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Endoscopic necrosectomy of walled-off pancreatic necrosis by large-bore percutaneus metal stent: a new opportunity?

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ABSTRACT

Background and study aims Endoscopic drainage of walled-off pancreatic necrosis (WOPN) is feasible when contact with the gastric or duodenal wall is present; when WOPN cannot be accessed endoscopically, a percutaneous approach can be considered. Percutaneous use of esophageal self-expandable metal stents (SEMS) to establish access to a WOPN cavity was evaluated.

Introduction

Development of well-circumscribed areas of necrosis is a complication of acute pancreatitis, occurring in approximately 5 % to 10 % of patients [1]; moreover, after 4 weeks of maturation, an enhancing wall of reactive tissue may surround the necrotic area, resulting in a "walled-off pancreatic necrosis" (WOPN), as described in the 2012 revised Atlanta classification [1].

The optimal interventional modality for treatment of WOPN remains controversial [2]. The PANTER study demonstrated that a "step-up" approach, starting with computed tomography-guided percutaneous drain placement was superior to up-front open surgical necrosectomy, thus supporting the value of a minimally invasive approach for this condition [3].

Direct percutaneous/endoscopic necrosectomy was first described in 2000 [4]. Three recent series [5 – 7] as well as case reports [8 – 11] described the use of a percutaneous access to enter the WOPN for debridement and washout using flexible endoscopy. This allows the patient to avoid major surgery and could be used for various types of intra-abdominal fluid collections, regardless of anatomic location, provided that it can be first accessed by interventional radiology techniques.

This technique requires multiple dilations of the percutaneous tract in order to be able to insert scopes into the necrotic cavity.

Navarrete [12] proposed percutaneous insertion of esophageal self-expandable metal stents (SEMS) with the aim of making access to the necrotic cavity faster and easier.

Three cases of percutaneous/endoscopic necrosectomy through a large-bore esophageal SEMS are described here.

Case reports

Between June 2016 and January 2017, 3 patients (3 M, mean age 45 years, range 39 – 64) with symptomatic WOPN not accessible by EUS through the stomach or duodenum or contraindication to transmural drainage, were treated by endoscopic necrosectomy through a percutaneous large-bore esophageal SEMS. The diameter of the WOPN was 15 cm (range 7 – 20) on average. The mean interval between diagnosis of WOPN and initial treatment was 8 weeks (range 4 – 10). Written informed

▶ **Table 1** Patient demographics and clinical data.

Patient no.	Age, years	Sex	Pancreatitis etiology	WOPN diameter, cm	WOPN distribution	Gastric or duodenal contact	Contraindication to transmural endoscopic drainage	Infection	Symptoms	WOPN-induced complications	Comorbidity
1	64	M	Post-ERCP	7	Sp, Alp, Pob, Gsl, Sh	Yes	Cochlear implantation (monopolar current contraindicated)	Yes	Pain, fever	Portal vein system compression	Benign prostatic hypertrophy Diabetes Hypertension
2	39	M	Alcoholic	18	Alp, Pob	No	No contact with gastric or duodenal wall	Yes	Pain, fever	–	–
3	45	M	Post-kidney transplantation	20	Alp, Em, Rh	Yes	Referred after percutaneous drainage placement	Yes	Pain, fever, dyspnea	Pancreaticoduodenal vessels compression Cranial splenic dislocation	Colonic diverticulosis, Diabetes, Hypertension, Polycystic kidney disease

ERCP, endoscopic retrograde cholangiopancreatography ; WOPN, walled-off necrosis; Alp, anterior left pararenal; Emg, epimesogastric region; Gsl, gastrosplenic ligament; Pob, posterior wall of omental bursa; Rh, right hypochondrium; Sh, splenic hilum;

consent for off-label percutaneous insertion of the esophageal SEMS was obtained from all patients, who were also informed about the alternative treatments. Patient characteristics are summarized in ▶ **Table 1**.

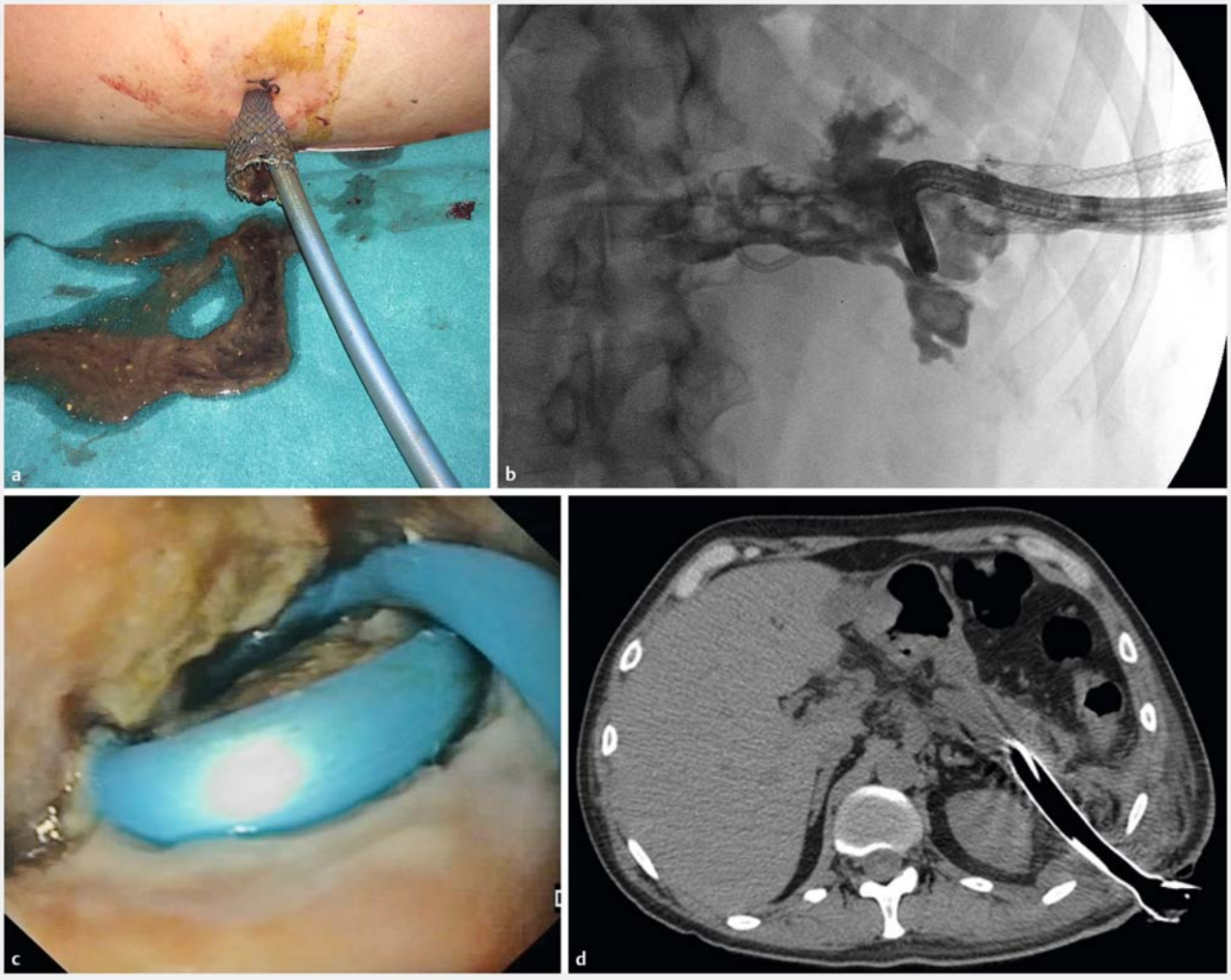
Percutaneous/endoscopic technique

Following a step-up approach [3, 13] all patients received a 10 – 20 french percutaneous drain; in that frame a fluid sample was collected and sent for amylase level, cytology and microbiology. After a mean time of 6 days (range 4 – 10) the patients still experienced fever and drainage of the percutaneous tube was almost absent. For that reason, under deep sedation with propofol, the percutaneous drain was removed, leaving a 0.035-inch stiff guidewire (Terumo Medical Corp., Tokyo, Japan) on site, under fluoroscopic control. Subsequently a 12-mm balloon dilatation (CRE PRO Wireguided 10 – 12 mm, Boston Scientific Corp, Marlborough, Ma) of the cutaneous tract was performed to pass the stent delivery catheter and to allow opening of the stent. An 18 – to 20-mm wide esophageal partially-covered SEMS (Evolution Esophageal controlled-release stent, Cook Group Inc., Bloomington, In; Ultraflex Esophageal NG Stent System, Boston Scientific Corp, Marlborough, Ma) was deployed transcutaneously at the site of necrosis (▶ **Fig. 1a**) (▶ **Video 1**); SEMS length (8 – 15 cm) was chosen according to the depth/location of the WOPN.

A standard 8.8-mm diameter or 12.9-mm diameter operative gastroscope (Olympus, Tokyo, Japan) was introduced through the SEMS into the necrotic cavity (▶ **Fig. 1b**). The WOPN was visualized and irrigated with sterile saline and 10 % H_2O_2; necrotic debris were removed using blunt removal, washout and solid debris were cleaned with Dormia baskets. Large necrotic pieces were sequentially removed over repeated procedures.

To provide continuous flushing between necrosectomies, a 7 Fr single-pigtail naso-biliary catheter (ENBD-6, Cook Group Inc., Bloomington, In) was placed through the percutaneous esophageal SEMS to the deepest site of the WOPN. The SEMS and the single pigtail drainage were secured to the skin with silk suture.

Once endoscopic debridement was satisfactory (▶ **Fig. 1c**) and CT scan reported more than 75 % reduction of the collection, SEMS was removed without the need for sedation and replaced by a 30 french surgical drain by the endoscopist, under fluoroscopic control in the endoscopic retrograde cholangiopancreatography room. Patients were discharged with the drain in place, which was progressively retrieved during subsequent outpatient visit, until complete removal, once cross-sectional imaging confirmed resolution of the collection (▶ **Fig. 1d**). Monthly office visits were scheduled for the first 3 months after drainage removal to assess possible signs or symptoms of collection recurrence.



▶ **Fig. 1** Transcutaneous SEMS insertion **a** and introduction of the endoscope into the necrotic cavity **b** final endoscopic **c** and CT scan **d** result after debridement.

Results

WOPN resolution by percutaneous necrosectomy through SEMS was achieved in all the patients on CT-scan imaging. An average of 3 endoscopic sessions (range 2 – 4) was necessary during the entire treatment period. SEMS were easily removed after an average of 12.7 days (range 10 – 15). The 30 Fr catheter drain was completely removed after an average of 35 days (range 28 – 42). No procedure-related adverse events were observed.

One of the three patients complained of fever 3 months later. CT scan showed recurrence of a 3 × 10 cm fluid collection that was successfully retreated by insertion of a 16 Fr percutaneous drain. No further recurrences were reported.

After a mean follow-up of 181 days (range 150 – 239) from the surgical drain removal and treatment of the recurrent collection, all patients are asymptomatic. Therapeutic data and outcomes are summarized in ▶ **Table 2**.

Discussion

Nowadays several endoscopic modalities have been developed to improve the step-up approach and avoid surgical necrosectomy [3, 14, 15].

Direct percutaneous endoscopic necrosectomy has shown promising results, even if the literature is still limited [5 – 7]. In this small series the effectiveness and safety of a novel percutaneous/endoscopic approach to the treatment of infected WOPN without a contact with the stomach or duodenum or contraindication to transmural drainage, was evaluated.

In 2011, a single case report in the literature by Navarrete et al. [12] reported use of percutaneous esophageal SEMS insertion to treat WOPN. Other investigators [5 – 7] used a percutaneous/endoscopic approach with catheter introduction into the skin to access the collection and perform a wide opening access by balloon dilation to endoscopically debride the WOPN; this approach required repeated dilatation of the cutaneous tract which carries some risk of bleeding [12] and more

▶ **Table 2** Details of treatment of WOPN drainage with esophageal percutaneous SEMS.

		Percutaneous drain		Percutaneous esophageal SEMS details						
Patient no.	**Time from pancreatitis onset to WOPN treatment, weeks**	**Diameter (french)**	**Site of insertion**	**Type**	**Body diameter (Flared end diameter) mm**	**Length (cm)**	**Stenting period (days)**	**Hospitalization from SEMS placement (days)**	**30 Fr drainage removal after days**	**Follow-up from the surgical drain removal (days)**
1	10	16	Posterior (left flank)	Ultraflex (Boston Scientific)	18 (20)	15	15	17	35 (1st treatment)	86 (collection recurrence)[1]
2	4	20	Posterior (left flank)	Evolution (Cook Endoscopy)	20 (25)	15	13	15	42	239 (asymptomatic)
3	10	10	Anterior (epigastric)	Evolution (Cook Endoscopy)	20 (25)	8	10	21	28	154 (asymptomatic)

WOPN, walled-off pancreatic necrosis; SEMS, self-expandable metal stent

[1] Recurrent collection was successfully retreated by 16 Fr percutaneous drainage; patient is asymptomatic more than 3 months after from removal of the drainage.

debridement endoscopic sessions [5,6] than our technique. Furthermore SEMS placement provides wide access without needing repeated dilatations. The catheter inside the esophageal stent allows continuous lavages, facilitating collection healing. Another key factor of our technique is insertion of a large surgical drain once the SEMS was removed, which can prevent a percutaneous fistula.

Short-term resolution of the collection was obtained in all cases, with a recurrence in the first one.

Video 1 A partially covered, 20-mm esophageal self-expandable metal stent (SEMS) is inserted through the skin into a walled-off pancreatic necrosis. Drainage of the necrotic debris is obtained and the endoscope is advanced into the percutaneous SEMS to perform necrosectomy.

Percutaneous SEMS insertion can become part of the armamentarium of the step-up approach to WOPN, but indications need to be defined considering the following points.

First, percutaneous access along a large-bore esophageal SEMS allows for a wide opening access that also permits a stable position for endoscopic intervention with standard or even therapeutic endoscopes. Second, the percutaneous approach can be used for any intraabdominal fluid collection fit for interventional radiology techniques, such as the pararenal cyst debridement and washout, and omental necrosis debridement included in this series. Third, collections can be drained in the most declivous side which guarantees much better empting in comparison to a transgastric approach, even when it would be feasible. Fourth, a large drainage catheter left in situ after endoscopic sessions and slowly withdrawn can prevent development of a pancreatico-cutaneous fistula, which is a well-known potential AE of percutaneous drainage of pancreatic fluid collections [7]. Finally, direct percutaneous endoscopic necrosectomy through a SEMS can be performed with standard or therapeutic endoscopes under conscious sedation without the need for general anesthesia, which often is required for prolonged per-oral endoscopies.

There are some limitations to our small consecutive series, mainly absence of a control group and short-term follow-up. Furthermore, this complex procedure can only be performed in a tertiary care center with expert interventional endoscopists, radiological facilities and appropriate surgical availability.

Conclusion

Despite the limitations of our study, our experience can expand the available armamentarium for treatment of pancreatitis and its complications. Wide percutaneous access to WOPN with

SEMS is a safe and effective intervention for intraabdominal and retroperitoneal fluid collections and necrosis in appropriately selected patients.

Competing interests

Dr. Costamagna received grant/research support from Olympus. He is a member on advisory board committees or review panels for Boston Scientific and Cook Endoscopy.

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