ANNALI ITALIANI DI CHIRURGIA

Digital Edition
e-publish on-line
ISSN 2239-253X
Direttore Nicola Picardi

Intractable external pancreatic fistula post-necrosectomy treated successfully with a fistulojejunostomy

Ann Ital Chir, Digital Edition 2020, 9
pii: S2239253X20031898 - Epub, March 9
free reading: www.annitalchir.com

Osman Erdogan*, Zafer Teke*, Abdullah Ulku**, Ahmet Gokhan Saritas**, Atilgan Tolga Akcam**

**Cukurova University, Faculty of Medicine, Department of Surgical Oncology, Adana, Turkey*
***Cukurova University, Faculty of Medicine, Department of General Surgery, Adana, Turkey*

Intractable external pancreatic fistula post-necrosectomy treated successfully with a fistulojejunostomy

Pancreatic fistula formation is a known complication of pancreatic surgery, pancreatitis, and pancreatic injury.
We here report a case of a 65-year-old man who was diagnosed with gallstone-induced acute pancreatitis with walled-off pancreatic necrosis. The patient initially underwent medical treatment and percutaneous drainage at 4 weeks. After a four-week period, a formal laparotomy with necrosectomy, and the catheter drainage of the cavity were performed. Having postoperatively developed a pancreatic fistula, the patient was managed conservatively. After 6 weeks of medical treatment, patient underwent an endoscopic retrograde pancreatography and was diagnosed with disconnected duct syndrome. The conservative management was continued for 3 more months. Pancreatic duct stenting was attempted but was not successful in cannulating the disconnected duct, and he was finally planned for a Roux-en-Y fistulojejnuostomy. The fistulojejunostomy was performed on an average of 6 months after placement of peri-pancreatic drain. The patient recovered uneventfully and is doing well at a 12-month follow-up.
Refractory external pancreatic fistula is defined as an external pancreatic fistula not resolving with these measures for longer than 6 weeks. Most fistulas developing after acute pancreatitis are related directly to the need for necrosectomy to treat infected necrosis. Patients are initially approached conservatively. When patients fail to respond to either percutaneous drainage, endoscopic interventions, or novel techniques, operative intervention is the most viable approach to treat the fistula.
Fistulojejunostomy is a safe and effective treatment for intractable pancreatic fistula having the benefit of avoiding a difficult major pancreatic resectional surgery, along with low postoperative morbidity and mortality.

KEY WORDS: Acute pancreatitis, Pancreatic necrosis, Pancreatic fistula, Fistulojejunostomy

Introduction

Pancreatic fistulas can result from surgery for various indications, including pancreatic necrosis, pancreatic pseudocysts, benign or malignant pancreatic lesions, chronic pancreatitis, trauma, pancreatic ascites, and percutaneous interventions for fluid collections or pseudocysts [1-3]. Torba *et al.* reported a case of blunt pancreatic trauma (grade III) who was managed with evacuation of fluid pus and necrotic tissue, large lavage of peritoneal cavity, distal pancreatectomy with complete removal of necrotic tissue and splenectomy [4]. The proximal pancreatic stump was hand-sewn with interrupted 4-0 prolene sutures in a U-type fashion. After cholecystectomy, T-tube in the common bile duct, peri-pancreatic and retroperitoneal drains were placed. The patient's postoperative course with necrotic leakage from peri-pancreatic drain was complicated. They

Pervenuto in Redazione Dicembre 2019. Accettato per la pubblicazione Gennaio 20202
Correspondence to: Osman Erdogan, MD, Cukurova University, Faculty of Medicine, Department of Surgical Oncology, Adana, Turkey (e-mail: osman_erdogan85@hotmail.com)

reported that necrotic leakage from peripancreatic drain lasted for forty six days. The patient was discharged after two months postoperatively. The incidence of pancreatic fistula after pancreatectomy ranges from 0% to 30%. This incidence seems to be greater after distal pancreatectomy when compared to pancreatoduodenectomy. Pancreatic fistula rates in patients with severe acute pancreatitis undergoing necrosectomy have been reported to be in the range of 15% to 17% [5]. Pancreatic fistulas can lead to locoregional complications such as abscess formation, hemorrhage, pseudoaneurysms, peritonitis, and sepsis [1,3]. High mortality rates ranging between 13% and 36% have been reported. Initial conservative management is usually successful in 90% of the patients without development of fever, tachycardia, leucocytosis, wound site infection, or peritonitis [1,3,6]. Clinical deterioration warrants a step-up approach, with total parenteral nutrition, wound care, drainage of intra-abdominal collections with percutaneous drains, repositioning of previously placed drains, and sometimes, exploration with abdominal lavage. Prevention of wound complications, percutaneous dilatation of stenotic segments in anastomosis, and pancreatic duct stenting are all adjuncts for management.

The surgical options in the emergent setting include lavage with wide drainage, reinforcing or refashioning of anastomosis in case of a minor leak, disconnection of anastomosis with external pancreatic drainage through feeding jejunostomy, and rarely a total pancreatectomy, which leads to diabetes mellitus and carries a high mortality [7-9]. Refractory external pancreatic fistula is defined as an external pancreatic fistula not resolving with these measures for longer than 6 weeks [1]. Unluckily, pancreatic fistulas can be associated with morbidities, including fluid and electrolyte imbalances, malnutrition, hemorrhage, and sepsis [10].

When medical or endoscopic interventions fail to resolve pancreatic fistulas, operation remains the only treatment option. There are a couple of surgical options to treat refractory external pancreatic fistula: internal drainage by Roux-en-Y fistulojejnuostomy or fistulogastrostomy, and pancreatic resection procedures are the available surgical options to treat refractory external pancreatic fistula not resolving with endoscopic, percutaneous and combined endoscopic–percutaneous procedures [2]. Optimal time for performing fistulojejunostomy is a matter of debate [1,3]. Unfortunately, reoperative pancreatic surgery is technically challenging and can also be associated with serious morbidity [10]. In this article, we describe our experience using fistulojejunostomy as a means of treating refractory pancreatic fistula. In the general sense, this technique is highly effective and avoids dissection of the retroperitoneum, revision of the previously failed anastamosis, and possibly completion pancreatectomy.

Case Presentation

A 65-year-old man was diagnosed with gallstone-induced acute pancreatitis with walled-off pancreatic necrosis. The patient initially underwent medical treatment and percutaneous drainage of a necrotic collection at 4 weeks (Fig. 1). After a four-week period, a formal laparotomy with necrosectomy, cholecystectomy and the catheter drainage of the cavity (Fig. 2) were performed due to the development of infected pancreatic necrosis. Having postoperatively developed a pancreatic fistula with an output of approximately 300-400 mL/day, the patient was managed conservatively with nasojejunal enteral feeding. The pancreatic fistula was defined by the presence of amylase-rich fluid (greater than 3 times of

Fig. 1: Abdominal CT scan showing the initial percutaneously drained peri-pancreatic necrotic collection (white arrow indicates the percutaneously placed catheter).

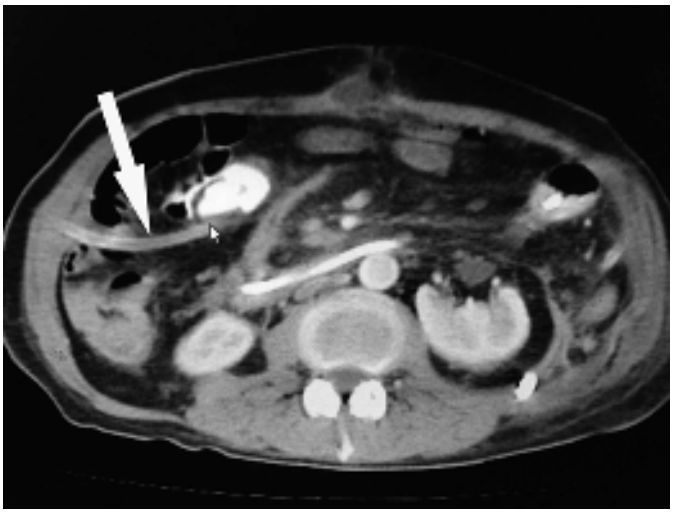

Fig. 2: Abdominal CT scan showing the catheter placed after a laparotomy with necrosectomy and drainage of the cavity for infected pancreatic necrosis (white arrow indicates the surgically placed drainage catheter)

serum concentration) collected by an operatively placed drain after postoperative day 3 [11]. Oral intake was allowed and advanced to a low fat diet, as long as fistula output did not increase by more than 30 mL per day. We did not use long-term octreotide treatment in our patient. After 6 weeks of conservative management, patient underwent an endoscopic retrograde pancreatography and was diagnosed with disconnected duct syndrome. The conservative management was continued for 3 more months due to a decreasing drain output. Pancreatic duct stenting was attempted but was not successful in cannulating the disconnected duct, and he was finally planned for a Roux-en-Y fistulojejnuostomy. A contrast-enhanced computed tomography was done for preoperative planning to evaluate the size of the fistula tract and its wall thickness, and rule out any associated intra-abdominal collections (Figs. 3 A-C). The fistulojejunostomy was performed on an average of 6 months after placement of peri-pancreatic drain. During laparotomy, the fistula tract was identified as a scar tube surrounding the drain. The mature fistula tract was isolated by limited adhesiolysis to prevent devascularization of the tract, and it was dissected as close to the pancreas as possible, avoiding the immediate peri-pancreatic area. This scar tube was then transected circumferentially approximately 4-6 cm away from the pancreatic parenchyma (Fig. 4). Once transected, the drain within the tract was identified easily and removed. The distance between the pancreas and the anastomotic site was measured. A single layer end-to-side anastomosis was constructed to a 45-cm-long Roux loop of the jejunum using interrupted 4-0 prolene sutures (Fig. 5). A trans-anastomotic tube or stent was not used. Drains were placed at the end of the procedure. Anastomosis was supracolic and infrahepatic, approximately 4-6 cm from the pancreas. The surgery lasted 120 minutes, and blood loss was 50 mL. There were no intraoperative and postoperative complications. The patient recovered uneventfully

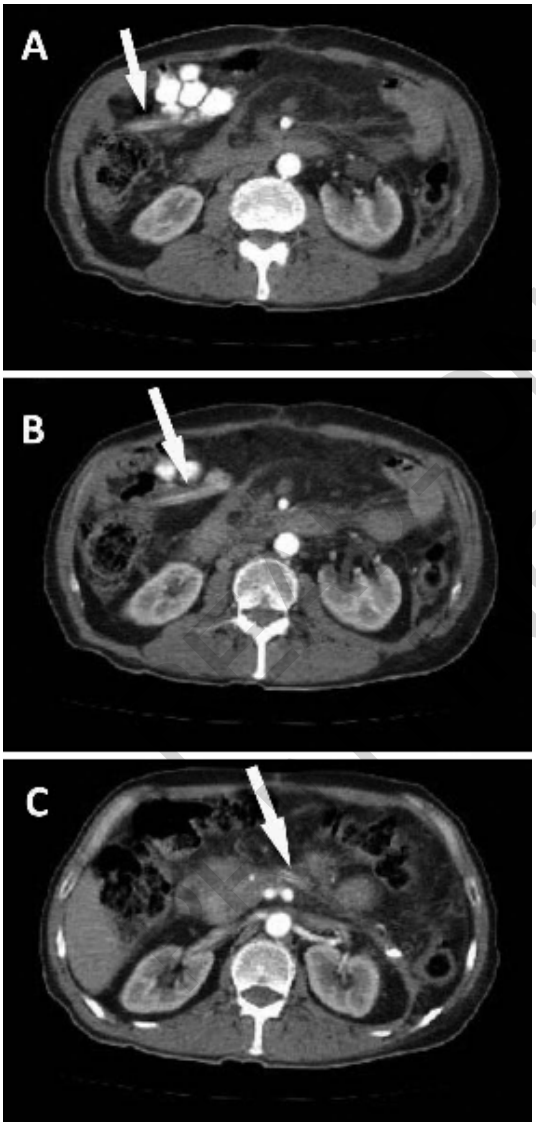

Fig. 3: A-C.) Abdominal CT scan images taken for preoperative planning to evaluate the size of the fistula tract and its wall thickness and rule out any associated intra-abdominal collections (white arrows indicate the surgically placed drainage catheter throughout the pancreatic bed)

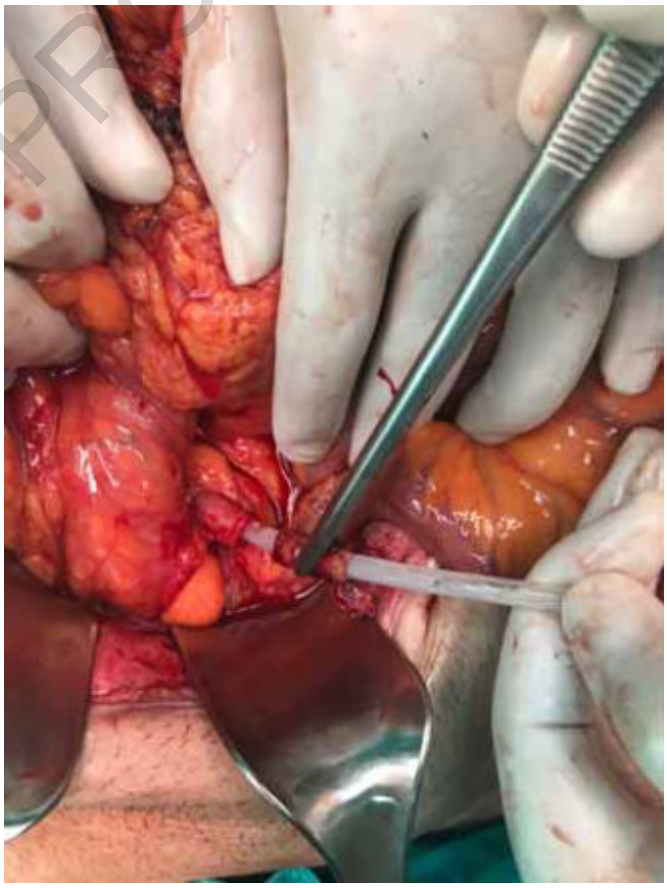

Fig. 4: Intraoperative image showing the identification of the fistula tract along the abdominal drain.

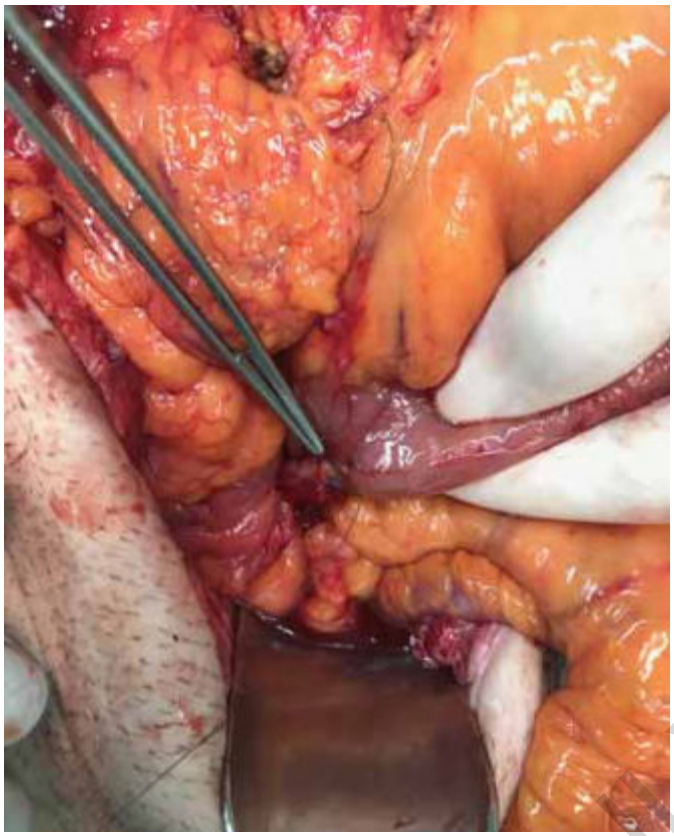

Fig. 5: Intraoperative image showing the anterior layer sutures for Roux-en-Y fistulojejunostomy.

and is doing well at a 12-month follow-up. Patient was followed in the outpatient department with clinical examination and computed tomography of abdomen and pelvis.

Discussion

Pancreatic fistula is a common problem. The incidence of pancreatic fistula after acute and chronic pancreatitis ranges from 5% to 70% [11-14]. Most fistulas developing after acute pancreatitis are related directly to the need for necrosectomy to treat infected necrosis. Similarly, most fistulas developing from chronic pancreatitis are a result of interventions, such as endoscopic procedures, biopsies, or operations designed to treat chronic debilitating abdominal pain. Mosca evaluated the efficacy of percutaneous drainage in post-necrotic and post-operative pancreatic pseudocysts [15]. In his experience percutaneous drainage was feasible in all but one case (95/96). The initial diagnosis of post-necrotic pancreatic pseudocyst was confirmed in 92 cases. The overall morbidity was 18% with no specific mortality. Overall 3-year success rate was 85% with well evident variations among different pancreatic pseudocysts types. The most common complication in patients who survive blunt or penetrating pancreatic injury is pancreatic fistula with an incidence of around 10% [5]. Nowadays pancreatic fistula most often develops after pancreatic surgery. The incidence of pancreatic fistula after pancreatoduodenectomy ranges from 10% to 20% [16,17]. Pancreatic fistula is an even more common complication of distal pancreatectomy with an incidence of 10% to 30%. [5,18]

External pancreatic fistulas have been classified as side fistulas and end fistulas. End fistulas include disconnected duct syndrome, which is the most common cause of refractory external pancreatic fistula, as in our patient. Disconnected duct syndrome, which can be partial or complete, is necrosis of a pancreatic duct segment along with a large segment full-thickness parenchymal necrosis leading to the disconnection of distal viable pancreas. Side fistulas have been further subdivided into post-operative and post-inflammatory fistulas [1]. The fistula may originate in the head, neck, body, or tail of the pancreas. Sometimes, the proximal pancreatic duct is strictured, preventing spontaneous fistula healing, which results in refractory external pancreatic fistula [6]. Most patients are initially approached conservatively. These patients can usually tolerate post-pyloric enteral nutrition without increasing fistula output. This management is often successful 80% of the time. When this management was employed by Sikora *et al*. in 43 patients with externally drained pancreatic fistulas, spontaneous closure occurred in 38 patients (88%); the median time to closure was 70 days [19]. Others have also demonstrated the success of this approach [20]. If after 4-6 weeks this treatment approach does not resolve the fistula, most patients should undergo reevaluation with endoscopic retrograde pancreatography or a magnetic resonance pancreatography. This approach allows delineation of pancreatic duct anatomy to rule out distal duct obstruction or main duct disruption. Disconnected duct syndrome can be managed by endoscopic sphincterotomy with a bridging stent placement across the discontinuity in the pancreatic duct. The management of complete disconnected duct syndrome depends on the presence or absence of a significant fluid collection (> 2 cm), demonstrable duct disconnection, and presence or absence of an external drain. When these factors are present, endoscopy-guided or endoscopic ultrasound-guided transmural drainage with or without stenting or percutaneous transfistulous distal pancreatic duct drainage or embolization with prolamine, ethylene-vinyl alcohol, fibrin sealant, or cyanoacrylate glue can be attempted with variable results. When the duct is not demonstrable, a percutaneous approach followed by an endoscopy-guided or endoscopic ultrasound-guided transmural drainage is required [1,6,9]. These procedures need high technical expertise and are so far recommended for low-output (< 200 mL/day) fistulas with a short tract (< 2 cm). The availability of expertise, stent blockage or migration, hemorrhage, post-pro-

cedure pancreatitis, and need for multiple interventions are some of the limitations [9].

When patients fail to respond to either percutaneous drainage, endoscopic interventions, or novel techniques, operative intervention is the most preferable approach to treat the fistula. It should be emphasized that enough time must be allowed for spontaneous closure of the fistula; as stated, spontaneous closure of fistulas can occur at a average of 70 days [19]. Pancreatic surgeries for refractory external pancreatic fistula require difficult dissection in inflamed and friable tissues, which lead to an increased blood loss, longer operative times, and an extended hospital stay with higher treatment costs [1-3]. Many different operative approaches have been employed. Operative choices depend on the ductal anatomy and history of previous resections. If a patient has had a prior pancreatoduodenectomy, then either a completion pancreatectomy or a revision of the anastamosis can be performed. Many authors have demonstrated substantial morbidity and mortality associated with performing a completion pancreatectomy [21,22]. This operation is not only associated with perioperative complications related to the technical challenges but also leads to the significant morbidity of the apancreatic state. For patients with a duct disruption in the body or tail region, a distal pancreatectomy can be performed. Novel operative approaches to treat refractory pancreatic fistulas include performing a pancreaticojejunostomy [23,24], use of a serosal patch, or the creation of a fistulojejunostomy [3,9,25-29].

Fistulojejunostomy was first described by Lahey and Lium in 1937 [9]. This operation uses the fistula tract that develops around a percutaneous drain. This scar tube is then anastomosed to a loop of small intestine. Bassi *et al*. reported a series of 17 patients in 2000 [3]. In this series, 16 of 17 patients had successful resolution of their fistulas. The last patient had a persistent fistula that resolved with conservative management on postoperative day 29. Subsequently, Howard *et al*. reported 27 patients with disconnected duct syndrome caused by severe acute pancreatitis [27]. Thirteen of these patients were treated with internal drainage, of which 9 underwent fistulojejunostomy. The remaining 14 patients underwent a distal pancreatectomy and splenectomy. Clinical outcomes, including complication rates, reoperation rates, fistula recurrence rates, and death rates, were similar between the two groups; however, operative parameters, including operative time, blood loss, and transfusion requirements, favored fistulojejunostomy. Finally, Voss *et al*. reported a series of patients who underwent various treatments for external pancreatic fistula [28]. Some of these patients underwent a fistulojejujnostomy as definitive treatment. Roux-en-Y fistulojejnuostomy has also been suggested for the treatment of chronic external refractory biliary fistula and post-sleeve gastrectomy fistula, and it has been attempted laparoscopically [3].

The fistulojejunostomy was performed at our center based on principles put forward by Bassi et al. [3], which preserved the pancreatic parenchyma. Dissection in the lesser sac and difficult pancreatic surgery were avoided. Dissection was simpler and guided by the drainage tube, leading to shorter operating times, with less blood loss. The anastomosis was carried out as close to the pancreas as possible; however, exposure of the pancreas was not essential. Once the anastomosis was completed, the fistula tract remained patent secondary to the constant flow of pancreatic secretions. This procedure allowed preservation of both exocrine and endocrine function. As a result, associated costs and hospital stay were also reduced [3,8,29]. Bassi *et al*. questioned the notion of going very close to the pancreas [3]. In their experience, the difference in outcomes with different distances from the pancreas was not significant [1-3,29].

A variety of of fistulojejunostomy have been described with similar outcomes and no demonstrable superiority of one technique over other [6,7,30]. Embedding fistulojejunostomy has been suggested by Luo *et al*. [7], in which the fistula tract is disconnected from the abdominal wall and drained externally through a transluminal tube drain, with both the drain and the tract fixed to a Roux loop of the jejunum with seromuscular sutures. The drain is also fixed to the abdominal wall with absorbable sutures and removed after 30 days. It is an easy and safe technique with very limited entry into the abdominal wall, but drawbacks include a 1-month longer waiting period and the need of pancreatic enzyme supplementation as long as the drainage tube is present [8]. The binding fistulojejunostomy technique involves suturing a 2 cm length of fistula tract with a tube drain to an everted cut end of the Roux loop after carbolic acid ablation of the jejunal mucosa in the everted segment [30]. The everted bowel is then wrapped over this anastomosis site with seromuscular sutures. The drainage tube is brought out transjejunally and through the abdominal wall, and it is removed after one month. Subcutaneous fistulojejunostomy involves bringing out a Roux loop of jejunum in the subcutaneous plane followed by anastomosis in that area with the disconnected fistula tract [6]. The proponents of this technique suggest that there is necrosis or stenosis of the embedded or buried part of the fistula along with the anastomotic segment. The technique requires minimal dissection of the tract, and the anti-gravity position ensures that there is no enteric contents entering the loop, minimizing the chances of leak [7].

The optimal time of performing fistulojejunostomy is still a matter of debate. Across various studies, timing ranges from 2 months to 1 year [1,7,8,29,30]. Bassi *et al*. recommended 6 to 12 weeks after identification of refractory external pancreatic fistula as the appropriate time [3]. A delay allows adhesions to soften, inflammation to subside, and the tract wall to thicken and mature enough to allow a secure anastomosis. In our case, the procedure was performed 6 months from the first identi-

fication of fistula. Fistulojejunostomy was successful in our patient without any complications.
Fistulojejunostomy requires the patient to undergo prolonged percutaneous drainage before surgical intervention. The average time between drain placement and fistulojejunostomy is 6 months. This time interval is necessary to allow a defined fistula tract to form around the percutaneous drain that allows patients to recover and gives the surgeon an opportunity to maximize the patient's nutritional status before operative intervention. In our experience, the patient could work and maintain an active lifestyle during this interval.

Conclusion

In conclusion, our experience confirms the effectiveness of fistulojejunostomy as a definitive treatment for intractable external pancreatic fistula. This procedure was effective in our patient with fistula secondary to necrotizing pancreatitis and as a result of surgical intervention. This operation is easy to perform and can be associated with decreased morbidity. Fistulojejunostomy should be considered when defining a treatment algorithm for refractory pancreatic fistula .

Riassunto

La formazione di fistole pancreatiche è una complicazione nota di chirurgia pancreatica, pancreatite e lesioni del pancreas.
Qui riportiamo un caso di un uomo di 65 anni a cui è stata diagnosticata una pancreatite acuta indotta da calcoli biliari con necrosi pancreatica murata. Il paziente inizialmente è stato sottoposto a trattamento medico e drenaggio percutaneo a 4 settimane. Dopo un periodo di quattro settimane, sono state eseguite una laparotomia formale con necrosectomia e il drenaggio del catetere nella cavità. Dopo aver postoperatorio sviluppato una fistola pancreatica, il paziente è stato gestito in modo conservativo. Dopo 6 settimane di trattamento medico, il paziente è stato sottoposto a pancreatografia retrograda endoscopica e gli è stata diagnosticata la sindrome del dotto disconnessa. La gestione conservativa è stata continuata per altri 3 mesi. È stato tentato lo stenting del dotto pancreatico, ma non è riuscito a cannulare il dotto disconnesso, ed è stato finalmente programmato per una fistulojejnuostomy di Roux-en-Y. La fistulojejunostomy è stata eseguita in media 6 mesi dopo il posizionamento del drenaggio peri-pancreatico. Il paziente si è ripreso senza problemi e sta facendo bene a un follow-up di 12 mesi.
La fistola pancreatica esterna refrattaria è definita come una fistola pancreatica esterna che non si risolve con queste misure per più di 6 settimane. La maggior parte delle fistole che si sviluppano dopo pancreatite acuta sono direttamente correlate alla necessità di necrosectomia per il trattamento della necrosi infetta. I pazienti vengono inizialmente avvicinati in modo conservativo. Quando i pazienti non riescono a rispondere al drenaggio percutaneo, agli interventi endoscopici o alle nuove tecniche, l'intervento operativo è l'approccio più praticabile per trattare la fistola.
La fistulojejunostomy è un trattamento sicuro ed efficace per la fistola pancreatica intrattabile che ha il vantaggio di evitare una chirurgia chirurgica pancreatica maggiore difficile, insieme a bassa morbilità e mortalità postoperatoria.

References

1. Nair RR, Lowy AM, McIntyre B, Sussman JJ, Matthews JB, Ahmad SA: *Fistulojejunostomy for the management of refractory pancreatic fistula*. Surgery, 2007; 142: 636-42.

2. Hirota M, Kanemitsu K, Takamori H, Chikamoto A, Hayashi N, Horino K, et al.: *Percutaneous transfistulous pancreatic duct drainage and interventional pancreatojejunostomy as a treatment option for intractable pancreatic fistula*. Am J Surg, 2008; 196: 280-84.

3. Bassi C, Butturini G, Salvia R, Contro C, Valerio A, Falconi M, et al.: *A single-institution experience with fistulojejunostomy for external pancreatic fistulas*. Am J Surg, 2000; 179: 203-6.

4. Torba M, Gjata A, Rulli F, Kajo I, Ceka S, Asqeri T: *Delayed diagnosis and treatment of high grade blunt pancreatic trauma. Case report and review of literature*. Ann Ital Chir, 2017; 88: 539-45.

5. Alexakis N, Sutton R, Neoptolemos JP: *Surgical treatment of pancreatic fistula*. Dig Surg, 2004; 21: 262-74.

6. Shibuya T, Shioya T, Kokuma M, Watanabe Y, Moriyama Y, Matsumoto K, et al.: *Cure of intractable pancreatic fistula by subcutaneous fistulojejunostomy*. J Gastroenterol, 2004; 39: 162-7.

7. Luo SC, Cheng SB, Wu CC, Huang CC, Lin YL, P'eng FK: *Embedding fistulojejunostomy: An easy and secure technique for refractory external pancreatic fistula*. Asian J Surg, 2018; 41: 143-47.

8. Solanki R, Koganti SB, Bheerappa N, Sastry RA: *Disconnected duct syndrome: refractory inflammatory external pancreatic fistula following percutaneous drainage of an infected peripancreatic fluid collection. A case report and review of the literature*. JOP, 2011; 12: 177-80.

9. Lahey FH, Lium R: *Cure of pancreatic fistula by pancreatojejunostomy*. Surg Gynecol Obstet, 1937; 64: 78-91.

10. Ahmad SA, Wray C, Rilo HR, Choe KA, Gelrud A, Howington JA, et al.: *Chronic pancreatitis: Recent advances and ongoing challenges*. Curr Probl Surg, 2006; 43: 127-238.

11. Bassi C, Dervenis C, Butturini G, Fingerhut A, Yeo C, Izbicki J, et al.: *Postoperative pancreatic fistula: An international study group (ISGPF) definition*. Surgery, 2005; 138: 8-13.

12. Falconi M, Valerio E, Caldiron E, Salvia R, Sartori N, Talamini G, et al.: *Changes in pancreatic resection for chronic pancreatitis over 28 years in a single institution*. Br J Surg, 2000; 87: 428-33.

13. Ho HS, Frey CF: *Gastrointestinal and pancreatic complications associated with severe pancreatitis*. Arch Surg, 1995; 130: 817-22.

14. Tsiotos GG, Smith CD, Sarr MG: *Incidence and management of pancreatic and enteric fistulas after surgical management of severe necrotizing pancreatitis*. Arch Surg, 1995; 130: 48-52.

15. Mosca F: *Drenaggio percutaneo delle pseudocisti pancreatiche*. Ann Ital Chir, 1999; 70: 173-6.

16. Lowy AM, Lee JE, Pisters PW, Davidson BS, Fenoglio CJ, Stanford P, et al.: *Prospective, randomized trial of octreotide to prevent pancreatic fistula after pancreaticoduodenectomy for malignant disease*. Ann Surg, 1997; 226: 632-41.

17. Yeo CJ, Cameron JL, Lillemoe KD, Sauter PK, Coleman J, Sohn TA, et al.: *Does prophylactic octreotide decrease the rates of pancreatic fistula and other complications after pancreaticoduodenectomy? Results of a prospective randomized placebo-controlled trial*. Ann Surg, 2000; 232: 419-29.

18. Lillemoe K, Kaushal S, Cameron J, Sohn T, Pitt HA, Yeo CJ: *Distal pancreatectomy: Indications and outcomes in 235 patients*. Ann Surg, 1999; 229: 693-8.

19. Sikora SS, Khare R, Srikanth G, Kumar A, Saxena R, Kapoor VK: *External pancreatic fistula as a sequel to management of acute severe necrotizing pancreatitis*. Dig Surg, 2005; 22: 446-51.

20. Balcom JH 4th, Rattner DW, Warshaw AL, Chang Y, Fernanadez-del Castillo C: *Ten-year experience with 733 pancreatic resections: changing indications, older patients, and decreasing length of hospitalization*. Arch Surg, 2001; 136: 391-8.

21. Cullen JJ, Sarr MG, Ilstrup DM: *Pancreatic anastomotic leak after pancreaticoduodenectomy: incidence, significance and management*. Am J Surg, 1994; 168: 295-98.

22. Ishikawa O, Ohigashi H, Imaoka S, Teshima T, Inoue T, Sasaki Y, et al.: *Concomitant benefit of preoperiative irradiation in preventing pancreas fistula formation after pancreaticoduodenectomy*. Arch Surg, 1991; 126: 885-89.

23. Ihse I, Larsson J, Lindström E: *Surgical management of pure pancreatic fistulas*. Hepatogastroenterology, 1994; 41: 271-75.

24. Martin FM, Rossi RL, Munson JL, ReMine SG, Braasch JW: *Management of pancreatic fistulas*. Arch Surg, 1989; 124: 571-73.

25. Fielding GA, McLatchie GR, Wilson C, Imrie CW, Carter DC: *Acute pancreatitis and pancreatic fistula formation*. Br J Surg, 1989; 76: 126-28.

26. Wolfsen HC, Kozarek RA, Ball TJ, Patterson DJ, Traverso LW, Freeny PC: *Pancreaticoenteric fistula: no longer a surgical disease?* J Clin Gastroenterol, 1992; 14: 117-21.

27. Howard TJ, Rhodes GJ, Selzer DJ, Sherman S, Fogel E, Lehman GA: *Roux-en-Y internal drainage is the best surgical option to treat patients with disconnected duct syndrome after severe acute pancreatitis*. Surgery, 2001; 130: 714-19.

28. Voss M, Ali A, Eubanks WS, Pappas TN: *Surgical management of pancreaticocutaneous fistula*. J Gastsrointest Surg, 2003; 7: 542-46.

28. Aranha GV, Aaron JM, Shoup M, Pickleman J: *Current management of pancreatic fistula after pancreaticoduodenectomy*. Surgery, 2006; 140: 561-68.

29. Varadarajulu S, Rana SS, Bhasin DK: *Endoscopic therapy for pancreatic duct leaks and disruptions*. Gastrointest Endosc Clin N Am, 2013; 23: 863-92.

30. Zhao YF, Wu Y, Sun WR, Zhai WL, Zhang SJ: *Binding fistulojejunostomy for the treatment of external pancreatic fistula*. Zhonghua Yi Xue Za Zhi, 2006; 86: 2721-2.