

The Combination of Double Pigtail Plastic Stent, Nasocystic Tube and Percutaneous Catheter in Endoscopic Ultrasound-Guided Transluminal Drainage for Peripancreatic Fluid Collection

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Abstract

Background: Endoscopic ultrasound-guided drainage is first-line treatment of Pancreatic fluid collection. The invention of metallic stents has provided a safer and more efficient approach route for internal drainage. But because of the high cost of metal stents, a large number of patients still choose plastic stents, which can help them from the disease with much lower cost.

Patients and Methods: Between March to December in 2017, 20 patients with Peripancreatic fluid collections were prospectively enrolled to receive the double pigtail plastic stent with nasocystic tube and/or percutaneous catheter.

Results: There were 20 cases of pseudocyst including 4 cases of infected pseudocyst. The causes of the PFC were mainly gallstones (60%), followed with alcohol (30%) and hyperlipoidemia (10%). Technical success was achieved in 100% of the cases. All patients were completely resolved with the evidence of CT scan and clinical evaluation. The mean time for resolution was 15 ± 20 days. The mean follow-up was 3 months.

Conclusion: The combination drainage of double pigtail plastic stent with nasocystic tube and/or percutaneous catheter of pancreatic pseudocyst is feasible and efficacious to most patients. Using a titanium clip could prevent migration occurrence. With the economic benefits of plastic stents, they are still wildly used in developing countries.

Keywords: Endoscopic Ultrasound-Guided Drainage, Peripancreatic Fluid Collection, Pancreatic Pseudocyst, Plastic Stents

Introduction

Peripancreatic fluid collections (PFCs) result from multiple reasons including pancreatic damage or malignant conditions. There are different types of PFCs, such as acute peripancreatic fluid collection, acute necrotic collection, pancreatic pseudocyst and walled-off necrosis. Sometimes when patients were attacked with surgery, acute or chronic pancreatitis or abdominal trauma, they may develop fluid leakage or liquefaction after pancreatic necrosis. Endoscopic ultrasound-guided transluminal drainage (EUS-TD) has become the first-line procedure for symptomatic PFC treatment with the benefit of less complications compared to surgical and percutaneous drainage [1, 2]. During past several years, double pigtail plastic stents was wildly used for PFC patients [3, 4]. More

recently, the covered self-expandable metallic stents (CSEMSs) was safer and more efficient [5]. However, the plastic stents are still recommended with its economic benefits (ten percent of the cost of the metallic stents). In this study, we evaluated the clinical outcome and safety of the combination drainage of double pigtail plastic stent, nasocystic tube and percutaneous catheter and discussed possible indications for plastic stents.

Patients and Methods

The study was conducted from March to December 2017 at our hospital, with approval of ethics committees. 20 patients with PFC were referred to receive endoscopic ultrasound-guided drainage according to the following inclusion criteria (1) patients were di-

agnosed with PFC based on the revised Atlanta classification; (2) symptoms of PFC persisted more than 6 weeks; (3) patients had symptoms such as nausea, abdominal discomfort, pain and post-prandial vomiting; (4) normal coagulation function; (5) large PFC diameter (more than 5cm). Patients met all the criteria above were enrolled in this study and provided written formal consents. The EUS-guided PFC drainage was conducted under monitored sedation by using of intravenous midazolam, fentanyl, and propofol. The sedation procedure was administered by senior anesthesiologists and patients' blood pressure, pulse rate, oxygen saturation was under continuous monitoring [6].

All endoscopic procedures were performed by using a 3.8mm channel, linear echo endoscope (SU8000, FUJIFILM Medical Co., Ltd., Tokyo, Japan) and the best side to access PFC was identified. Using the Color Doppler ultrasound to avoid vascular injury during the piercing process. The PFC was punctured with a 19-gauge needle (Boston Scientific, Natick, MA, USA) and a 0.035-inch guide wire was then threaded through the needle into the cavity. The needle was withdrawn and a needle knife (Olympus Medical Systems Co., Tokyo, Japan) was placed over the wire to cut through the puncture site in the gastric wall, using 70W of pure cut current (ERBE Erbotom ICC 200 unit, Surgical Technology Group, Hampshire, England, UK). The drainage tract was dilated by using of 10Fr biliary bougie or balloon. Then the plastic double pigtail stent (Cook Ireland Ltd., Limerick, Ireland) with 10Fr diameter and 3-5 cm length was inserted into the cavity (cavity diameter 5-10cm). Titanium clip was used to reduce transposing. Nasocystic tube would be inserted simultaneously if necessary (cavity diameter 10-15cm or thick infected collection) Some patients with nasocystic catheter underwent additional washing of the cavity with α -chymotrypsin or antibiotics 4000-8000IU in 50 to 400 ml saline solution until the PFC lavage fluid remained clear. If the diameter of the cavity was more than 15cm and the contents was thick, sticky, or necrotic, percutaneous drainage with a 14-16Fr close loop pigtail type catheter (Bioteque corporation, Taipei, Taiwan) would be considered in some patients. An abdominal computed tomography (CT) would be performed 1-2 weeks after the endoscopic procedure and the stent, nasocystic tube and percutaneous catheter would be removed when the PFC was complete resolved.

Results

There were 20 patients (14 males, 6 females; mean age 48, range 31-72) underwent curved linear EUS drainage including 4 cases of infected pseudocyst, 1 case of double pseudocysts complicated with ascites and jaundice, 5 cases of parceled pseudocyst. The

causes of the PFC were mainly gallstones (12 of 20 patients, 60%), followed with alcohol (6 of 20 patients, 30%) and hyperlipidemia (2 of 20 patients, 10%). The mean diameter of the cavity was 12cm, ranging from 5 to 28cm. The mean time between the initial pancreatitis episode and PFC drainage was 14 weeks, ranging from 6 to 48 weeks. Dates were shown in Table 1.

Table 1: Characteristics of Patients Submitted to EUS-Guided Transmural Drainage of Pancreatic Pseudocysts(n=20)

Patients(n)	20
Sex(M/F)	14/6
Age(years)	48+/-13.5(31-72)
Etiology of pancreatitis	
gallstone	12(60%)
Alcohol	6(30%)
Hyperlipidemia	2(10%)
Location of PFC	
Head	3(15%)
Body	12(60%)
Tail	5(25%)
Cyst diameter(cm)	12+/-4.5(5-28)
Drainage methods	
Double pigtail stent*	18
Along with nasocystic tube*	10
Along with percutaneous catheter*	2
*12 patients deployed with simple stent and 6 with multiple stents.	
*2 patients suffering PFC fibrotic wall deployed nasocystic tubes alternatively and 8 patients deployed both pigtail stent and nasocystic tube.	
*1 of these two patients transferred to have a surgical percutaneous nephroscopy procedure to debride necrotic tissue.	

Each patient underwent drainage singly with double pigtail stent, or in combination with nasocystic and percutaneous close loop pigtail type catheter. In 2 cases when the patient had developed fibrosis of the cavity wall, pigtail stents can only be deployed with the help of 8.5-F cystotome and the nasocyst drainage tubes were alternatively deployed. 18 patients underwent either simple or multiple 10Fr double pigtail stents and 8 cases of them were combined with nasocystic tube (a female patient's procedure photos were showed in Figure 1).

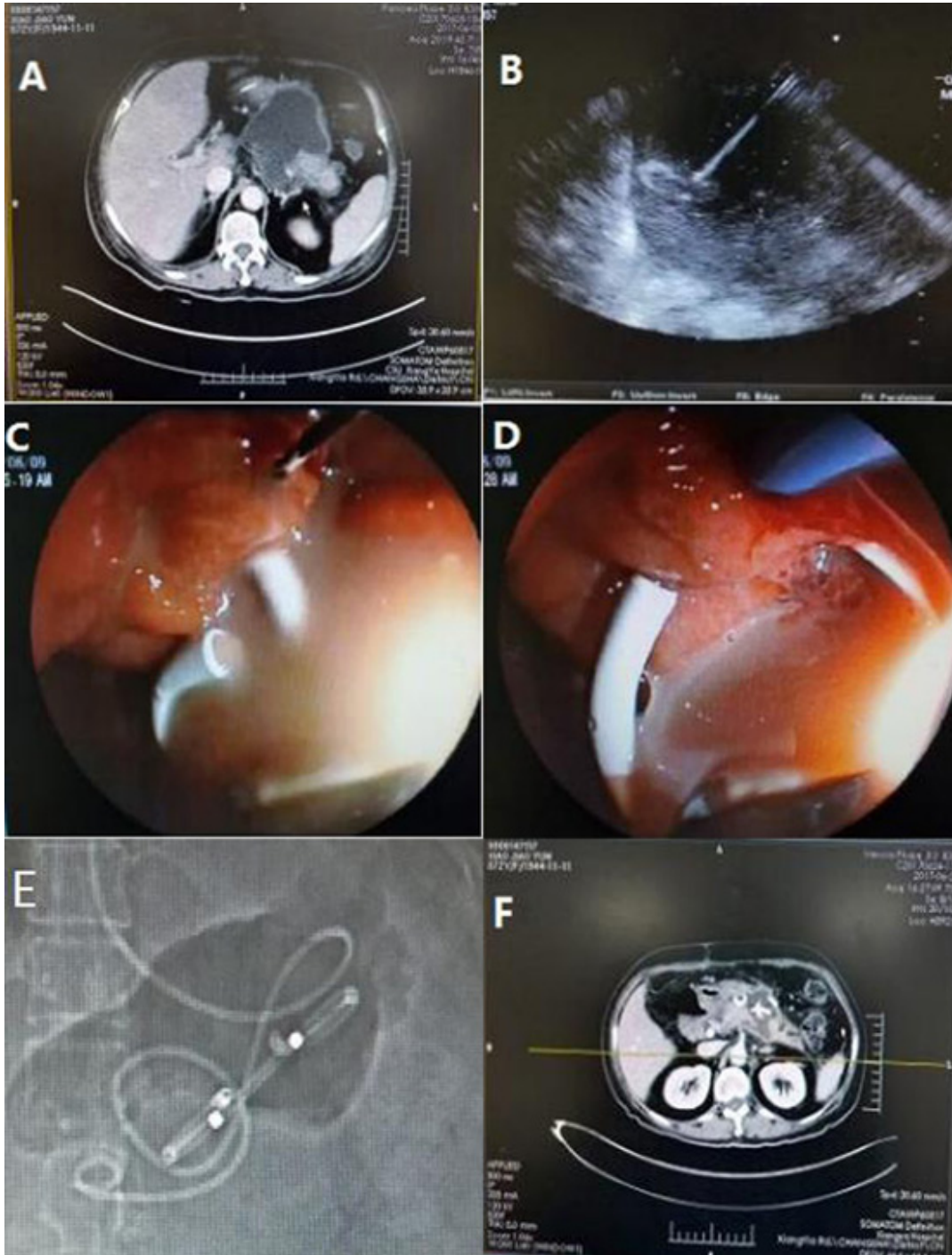


Figure 1: A Female Patient with An Infected Pancreatic Pseudocyst Was Deployed with Double Pigtail Stent and Nasocystic Tube. A: CT Scan Photo Showing the Pancreatic Pseudocyst. B: Endoscopic Ultrasound Guiding the Transluminal Draining Procedure. C: A Double Pigtail Stent Being Deployed in The Pancreatic Infected Pseudocyst. D: A Nasocystic Tube Combined A Double Pigtail Stent Being Deployed in The Pancreatic Infected Pseudocyst. E: Radiograph Showing A Double Pigtail Stent and A Nasocystic Tube in The Pancreatic Pseudocyst. F: CT Scan Photo Showing Resolution of The Pancreatic Pseudocyst.

4 patients developed fever and leukocytosis (>15000 leukocytes) and recovered after antibiotic treatment and thoroughly washing of the cavity through nasocystic tube. However, in 2 of these four patients, fever and leukocytosis presented more than one week. The following percutaneous drainage with 14-16Fr close loop pigtail type plastic catheter was performed to wash the cavities.

One of them underwent surgical percutaneous nephroscopy procedure to debride necrotic tissue in PFC cavity two weeks later. The mean procedure time was about 40 minutes, ranging from 20 to 60 minutes. The patients were discharged 1 to 3 weeks later and instructed to avoid solid food for 1 week. The complications were summarized in Table 2.

Table 2: Complications of Patients Submitted to EUS-Guided Transmural Drainage of Pancreatic Pseudocysts

Patients(n)	20
Procedure-related complications	
Minor hemorrhage	5(25%)
Massive hemorrhage	0(0%)
Separation of gastric wall from cystic wall	2(10%)
Late stent obstruction	3(15%)
Late stent migration*	4(20%)
Recurrence	0(0%)
Secondary infection※	4(20%)
*CT scan identified that the stents slide into stomach cavity but not PFC cavity. ※These 4 patients were deployed nasocystic tubes simultaneously. 2 of them were completely resolved by series washing procedure and the other two resolved by additional percutaneous catheter drainage.	

All patients were completely resolved with the evidence of CT scan and clinical evaluation. The mean time for resolution was 15±20 days (ranging from 7 to 60 days). The mean follow-up was 3 months.

Discussion

Endoscopic transluminal drainage is the recommended procedure for PFCs with the benefits of high success rates, low morbidity and rarely mortality. According to the PFC drainage guideline in our institution, pseudocyst drainage would be recommended when the symptomatic collections had large PFC diameter and persisted for more than 6 weeks while the asymptomatic pseudocyst can be observed for 1 year. In this paper, we presented our experience with double pigtail stent and nasocyst plastic tube to drain PFC, demonstrated that it is technically feasible, the procedure is efficient and safe and can provide long-term resolution of the PFC in most patients.

As we know, drainage success depends not only on the access of cavity but also on the ability of the PFC contents to drain into the lumen, which is determined primarily by the diameter of the enterocystic fistula. With the restriction of endoscopy, only small-diameter plastic stents could be inserted and sometimes we need to use several stents to promote drainage, especially in cases with the presence of debris or thick collections. But in patients with debris, necrosis or bigger diameter (more than 15cm) of the cyst, we will combine percutaneous drainage by the use of 14-16Fr plastic tube. Nonetheless, some patients still develop fever because of insufficient drainage of the thick collections. This mainly happens when there were sticky and debris-rich collections caused by pancreatitis and we will clear the thick collections by nephroscopy through the percutaneous fistula. There are several case reports and series doc-

uments about the efficacy of self-expanding metal stent (SEMS) or lumen apposing metal stent (LAMS) drainage of PFC [7-10]. However, our guideline of plastic stent combined with nasocystic tube and percutaneous catheter provided affordable treatment for most of the patients with similar clinical outcome but much lower expenses.

In our study we evaluated plastic stent for PFC in several aspects. First, we confirmed the findings of others that the combination of plastic stent, percutaneous catheter and nasocystic tube has inherent characteristics that may prove beneficial in the PFC drainage. It provides specific advantages: a faster drainage; almost no risk of early obstruction; and access into the PFC cavity through the percutaneous orifice with lesion debridement or washing by percutaneous catheter. Only large PFC diameters were selected for our study, because, in our experience, these patients usually have more complications and take longer time to resolve with simple double pigtail stent drainage. The combination plan is technically more convenient to wash and clear cavity than using only plastic stents, and also does not require fistula balloon dilation, reducing procedure time, and theoretically decreases the risk of bleeding and separation of the PFC wall from the gastric or duodenal walls. We used double pigtail stents with an outer diameter of 10Fr in our study. We encountered problems such as secondary infection and plastic stent occlusion and thus do not recommend their simple use for draining PFC of diameter more than 10cm.

The first 3 cases in which we used double pigtail stent evolved with late stent obstruction due to sticky content inside the stent lumen, resulting with secondary infection of PFC cavity. After that, we concluded that double pigtail stent should be combined with nasocystic tube when the diameter of the PFC cavity is more

than 10cm, and with 14-16Fr percutaneous catheter when the diameter of PFC cavity is more than 15cm. Even employing these three methods, some patients still developed fever and surgical nephroscope should be applied through the percutaneous fistula to complete lesion debridement and washing. Third, we noted that sometimes the double pigtail stent could migrate not into the PFC cavity but more easily into gastric lumen and this could be explained by the gastric peristalsis. We use a titanium clip to prevent migration occurrence in 3 patients. Previous studies did not consistently used this clip and there are several reports of migration. Fourth, we provided the idea of the potential use of sequential flushing of the cavity. Of the 18 patients, 4 needed more than one session to wash the PFC cavity. All these 4 patients had parcel or debris, which made spontaneous drainage difficult. Fifth, we documented potential complications. Despite the larger diameter, obstruction and infection still may occur. In the study by Talreja the complication rate was 44% including superficial infection, bleeding, and inner migration. Most recently, Penn reported 20 cases, in which only 2 patients had major complication and 1 patient had a minor complication. In their study, Penn's patients were mainly acute and chronic pseudocysts. In our study, we included one patient with necrosis and debris. We believe that using larger diameter SEMS or LAMS is more efficient to achieve adequate drainage [11]. A new single-device, LAMS has been licensed for PFC drainage and a multicenter case series demonstrates that the use of the new LAMS is effective, feasible and relatively safe in draining PFC with a technical success rate of 99 % and cumulative serious adverse events (SAE) rate of 11.2 % [8]. The authors utilized a novel, fully covered SEMS with a dual-anchoring mechanism. Due to the anchoring mechanism, their stent will obviate the need for insertion of double pigtail plastic stents. But with consideration of the huge expenses of the stents above, we used only plastic stent combined with nasocystic tube or percutaneous catheter and had a complete resolution for PFC patients. However, our study was only retrospective and the sample size was relatively small. A larger randomized study with a control arm receiving plastic stent drainage compared with SEMS or LAMS drainage should be conducted in the future.

In summary, we have demonstrated that transmural EUS-guided drainage of PFC using double pigtail stent combined with nasocystic tube or percutaneous catheter is feasible, efficacious, and safe. SEMS or LAMS as a novel apparatus for drainage versus traditional plastic stents have some advantages but are much more expensive. We still recommend plastic double pigtail stent drainage combined with nasocystic tube or percutaneous catheter for PFC patients since it can provide with complete resolution with much lower cost, which can benefit more people especially in developing areas of this world.

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Ethical Approval

This study was approved by the Ethics Committee of the Xiangya Hospital of Central South University, China. (No. 2017-0301).

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