

Title:

Application of the fourth space in peroral endoscopic myotomy (POEM) surgery for achalasia

Authors:

Taofeng Jiang, Yang Yang, Wen Luo

DOI: 10.17235/reed.2025.11331/2025

Link: [PubMed \(Epub ahead of print\)](#)

Please cite this article as:

Jiang Taofeng, Yang Yang, Luo Wen. Application of the fourth space in peroral endoscopic myotomy (POEM) surgery for achalasia. Rev Esp Enferm Dig 2025. doi: 10.17235/reed.2025.11331/2025.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Application of the fourth space in peroral endoscopic myotomy (POEM) surgery for achalasia

Taofeng Jiang¹ Yang Yang¹ Wen Luo¹

¹Department of Gastroenterology, Meizhou People's Hospital, Meizhou Academy of Medical Sciences, No. 63, Huangtang Road, Meizhou 514031, Guangdong Province, China

Keywords: Peroral endoscopic myotomy (POEM). The fourth space.

Dear Editor,

A 79-year-old male patient presented with dysphagia five years ago and was later diagnosed with achalasia. The patient underwent endoscopic balloon dilatation, which initially improved his symptoms, but over time, they gradually worsened. In the past week, the patient had significant obstruction when drinking water. The preoperative Eckardt score was 5 points [1]. After multidisciplinary consultation, POEM (peroral endoscopic myotomy) was recommended as the primary treatment option. The specific operation steps (Figure 1) are as follows: 1. Mucosal incision: Use a hybrid knife from the German ERBE company to incise the mucosa 10 cm proximal to the esophagogastric junction (EGJ). 2. Submucosal tunnel establishment: Under endoscopy (with distal cap), dissect the submucosal tunnel to 2 cm from the EGJ. 3. Circular myotomy: In the tunnel, perform selective circular myotomy 5 cm intraorally at the EGJ to expose the underlying longitudinal muscle layer. 4. Establishment of the fourth space: Using a hybrid knife, inject a mixture of methylene blue and saline along the circular myotomy site to achieve adequate water separation and establish the fourth space between the longitudinal muscle layer and the adventitia. 5. Full-thickness myotomy of the muscularis propria: Using an electric knife, perform a full-thickness myotomy retrogradely along the submucosal tunnel in the fourth space, and continue to 2 cm distal to the EGJ. 6.

Closure of mucosal entrance: Close the mucosal incision firmly with hemostatic clips. Postoperative endoscopic examination showed that the cardiac diastolic function was significantly enhanced compared with the baseline, and no surgical complications were observed. During the follow-up for more than six months, the patient did not report symptom recurrence, and the current Eckardt score is 0.

Discussion

In this case of elderly refractory achalasia, POEM was considered the most appropriate treatment and full-thickness myotomy may help reduce recurrence rates and shorten procedure duration [2, 3]. However, reducing technical difficulty during myotomy is crucial for both procedural feasibility and safety. Our innovative approach is to create a "fourth space" by injecting drugs between the adventitia and longitudinal muscle layer before myotomy. This technique shows several advantages. First, the fourth space created allows direct observation of the position of the scalpel, effectively avoiding damage to the extramural structure. Second, full-thickness myotomy is technically easier to perform, which may shorten the operation time. Finally, excessive damage to the esophageal adventitia is avoided, and the liquid cushion and intact adventitia help prevent excessive gas leakage, thereby reducing gas-related complications.

It is the first report in the literature on this innovative approach in esophageal POEM surgery, which can significantly improve the safety and convenience of myotomy. However, large-scale prospective studies are needed to verify the effectiveness and safety of this technique.

References

1. Eckardt VF, Aignherr C, Bernhard G. Predictors of outcome in patients with achalasia treated by pneumatic dilation. *Gastroenterology*. 1992;103(6):1732-8.
2. Gutschow CA, Hölscher AH. Myotomy for esophageal achalasia - laparoscopic versus peroral endoscopic approach. *Endoscopy*. 2010;42(4):318-9.
3. Vaezi MF, Pandolfino JE, Yadlapati RH, Greer KB, Kavitt RT. ACG Clinical Guidelines: Diagnosis and Management of Achalasia. *The American journal of*

gastroenterology. 2020;115(9):1393-411.

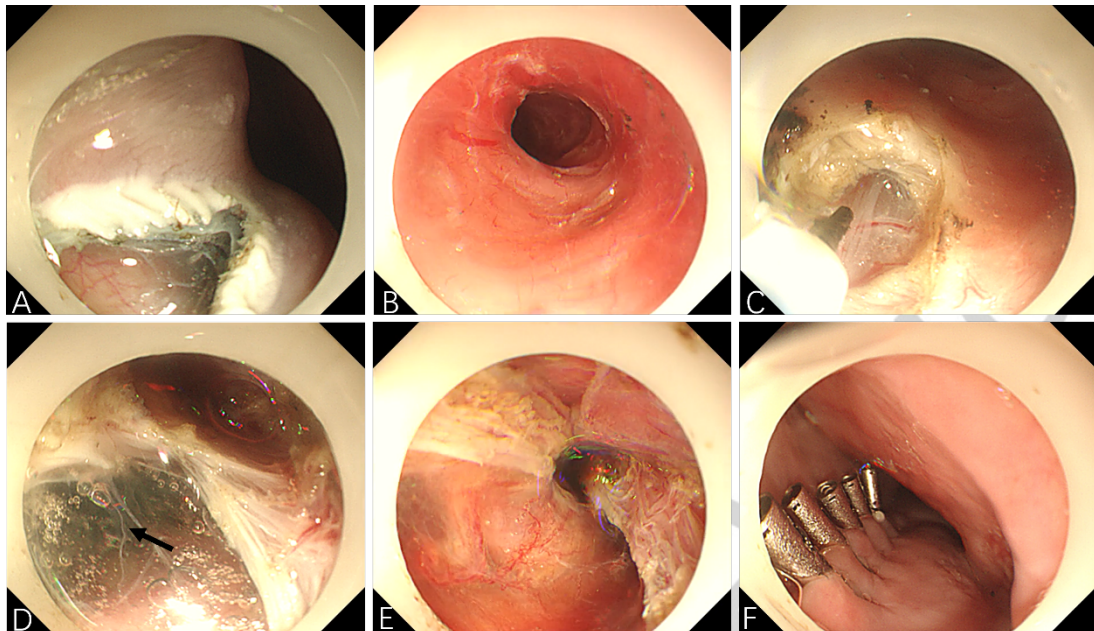


Fig. 1: POEM Steps Using the Fourth Space: (A) Mucosal incision and tunnel entry; (B) Submucosal tunnel establishment; (C) Circular myotomy; (D) Injection between the longitudinal muscle and adventitia to form the fourth space (black arrow); (E) Full-thickness myotomy; (F) Tunnel entry closure.