



Case Report:

Surgical intervention of severe post-ERCP-pancreatitis accompanied with duodenum perforation*

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Abstract: Endoscopic retrograde cholangiopancreatography (ERCP) is a procedure widely used to diagnose and treat conditions of biliary or pancreatic ductal system. The post-ERCP severe acute pancreatitis (SAP) accompanied with duodenum perforation is rare but serious, remaining a challenge in clinic. In this study we report two such cases. Two Chinese women were treated for clinical suspicion of bile duct obstruction and underwent ERCP after admission. Both developed duodenum perforation and SAP after ERCP, and were managed in the intensive care unit (ICU) and required an organ-failure support. The surgical intervention of the peri-pancreatic debridement with lumbar-abdominal compound incisions and postoperative washing and drainage was performed, and the two patients recovered well. The therapeutic effect of the peri-pancreatic debridement with lumbar-abdominal compound incisions combined with postoperative washing and drainage in the patients of severe post-ERCP-pancreatitis (PEP) and duodenum perforation is satisfactory.

Key words: Endoscopic retrograde cholangiopancreatography (ERCP), Post-ERCP-pancreatitis (PEP), Duodenum perforation, Debridement, Drainage

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1 Introduction

Endoscopic retrograde cholangiopancreatography (ERCP) is a procedure that combines the use of endoscopy and fluoroscopy to diagnose and treat conditions of biliary or pancreatic ductal system. It is minimally invasive, and its therapeutic efficacy has been well characterized clinically. However, ERCP still develops several complications, including post-ERCP pancreatitis (PEP) (Cotton *et al.*, 1991; Freeman *et al.*, 1996). The post-ERCP severe acute pancreatitis (SAP) accompanied with duodenum perforation is rare but serious, remaining a challenge in clinic (Freeman *et al.*, 2001; Salminen *et al.*, 2008).

The management of SAP includes intensive care unit (ICU) organ support, nutritional support, surgical intervention, the use of drainage technology, and application of a wide range of imaging technology (Johnson *et al.*, 2004; Jean-Louis *et al.*, 2008). Here, we present two rare cases of SAP accompanied with duodenum perforation from 1238 cases of patients who had accepted ERCP in our hospital in 2007. The two patients underwent ERCP and received surgical intervention of peri-pancreatic debridement with lumbar-abdominal compound incisions combined with postoperative washing and drainage.

2 Case presentation

2.1 Case 1

A 53-year-old Chinese woman who had occasional abdominal pain for two years was referred to our hospital with a clinical diagnosis of common bile

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duct stenosis. The patient accepted ERCP and endoscopic sphincterotomy (EST) and complained of increasing abdominal pain. Computed tomography (CT) showed a perforation of the duodenum. Laparotomy in emergency using the roof-shaped upper abdominal incision revealed a duodenal perforation of 2 mm in diameter and a fluid collection in retroperitoneal area. A duodenum perforation repairing surgery was performed, and a T-tube was placed into the common bile duct for drainage. The patient was managed in the ICU postoperatively and required a mechanical ventilation because of the acute respiratory distress syndrome (ARDS) occurring on Day 5. Repeated CT scan demonstrated an acute pancreatitis and extensive retroperitoneal cellulites. The severity of pancreatitis was demonstrated by the elevated serum amylase (2356 U/L) and C-reactive protein (CRP) (195 mg/L), as well as the increasing acute physiology and chronic health evaluation (APACHE II) score (Knaus *et al.*, 1985), Marshall multiple organ dysfunction syndrome (MODS) score (Marshall *et al.*, 1995), and Balthazar CT score (Balthazar *et al.*, 1985; 1990; Johnson *et al.*, 2004; Mayumi *et al.*, 2002) (Table 1). On Day 7 the peri-pancreatic debridement surgery using right lumbar-abdominal compound incision (Figs. 1–2) was organized mainly in the retroperitoneal area next to the right kidney. The compound incision was left open postoperatively, and self-made drain tubes were placed to the pancreatic remnant through the two incisions for drainage. Thereafter the

one-way continuous negative pressure washing and drainage system was carried out as well as manual elimination of necrotic remnant (Fig. 3). Events of the patient are listed in Table 2. At 4 weeks, the patient improved her abdominal and systemic status, and both the lumbar and the abdominal incisions were sutured. Enteral nutrition [30–40 kcal/(kg·d)] by the jejunum stoma was realized postoperatively. She went home 10 weeks after admission, and laboratory findings of a 6-month follow-up were normal, except that ultrasonography (US) showed right uronephrosis (1.5 cm).

2.2 Case 2

A 51-years-old Chinese woman was admitted to our hospital for the primary diagnosis of common bile duct stones. She had a history of cholecystectomy. ERCP and EST were performed and plastic stent (8.5 Fr) and nasobiliary duct (7 Fr) were placed for drainage. On Day 3, CT confirmed acute pancreatitis, and ARDS occurred. The patient was transferred to ICU despite conservative management. The serum amylase, CRP, APACHE II score, Marshall MODS score, and Balthazar CT score together confirmed the SAP (Johnson *et al.*, 2004; Mayumi *et al.*, 2002) (Table 1). Surgical debridement using the right lumbar-abdominal compound incision to remove necrotic tissue was organized, and the incisions left open postoperatively. Fever and wound infection developed, and she underwent a secondary debridement followed the compound incision on Day 39. The

Table 1 Data of patients after ERCP when patients were transferred to ICU

Patient	Age (year)	Sex	Amy (U/L)	CRP (mg/L)	APACHE II	Marshall MODS	Balthazar CT	ICU stay (d)
1	53	Female	2356	195	12	14	7	13
2	51	Female	1958	178	13	16	7	16

Amy: amylase; CRP: C-reactive protein; APACHE II: acute physiology and chronic health evaluation; MODS: multiple organ dysfunction syndrome; CT: computed tomography; ICU: intensive care unit

Table 2 Events (time* and treatment) of patients during treatment after ERCP

	Patient 1	Patient 2
Age (year)	53	51
Sex	Female	Female
Event 1	Day 1: ERCP	Day 1: ERCP
Event 2	Day 2: emergence duodenum repair surgery	Day 3: transfer to ICU
Event 3	Day 5: ARDS, transfer to ICU	Day 7: compound incision surgery
Event 4	Day 7: compound incision surgery	Day 39: debridement surgery
Event 5	Day 20: washing and drainage system	Day 43: washing and drainage system
Event 6		Day 55: duodenal exclusion T-tube drainage

*Time based on the ERCP as the first day (Day 1). ERCP: endoscopic retrograde cholangiopancreatography; ARDS: acute respiratory distress syndrome; ICU: intensive care unit

rubber drainage tubes were placed into the incisions for drainage of a pancreatic remnant. However, alternative procedures, such as one-way continuous negative pressure washing and drainage system, were required on Day 43 because of fever. Her temperature recovered soon. On Day 55 the duodenum fistula was confirmed by gastro-intestinal (GI) radiography, and the surgery of duodenal exclusion operation, T-tube drainage, and jejunostomy by roof-shaped upper abdominal incision were performed. Events of patient are listed in Table 2. Unfortunately, persistent duodenal fistula was demonstrated by intestinal juice draining through the right lumbar incision postoperatively. The one-way continuous negative pressure washing and drainage system remained and the intestinal fistula drainage reduced gradually. The abdominal incision was sutured and drainage system of lumbar incision was kept open. Radiographies of both T-tube (Fig. 4a) and drainage tube (Fig. 4b) revealed sinus fistula formation and no retained stones within the biliary tree. With fasting and intravenous nutrition, she underwent the repairing of the fistula by using of fibrin glue *in vitro*. Enteral nutrition [30–40 kcal/(kg·d)] by the jejunum stoma was realized postoperatively and part of the bile drainage was transfused for the enteral nutrition especially. Thereafter the fistula resolved suddenly, and the patient went home 15 weeks after admission. At 8 months she accepted a second operation to remove stones (0.8 cm in diameter) in the common bile duct. Laboratory findings of a 12-month follow-up were normal.

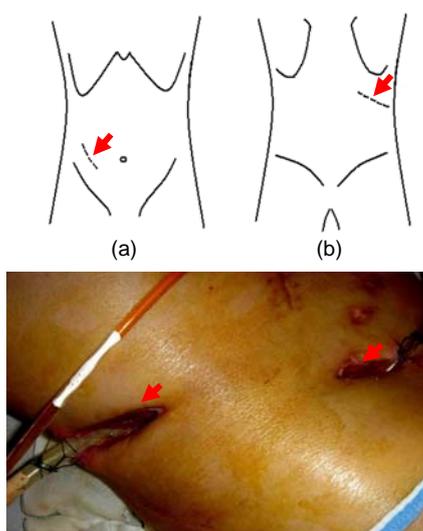


Fig. 1 Lumber-abdominal compound incision (arrows)
(a) Abdomen margin located at the right lower abdomen, a similar expansion of appendix's incision; (b) Lumbar incision followed the right kidney resection margin

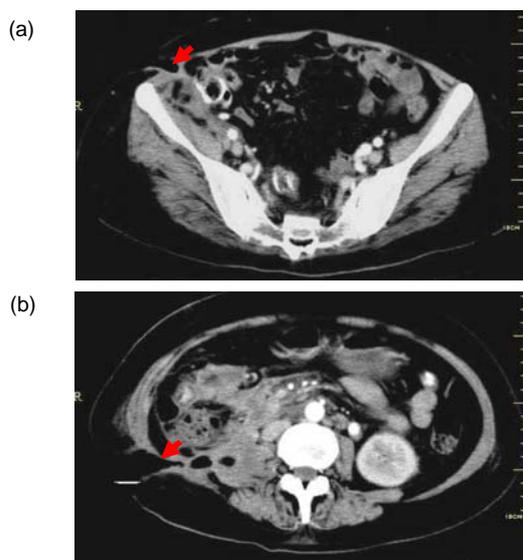


Fig. 2 Abdominal incision (a) and lumbar incision (b) on CT (arrow)



Fig. 3 One-way continuous negative pressure washing and drainage system

Saline solution (0.9%, w/v) went through abdominal incision for washing and was drained from right lumbar incision by continues negative pressure suction (arrow)

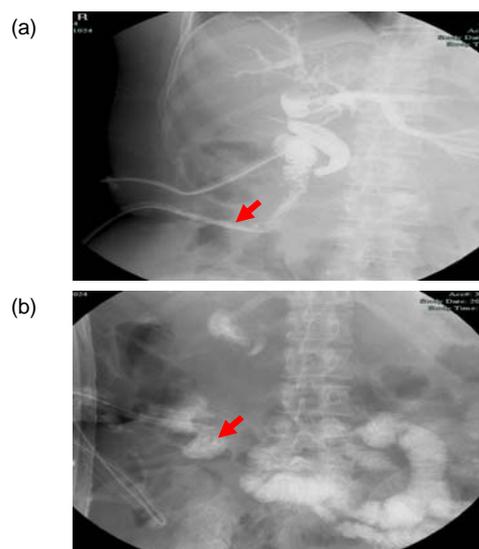


Fig. 4 Radiographies of T-tube (a) and drainage tube (b)
(a) Radiography of T-tube revealed sinus fistula formation (arrow) and no retained stones within the biliary tree; (b) Radiography of drainage tube revealed sinus fistula formation (arrow)

3 Discussion

According to Cotton standards (Cotton *et al.*, 1991), PEP is a common complication of ERCP and its incidence rate ranges from 4% in low risk patients to 40% in high risk patients (Cotton *et al.*, 1991; Cheon *et al.*, 2007; Freeman *et al.*, 1996). Some aspects of the etiology of PEP may be applicable to pancreatitis, although it is important to distinguish between those associated with bile and pancreatic juice outflow obstruction (Enns *et al.*, 2002; Jean-Louis *et al.*, 2008). The clinical incidence of duodenum perforation after ERCP is approximately 1%. Observation of the perforation with endoscope or estimation of enhanced CT is essential in the diagnosis of a duodenum perforation after ERCP (Genzlinger *et al.*, 1999). CT helped in the imaging of duodenum perforation in case 1. GI radiography also had a role in further defining duodenum perforation in case 2.

There are four types of duodenum perforation, of which details regarding the location of duodenal perforation have been studied. Among them, type I, the lateral or medial wall perforation of duodenum, is the most serious (Stapfer *et al.*, 2000). Both the two cases were confirmed to be the type I duodenum perforation by surgery, which deteriorated to persistent organ failure within 1 week, consistent with the standard of SAP (Johnson *et al.*, 2004). Although ERCP-induced duodenum perforation combined with severe PEP is rare, it is a serious condition, remaining a challenge in clinic (Salminen *et al.*, 2008).

Mild PEP can alleviate after conservative treatment (Jean-Louis *et al.*, 2008). The management of SAP requires organ support in the systemic inflammatory response syndrome (SIRS) phase and surgical intervention if pancreatic necrosis developed (Castillo *et al.*, 1998; Johnson *et al.*, 2004; Uhl *et al.*, 2002). Patients of duodenal perforation after ERCP, such as type I perforation, continued to deteriorate with leakage of intestinal juice and pancreatic juice into the abdominal or retroperitoneal cavity, resulting in peritonitis or retroperitoneal extensive cellulites and often being in the need of emergency surgery for perforation repair (Enns *et al.*, 2002; Stapfer *et al.*, 2000). Therefore, surgical intervention is required in advance in patients with duodenum perforation of type I caused by ERCP despite initial SAP conservative management, and the operation requires dealing with both duodenum perforation and immature peri-

pancreatic necrotic tissue together. We speculated that the peri-pancreatic tissue in those patients mainly was involved in the pancreatic head and was restricted to percutaneous puncture drainage under the guidance of CT or ultrasound.

Surgical debridement is difficult in emergency and often needs a second surgical removal or more (Uhl *et al.*, 2002). The pancreatic abscess and preoperative pancreatic remnant are often one of the reasons of death (Castillo *et al.*, 1998). In this report both patients underwent surgical intervention despite initial SAP conservative management. Avoiding repeated surgery in such severe cases and confirming the effectiveness of drainage of residual abscess and pancreatic remnant are the keys for survival. We speculated that once the ERCP encounters with duodenum perforation and severe PEP, it requires an early surgery, usually in emergency, and simple and practical operation to maintain life at first. In addition, lesions would be mainly involved in the right abdominal region, and the conventional roof-shaped incision of SAP would not be suggested. Moreover, the surgical debridement could not be completed at one time, and the surgery should be aimed to create the conditions for effective drainage postoperatively. Therefore, we proposed the peri-pancreatic debridement with lumber-abdominal compound incisions combined with postoperative washing and drainage for ERCP complicated with duodenum perforation. In this report, the two patients underwent the compound incision during surgery, in which the lumber incision followed the right kidney resection margin, and the abdomen margin was located at the right lower abdomen, a similar expansion of appendix's incision. In the two patients, the peri-pancreatic necrotic tissue was partly removed, especially in the right retroperitoneal legion, so that the two incisions could be made to have joint communication through the retroperitoneal region. Therefore, the so-call compound incision was identified and the two incisions left open conventionally postoperatively. We suggest that vaseline gauze should be placed into the incision for a few days in order to prevent hemorrhage of necrotic tissue after surgery.

The two patients went through the hemorrhage phase successfully. Routine drainage of rubber tube was performed, and patients deteriorated with increased body temperature in clinic despite antibiotics therapy. For the elimination of peri-pancreatic necrotic tissue and secondary infection, effective

drainage was the key. Followed the principle of drainage we designed the one-way continuous negative pressure washing and drainage system through the two incisions. The washing tube (tube 1), usually made of clinical drainage thin tube, was placed in the right lower quadrant incision. The drainage tube (tube 2) was put in the right lumbar incision. Saline solution (0.9%, w/v) went through tube 1 for washing, and tube 2 drained the saline out from the right lumbar incision by continuous negative pressure suction. During washing and drainage, we put an index finger into the two incisions and used pulp to scrub soft mud-like tissue without violence, so that part of necrotic tissue could be washed away with saline flow through the tube 2 by negative pressure suction. The enhanced drainage system could effectively prevent peripheral nerves and vessels from corrosion and bleeding caused by necrotic tissue. Moreover, enteral nutrition [30–40 kcal/(kg·d)] by the jejunum stoma went through in both cases postoperatively, and part of the bile drainage was transfused through jejunostomy tube for the enteral nutrition.

In conclusion, clinical severe PEP accompanied with duodenum perforation should be managed to have ICU organ support, nutritional support, surgical intervention and drainage technology, and a wide range of imaging technology (Johnson *et al.*, 2004; Jean-Louis *et al.*, 2008). We developed a surgical incision and drainage system, and suggested that the right lumbar-abdominal compound incisions should be left open for a long time postoperatively for the treatment of severe PEP accompanied with duodenum perforation.

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