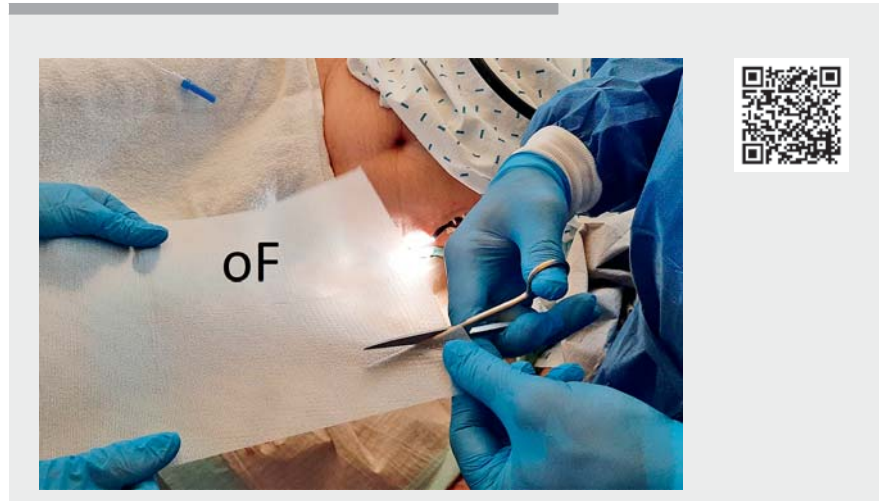


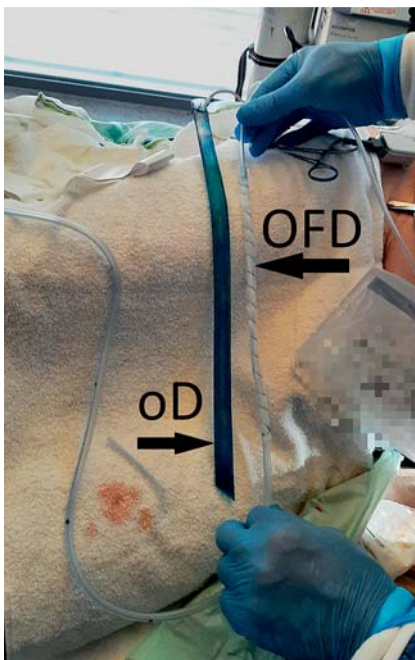
Transabdominal esophago-cutaneous fistula closure with endoscopic negative pressure therapy using a thin open-pore film drain in a pull-through technique



► **Fig. 1** Yellow line: route of the endoscope through the fistula tract. A thin endoscope (GIF XP 190 N, Olympus) was used to follow the entire fistula tract from the internal defect at the esophago-jejunal anastomosis after gastrectomy to the external cutaneous fistula opening. The blue-colored surgical drain is still in situ.



► **Video 1** The video demonstrates the course of therapy and the pull-through method of placing the open-pore film drainage (OFD). The video image shows the cutting of a strip of the thin open-pore film to make the OFD.

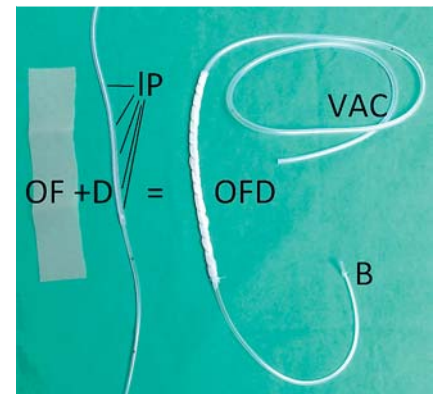


► **Fig. 2** Figure shows the removed surgical drain (oD) and the open-pore film drain (OFD) with the long, open-pore drainage element middle section for endoscopic negative pressure treatment. The length of the drainage element was adjusted to the length of the surgical drain so that the entire fistula tract could be set under negative pressure.

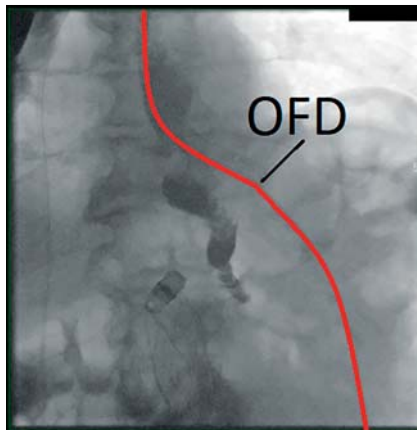
A 77-year-old patient underwent gastrectomy for AEG III (G3, pT3, pN0). The postoperative course was complicated by insufficiency of the esophageal-jejunal anastomosis. Endoscopic treatments with endoscopic negative pressure therapy (ENPT), clips, and stenting did not result in a final defect closure. A long transabdominal esophago-cutaneous fistula persisted. The patient was transferred to us 4 weeks after surgery, with the surgical drain and a stent still in place.

The stent was removed. The surgical drain was seen through the anastomotic defect, which was approximately 1 cm in diameter. With a small endoscope, a 30-cm transabdominal fistula channel was examined from the anastomotic defect to the cutaneous opening (► **Fig. 1**). The surgical drain was removed.

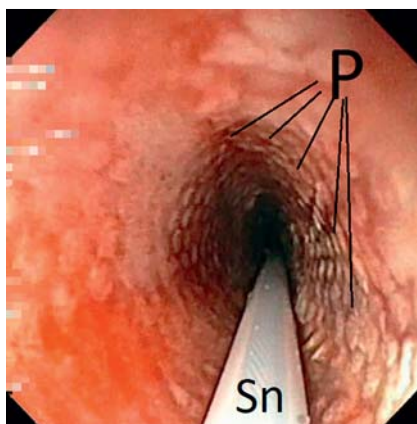
Using the endoscope, an open-pore film drainage (OFD) (with a 25-cm open-pore film drainage element in the middle sec-



► **Fig. 3** Open-pore film drain (OFD) used for the pull-through method. In this type of drainage, the open-pore drainage element is placed with the middle section of the drain. It consists of a very thin, open-pored double-layered film (OF) wrapped around the lateral perforation (IP) holes of the drain (D). The OFD is 6 mm in diameter and the drain element was 25 cm long. The distal end of the OFD is blocked (B) with a knot or a clamp. Vacuum is applied at the oral end (VAC).



► **Fig. 4** Fluoroscopy proves the closure of the defect and the fistula. No contrast discharge can be seen with the OFD in the fistula tract after application of negative pressure to the OFD.



► **Fig. 5** During the first change of the OFD after a 4-day treatment period, the shrunken fistula channel is already lined with the typical regular aspiration effects (P) due to the open-pore film. A snare (Sn) in the fistula channel was used to grasp the OFD for pull-through.

tion, diameter 6 mm) (► **Fig. 2**) was pulled from the cutaneous opening into the fistula tract using the pull-through technique [1–5] (► **Video 1**, ► **Fig. 2**).

In OFDs, a thin, open-pore, double-layered membrane (Suprasorb CNP Drainage Film; Lohmann & Rauscher, Reingsdorf, Germany) is wrapped around a drainage tube as a drainage element (► **Fig. 3**).

The drainage element was placed in the fistula channel; the oral end of the element overlapped the esophageal defect by 1 cm. The cutaneous end of the OFD

was closed with a clamp. The oral end was led out nasally and connected to an electronic pump (ACTIV.A.C; KCI, San Antonio, Texas, USA). Continuous negative pressure of –125 mmHg was applied. Secretion through the fistula stopped immediately. Fluoroscopy confirmed adequate fistula closure (► **Fig. 4**).

After 4 days, the OFD was exchanged for a thinner OFD (4 mm in diameter, 25 cm drainage element) again using the pull-through technique. The collapsed fistula channel was completely lined with a typical regular suction pattern along its entire length (► **Fig. 5**).

After a total of 10 days ENPT ended. The patient was allowed to drink water. On the following day, radiological contrast examination confirmed fistula closure and patient started with a soft diet. Endoscopy showed the healed leak without stenosis during further follow-up.

Endoscopy_UCTN_Code_CPL_1AH_2AG

Acknowledgments

We like to thank the nursing staff of the interdisciplinary endoscopic unit of the Marienkrankenhaus Hamburg for their excellent technical assistance. We gratefully acknowledge the support of the Department of Anesthesiology and Intensive Care Medicine.

Competing interests

Gunnar Loske is consultant of Lohmann & Rauscher GmbH & Co.KG. Johannes Müller, Lilith Boon Kyung Braun, Dalia Majert, Burkhard Riefel, Martin Zeile and Christian Theodor Müller declare no conflict of interest.

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Endoscopy 2023; 55: E173–E174

DOI 10.1055/a-1948-1816

ISSN 0013-726X

published online 28.10.2022

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Georg Thieme Verlag KG, Rüdigerstraße 14, 70469 Stuttgart, Germany

