

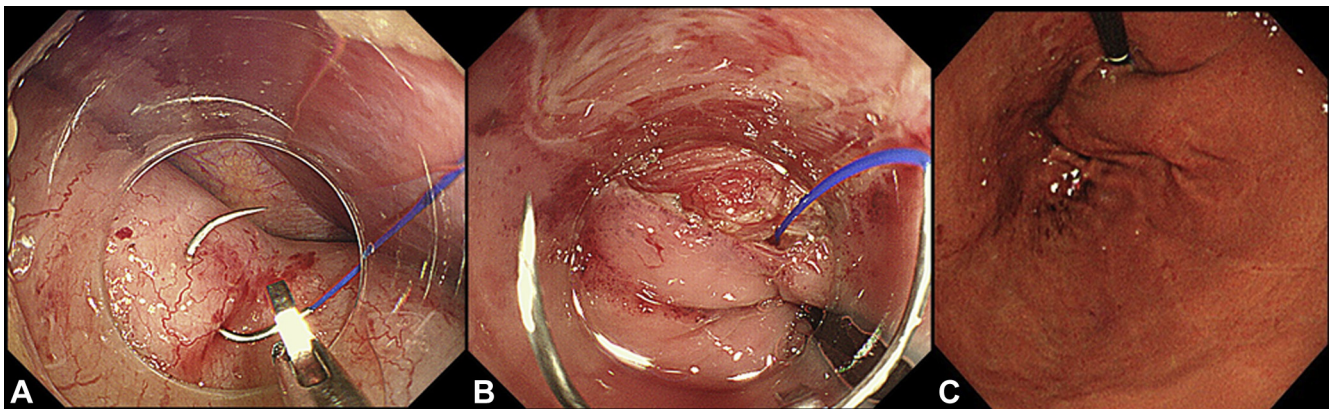
## Peroral endoscopic fundoplication: a brand-new intervention for GERD



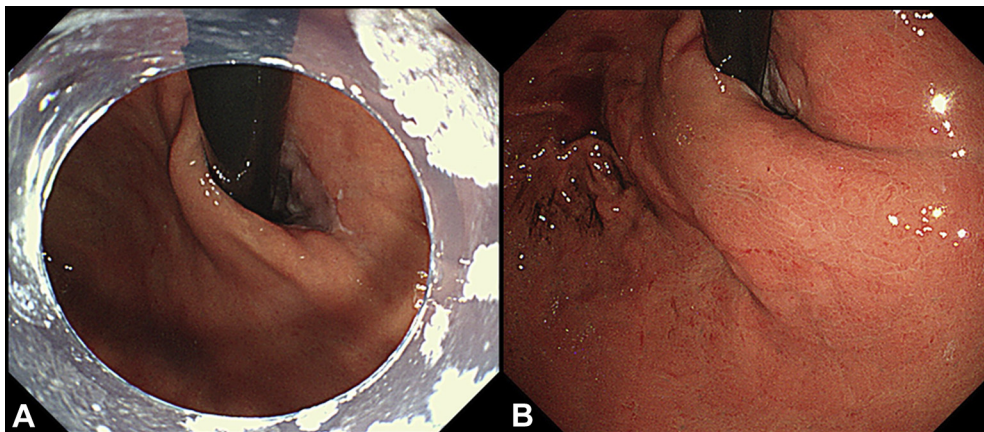
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Minimally invasive treatments are preferred in any field of medical treatment. Relevant to that, we started peroral endoscopic myotomy (POEM) in 2008<sup>1</sup> as a minimally invasive endoscopic treatment for achalasia and related motility disorders. Use of POEM has spread all over the world. However, the potential risk of developing GERD after POEM has been reported in multiple studies.<sup>2</sup> Seeking to prevent post-POEM GERD, we conducted a pilot study on the effectiveness of POEM + fundoplication (POEM+F)<sup>3</sup> as a natural-orifice transluminal endoscopic surgery procedure using submucosal endoscopy with

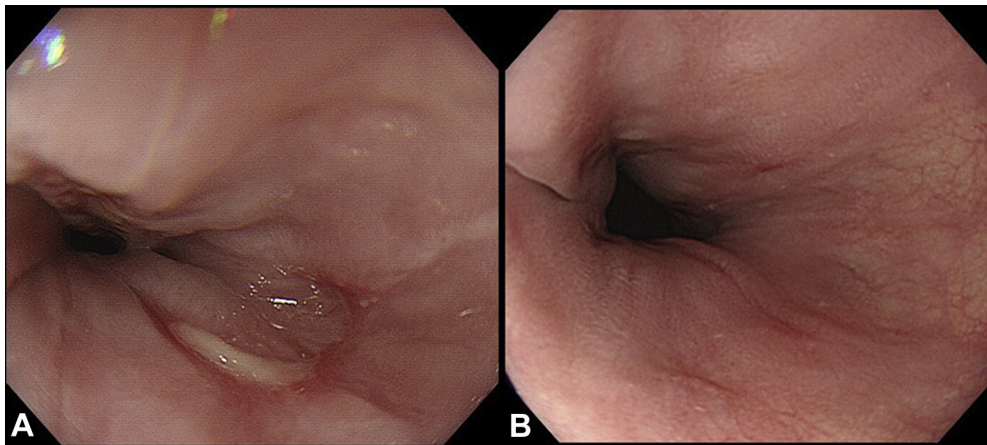
the mucosal flap safety valve technique reported by Sumiyama et al.<sup>4</sup> From our experience with POEM+F, we found that peroral endoscopic fundoplication (POEF) may become a solution for proton pump inhibitor-refractory GERD, especially that after POEM. We applied the endoloop and clip method for the initial POEM+F procedure, and we recently refined the technique to the endoscopic hand-suturing (EHS) initially reported by Goto et al<sup>5</sup> to avoid leaving foreign bodies in situ. We also applied this new EHS method to POEF. Herein, we report our first POEF case.



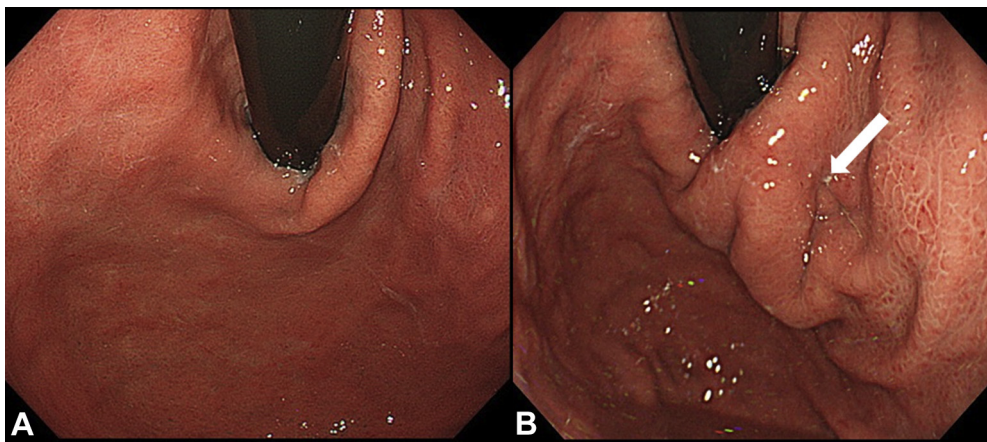
**Figure 1.** Peroral endoscopic fundoplication procedure by endoscopic suturing. Distal anchoring at the anterior gastric wall. **A**, In the abdominal cavity. **B**, By pulling back the endoscope and the device, the suture is tightened and a partial wrap is created at the gastric cardia (**C**).



**Figure 2.** The morphologic change at gastric cardia before (**A**) and after fundoplication (**B**).



**Figure 3.** Reflux esophagitis is improved 2 months after peroral endoscopic fundoplication (POEF) (B) compared with preoperative status (A).



**Figure 4.** Intragastric retroflex view before (A) and 10 months after (B) peroral endoscopic fundoplication. The fundoplication remains, and the suture site is recognized as resembling a dimple (arrow).

## CASE

A 51-year-old man who underwent POEM for distal esophageal spasms presented with GERD symptoms 2 months after POEM. A gastroscopy revealed erosive esophagitis (LA grade B), and his GERD-Questionnaire score was 11, despite taking daily vonoprazan for 6 months. Hence, he underwent POEF 8 months after the initial POEM procedure (Video 1, available online at [www.VideoGIE.org](http://www.VideoGIE.org)).

POEF consists of the following 3 steps:

1. Submucosal tunneling: We created a 7-cm submucosal tunnel at the anterior wall of the lower esophagus by using GIF-Q260J (Olympus Medical Systems Corp, Tokyo, Japan) and a super soft hood, Space adjuster (TOP, Tokyo, Japan),<sup>6</sup> as well as a Triangle Tip Knife J (KD-645L; Olympus).
2. Fundoplication: The submucosal endoscope was advanced through the peritoneum into the abdominal cavity by using coagulation forceps and a Triangle-Tip Knife J. Next, we prepared a surgical suture needle

(VLOCL0804; Covidien, Mansfield, Mass, USA) with a self-made anchor made from a fragment of PLEDGET (commonly used in cardiovascular surgery) outside the body. The suture needle was held by an endoscopic needle holder (E650007, prototype; Olympus). Keeping the needle within the hard hood, the endoscope was advanced into the peritoneal cavity through the submucosal tunnel. We carried the needle and made the distal anchoring at the anterior gastric wall by grasping the full thickness of the gastric wall (Fig. 1A). The second stitch was placed at the distal end of the exposed dissected muscle layer in the submucosal tunnel. By pulling back the endoscope and the device (Fig. 1B), the suture was tightened and a partial wrap was created at the gastric cardia (Fig. 1C). We made another stitch to reinforce the fundoplication. We then cut the suture by using endoscopic scissors forceps. Figure 2 shows the morphological change of gastric cardia before and after fundoplication.



3. Mucosal closure: The entry site was completely closed by clips, similar to the POEM procedure.

The patient was discharged without any adverse events. Follow-up gastroscopy 2 months later showed improvement of the erosion at the junction (Fig. 3), and his symptoms also improved (GERD-Questionnaire decreasing from 11 to 6) without acid suppression drugs. Ten months after the procedure, morphologic change of the gastric cardia remained (Fig. 4), and neither erosive esophagitis nor symptoms recurred.

In summary, we achieved pure natural orifice transluminal endoscopic surgery fundoplication with EHS. POEF is a novel procedure and may become one of the solutions for refractory GERD.

## DISCLOSURES

*Dr Inoue is an advisor for Olympus Corporation and Top Corporation; and received educational grants from Olympus Corp. and Takeda Pharmaceutical Co. All other authors disclosed no financial relationships.*

## ACKNOWLEDGMENT

We thank Dr. Kaori Ohwada for creating the illustration of the procedure in the video.

*Abbreviations: EHS, endoscopic band-suturing; POEF, peroral endoscopic fundoplication; POEM, peroral endoscopic myotomy; POEM+F, peroral endoscopic myotomy + fundoplication.*

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