Investigating Deeper

Muscularis Propria to Natural Orifice Transluminal Endoscopic Surgery

Kazuki Sumiyama, MD, PhD[a,*], Christopher J. Gostout, MD[b], Hisao Tajiri, MD, PhD[a,c]

KEYWORDS

- Submucosal endoscopy with a mucosal flap safety valve technique
- Intramural endoscopy • Muscularis propria • Enteric nerve system
- Endomicroscopy • Peroral endoscopic myotomy • Submucosal tumor removal
- Submucosal endoscopy with mucosal resection

KEY POINTS

- Submucosal endoscopy with a mucosal flap (SEMF) safety valve technique is a global concept that uses the submucosa as a free working space for endoscopic interventions.
- A purposefully created intramural space provides an endoscopic access route to the deeper layers and into the extraluminal cavities.
- The mucosa overlying the intramural space is protective, reducing contamination during natural orifice transluminal endoscopic surgery (NOTES) procedures and providing a sealant flap to repair the entry point and the submucosal space.
- In addition to NOTES, SEMF has been used to enable endoscopic achalasia myotomy; histologic analysis of the muscularis propria, including neural components; and submucosal tumor removal.

INTRODUCTION

Research into endoscopic tissue excision has focused on pursuing methods to obtain larger specimens.[1] The eventual development of endoscopic submucosal dissection (ESD) enabled radical en bloc removal of a mucosal lesion regardless of size. During efforts to accomplish widespread endoscopic mucosal resection (EMR) in the Mayo

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[a] Department of Endoscopy, The Jikei University School of Medicine, 3-25-8 Nishi Shinbashi, Minato-ku, Tokyo 105-8461, Japan; [b] Developmental Endoscopy Unit, Division of Gastroenterology and Hepatology, Mayo Clinic College of Medicine, 200 First Street Southwest, Rochester, MN 55905, USA; [c] Division of Gastroenterology and Hepatology, Department of Internal Medicine, The Jikei University School of Medicine, 3-25-8 Nishi Shinbashi, Minato-ku, Tokyo 105-8461, Japan
* Corresponding author.
E-mail address: kaz_sum@jikei.ac.jp

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Clinic Developmental Endoscopy Unit (DEU), the authors observed that the mucosa could be separated from the underlying submucosa (ie, delamination) with relative ease.[2] The potential value of delamination later resurfaced. Natural orifice transluminal endoscopic surgery (NOTES) established a path for flexible endoscopy beyond the gut wall.[3] During the NOTES experience, the authors recognized that with delamination of the mucosa from the submucosa, the submucosal layer could be converted into a practical endoscopic working space. Pilot animal studies demonstrated that a purposefully created free space within the submucosa would provide off-set tunneled access to the deeper layers as well as a safer and cleaner portal into the extraluminal cavities for NOTES procedures compared with direct full-thickness viscerotomy (**Fig. 1**).[4–8] Conversely, once the submucosa has been opened, the overlying mucosa can be excised more safely from inside the submucosa out into the gut lumen. This inside-out technique could be a safer and easier alternative to the current labor-intensive ESD for en bloc resection of mucosal disease.[9]

Intramural endoscopy has attracted great attention internationally. A variety of promising spin-offs have developed and pioneering clinical studies have already revealed practical advantages of this novel application for gastrointestinal (GI) endoscopy.[10]

SUBMUCOSAL ENDOSCOPY WITH MUCOSAL FLAP SAFETY VALVE TECHNIQUE AND OFF-SET ACCESS TO EXTRALUMINAL SPACES FOR NOTES

Submucosal endoscopy with a mucosal flap (SEMF) safety valve technique was devised as a method to convert the submucosa into a working space for endoscopic intervention and to provide an off-set entry point into the extraluminal space to enable NOTES (see **Fig. 1**).[4,8] The unique feature of this technique is the protective function of the overlying mucosa, which minimizes contamination from luminal contents and provides a sealant flap to the submucosal space after any off-set exit from the gut wall into a body cavity (**Fig. 2**).

The submucosal space, or tunnel, in more limited applications of SEMF, requires a 4 to 5 cm length to provide a safety flap valve. In the authors' experience, a 5 to 10 cm long tunnel is superior; the greater length acts as an added safety measure during NOTES procedures for less risk of extraluminal contamination.[6,7] The SEMF procedure is initiated by creation of a submucosal fluid cushion (SFC) to access the submucosa and initiate the anticipated route of the submucosal tunnel. The SFC is critical for entering the dissection plane and for preventing inadvertent full-thickness injury. Saline works well for quick procedures; however, viscous solutions,

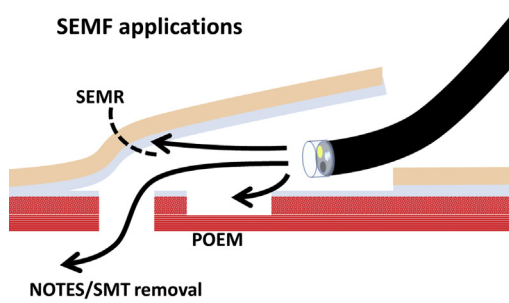

Fig. 1. Submucosal endoscopy with a mucosal flap (SEMF) safety valve technique. NOTES, natural orifice transluminal endoscopic surgery; POEM, peroral endoscopic myotomy; SEMR, submucosal endoscopy with mucosal resection; SMT, submucosal tumor.