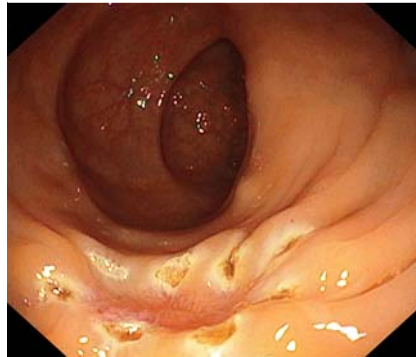


## Over-the-scope clip-assisted endoscopic full-thickness resection after incomplete resection of a rectal neuroendocrine tumor



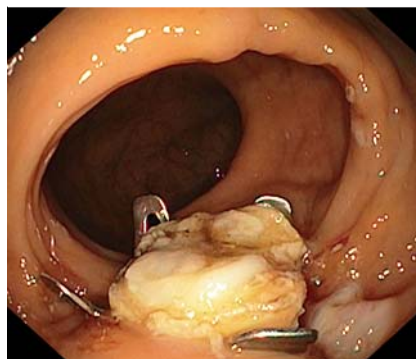
**Fig. 1** Resection site 6 weeks after initial endoscopic mucosal resection of a 5-mm neuroendocrine tumor found in the rectum of a patient during screening colonoscopy.



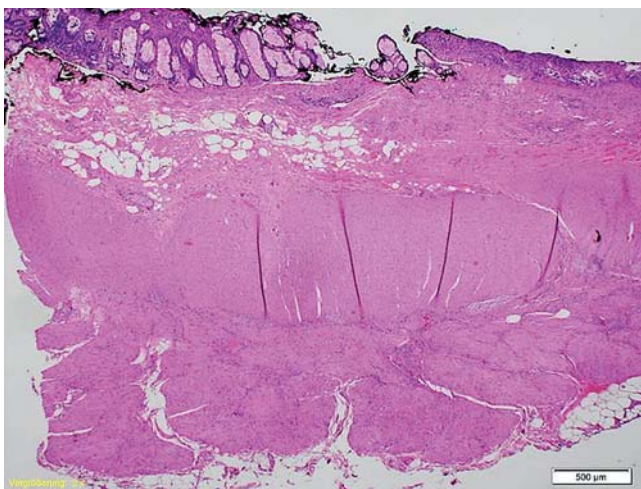
**Fig. 2** Margins of the resection site were marked with argon plasma coagulation.



**Fig. 3** The area of the rectal wall containing the scar is pulled inside the cap. The picture shows the open over-the-scope clip immediately before deployment.



**Fig. 4** View of the rectum immediately after the full-thickness resection. The over-the-scope clip seals the rectal wall defect.



**Fig. 5** Hematoxylin and eosin stain of the full-thickness resection specimen. On the luminal side (upper part), normal mucosa is seen close to the area of fibrosis due to the initial endoscopic mucosal resection.

The incidence of neuroendocrine tumors of the colorectum has increased during recent years [1]. Because small lesions usually cause no symptoms and resemble

colonic polyps or other entities, the diagnosis of neuroendocrine tumor is often made by pathologic evaluation *after* endoscopic resection [2].

A 50-year-old asymptomatic man underwent screening colonoscopy with polypectomy in the rectum. Histology showed a 5-mm neuroendocrine neoplasm that contained typical salt-and-pepper nuclei and that was positive for synaptophysin on immunohistochemical staining. The proliferation rate of the neuroendocrine tumor was <2% (G1). However, some tumor cell nests reached the deep resection margin of the specimen, so that the pathologist classified the resection status as incomplete (R1).

Following this histopathologic diagnosis, the patient was promptly referred to our center for further work-up. His serum chromogranin A levels were slightly elevated (86.7 ng/mL; normal range, <84.7). At 11 days after the polypectomy, sigmoidoscopy showed a 10-mm resection ulcer approximately 7 cm above the dentate line. No tumor residues were found macroscopically. Rectal endoscopic ultrasound showed neither a residual local tumor nor pararectal lymph node metastases. Positron emission tomography and computed tomography showed no further manifestation of tumor. The diagnosis was neuroendocrine tumor of the rectum, <1 cm, G1 N0 R1.

At 6 weeks after the initial polypectomy, an endoscopic full-thickness resection of the scarred resection site was conducted (Fig. 1), as described previously [3,4]. The procedure is shown in Video 1. We used a novel over-the-scope device (FTRD [Full-Thickness Resection Device]; Ovesco Endoscopy, Tübingen, Germany), which consists of a 23-mm-long cap that is loaded with a modified over-the-scope clip (OTSC) and an integrated resection snare. After the resection area had been marked (Fig. 2), the rectal wall containing the scar was pulled inside the cap with a grasping forceps (Ovesco) (Fig. 3). The OTSC was deployed, and an immediate full-thickness resection of the rectal wall was performed with the integrated electrical snare (Erbe VIO, autocut mode, effect 2, 200W; Erbe Elektromedizin, Tübingen, Germany). Fig. 4 shows the resection site with the OTSC sealing the resection defect. There were no complications, and the patient was able to leave the hospital on the following day.

### Video 1

Use of a novel over-the-scope device to perform endoscopic full-thickness resection after incomplete resection of a rectal neuroendocrine tumor.

Pathology showed a 2.0×2.5-cm full-thickness specimen of the rectal wall, with fibrosis on the mucosal side of the specimen. No residual cells of the known neuroendocrine tumor were found (Fig. 5).

Small (<1 cm) neuroendocrine tumors of the rectum with a modest proliferation rate (G1 and G2) can be resected endoscopically [5]. If endoscopic treatment is incomplete, current guidelines allow annual surveillance of a patient with a G1 proliferation rate [5]. However, evidence for such a cautious approach is sparse, and the only option guaranteed to be curative is complete resection of the lesion [5].

Finally, endoscopic full-thickness resection provides a minimally invasive alternative for achieving definitive histologic clarification in patients with microscopically visible residual tumor cells and primarily incomplete resection.

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**Competing interests:** None

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