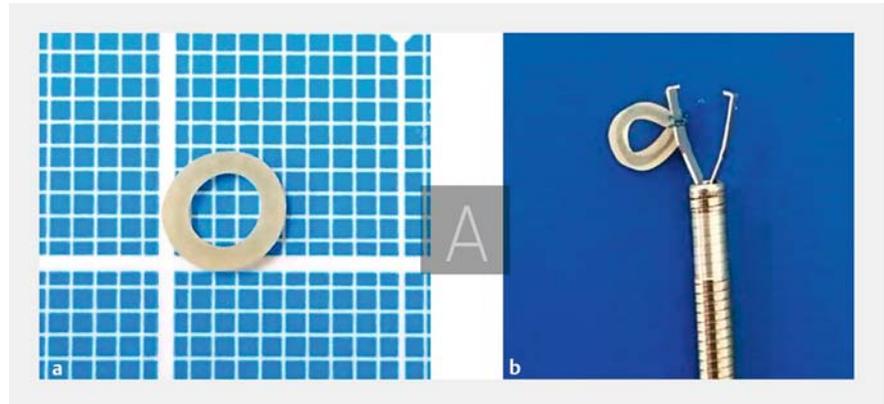


A novel method for endoscopic closure of endoscopic submucosal dissection-induced defects in the colorectum: the closure method with an elastic-rubber ring (CMER)

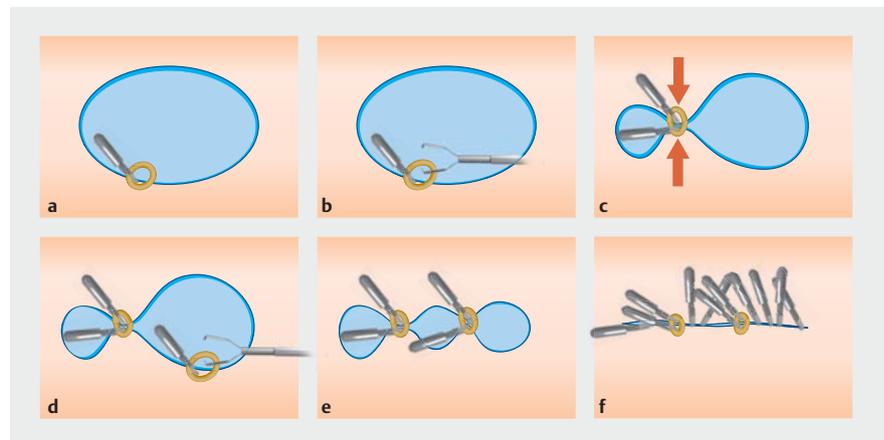
Endoscopic submucosal dissection (ESD) is a widely used technique associated with high en bloc resection rates for colorectal lesions [1], but at the cost of a higher incidence of adverse events, such as delayed bleeding and perforation, compared with endoscopic mucosal resection [2]. To prevent such complications, closure of ESD-induced mucosal defects is pursued, although this task can become challenging owing to their large size [3]. Herein, we report a new closure method for ESD-induced defects using endoclips and an elastic-rubber ring designed for orthodontics, which we have called the closure method with an elastic-rubber ring (CMER).

CMER is a modification of the loop–clip closure technique using a rubber band [4,5]. A 3-mm elastic-rubber ring (Ormco, Orange, California, USA) (► Fig. 1 a) is tied with a 3-0 nylon thread onto either “arm” of a semi-open endoclip (HX-610-090; Olympus, Tokyo, Japan) (► Fig. 1 b), which is then retracted into the sheath. The sheath is introduced through a single-channel endoscope and the clip with the attached elastic-rubber ring is “anchored” at the anal side of the ESD defect. The elastic-rubber ring is then “hooked” with another endoclip and fixed to the oral side of the defect. The tension generated by the elastic-rubber ring pulls the resection margins closer. This process is repeated, subsequently leading to further margin approximation and finally to complete closure with the addition of some further endoclips (► Fig. 2).

In the illustrated case, CMER was performed, as described above, post-ESD for cancer in the upper rectum. At repeat endoscopy on day 4 post-ESD, the defect remained completely closed, and complete healing of the defect was documented after 2 months (► Fig. 3; ► Video 1). CMER uses tension induced by an elastic-rubber ring to reduce the defect size, which thereby facilitates complete clip



► Fig. 1 Photographs showing: a the 3-mm elastic-rubber ring designed for orthodontics; b the rubber ring attached to an endoclip.



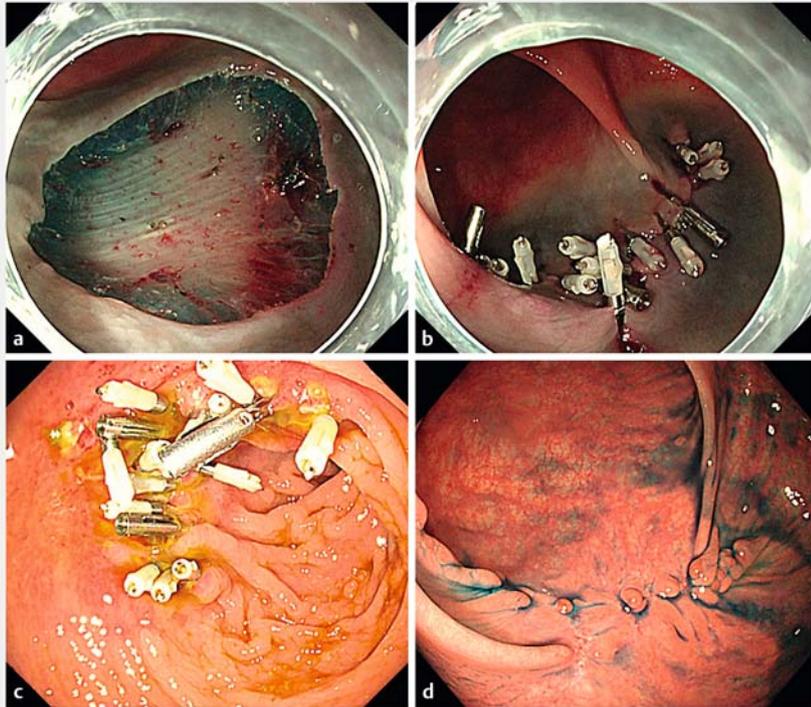
► Fig. 2 Schematic of the closure method with an elastic-rubber ring (CMER) showing: a the clip with the elastic-rubber ring positioned at the anal side of the defect; b the elastic-rubber ring hooked with another endoclip; c the second endoclip fixed at the oral side of the defect, so that the tension generated by the elastic-rubber ring brings the defect margins closer; d, e the defect having been further shrunk by repeated application of the above steps; f complete closure achieved with the application of additional endoclips.

closure, while at the same time distributing the tension burden across the clips to prevent separation. All of the instruments used can be introduced through the working channel, therefore scope retraction and re-insertion is unnecessary. In conclusion, CMER is a simple, inexpensive, and effective technique for complete durable closure of ESD-induced defects in the colorectum.

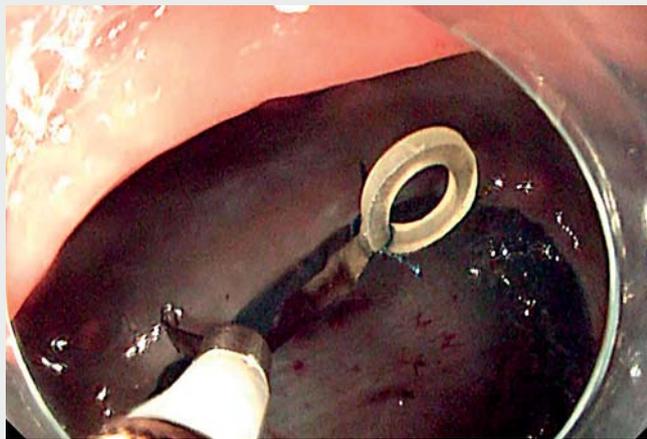
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Competing interests

The authors declare that they have no conflict of interest.



▶ **Fig. 3** Endoscopic images showing: **a** the mucosal defect after endoscopic submucosal dissection (ESD); **b** complete closure of the defect using the closure method with an elastic-rubber ring (CMER); **c** the appearance 4 days post-ESD, with all clips still in place and the defect remaining completely closed; **d** the appearance 2 months post-ESD, with complete healing of the mucosal defect evident.



▶ **Video 1** Application of closure method with an elastic-rubber ring (CMER) to achieve complete closure of a mucosal defect after endoscopic submucosal dissection in the proximal rectum.

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