

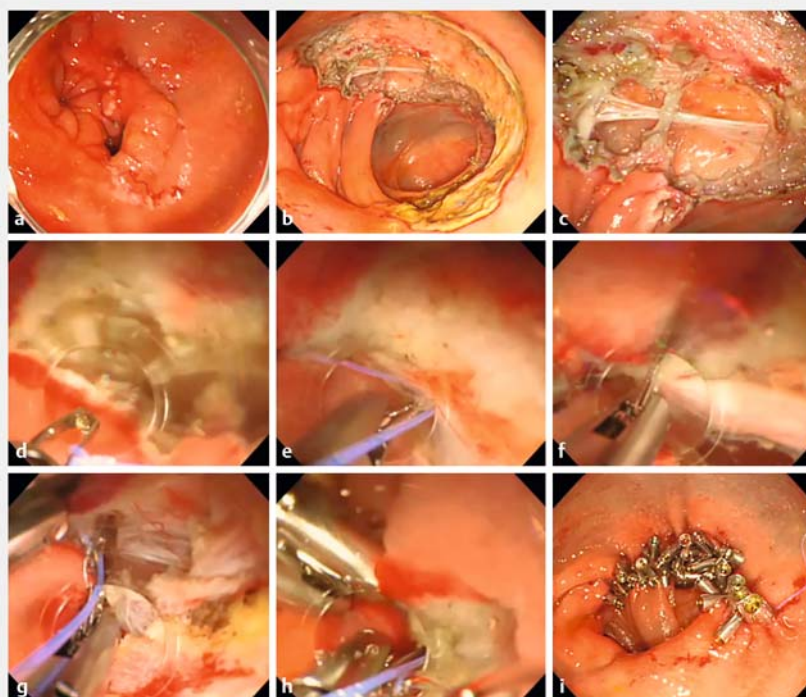
Closure of full-thickness perforation following endoscopic submucosal dissection of a gastric tumor near an anastomosis, using the reopenable clip-over-line method

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Early gastric tumors can be completely resected using endoscopic submucosal dissection (ESD). However, ESD is challenging for tumors located above a gastric anastomosis, and intraoperative perforation can create difficulty [1]. We have developed a closure technique using reopenable clips with a hole in one jaw (or “arm”) of the clip (Sureclip 8 mm; Micro-Tech, China) and a line (nylon, 0.22 mm) that allows complete closure of thick mucosa and muscle layers, such as those in the stomach. We have previously described the reopenable clip-over-line (RCOL) technique [2,3]. In this report, we present complete defect closure using the RCOL method after perforation during ESD at a gastric anastomosis.

A 74-year-old woman presented with an early gastric tumor at the anastomosis site of a Billroth II gastrectomy (► **Fig. 1**, ► **Video 1**). We performed a complete resection with ESD. The resected specimen size was approximately 50 mm, and a full-thickness defect of approximately 15 mm was observed on the jejunal side of the mucosal defect. We closed the defect using the RCOL method. A calibrated, small-caliber tip, transparent hood with a tip tapering to 4 mm was used for precise placement of the reopenable clips [4].

First, a line was tied to one jaw of a reopenable clip and this first clip was inserted through the accessory channel. The reopenable clip was then deployed to grasp both the mucosa and the muscle layer at the margin of the defect. Outside the patient, the other end of the line was pulled through the hole in a second reopenable clip. This second reopenable clip was then inserted through the accessory channel guided by the line passing through the hole in the jaw of the clip, and deployed similarly to the first clip. With traction applied to the line, several clips were successively slid along the line



► **Fig. 1** Closure of 15-mm full-thickness defect after endoscopic submucosal dissection (ESD) of a tumor above a gastric anastomosis site, using the reopenable clip-over-line (RCOL) method. **a** Early gastric tumor above the anastomosis site. **b** Mucosal defect after ESD. **c** Full-thickness defect as large as 15 mm caused during ESD. **d** A reopenable clip attached to a line was placed at the edge of the defect, grasping the mucosa and the adjacent muscle layer. **e** Outside the patient, the other end of the line had been passed through the hole in the jaw of a second reopenable clip, and this clip was then passed, guided by the line, through the accessory channel and placed on the defect. **f–h** Applying traction on the line, several clips were successively slid along the line through the channel and placed to gradually close the perforation. **i** Complete closure of the post-ESD full-thickness defect using the RCOL method.

through the channel and placed on the defect to gradually close the perforation. When the defect was completely closed, the line was fixed to the normal mucosa using the modified locking-clip technique [5] and then cut. The duration from the first clip placement to the last clip placement was 34 minutes, and 35 clips were used.

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Competing interests

The authors declare that they have no conflict of interest.



Video 1 Closure of a full-thickness perforation defect following endoscopic submucosal dissection of a tumor at a gastric anastomosis, using the reopenable clip-over-line (RCOL) method.

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