Microperforation due to segmental absence of intestinal musculature during endoscopic submucosal dissection for early esophageal cancer: a case study

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Endoscopic submucosal dissection (ESD) has been widely applied for early esophageal cancer in recent years, but perforation is sometimes an adverse event. Here, we report a case of a patient found, during ESD, to have a segmental absence of intestinal musculature (SAIM) that caused a microperforation.

The patient was a 75-year-old man without any congenital disorder. A flat lesion, 8 mm in diameter, was found in his middle thoracic esophagus, and he was subsequently diagnosed as having early esophageal cancer (Fig. 1). An esophageal diverticulum was not detected endoscopically. ESD was performed by an experienced endoscopist using a Dual Knife (KD650; Olympus, Tokyo, Japan) and an IT knife nano (KD612; Olympus). Carbon dioxide insufflation was used throughout the procedure to reduce the risk of mediastinal emphysema. A microperforation in the absence of muscle injury was encountered during an initial circumferential incision and was immediately closed with clips (Fig. 2). A longitudinal muscle layer defect was found around the perforation on the right side of the lesion, which was resected en bloc without subsequent perforation by dissecting the shallow layer of the submucosa using a dental floss–clip traction method.

In the area of the muscle layer defect, an area more transparent than the surrounding submucosal layer was observed, with portions of mediastinal organs visible through the submucosal layer. The esophageal submucosal layer repeatedly protruded into and retracted from the esophageal lumen, in synchrony with respiration (Fig. 3A and B). The SAIM was completely closed prophylactically using clips (Fig. 4; Video 1, available online at www.VideoGIE.org) (Video 1).

The patient was treated with fasting and total parenteral nutrition and was administered proton pump inhibitors and antibiotics. CT scanning after the ESD revealed mediastinal emphysema that subsequently improved with conservative treatment. The patient was discharged on hospital day 12.

According to pathological findings, the cancer was diagnosed as a moderately differentiated squamous cell carcinoma, with an invasion depth of lamina propria mucosa;
both vascular invasion and the margin were negative. Because muscularis propria was not found in the resected specimen (Fig. 5), it was unlikely that the initial microperforation encountered during the circumferential incision was caused by the ESD. EGD showed an artificial ulcer after ESD during the healing stage 1 month after discharge (Fig. 6). The artificial esophageal ulcer after ESD healed in the scarring stage 2 months after discharge, at which point the SAIM was not detected (Fig. 7).

SAIM is considered one of the causes of spontaneous intestinal perforation, as has been previously reported. There have been no reports of a spontaneous perforation in the esophagus, although several recent studies have described the presence of a muscle layer defect after a finding of perforation during ESD. Although patients with esophageal muscle layer defects are rare, the existence of such patients without evidence of an esophageal diverticulum, as described in our case study, should be considered when performing esophageal ESD. In addition, SAIM should be suspected if mediastinal organs are observed through a relatively transparent submucosal layer, the movement of which is synchronized with respiration. The early detection of SAIM likely enabled us to avoid an esophageal perforation by dissecting the shallow submucosal layer

Figure 3. Endoscopic findings after endoscopic submucosal dissection. A, In the area of the muscle layer defect, portions of mediastinal organs could be seen through the submucosal layer (arrows). B, The esophageal submucosal layer repeatedly protruded into and retracted from the esophageal lumen in synchrony with respiration (arrows).

Figure 4. A segmental absence of intestinal musculature was completely closed using clips.

Figure 5. Pathological findings of a resected specimen. A, Pathological diagnosis revealed moderately differentiated squamous cell carcinoma. The muscularis propria was not found in the resected specimen (hematoxylin and eosin staining). B, Muscularis propria was not observed in the specimen (desmin staining, loupe image). A lamina muscularis mucosae–sparse area was found (arrows).
with traction devices. Importantly, a microperforation during initial entry should alert experienced ESD endoscopists to the possibility of SAIM.

**DISCLOSURE**

*All authors disclosed no financial relationships.*

**Abbreviations:** ESD, endoscopic submucosal dissection; SAIM, segmental absence of intestinal musculature.

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