alternative to traditional laparoscopic Heller myotomy.⁶ Kumbhari et al. 2015 noted the success of POEM for type I and II achalasia and offered evidence that POEM can be considered safe and effective for type III patients. This study compared results of POEM and traditional laparoscopic Heller myotomy in type III disorders, finding POEM in this situation to have a smaller rate of adverse events than the Heller myotomy, as well as better results for type III cases than Heller myotomy patients.⁷

There is limited data concerning the effectiveness of POEM for non-achalasia esophageal disorders,⁸ but literature is emerging showing some success in these cases.^{9,10} This review will summarize several studies describing the outcomes of POEM for non-achalasia disorders. These non-achalasia disorders include spastic esophageal motility disorders including jackhammer esophagus, esophageal spasm, and esophagogastric junction outlet obstruction (EGJOO).

Jackhammer Esophagus (formerly referred to as “nutcracker esophagus”)

Jackhammer esophagus (JE) is a condition in which there are high amplitude contractions of the esophageal muscle, defined as at least one contraction with a distal contractile interval (DCI) of >8000 Hg.s.cm. The diagnosis is made with high resolution manometry (HRM).¹¹ Kristensen et al. 2014 followed 3 patients with nutcracker esophagus and tracked their Eckhardt score, LES pressure, distal contractile integral, and amount of reflux pre- and post-POEM procedure.¹² At one year follow-up, these patients had relief of symptoms, with one patient experiencing post-POEM reflux. In another study of 24 non-achalasia patients, including “nutcracker esophagus”, 70.8% experienced an improvement of dysphagia and 71.5% had resolution of chest pain.¹³ Using HRM after POEM, Kandulski et al. 2016 demonstrated that there are much fewer contractions post-procedurally.¹⁴ Bechara et al. 2016 treated 4 patients with JE and



Figure 1. Barium esophagram in a case of a spastic esophageal disorder; in this case the manometry showed Jackhammer esophagus.

noted POEM as a suitable treatment for JE, with none of the patients experiencing intraoperative or postoperative complications. Three of the four patients received POEM that included LES, and they all experienced excellent clinical success. The remaining patient did not receive POEM including LES because the LES was believed to be uninvolved in the abnormal contractions. After the procedure, the patient developed symptoms of dysphagia and regurgitation. This patient received a second POEM procedure, which resulted in the resolution of his remaining symptoms.¹⁵ The length of the myotomy in this study was 12-23 cm (mean 19 cm). These investigators recommended LES myotomy in addition to a more proximal myotomy because the iatrogenic ineffective esophageal motility that can result can be made more symptomatic if no LES myotomy is done. The HRM tracing is helpful to help decide on the optimal length of the myotomy in JE.¹⁶ There is a distinct advantage to using POEM over surgery for JE because it allows performance of a long myotomy, which is not possible with the laparoscopic Heller myotomy procedure.¹⁷

Esophageal Spasm

Diffuse esophageal spasm (DES) is a dysmotility disorder characterized by abnormal contractions of the distal esophagus, with typical symptoms being

dysphagia and chest pain.¹⁸ Minami et al. 2014 performed POEM on 2 patients with DES.¹⁹ The patients did not have dysphagia or gastroesophageal reflux at 5- and 6-months follow-up. Sugihara et al. 2018 also had a successful POEM in a 67-year-old man with a 4-year history of symptomatic DES.²⁰ An extended myotomy is usually done for DES, much like JE. POEM for DES can be more technically difficult due to esophageal spasm during the procedure. Shiwaku 2013 reported a successful use of POEM for DES, in which their patient's original Eckardt score of 7 was reduced to 0 after POEM.²¹ Sharata et al.¹³ used POEM with extended myotomy in 25 non-achalasia patients, including 5 with DES. Overall, dysphagia relief was better for achalasia patients (97.8%) compared to non-achalasia patients (70.8%). Importantly, in patients with pre-POEM symptoms of chest pain, 91.5% reported complete relief.

Esophagogastric Junction Outlet Obstruction

Esophagogastric junction outlet obstruction (EGJOO) is characterized by an increase of the integrated relaxation pressure (IRP) of the LES, with maintenance of esophageal peristalsis. Jacobs et al. 2021 reported clinical success in 47 of 55 patients at a median of 117 days follow-up.²² There were several relatively minor adverse effects, including 2 mucosal perforations, 2 cases of pneumoperitoneum requiring decompression, and 1 mucosal perforation which was treated with an esophageal stent resulting in full recovery. Reflux esophagitis was observed in 10 of 25 patients who underwent post-procedural endoscopy. Ichkhanian et al. 2020 described POEM for 15 EGJOO patients, with a 93% success rate 6 months after the procedure. There was a significant decrease in the IRP, as well as improved quality of life scores.²³

Data is incomplete on the long-term effectiveness of POEM for EGJOO. Some studies have a short follow-up period, and loss of effectiveness of the POEM in EGJOO over time has been noted in studies with longer clinical follow-up.²⁴ For example, Modayil reported POEM in 15 EGJOO patients with initial success at 6-month follow-up. These cases had Eckhart scores of 1.9, which is higher than the usual score of 1.2 after POEM. At a 12-month follow-up, mean Eckhardt scores rose to 2.4 and success rates dropped to

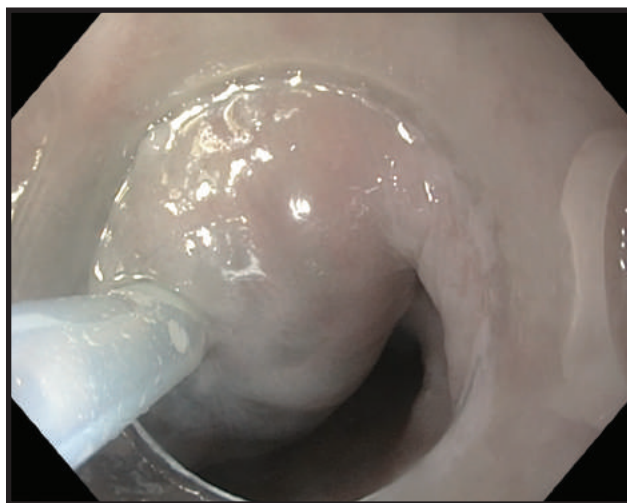


Figure 2. An initial submucosal “bleb” is created by injection of blue tinted saline; in this case an anterior tunnel was planned.

87%, and at 24-month follow-up mean Eckhardt scores rose to 3.0 and success rates fell to 73%. Even in patients who were selected carefully due to their EGJOO conditions resembling achalasia disorder symptoms, POEM still appears to not be as effective as it is for the achalasia patients.

Teitelbaum et al. 2018 reviewed clinical outcomes five years after POEM for several esophageal motility disorders, including EGJOO.²⁵ Five of their patients had EGJOO and 2 required reintervention for symptom recurrence. One underwent a laparoscopic Heller myotomy 11 months after POEM. The other patient developed cervical dysphagia 2 years later, managed with endoscopic cricomyotomy. Both of the patients who had reintervention improved, with postoperative Eckhardt scores of ≤ 2 . The authors concluded that POEM resulted in long term relief of symptoms in the majority of patients, for both achalasia and non-achalasia disorders.

Knowledge Gaps for Poem in Achalasia, Non-Achalasia, and Esophageal Motility Diseases

Despite the large clinical experience with POEM, there are still relatively few being done for non-achalasia disorders. A knowledge gap in this field is defining the incidence of GERD after POEM in non-achalasia patients. Because of the lack of fundoplication with POEM, there is approximately a 30% likelihood of post-POEM patients GERD.²⁶

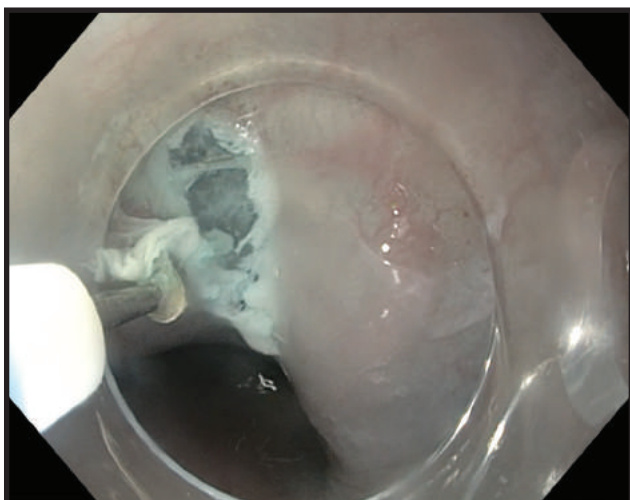


Figure 3. The initial mucosotomy is done with an ESD knife; in this case the T-Type Hybrid knife was used.

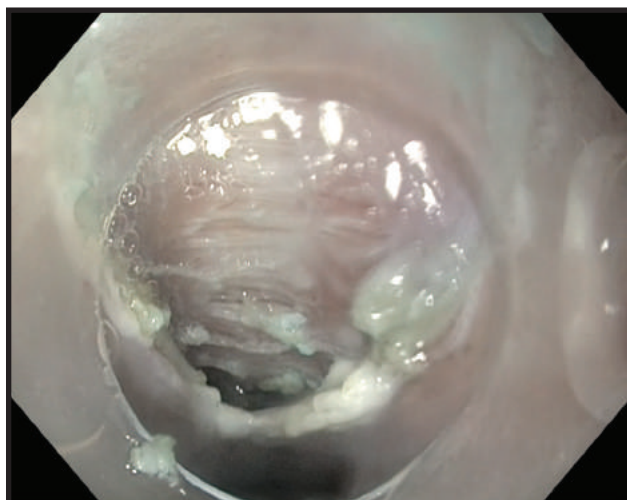


Figure 4. Space is created by freeing up submucosal fibers to create a submucosal tunnel that will allow scope entry.

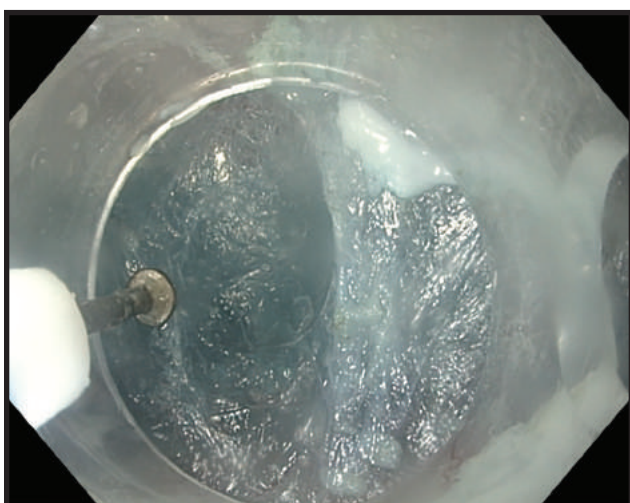


Figure 5. Once the endoscope is in the submucosal tunnel, the space is expanded by intermittent injection of tinted saline, and the submucosal fibers cut with the dissection knife.

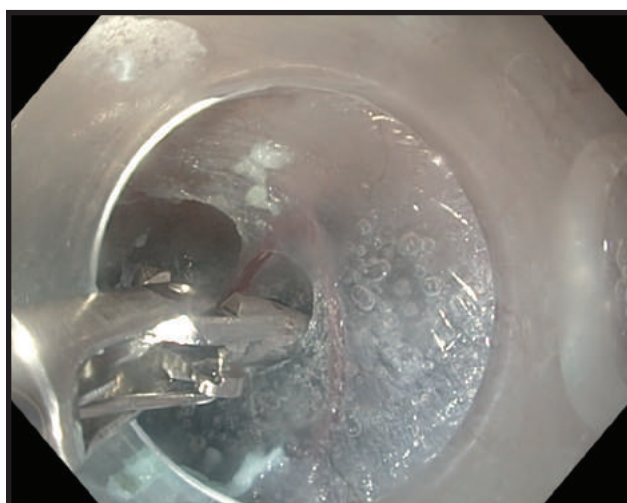


Figure 6. Submucosal vessels that are encountered are cauterized; larger vessels can be cauterized with a hemostatic forceps, shown here.

However, it typically can be controlled with acid suppression. POEM is not typically followed by fundoplication, but there is data suggesting that the likelihood of GERD occurring post-POEM in non-achalasia esophageal motility disorders is not very different from the traditional Heller myotomy.²⁷ Stavropoulos et al. 2021 noted decreases in post-POEM GERD over time after healing and scar contraction occur, which contrasts from the typical increase in GERD after the Heller myotomy procedure paired with fundoplication.

Modifications of the POEM Procedure

Procedural modifications may be necessary when doing a POEM for non-achalasia disorders. Wang et al. 2015 advocate for a shorter myotomy in achalasia, as well as a shorter submucosal tunnel.²⁸ This modification may be ideal for some cases of EGJOO without esophageal spasm. This group performed a shorter myotomy (with a mean length of 4.9 cm plus 1 cm at the gastric side, compared to the traditional 8 cm) in the POEM procedure on 46 consecutive achalasia patients. At a 3-month



Figure 7. The tunnel is extended through the esophageal submucosal space and down on to the submucosa of the stomach for approximately 2cm. The end of the tunnel is shown here.

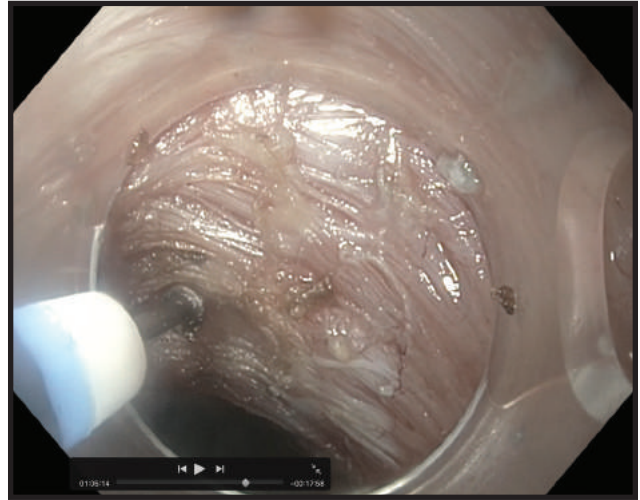


Figure 8. The circular muscle of the esophagus is seen here. Complete circular myotomy is done, with the length of the myotomy determined by the indication for the POEM. POEM for spastic esophageal disorders are longer than for types I and II achalasia.

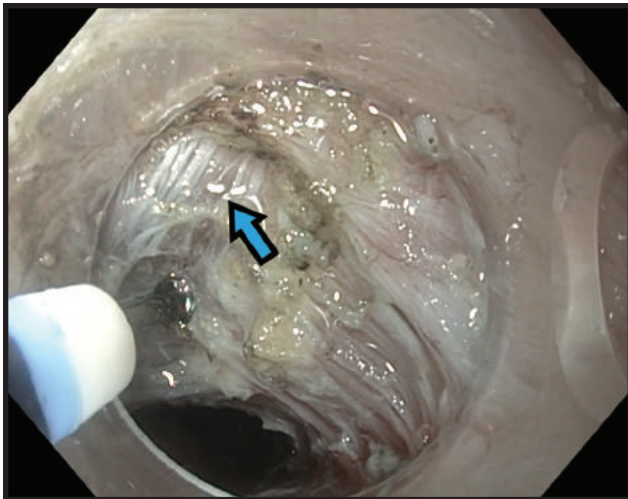


Figure 9. After the circular muscle fibers are cut, the longitudinal muscle fibers can be seen.

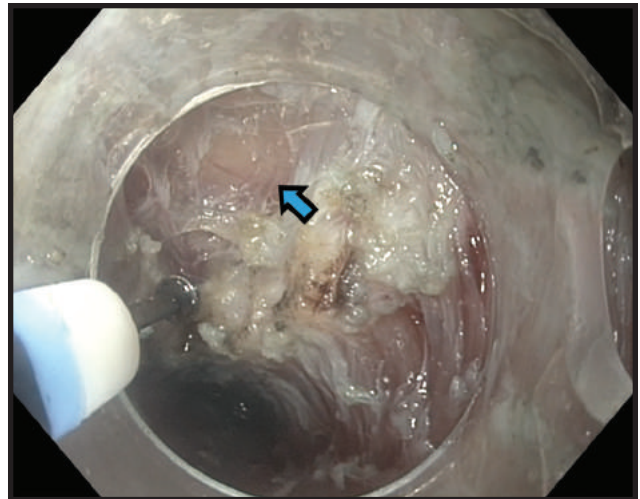


Figure 10. Often the longitudinal fibers “split”, creating in effect a full thickness myotomy. This typically does not cause a problem.

follow-up, patients were experiencing lower Eckhardt scores, decreased lower esophageal sphincter pressure, integrated relaxation pressure, and a decrease in height of esophagus barium-contrast column. Only 3 patients experienced GERD at 3-month follow-up. A short myotomy could be a solution to post-POEM reflux when long myotomy is not necessary.

Longer myotomies are often required in non-achalasia disorder settings because the spasticity

involves differing lengths of the esophageal body. The length of the myotomy can be determined by reviewing the high-resolution manometry and the proximal border of the high-pressure zone.²⁹ Huang et al. 2020 compared the outcomes of 129 patients who received longer and shorter myotomies in otherwise equivalent POEM procedures.³⁰ They determined that there was no significant difference in terms of efficacies of shorter and

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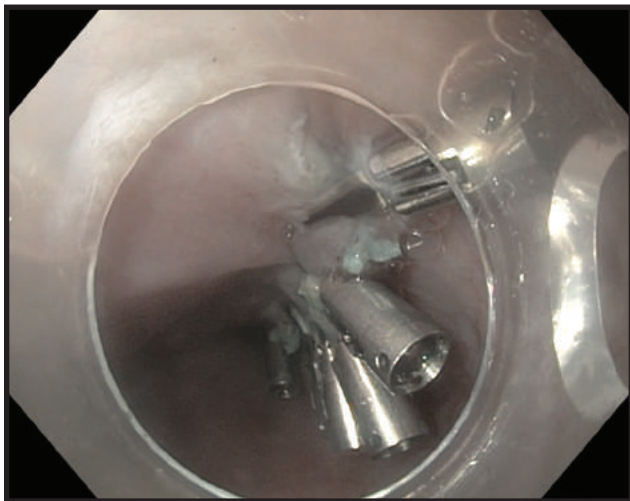


Figure 11. After completion of the myotomy, the mucosal entry point is closed, in this case using clips.

longer myotomies. Longer myotomies can prove to be needed in certain types of esophageal spasm disorders, such as for jackhammer esophagus.³¹

Ponds et al. 2018 describes the challenges of POEM as a treatment method for DES.³² Intraprocedural esophageal spasm and problematic contractions can occur, which can make the procedure more difficult. Administration of nitroglycerin during the procedure was found to be of benefit. Myotomy should start more proximally than in non-spastic achalasia patients, otherwise some of the contractions may persist postoperatively. HRM can be used as a method to guide this process. Ponds et al. concluded that POEM has much promise for treating therapy-refractory DES.

CONCLUSION

POEM can be effectively used for both achalasia and non-achalasia esophageal disorders. For spastic motility disorders of the esophagus, including jackhammer esophagus, esophageal spasm, and esophagogastric junction outlet obstruction, POEM has been shown to be effective in reported cases, although there are a relatively small number of reports for these types of cases. Modifications of the POEM procedure for non-achalasia disorders is typically necessary, with longer myotomies required for adequate treatment of spastic disorders, and potentially shorter myotomies for

EGJOO. As POEM continues to be used by an expanding number of advanced endoscopists, more data should become available on the effectiveness of this treatment for non-achalasia esophageal disorders. ■

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Answers to this month's crossword puzzle:

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