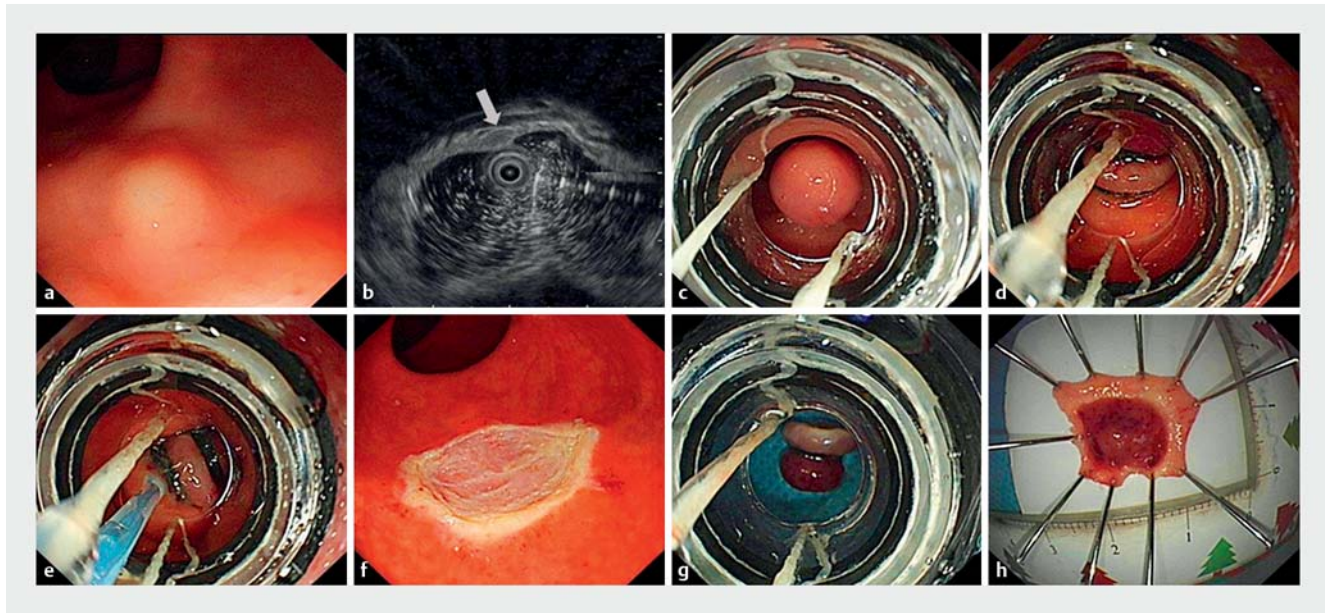
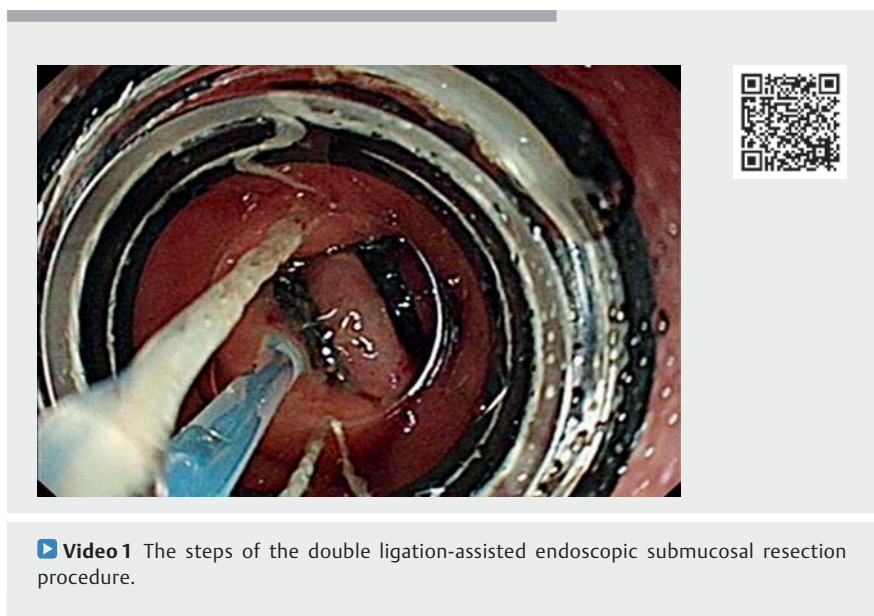


Double ligation-assisted endoscopic submucosal resection for rectal neuroendocrine tumors



► Fig. 1 Steps in the double ligation-assisted endoscopic submucosal resection procedure. **a, b** Endoscopy and endoscopic ultrasound showed a hypoechoic lesion originating from the submucosa layer (indicated by the arrow). **c** The first band was placed. **d** The second band was deployed. **e** Completion of the resection using a snare. **f** Postoperative mucosal defect. **g, h** Postoperative specimens.

Rectal neuroendocrine tumors (NETs) are rare neoplasms with a relatively good prognosis. Currently, the first choice of treatment is endoscopic resection if the rectal NET is ≤ 10 mm because of the low risk of metastasis [1,2]. Although conventional endoscopic mucosal resection (EMR) was considered an option for rectal NETs, it is difficult to achieve deep resection margins because most rectal NETs invade the submucosal layer. Therefore, modified EMR, including EMR with ligation (EMR-L) and EMR after circumferential incision, is widely performed because it has a low technical burden and short procedure time compared with endoscopic submucosal dissection [3]. EMR-L was recently introduced for securing a deep resection margin easily and safely; however, according to previous reports, the R0 resection rate varies from 86.2% to 92.5% [4,5]. We present a novel variant EMR technique, double ligation-assisted endo-



► Video 1 The steps of the double ligation-assisted endoscopic submucosal resection procedure.

scopic submucosal resection (ESMR-DL), for achieving a deeper vertical resection margin compared with EMR-L. The ESMR-

DL procedure was successfully carried out as follows (► Fig. 1, ► Video 1). First, endoscopic ultrasound was performed to

assess the exact size and depth of invasion before treatment. After a standard endoscopic variceal ligation device had been attached to the scope, the lesion was suctioned into the ligating device without prior submucosal injection. Next, an elastic band was placed to increase luminal protuberance, followed by a second band that was deployed after endoscopic suctioning of the tumor into the cap. Then, a snare was looped around the lesion and electrocautery was applied for resection. The mucosal defect was then left open. The result showed both endoscopic en bloc resection and histologic complete resection of the lesion. Although ESMR-DL may be the preferable method for endoscopic resection of rectal NETs, further studies with more cases are needed to validate the advantage of this technique.

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Competing interests

The authors declare that they have no conflict of interest.

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