

# Submucosal Endoscopy

## From ESD to POEM and Beyond

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### KEYWORDS

- Endoscopic mucosal resection • Endoscopic submucosal dissection
- Peroral endoscopic myotomy • Achalasia • Heller myotomy
- Submucosal endoscopic tumor resection • Submucosal tumor

### KEY POINTS

- The development of snare polypectomy with electrocautery opened the door for therapeutic endoscopy in the gastrointestinal tract.
- At present, endoscopic submucosal dissection (ESD) consists of endoscopic microsurgery using a flexible endoscope.
- In both ESD and peroral endoscopic myotomy (POEM) if either the mucosa or the muscle layer are kept intact, neither peritonitis nor mediastinitis may occur, because either the mucosa or the muscle layer acts as a strong barrier.
- POEM is performed under general anesthesia with endotracheal intubation, keeping the patient in the supine position.
- Another major advantage of POEM is the flexibility of myotomy length.

### INTRODUCTION

Peroral endoscopic myotomy (POEM)<sup>1</sup> is an evolving minimally invasive endoscopic surgical procedure, with no skin incision, intended for long-term recovery from symptoms of esophageal achalasia. POEM is considered one of the best applications of NOTES (Natural Orifice Transluminal Endoscopic Surgery).<sup>2</sup> The first case was performed on September 8, 2008 at Showa University Northern Yokohama Hospital.<sup>3</sup> Since then more than 390 achalasia cases have been treated with the POEM procedure in this hospital, with no major complications. POEM was developed based on both the already established surgical principles of esophageal myotomy and the

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advanced techniques of endoscopic submucosal dissection (ESD). This article relates how POEM was developed, and its use in practice is reported and discussed. As an extension of the POEM technique, submucosal endoscopic tumor resection is introduced.<sup>4</sup>

### **ADVANCEMENT IN TECHNOLOGY FROM ENDOSCOPIC MUCOSAL RESECTION/ESD TO POEM**

The development of snare polypectomy with electrocautery opened the door for therapeutic endoscopy in the gastrointestinal tract. With less risk of bleeding, snare polypectomy quickly became the standard treatment for polypoid lesions. However, application of snare polypectomy to nonpolypoid lesions was technically difficult and remained unsolved. Endoscopic mucosal resection (EMR) was then developed for resection of flat mucosal lesions. Dehyle and colleagues<sup>5</sup> reported endoscopic resection of mucosa combined with submucosal injection. Submucosal injection creates a mucosal bleb, which is followed by snare resection. Later, EMR using a suction cap (EMR-C) was developed by the authors.<sup>6</sup> EMR-C was then further modified to EMR using a band ligator,<sup>7,8</sup> which accelerated the popularization of the technique. EMR does enable the resection of flat mucosal lesions, but the size of resection is somewhat limited. Large mucosal lesions can be successfully excised in a piecemeal fashion through repeated EMRs, although the resulting specimens are fragmented.<sup>9,10</sup>

To acquire large, one-piece specimens for accurate histopathologic evaluation, the novel method of ESD was developed by Ono.<sup>11</sup> To successfully complete ESD, various basic techniques are used such as submucosal injection, mucosal cutting, submucosal dissection, and hemostasis. ESD currently consists of endoscopic microsurgery using a flexible endoscope. The fundamental techniques used in the POEM procedure (submucosal injection, mucosal incision, submucosal tunneling, and hemostasis) are very similar to those of ESD.

### **HISTORY OF ACHALASIA TREATMENT**

Achalasia (the word itself is a Greek term that means “does not relax”) is a chronic benign disease with a subtle onset and symptoms that may progress gradually for years before an exact diagnosis can be made.<sup>12</sup> It is the most common primary motility disorder of the esophagus; however, it occurs rarely, with an annual incidence of approximately 0.03 to 1 per 100,000 per year. Achalasia affects men and women equally and may occur at any age. Despite an increasing understanding of its pathophysiology, the etiology of achalasia remains largely unknown,<sup>13</sup> and all current treatments have different advantages and drawbacks.<sup>14–17</sup>

Therapy has focused mainly on the forced relaxation of the lower esophageal sphincter (LES) by endoscopic or surgical means. As few randomized controlled trials have attempted to determine the optimal strategy, treatment still varies widely. First-line endoscopic treatments are botulinum toxin (Botox) injection and esophageal balloon dilatation.<sup>18</sup> Endoscopic pneumatic balloon dilatation temporarily relieves dysphagia in up to 70% of cases, and is still widely performed because of its relative noninvasiveness. However, it is associated with a potential risk of esophageal perforation (2.5%) and frequent recurrences. The cumulative 5-year remission rate of pneumatic dilatation for achalasia is reported to be between 50% and 70%. If these interventions are ineffective, surgical myotomy is generally indicated. Surgical myotomy was originally reported by Heller in 1913, and consisted of 2 longitudinal cuts of approximately 8 cm on the anterior and posterior esophageal wall, which included an approximately 2-cm cut on the dilated part (esophagus) and a short

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