



Evaluation of sling fibers and two penetrating vessels for guiding extent of the tunnel and myotomy during posterior peroral endoscopic myotomy in a Western cohort

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Peroral endoscopic myotomy (POEM) was performed first in 2008 by Professor Inoue. Its use is now widespread as a first-line treatment for achalasia, with similar efficacy to Heller’s myotomy.¹

There are 2 main technical approaches to performing myotomy: anterior or posterior submucosal tunneling. They have similar efficacy and safety, according to recent meta-analysis and randomized controlled trial, although posterior POEM seems to be faster to perform²⁻⁴ and is preferable after Heller’s myotomy.

According to anatomic studies,⁵ it is believed anterior POEM at the 2 o’clock position results in myotomy of the “clasp” muscular fibers seen endoscopically as the continuation of the inner esophageal circular muscle fibers, whereas posterior POEM at the 5 or 6 o’clock position results in myotomy of the “clasp” fibers with risk of damaging the inner gastric oblique “sling” fibers (Figs. 1 and 2).

It is important to avoid a long myotomy (>3 cm) because this might be associated with higher post-POEM gastroesophageal reflux disease (GERD)⁶; it is also important to preserve the sling fibers because they may help to prevent GERD by maintaining the acuity of the angle of His.

Recently, Tanaka et al^{7,8} described the presence of two penetrating vessels (TPVs) as a good landmark to end the

submucosal tunnel and guide the myotomy direction to spare the sling fibers during posterior POEM, with the potential of reducing the incidence of post-POEM GERD (Figs. 3 and 4).

We aimed to study and characterize the presence of the TPVs according to sling fibers in a prospective Western cohort of patients undergoing posterior POEM. We show the endoscopic and technical details in Video 1 (available online at www.VideoGIE.org).

METHODS

Patients

We included all consecutive cases of patients with achalasia who underwent posterior POEM from November 2018 to February 2020 at 2 institutions. Written informed consent was obtained from each patient before the study.

POEM procedure

Posterior POEM was performed by 1 endoscopist actively looking for the TPVs as described by Tanaka et al,⁷ using a standard gastroscope, short transparent cap, Hybrid Knife T-Type (Erbe, Tübingen, Germany), CO₂ insufflation, and coagulation grasper when needed.

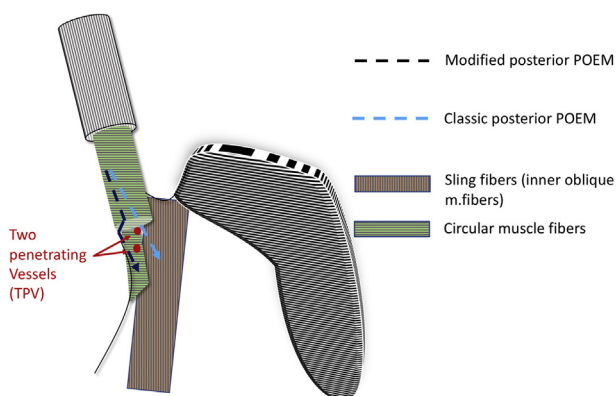


Figure 1. Modified posterior peroral endoscopic myotomy direction according to two penetrating vessels and the sling fibers.

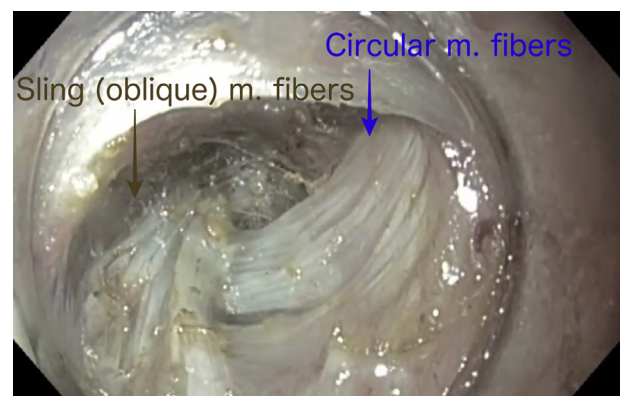


Figure 2. Inner oblique (sling) muscular fibers and circular (clasp) muscular fibers.

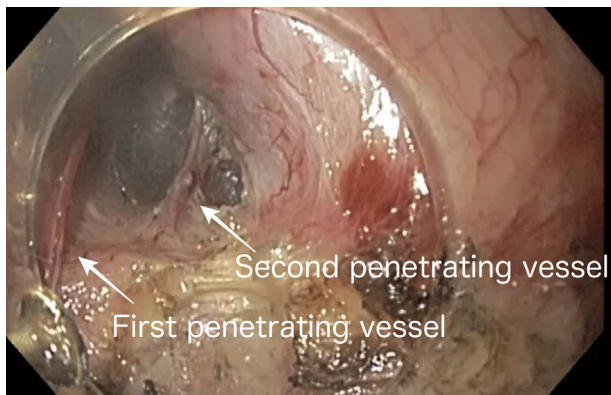


Figure 3. Two penetrating vessels.

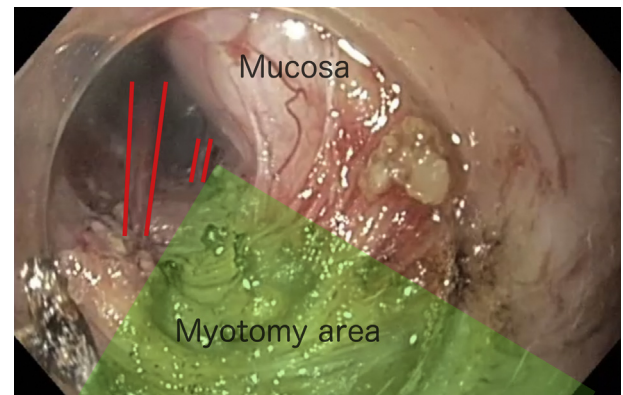


Figure 4. Posterior myotomy direction according to two penetrating vessels.

The procedures were performed with the patient under general anesthesia and lying in the supine position. A longitudinal mucosal incision and submucosal tunneling were performed at the 5 to 6 o'clock position until reaching the gastroesophageal junction (GEJ). The GEJ was defined by a narrowing area followed by expansion of the submucosal space, the distance from the incisors (similar to the GEJ on the luminal side), the presence of spindle veins, and edema at the level of the luminal side of the GEJ. In doubtful cases, transillumination using a parallel slim endoscope or X-ray was used to confirm the GEJ's position.

After the GEJ, we modified the direction of the tunnel by looking actively for the TPVs, trying to preserve the sling fibers, as described by Tanaka et al.⁸ Careful dissection was needed at this point. If the penetrating vessels were not detected, the tunneling and subsequent myotomy at the gastric level were carried out at around the 3 to 4 o'clock position (toward the lesser curvature).

Selective esophageal myotomy was followed by a 2- to 3-cm gastric myotomy. After the myotomy, the mucosal incision was closed with clips.

OUTCOMES

Clinical, anatomic, and technical endoscopic data were collected prospectively from all cases. The distance from the incisors and clock position of the first and second penetrating vessel were collected.

TPVs were defined as branches from the left gastric artery found in the posterior wall of the gastric cardia, with the first vessel found immediately after passing the GEJ and the second a few centimeters distally, as described by Tanaka et al.^{7,8}

RESULTS

Twenty-three posterior POEM procedures were performed. The patient group was 52% male and 48% female, with a mean age of 57 years (range, 24-80). Technical

TABLE 1. Location of two penetrating vessels

| Characteristics | Value |
|---|---------------|
| Mean height (range), cm | 165 (151-185) |
| First penetrating vessel | |
| Mean distance from incisors (range), cm | 42.5 (40-48) |
| Clock position (%) | 6 (100) |
| Second penetrating vessel | |
| Mean distance from incisors (range), cm | 44.3 (42-49) |
| Clock position (%) | 4 (50) |
| | 5 (50) |
| Mean distance between penetrating vessels (95% confidence interval), cm | 1.8 (1.5-2.1) |

and clinical success rates were 100% (minimum 30-day follow-up).

Cases included 6 sigmoid esophagus, 4 with previous Heller myotomy, 7 with previous balloon dilation, and 6 cases of type 3 achalasia. Mean procedural time was 68 minutes (range, 40-112). TPVs were identified in 16 cases (69.57%). The first vessel was usually found immediately after or 1 cm distal to the narrow GEJ, at the 6 o'clock position, and the second vessel usually was 1.5 to 2 cm distal (to the first vessel), at the 5 or 4 o'clock position (Table 1). Sling fibers were seen as internal oblique fibers running at the left side of the TPVs. Only the first penetrating vessel was identified in 4 cases (17.39%). The sling fibers were identified in 6 cases (26.08%). TPVs or sling fibers were detected in 18 cases (78.26%) and at least 1 penetrating vessel or sling fibers in 21 cases (91.30%).

All patients completed at least 3 months of follow-up (range, 3-16 months), with a clinical symptom evaluation. All patients started proton pump inhibition per protocol after the POEM procedure. Use was discontinued after clinical evaluation in all asymptomatic patients.

Regarding GERD symptoms, most patients remained asymptomatic (82%), and 4 patients presented at least mild GERD symptoms. Upper endoscopy was performed

in 4 patients: 2 were negative, 1 patient presented Grade A esophagitis, and 1 patient presented Grade C esophagitis. In the latter case, TPVs were not identified during POEM.

CONCLUSIONS

TPVs seem to be easy to identify in a Western population. They seem to be a good indicator of the optimal distal extent of posterior POEM and to guide myotomy to preserve gastric oblique fibers (sling fibers), potentially reducing the incidence of post-POEM reflux. When TPVs or sling fibers are not identified, the tunneling and subsequent myotomy at the gastric level at the 3 to 4 o'clock position (toward the lesser curvature) might be equivalent.

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DISCLOSURE

All authors disclose no financial relationships.

Abbreviations: GEJ, gastroesophageal junction; GERD, gastroesophageal reflux disease; POEM, peroral endoscopic myotomy; PV, penetrating vessel; TPVs, two penetrating vessels.

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