The suture-pulley method for endolumenal triangulation in endoscopic submucosal dissection

Endoscopic submucosal dissection (ESD) is a time-consuming and technically demanding technique [1 – 3]. The main difficulty is the lack of triangulated countertraction with current endoscopes [4]. To improve speed and efficacy of the procedure, an intriguing pulley method using dental floss together with endoscopic clips has recently been described [5]. However, current clip technology is unlikely to provide a robust and dependable anchor for this "pulley" technique.

To create a more stable pulley mechanism, we used a novel endoscopic suturing device (Overstitch, Apollo-Endosurgery, Austin, Texas, USA; **Fig. 1**). The device consists of a suture with an anchor/needle threaded through one endoscopic working channel. The anchor can be linked to a curved suturing-arm manipulated via a system-handle on the proximal end of a dual-channel therapeutic gastroscope (**Video 1**). We believe the use of this system could greatly facilitate ESD by providing endoluminal triangulation and retraction (**Fig. 2**).

In an anesthetized 45-kg pig, hypothesized gastric lesions (n = 2) were marked by mucosal burns (diameter 3 cm). After lifting the area with saline, a circumferential mucosal incision was performed using a standard needle knife. With the suturing device a suture was first endoluminally anchored at an anterior gastric fold (**Fig. 3**), distal from the lesion. A second bite was placed through the lateral proximal edge of the specimen and the anchor/needle, serving as a lifting retainer, was released. To generate triangulation, another endoluminal pulley was created (**Fig. 4**) at the contralateral mucosal edge. Both suture tails were withdrawn through the mouth and separately clamped with a hemostat. An isolated tip needle knife (IT-knife, Olympus, Center Valley, Pennsylvania, USA)

Fig. 1 The distal part of the endoscopic suturing device, mounted onto the tip of a dual-channel endoscope.

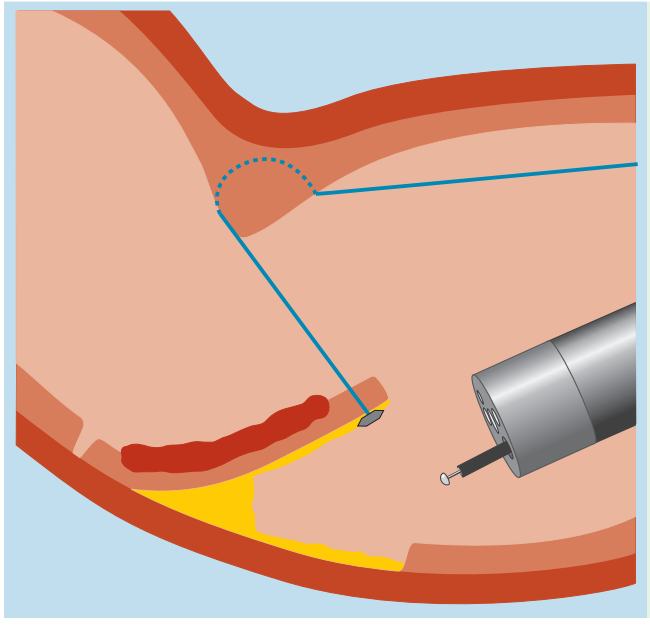

Fig. 2 The anchor/needle of the device has been released and serves as secure lifting retainer for the endoluminal suture pulley, providing endoluminal triangulation and retraction.

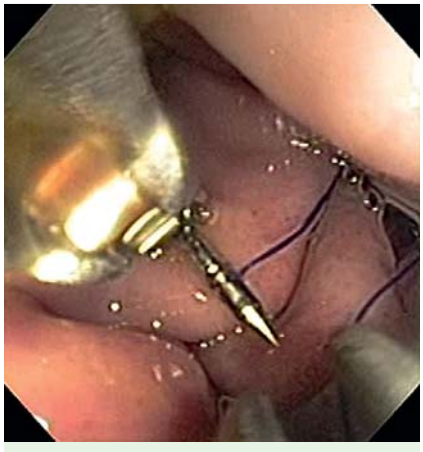

Fig. 3 The anchor/needle is linked to the curved suturing arm, before the suture will be endoluminally anchored to an anterior gastric fold.

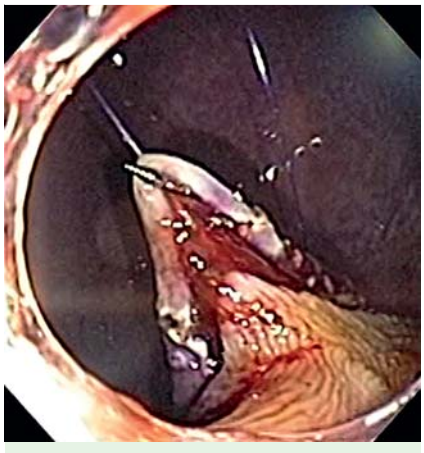

Fig. 4 After a second bite through the lateral proximal edge of the hypothesized lesion the anchor/needle has been released and serves as secure lifting retainer.

Video 1

The curved suturing-arm and the anchor/needle are manipulated via a system-handle mounted onto the proximal end of the endoscope (endoscopic and external view).

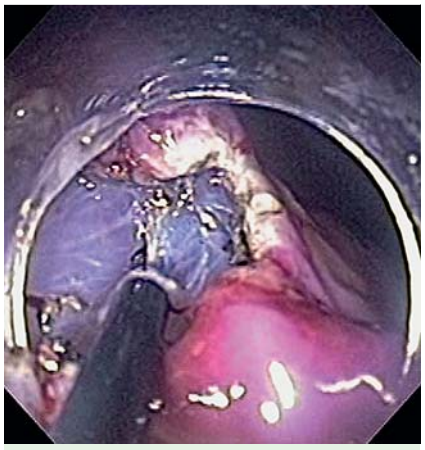

Fig. 5 Triangulation and retraction provided by the suture-pulleys facilitates endoscopic submucosal dissection.

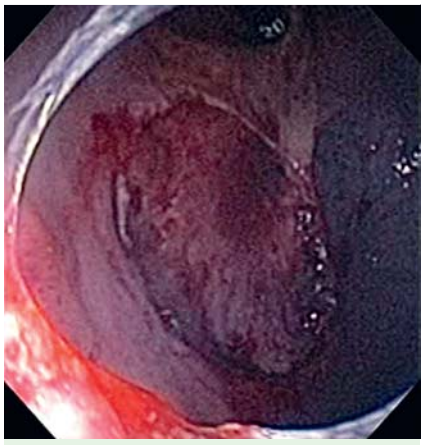

Fig. 6 The hypothesized gastric lesion has been resected (retroflexed view).

was used for submucosal dissection while alternately pulling on the sutures to lift and retract the specimen (**Fig. 5**). All suture-pulleys (n = 4) were easily created within 5.3 ± 0.3 min. Subsequent submucosal dissections were successfully performed in 34.0 ± 1.4 min, without perforations (**Fig. 6**, **Video 2**).

Video 2

Creation of an endolumenal suture pulley to enable triangulation and retraction for endoscopic submucosal dissection.

The use of an endoscopic suturing device could facilitate dissection of large superficial gastrointestinal lesions by enabling endolumenal triangulation.

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Competing interests: None

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