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Endoscopic ultrasonography-guided drainage combined with trans-duodenoscope cyclic irrigation technique for walled-off pancreatic necrosis

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ABSTRACT

Background: Endoscopic ultrasonography-guided drainage has been established as a good treatment modality in the management of walled-off pancreatic necrosis, but the unmanageable infection of post-operation is still a thorny problem due to the poor drainage ability for solid necrotic debris only through transmural stent and nasocystic catheter.
Aims: Introduce a novel therapeutic method, namely endoscopic ultrasonography-guided drainage combined with cyclic irrigation technique in managing patients with walled-off pancreatic necrosis.
Methods: 18 patients with severe acute pancreatitis complicated with walled-off pancreatic necrosis received treatment with endoscopic ultrasonography-guided drainage combined with cyclic irrigation were involved in this retrospective study.
Results: 17 of 18 patients with walled-off pancreatic necrosis were treated by this new therapeutic method. Subsequent surgery was performed in 1 case due to uncontrolled infection, complications such as perforation, bleeding or multiple organ failure were not observed. Treatment success rate was high (16 in 17, 94.12%).
Conclusion: Endoscopic ultrasonography-guided drainage combined with cyclic irrigation is an effective treatment option for symptomatic walled-off pancreatic necrosis to facilitate drainage and obviate the need for subsequent surgery or endoscopic necrosectomy.

The EUS-guided drainage of walled-off pancreatic necrosis has been considered the first-line treatment modality as a minimally invasive alternative to surgical drainage [1–6]. This is due to the ability of the EUS to assess the wall thickness, identify major vessels and find the closest access to the fluid cavity. The procedure will create an internal fistula between fluid collections and the gastric or duodenal lumen, a transmural stent or a nasocystic catheter is then deployed within necrotic collection to facilitate drainage, which avoid the inconvenience of an external drainage and the risk of cutaneous fistula [4,7,8]. However, the effectiveness of EUS-guided drainage was unsatisfactory in last decades. The poor ability of drainage of solid necrotic debris resulting in long-time unmanageable infection is the bottleneck of this therapeutic method [9]. We reported our experience that EUS-guided drainage combined with cyclic irrigation (EDCCI) would be useful in overcoming these difficulties.

1. Patients and methods

1.1. Patients

18 patients with symptomatic walled-off pancreatic necrosis who underwent EUS-guided drainage combined with cyclic irrigation in Shanghai First People's Hospital, China from January 2010 to May 2015 were recruited into this retrospective study. Walled-off pancreatic necrosis was defined as a poorly demarcated area, which may be sterile or infected [10]. The walled-off pancreatic necrosis suitable for EUS-guided drainage met these criteria: (1) >5 cm in size and the lesion located adjacent to the stomach or duodenum, (2) ongoing infection which could not be controlled by antibiotics, (3) clinical symptoms such as abdominal pain, fever, gastric outlet obstruction or obstructive jaundice [10,11]. The exclusion criteria

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were patients with the walled-off pancreatic necrosis located more than 1.5 cm from the GI lumen or those with coagulopathy.

This study was approved by the Institutional Review Board of our hospital. All patients were informed the potential risk and the benefits of the EUS-guided drainage, and provided written informed consent to the management.

1.2. Equipment and technique

Firstly, the conventional EUS-guided drainage was adopted: the GF-UCT 240 (3.7-mm working channel) therapeutic linear echoendoscope (Olympus Optical, Tokyo, Japan) and the ProSound-α5 ultrasound processor (Aloka, Tokyo, Japan) were used. Patients were sedated with intravenous 1% propofol. The walled-off pancreatic necrosis was evaluated by EUS and interposed vessels were excluded by color Doppler imaging. A 19-gauge needle (EUSN-19-T; Cook Endoscopy, Winston-Salem, NC) was used to puncture the cavity via a transgastric or transduodenal approach. Fluid was aspirated, and a 480-cm 0.035-in. guidewire (Tracer Metro Wire Guides; Cook Endoscopy) was inserted. The needle was withdrawn, and a wire-guided needle knife (KD-441Q; Olympus) was used to dilate the puncture site under electrocautery. Contrast was injected to outline the abscess. While maintaining the guidewire within the cavity, the echoendoscope was withdrawn and replaced with a therapeutic duodenoscope (JF 260V; Olympus). A 10F biliary dilator (Cook Endoscopy) was inserted over the guidewire into the cavity, and a second 450-cm 0.035-in. guidewire (Hydra Jagwire Guidewire; Boston Scientific, Natick, Mass) was inserted through the dilator. After withdrawal of the dilator, one or two 10F 7-cm double-pigtail stents (Solus; Cook Endoscopy) and 7F nasocystic catheter (Cook Endoscopy) were sequentially inserted (Fig. 1).

In addition, to ensure the necrotic debris to be removed timely, a cyclic irrigation technique with “one way in and three ways out” system was deployed. The puncture site was dilated with a 1.8-cm balloon dilator (CRE; Boston Scientific) every 3 days to maintain the opening of the necrosis-gastroenterostoma large enough. Then an 8.5-F flush catheter was inserted into cavity along the guide wire by a therapeutic duodenoscope (4.4-mm working channel) and a total of 1000 mL saline solution was injected into the cavity. At the same time, vacuum aspiration via absorbing channel of duodenoscope toward the opening of puncture site was performed to remove the necrotic debris out of the cavity, besides, diluted pus flowed out simultaneously through nasocystic catheter and stent (Fig. 2, Videos 1 and 2).

1.3. Post-procedure care

During the process of drainage, all patients remained hospitalized. The cavity was lavaged daily with saline solution through nasocystic catheter. Besides, the cyclic irrigation was performed through duodenoscope every three days with a total of 1000 saline solution. A nasojejunal tube was deployed for enteral nutrition in all patients. After 48–72 h, a repeated CT of abdomen was obtained in all patients. If the size of the walled-off pancreatic necrosis decreased significantly with improvement of patient symptoms, it demonstrated the therapy was successful. When walled-off pancreatic necrosis grew smaller and necrotic debris vanished, the nasocystic catheter was removed, and 2 more transgastric stents were placed instead (Fig. 3). If symptoms persisted, remedial surgery or endoscopic necrosectomy was planned to be undertaken by pancreatic surgeons or endoscopic physicians. Patients were discharged when the fever came down and the symptoms improved with normal laboratory testing results. All patients were evaluated again within 30 days by an enhanced abdominal CT.

1.4. Main outcome measures

Treatment success was defined as remission of clinical symptoms with improvement in imaging findings at follow-up CT and no need for subsequent surgery or endoscopic necrosectomy.

1.5. Statistical analysis

Basic characteristics of patients and the walled-off pancreatic necrosis lesions, endoscopic management details and clinical outcomes of patients were reported. Statistical analysis of the patients' data and clinical parameters were expressed as mean and ranges.

2. Results

EUS-guided puncture of the walled-off pancreatic necrosis was successfully performed in all 18 cases (the characteristics of all patients are presented in Table 1) with the prototype device. All patients underwent fluid aspiration for cell count, Gram stain, and culture to distinguish infection. After the puncture, two 0.035-in. guidewires were sequentially inserted into the abscess cavity in all cases, then a 10F or 8.5F double pigtail stent was transmurally inserted followed by insertion of a 7F nasocystic catheter. The pancreatic necrosis fluid collections were successfully drained in all cases, with a mean procedural time of only 43.5 min (range 28–65 min). No immediate complications such as clinically significant bleeding or perforation occurred.

17 of 18 patients underwent EUS-guided drainage combined with cyclic irrigation technology (EDCCI), with a total of 1000 mL of saline solution via “one way in and three ways out” system every three days. Surgical treatment was instead performed in 1 patient due to intolerance of endoscopic operation. Although transient fever presented in all patients with cyclic irrigation, it abated in 2–7 days. The cyclic irrigation was continued over a range of 3–5 weeks until all necrotic debris was removed. The necrosis subsequently resolved over a period of 4–6 weeks. After resolution of the necrosis, the transmural stent was removed. The walled-off pancreatic necrosis of 16 patients undergone EDCCI were completely vanished after treatment; no abscess recurrence was observed and no patient had any delayed complications. Surgical treatment was performed subsequently in 1 patient due to uncontrollable infection. At a median of 258 days' follow-up, all 16 patients who had successful outcomes were doing well without recurrence. The effective rate of EUS-guided drainage combined with cyclic irrigation technology (EDCCI)was up to 94.12% (16 in 17).

3. Discussion

The walled-off pancreatic necrosis is one of the common complications in acute severe pancreatitis. Primary surgery has been ever as an alternative treatment for walled-off pancreatic necrosis, but it is restricted in most cases due to the poor conditions of patients and invasive modality. Percutaneous catheter drainage is another option, but this method is usually recommended as a temporizing measure in poor surgical candidates because of the local complication, the significant risks of bleeding, perforation and cutaneous fistula, with a reported incidence rate ranging from 6% to 20% [6,12–14]. During the last decade with endoscopic techniques developed, EUS-guided drainage has emerged as an important treatment modality for walled-off pancreatic necrosis in many centers [1,2]. EUS can easily identify and distinguish the nature of the lesion even if there is no obvious bulge noted into the gastric lumen. On the other hand, the dynamic movements of the puncture needle during the procedure can be controlled and tracked longitudinally by the real-time image, thereby averting any inadvertent complica-