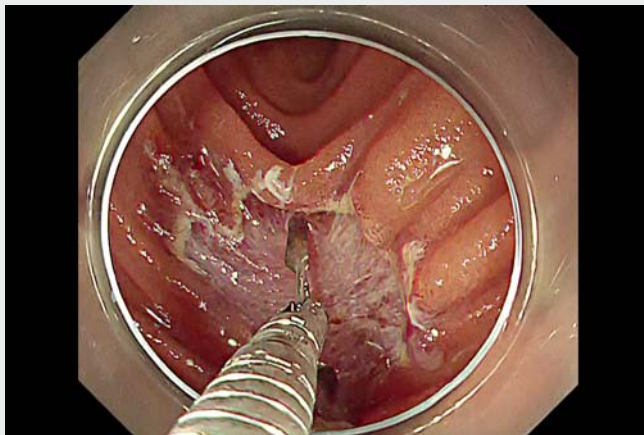


## Endoscopic closure, involving the muscle layer, of a duodenal post-resection mucosal defect using double-layer suturing assisted by reopenable clips



▶ **Video 1** Endoscopic double-layer suturing in combination with reopenable clips for closure of a duodenal defect following endoscopic mucosal resection.



▶ **Fig. 1** A 15-mm flat elevated lesion in the transverse part of the duodenum.

Endoscopic double-layered suturing is one of the methods for endoscopic closure. To approximate a mucosal defect, endoscopic clips are applied to the submucosal layer at the center of the long axis of the ulcer [1]. We report a case in which complete closure of the muscle layer of the duodenum was achieved by double-layer suturing assisted by reopenable clips (▶ **Video 1**).

A 15-mm flat elevated lesion with slight elevation was located in the transverse part of the duodenum (▶ **Fig. 1**) and was treated by underwater endoscopic mucosal resection. En bloc resection was achieved, and a resected specimen of size 16 mm × 13 mm was obtained. After resection, endoscopic double-layered suturing was performed as follows: (i) the central muscle layer of the ulcer was gently grasped with a reopenable clip (SureClip; MicroTech, Nanjing, China), thus folding the muscle layer in the direction of the long axis (▶ **Fig. 2 a, b**); (ii) the ulcer was closed by adding a second reopenable clip over the folded muscle

layer (▶ **Fig. 2 c**); (iii) the closure was reinforced with conventional endoscopic clips (EZ Clip, HX-610-090S; Olympus Medical Systems, Tokyo, Japan) (▶ **Fig. 2 d**). The pathological diagnosis was tubular adenoma, and R0 resection was achieved. There were no delayed adverse events.

The duodenum has a thin wall and a severe environment because of being exposed to bile and pancreatic juices. Closing the mucosal defect using endoclips is reported to significantly reduce delayed adverse events; however, the wound may sometimes dehiscence after closure when clipping is limited in suturing the together the edges of the mucosal defect, leaving a dead space below the mucosa [2–4]. Using reopenable clips to gently grasp the duodenal muscle layer and intentionally fold it could allow for more complete closure of the mucosal defect in the duodenum.

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### Competing interests

The authors declare that they have no conflict of interest.

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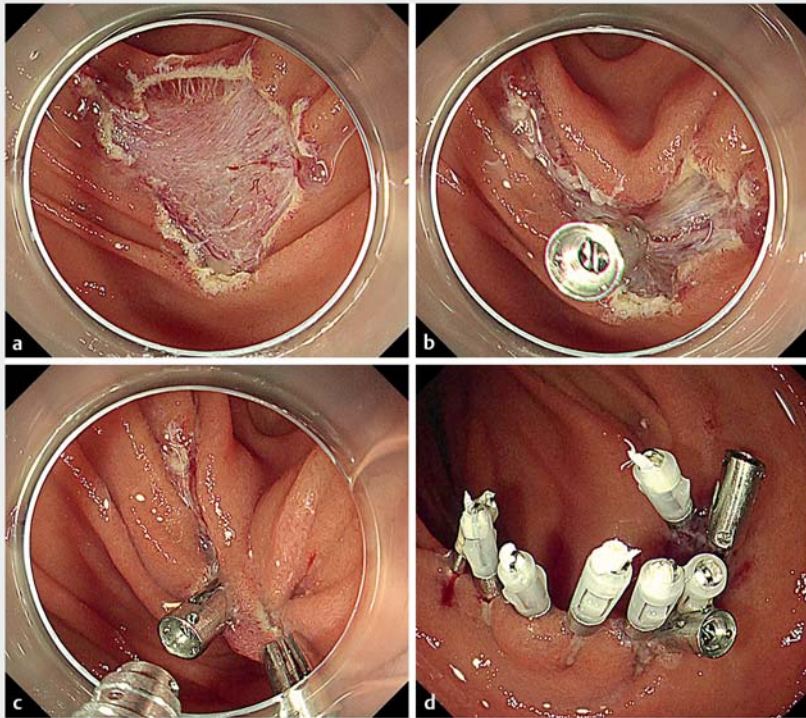
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► **Fig. 2** Double-layer suturing assisted by reopenable clips for closing the duodenal post-resection mucosal defect. **a** Duodenal mucosal defect after underwater endoscopic mucosal resection. **b** A reopenable clip was initially used to grasp the central muscle layer of the ulcer. The muscle layer was thus folded. **c** Another reopenable clip was added over the folded muscle layer. **d** Conventional endoscopic clips were used to reinforce the closure. Complete closure was achieved.

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