ANNALI ITALIANI DI CHIRURGIA

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

Pancreatic fistula: interventional radiological treatment by collection. Jejunal loop internal drainage.

Ann Ital Chir, 2023; 12 - Sept. 8
pii: S2239253X23039567
Online Epub

Maurizio Papa**, Vincenzo Tripodi*, Antonio P Francioso**, Pietro A.G. Bisagni*

**Department of General Surgery, ASST Lodi, Lodi, Italy*
***Department of Radiology, ASST Lodi, Lodi, Italy*

Pancreatic fistula: interventional radiological treatment by collection. Jejunal loop internal drainage.

Pancreaticoduodenectomy is a major surgical procedure associated with various and important complications, often difficult to be managed. Pancreatic fistula is due to leakage of pancreatic juice in the abdominal cavity and is the main and most frequent complication after pancreatic surgery. The treatment of pancreatic fistula may change according to degree. Interventional radiology (IR) can offer powerful minimally invasive alternatives in managing pancreatic fistulas. We report the case of a patient affected by ampullar adenocarcinoma who underwent pancreaticoduodenectomy. Surgery was complicated by high-flow pancreatic fistula treated conservatively with CT guided percutaneous transhepatic drainage. Due to persistent leak of pancreatic fluid the abdominal effusion was drained percutaneously in the jejunal loop by Interventional radiology.

KEY WORDS: Pancreatic fistula, Jejunal loop internal drainage, Radiological treatment

Introduction

In this case, we treated a pancreatic fistula through a percutaneous transhepatic approach. We placed a drain to facilitate the flow of pancreatic juice from Wirsung's duct to the jejunal loop and allow the healing of pancreatic fistula.
Pancreaticoduodenectomy is considered a major surgical procedure, commonly performed to remove cancerous tumors of the head of the pancreas. It is associated with various and important complications, often difficult to be managed.
Pancreatic fistula is the main and most frequent complication after pancreatic resection surgery. It is caused by the loss of pancreatic juice in the abdominal cavity [1].

The genesis of pancreatic fistula is different according to the chosen pancreatic resection technique. In pancreaticoduodenectomy it results from a leakage of the pancreas-jejunal anastomosis.
Several factors can be included for the outbreak of pancreatic fistula: age of the patient, body mass index, blood tests (Preoperative high ALP, ALT, AST, GGT values, low hemoglobin values), comorbidities, length of surgical procedure, pancreatic tissue consistency, duct diameter, excessive intra-operative blood loss [2-3].
The pancreatic gland consistency is the most important. Usually, the pancreas is a very soft and brittle organ.
In case of benign pathologies, non-ductal tumors of small-medium size or tumors of the periampullary region, the natural consistency of the pancreas remains unchanged. This situation is associated with a higher incidence of pancreatic fistula because the pancreatic parenchyma is not altered: therefore, the acinar component releases enzymes in response to surgical trauma that can cause a local inflammation leading to the development of pancreatic fistula.
Ductal tumors and chronic pancreatitis are instead more associated with the replacement of the soft acinar component with hard and compact fibrotic tissue. The latter pancreatic structure guarantees a minor loss of pan-

Pervenuto in Redazione Marzo 2023. Accettato per la pubblicazione Maggio 2023
Correspondence to: Vincenzo Tripodi, Department of General Surgery, ASST Lodi, 26900 Lodi, Italy (e-mail: vincenzo.trip@gmail.com).

creatic juice and better sealing of the anastomoses and is therefore associated with a lower incidence of fistula. A regular Wirsung's duct (<3 mm) is associated with a higher incidence of postoperative fistula. Soft pancreases tend to have small ducts, and the combination of the two factors increases the rate of this complication.
A predictive score has been developed to assess the risk of post operative pancreatic fistula [4] and it is based on different risk factors.
There is still no scientific evidences that allows us to prevent the development of pancreatic fistula. One of the possible way to prevent pancreatic fistula is the preoperative percutaneous biliary and pancreatic duct drainage/stenting with double invaginated pancreatojejunostomy [5].
Diagnosis of pancreatic fistula is based on the patient's symptoms, blood tests, drain fluid [6], CT evidence of abdominal fluid effusion, fistulography.
Pancreatic fistulas can be classified into different types based on the different clinical impact on patient's postoperative course [6].
In Grade A fistulas no treatments are required, and the postoperative hospital stay is not significantly increased.
In Grade B fistulas patients present fever, leukocytosis, pain, productive drainage, and CT findings of abdominal effusions.
Grade C fistulas are characterized by a more severe clinical situation, with intra-abdominal effusion, sepsis, need for parenteral nutrition usually leading to surgical reintervention to prevent further complications.
The treatment of pancreatic fistula may change according to its degree.
Grade A fistulas require no treatments. Grade B fistulas increase the hospital stay and require treatment that can be conservative (parenteral or enteral nutrition, antibiotic therapy) or invasive with percutaneous drainage.
In grade C fistulas the patient's clinical conditions often require hospitalization in intensive care units and leads to treatments which can be percutaneous drainage or even reoperation.
Interventional radiology (IR) can offer powerful minimally invasive alternatives for managing post-surgical complications of pancreatic fistulas [7,8]. Many different IR procedures, such as percutaneous drainage, aspiration of abscesses or fluid collections [9,10], percutaneous transhepatic biliary drainage [11], and arterial embolization [12,13] have been introduced in clinical practice to treat post-surgical complications. When an intra-abdominal collection is identified, in most cases it is possible to place a percutaneous drainage under image guidance, leading to a shorter hospital stay and re-operation rate [14, 15]. US-guided percutaneous drainage placement is generally the preferred choice when US identification is feasible.
In case of deep or difficult collections, computed tomography (CT) or Cone-Beam CT (CBCT) are the best imaging modalities to guide the placement of a percutaneous drainage.
Drainage placement can be performed using the trocar or Seldinger technique. In the trocar technique, the drainage catheter containing a trocar needle is inserted directly into the collection. The Seldinger technique implies multiple steps: the collection is punctured with a small needle (in general 18G), then guidewires are inserted, and the drainage is then advanced up to the collection over the guidewire. The Seldinger technique is safer and to be preferred in case of difficult or risky approach [16].

Case Report

The patient, a male in his 60's, with history of hypertension and chronic gastritis, presented in First Aid reporting three months dyspepsia, low-grade fever, recent episode of vomiting and hyperchromic urine.
The MRI scan showed a dilated biliary duct with an important shrinkage of its distal part. The ERCP showed a hypertrophic and centrally ulcerated papilla major, and biopsies were performed. The histological examination finding showed intestinal-type adenocarcinoma fragments.
Without any other lesions found in staging examination the patient underwent laparotomic pancreaticoduodenectomy. Presence of soft pancreas with a duct of less of 3 mm the reconstruction was performed with double loop, one for pancreas jejunal anastomosis and the other for biliary and duodenal anastomosis. The estimated blood loss was minimal (<500 ml).
Postoperative course presented fever, nausea, vomiting and abdominal pain. The value of amylases in the drain fluid was 4200 U/L.
An abdominal contrast enhanced CT was performed where an abdominal collection, secondary to a pancreatic fistula, was found (Fig. 1). The collection was at first managed by an epigastric percutaneous pig-tail

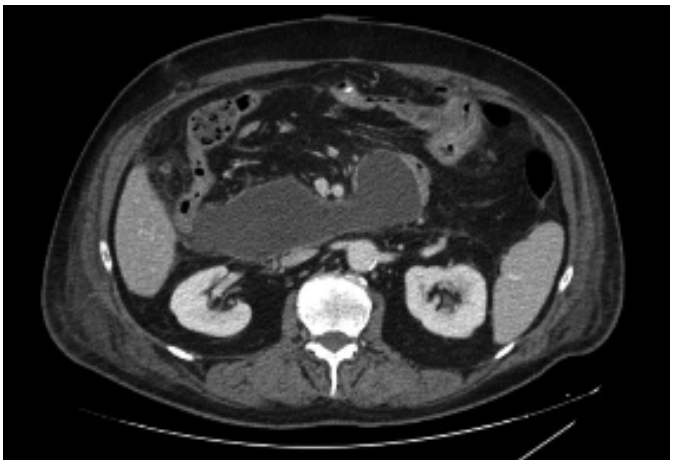

Fig. 1: Large post-surgical retroperitoneal collection (contrast enhanced CT scan - axial view, venous phase).

drainage (Fig. 2). A significant reduction of the cranial component of the collection was found a few days later the drainage was removed and the patient discharged. The patient was re-admitted 3 weeks later with fever and abdominal pain. A recurrence of the pancreatic collection was found at the admission CT-scan examination. A second approach was planned and a new drainage was inserted using a transhepatic pathway under CT-guided (Fig. 3). After accidental removing of this drainage by the patient himself, CT scan showed partial recurrence of the collection (Fig. 4) and persistence of the fistula. A different approach was needed and a new CT-guided transhepatic drainage was placed (Fig. 5). A fistulography through transhepatic drainage in angio-suite was performed showing direct communication among collection, Wirsung's duct and intestinal loop of the pancreatic-jejunal anastomosis (Fig. 6). Using the same percutaneous transhepatic approach, by means of angiographic guiding catheters and hydrophilic guidewire, the efferent intestinal loop from pancreatic-jejunal anastomosis was selectively catheterized (Fig. 7) and a biliary-type drainage was placed so that the drainage holes were as in the collection as in the jejunal loop (Figs. 8, 9), in order to allow the fistula to heal.

After twenty days the drainage was draining less of 2-3ml/die of fluid so it was removed and the patient discharged in good clinical conditions. Fistulography confirmed the resolution of the collection (Fig. 9).

The patient was discharged in good general clinical condition. At the follow-up visit, three months and six months after the procedure, the patient always presented in good general clinical condition without abdominal symptoms with normal nutrition and normal bowel function. On blood tests, he showed no inflammatory

Fig. 2: Collection's reduction after epigastric percutaneous drainage (non contrast CT scan – axial view).

Fig. 4: Partial collection's recurrence after accidental drainage removing (contrast enhanced CT scan - axial view, venous phase).

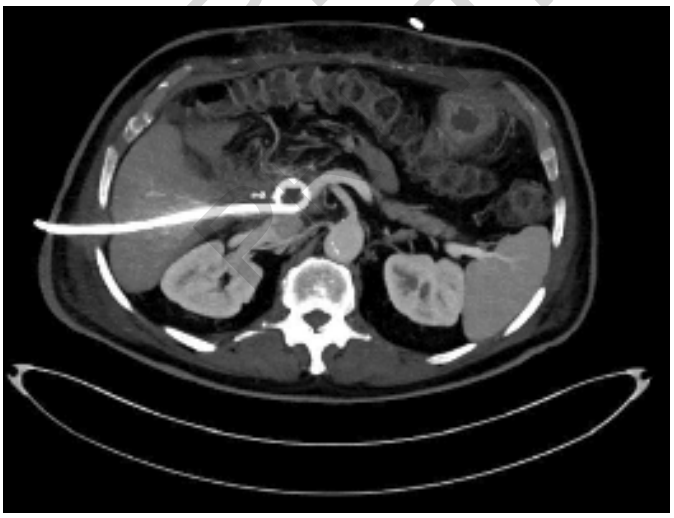

Fig. 3: First percutaneous transhepatic drainage of the residual collection (contrast enhanced CT scan (MIP axial view - venous phase).

Fig. 5: Second percutaneous transhepatic drainage placement (contrast enhanced CT scan - MIP axial view, venous phase).

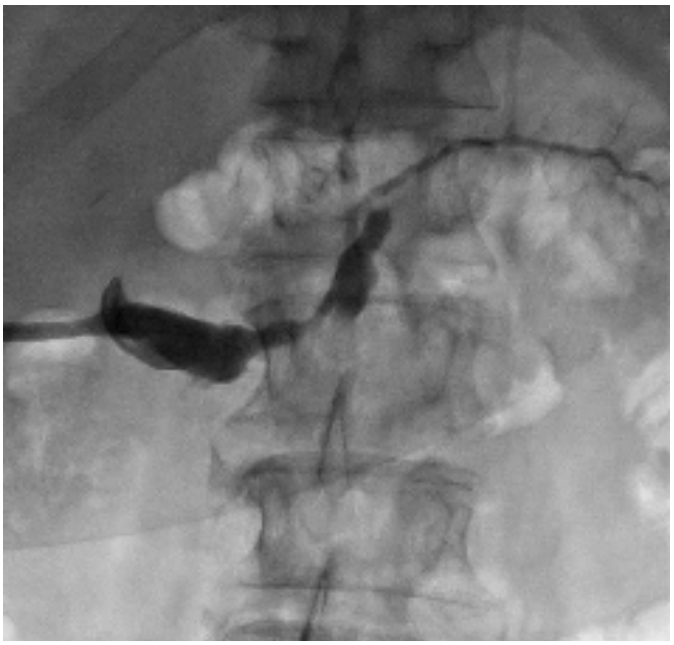

Fig. 6: Direct communication among collection, Wirsung's duct and intestinal loop of the pancreatic-digiunal anastomosis (fistulography).

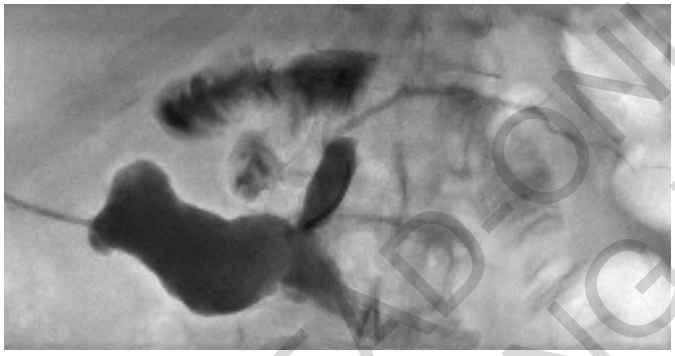

Fig. 7: Intra procedural image during catheterization of the intestinal loop.

Fig. 8: Biliary-type drainage localization (non contrast CT scan).

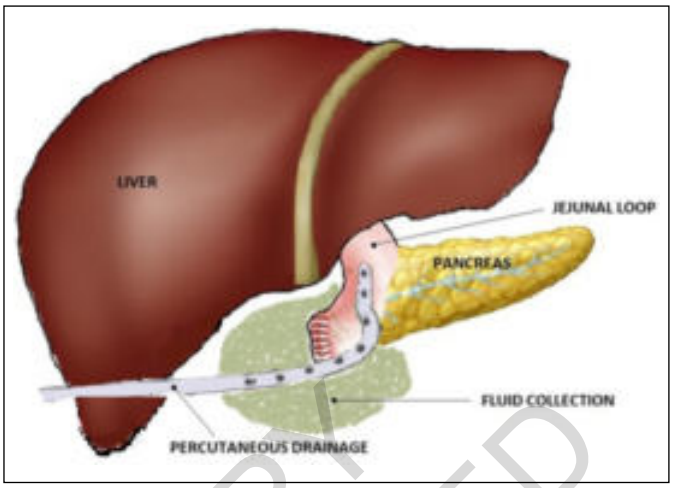

Fig. 9: Drainage positioning representation.

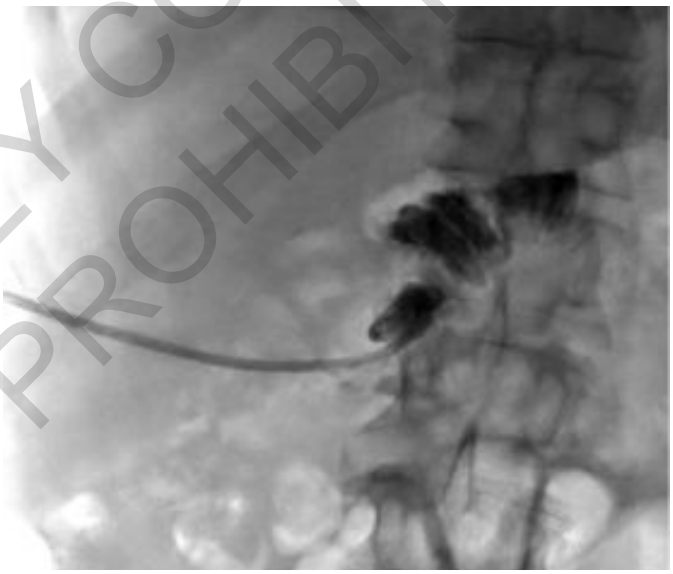

Fig. 10: Collection's resolution (fistulography).

indices. The patient returned to his usual daily activity after the treatments performed.
The patient also started and finished adjuvant chemotherapy with good tolerance. He performed a control Chest-Abdomen CT scan without finding any neoplastic disease and with complete resolution of the jejunal collection. The patient will continue the oncological follow-up.

Discussion

Pancreaticoduodenectomy is considered a major surgical procedure and it is associated with various and important complications, often difficult to be managed.
Pancreatic fistula is the main and most frequent complication after pancreatic resection surgery. It is caused by the loss of pancreatic juice in the abdominal cavity [1].

Diagnosis of pancreatic fistula is based on the patient's symptoms, blood tests, drain fluid [5], CT evidence of abdominal fluid effusion, fistulography. The treatment of pancreatic fistula may change according to its degree.
Interventional radiology (IR) can offer powerful minimally invasive alternatives for managing post-surgical complications of pancreatic fistulas [6,7]. Many different IR procedures, such as percutaneous drainage, aspiration of abscesses or fluid collections [8,9], percutaneous transhepatic biliary drainage [10], and arterial embolization [11,12] have been introduced in clinical practice to treat post-surgical complications.
In this case, according to the new guidelines, we treated a Grade B pancreatic fistula through minimally invasive interventional radiology. Through a percutaneous transhepatic approach, we placed a drain to facilitate the flow of pancreatic juice from Wirsung duct to the jejunal loop and allow the healing of pancreatic fistula.
Pancreatic fistula is a surgical complication that can compromise and get worse the patient's clinical course. Interventional radiology is a minimally invasive treatment option that in selected cases can fix this type of surgical complication.

Conclusions

Pancreatic fistula is due to leakage of pancreatic juice in the abdominal cavity and is the main and most frequent complication after pancreatic surgery. Interventional radiology can offer powerful minimally invasive alternatives in managing pancreatic fistulas. In this case, we treated a pancreatic fistula through a percutaneous transhepatic approach. We placed a drain to facilitate the flow of pancreatic juice from Wirsung's duct to the jejunal loop and allow the healing of pancreatic fistula.

Riassunto

La duodenocefalopancraesectomia è un intervento di chirurgia maggiore, associato a numerose e importanti complicanze, spesso difficili da gestire. La fistola pancreatica consiste nella fuoriuscita di liquido pancreatico nella cavità addominale e costituisce la principale e più frequente complicanza dopo chirurgia pancreatica. Il trattamento della fistola pancreatica può variare a seconda del grado. La radiologia interventistica (IR) può offrire alternative minimamente invasive nella gestione delle fistole pancreatiche. Riportiamo il caso clinic di un paziente affetto da adenocarcinoma ampullare, sottoposto a duodenocefalopancreasectomia con ricostruzione a doppia ansa. La chirurgia è stata complicata dallo sviluppo di una fistola pancreatica ad alta portate, trattata in modo conservativo con drenaggio transepatico percutaneo sotto guida TC. A causa della persistente perdita di liquido pancreatico, il versamento addominale è stato drenato per via percutanea nell'ansa digiunale mediante radiologia interventistica con risoluzione del quadro clinico

References

1. Bassi C, Marchegiani G, Dervenis C et al.: *The 2016 update of the International Study Group (ISGPS) definition and grading of post-operative pancreatic fistula: 11 Years After*. Surgery, 2017; 161(3):584-91. doi: 10.1016/j.surg.2016.11.014. Epub 2016 Dec 28.

2. Callery MP, Pratt WB, Kent TS et al.: *A prospectively validated clinical risk score accurately predicts pancreatic fistula after pancreaticoduodenectomy*. J Am Coll Surg, 2013; 216(1): 1-14. doi: 10.1016/j.jamcollsurg.2012.09.002. Epub 2012 Nov 2.

3. Sert OM, Berkesoglu M, Canbaz H, et al.: *The Factors of pancreatic fistula development in patients who underwant classical pancreaticoduodenectomy.* Ann Ital Chir, 2021; 92, 1:35-40.

4. Braga M, Capretti G, Pecorelli N, et al*: A prognostic score to predict majorcomplications after pancreaticoduodenectomy*. Ann Surg, 2011; 254(5):702-7; discussion 707-8. doi: 10.1097/SLA.0b013e31823598fb.

5. Kiladze MA, Janelidze M, Mizandari M, et al.: *Efficacy of percutaneous biliary and pancreatic duct drainage/stenting with double invaginated pancreatojejunostomy after pancreatoduodenectomy.* Ann Ital Chir, 2019; 90, 56.

6. Bassi C, Dervenis C, Butturini G, et al.: *Postoperative pancreatic fistula: An international study group (ISGPF) definition.* Surgery, 2005; 138(1): 8-13. doi: 10.1016/j.surg.2005.05.001.

7. Baker TA, Aaron JM, Borge M, et al.: *Role of interventional radiology in the management of complications after pancreaticoduodenectomy*. Am J Surg, 2007; 195(3):386–90.

8. Sohn TA, Yeo CJ, Cameron et al.: *Pancreaticoduodenectomy: Role of interventional radiologists in managing patients and complications.* J Gastrointest Surg, 2003; 7(2):209–19.

9. Gervais DA, Fernandez-del Castillo C, O'Neill MJ, et al.: *Complications after pancreatoduodenectomy: imaging and imaging-guided interventional procedures.* Radiographics, 2001; 21(3):673-90.

10. Zink SI, Soloff EV, White RR, et al.: *Pancreaticoduodenectomy: frequency and outcome of post-operative imaging-guided percutaneous drainage*. Abdom Imaging, 2009; 34(6):767-71.

11. Cozzi G, Severini A, Civelli E, et al: *Percutaneous transhepatic biliary drainage in the management of postsurgical biliary leaks in patients with nondilated intrahepatic bile ducts.* Cardiovasc Intervent Radiol, 2006; 29(3):380-88.

12. Lee HJ, Heo JS, Choi SH, et al: *Management of bleeding from pseudoaneurysms following pancreaticoduodenectomy*. World J Gastroenterol, 2010; 16(10):1239-244.

13. Miura F, Asano T, Amano H, et al.: *Management of postoperative arterial haemorrhage after pancreato-biliary surgery according to the site of bleeding: Re-laparotomy or interventional radiology*. J Hepatobiliary Pancreat Surg, 2009; 16(1):56–63.

14. Cozzaglio L, Cimino M, Mauri Get, et al.: *Percutaneous transhepatic biliary drainage and occlusion balloon in the management of duodenal stump fistula*. J Gastrointest Surg, 2011; 15:1977-981.

15. Kim JK, Ko GY, Sung KB, et al.: *Bile leak following living donor liver transplantation: Clinical efficacy of percutaneous transhepatic treatment*. Liver Transpl, 2008; 14:1142-149.

16. Mauri G, Mattiuz C, Sconfienza LM, et al.: *Role of interventional radiology in the management of complications after pancreatic surgery: A pictorial review*. Springer Insights Imaging, 2015; 6:231-39.