

CASE REPORT

Percutaneous Trans-jejunum Pancreatojejunostomy Reconstruction for Intractable Pancreatic Fistula after Pancreatoduodenectomy

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Abstract:

We present an interventional radiology technique for percutaneous trans-jejunal pancreatojejunostomy reconstruction for intractable pancreatic fistula. A 70-year-old man with pancreatic cancer who had undergone pancreatoduodenectomy underwent percutaneous drainage for leakage from the anastomosis of the pancreatic duct to the jejunum. The leakage continued and the hole at the anastomosis site in the jejunum closed completely after 5 months. We performed percutaneous jejunostomy; the previously placed drainage catheter was then replaced with a balloon catheter, which was punctured by a 19-gauge needle from inside the jejunum through the percutaneous jejunostomy tube. The seeking catheter was inserted into the pancreatic duct. Finally, a side-holed 6-Fr straight catheter was successfully placed in the pancreatic duct through the percutaneous jejunostomy route.

Keywords:

pancreatic fistula, pancreatojejunostomy reconstruction, pancreatoduodenectomy, interventional radiology

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Introduction

Pancreatic fistula (PF) is the main cause of operative mortality (due to events such as sepsis or arterial hemorrhage) among patients undergoing pancreatoduodenectomy [1]. Several reconstruction techniques are used to manage PF after pancreatoduodenectomy. Percutaneous drainage is the first choice as a minimally invasive, conservative treatment; however, operation and endoscopic treatment are considered potent alternatives in difficult cases refractory to percutaneous drainage [2]. Here, we describe a case where percutaneous trans-jejunal pancreatojejunostomy reconstruction was successfully performed for intractable PF using interventional radiology techniques.

Case Report**Patient**

A 70-year-old man with cancer of the pancreatic head un-

derwent pancreatoduodenectomy. Percutaneous drainage was performed for PF that developed after disconnection of the anastomosis of the residual pancreas to the jejunum after surgery (**Fig. 1**). The leakage from the pancreatic duct did not improve despite placing and keeping the drainage tube in place. Five months later, obstructive jaundice developed due to the dissemination of the cancer around the anastomosis of the common bile duct to the jejunum. Therefore, percutaneous transhepatic biliary drainage (PTBD) was also performed. Even five months passed after the percutaneous drainage, PF was not cured and the hole at the anastomosis in the jejunum completely closed. For removal of the drainage tube, percutaneous pancreatojejunostomy reconstruction was planned using two drainage routes.

Procedures

The following procedures (**Fig. 2**) were conducted step by step: (1) The PTBD catheter was inserted into the blind end of the jejunal limb (BEJL), followed by insufflation of the jejunum with air to distend and visualize the air-filled jeju-

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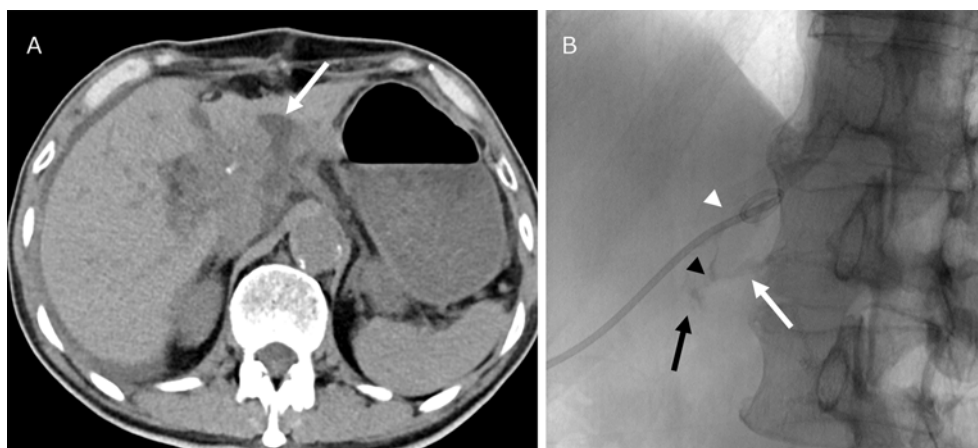


Figure 1. Percutaneous drainage of pancreatic fistula.

A. Plain CT showing the pancreatic fistula (white arrow) around the anastomosis between the pancreas and the jejunum.

B. Fistulography from the drainage tube (white arrowhead) placed in the pancreatic fistula was performed: the pancreatic duct (white arrow) and jejunum (black arrow). The black arrowhead indicates the leakage point of the anastomosis between the pancreatic duct and jejunum.

num to identify an adequate loop. (2) The BEJL was punctured using an enterostomy suture anchor set (COOK Medical, Tokyo, Japan) under guidance of computed tomography (CT) and fixed to the abdominal wall. (3) The BEJL was punctured using a 19-gauge needle under CT guidance and a 7-Fr introducer sheath (25-cm length) over a 0.035-inch guidewire was inserted into the jejunum. (4) The drainage tube for PF was changed to a 6-Fr balloon catheter (Selecon MP catheter II, 2-cm diameter; TERUMO, Tokyo, Japan). (5) The inflated balloon catheter placed outside the jejunum was punctured using a 19-gauge needle (20-cm length) through the 7-Fr introducer sheath, which was manually cut using scissors, under guidance of fluoroscopy. (6) Immediately after the puncture, the balloon burst. The 0.035-inch guidewire was then immediately inserted into the outer sheath of the puncture needle, and the balloon was deflated gently and kept away from the guidewire. The 5-Fr seeking catheter was advanced using the balloon placed outside the jejunum. (7) The seeking catheter was advanced into the pancreatic duct using the 0.035-inch hydrophilic guidewire. (8) A side-holed 6-Fr straight drainage tube, which was exchanged from the seeking catheter, was placed into the pancreatic duct through the BEJL route. (9) Finally, a 6-Fr and an 8-Fr pigtail drainage tube were positioned in the space outside and inside the jejunum, respectively, to protect against peritonitis due to leakage of intestinal juice from the jejunum. No complications occurred with during this series of procedures.

Outcome

Leakage of pancreatic juice from the percutaneous drain stopped 3 days after pancreatojejunostomy. The PF completely disappeared 1 month after percutaneous trans-jejunal pancreatojejunostomy reconstruction; then, the drainage tubes outside and inside of the jejunum were removed. Pancreatojejunography from the pancreatic duct confirmed that

the reconstruction was successful. The patient died due to the progression of the recurrent tumor 4 months after the procedure.

Discussion

PF is the most common complication after pancreatoduodenectomy, with an incidence rate of 2%-30% [1]. A previous paper reported that >90% of patients with PF can be managed nonoperatively by placing a percutaneous drainage tube, whereas 5.5% undergo reoperation [1]. In this case, PF was not cured with conservative treatment of continuous percutaneous drainage of the fistula surrounding the disconnected segment. Five months after placement of the drainage tube, the disconnection of the pancreato-jejunal anastomosis did not improve, with complete closure of the jejunal fistula observed. Reoperation was considered to achieve drain removal or pancreatojejunostomy reanastomosis; however, minimally invasive therapy using interventional radiological techniques was attempted as invasive treatments such as surgery or endoscopic therapy were judged to be inappropriate for this patient with a recurrent disseminated pancreatic head cancer.

Patients with some leakage or fistula after surgery can be managed using endoscopic or interventional radiological techniques to avoid reoperation. The endoscopic or interventional radiology management of complications has been described in several papers [3, 4]. Due to disconnection of the pancreato-jejunal anastomosis, PF can be treated effectively using a combination of endoscopic and percutaneous rendezvous or interventional radiological techniques with a T-tube [4, 5]. However, in this case, closure of only the jejunal fistula occurred 5 months after percutaneous drainage. Previous papers have reported that spontaneous fistula closure may occur from 70 days to 6 months after percutaneous drainage [6, 7]. Our patient had to possibly have a drainage

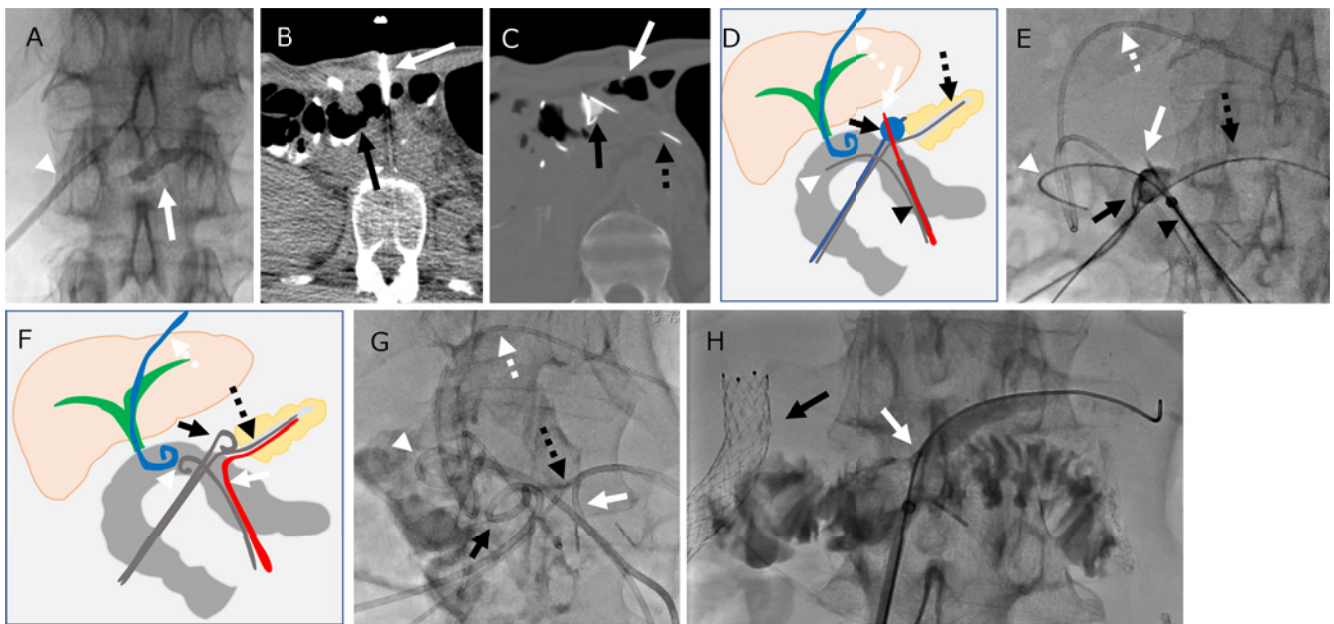


Figure 2. Percutaneous trans-jejunum pancreatojejunostomy reconstruction.

A. Five months after percutaneous drainage of the pancreatic fistula. The drainage tube (arrowhead) and pancreatic duct (white arrow) were detected, but the jejunum was not detected.

B. Plain CT showing the dilated blind end of the jejunal limb (black arrow), which was punctured using a 19-gauge needle (white arrow) under CT guidance.

C. Plain CT obtained immediately after the 6-Fr balloon catheter was exchanged with the percutaneous drainage tube, showing the 6-Fr balloon catheter with inflation (black arrow) and a 0.035-inch guidewire inserted into the pancreatic duct (black dotted arrow). The white arrow indicates the blind end of the jejunal limb.

D and E. The schema of D represents the image of E. Markers such as the arrow and arrowhead indicate the same targets in D and E. The drainage tube was replaced with a 6-Fr balloon catheter (balloon diameter, 2 cm; straight type); 6-Fr balloon and seeking catheters from the route of the drainage tube were placed outside the jejunum; then, the seeking catheter was inserted into the pancreatic duct. Thereafter, the pancreatic duct was kept dilated using a 0.035-inch guidewire (black dotted arrow). Then, a 7-Fr introducer sheath (black arrowhead) was inserted into the jejunum through the blind end of the jejunum limb, which distended by air insufflated through the percutaneous transhepatic biliary drainage tube (white dotted arrow), and the blind end of the jejunal limb was kept dilated using a 0.035-inch guidewire (white arrowhead); a 19-gauge needle (white arrow) was punctured toward the 6-Fr balloon catheter outside the jejunum through the sheath.

F and G. The schema of F represents the image of G. Markers such as arrows or arrowheads indicate the same targets in F and G. After the 6-Fr balloon catheter was punctured and the pancreatic duct was detected using the seeking catheter and a 0.035-inch hydrophilic guidewire, a 6-Fr straight tube (white arrow) was inserted into the pancreatic duct in the same route. The pancreatic duct was kept dilated using two tubes (black dotted and white arrows): a 4-Fr drainage tube (black dotted arrow) from the percutaneous drainage route and a 6-Fr drainage tube (white arrow) through the blind end of the jejunal limb. As a safety tube, a 6-Fr pigtail catheter (black arrow) was placed at the pancreatic fistula space. A percutaneous transhepatic biliary drainage transhepatic biliary drainage tube (white dotted arrow) and an 8-Fr pigtail tube (white arrowhead) were placed into the jejunum to prevent the leakage of intestinal fluid.

H. One month after the procedure, pancreatojejunostomy reconstruction (white arrow) was established and a biliary bare stent (black arrow) was placed at the common bile duct to the jejunum.

tube left in place for a prolonged period of time; hence, less invasive treatment became difficult. In this case, the endoscope could not be advanced to the leakage point in the jejunum; therefore, a multidisciplinary team including gastroenterologists, interventional radiologists, and pancreatic surgeons discussed the case and a treatment plan using minimally invasive techniques was devised.

Interventional radiology is considered as a less invasive alternative to reoperation or endoscopic therapy for managing intractable PF. In this case, the jejunal fistula had already closed, thus, an intraluminal position needed to be secured to construct the pancreatojejunostomy. Previous papers

[8, 9] have reported that percutaneous gastrostomy or jejunostomy reconstruction offer a high technical success rate with acceptable complication rates, and percutaneous jejunostomy reconstruction may be suitable for patients with extensive intra-abdominal adhesions. Another paper [10] reported that percutaneous drainage via BEJL after pancreatoduodenectomy may be a feasible treatment for PF. When gastrostomy or jejunostomy is performed, the intestinal wall should be fixed to the abdominal wall. In this case, the BEJL was fixed and the introducer sheath was safely secured in the intraluminal position. Then, the drainage tube was secured within a limited area of the extrajejunal space

shared with the PF. Moreover, intra-abdominal adhesions were formed because of prolonged drainage tube placement. No complications were observed because of several safety drain tubes placed in the extrajejunal and intrajejunal spaces.

In conclusion, pancreatojejunostomy reconstruction with this new interventional radiological technique offers an effective treatment for intractable PF with the benefits of avoiding invasive reoperation or permanent drainage tube placement. We have reported successful percutaneous transjejunal pancreatojejunostomy reconstruction for intractable PF using interventional radiological techniques.

This study has been presented at the 7th annual meeting of the Puncture and Drainage Study Group of Japan.

Conflict of Interest: None

Author Contribution: Operators of this procedure; Shohei Toyoda, Hideyuki Nishiofuku, and Takeshi Matsumoto Management of the patient; Takeshi Sato, Yuto Chanoki, Keisuke Oshima, and Mariko Irizato Manuscript writing; Shohei Toyoda, Hideyuki Nishiofuku, Toshihiro Tanaka Offered advice; Shinsaku Maeda, Tetsuya Masada, and Satoru Sueyoshi.

Informed Consent: At our institution, case reports do not need institutional review board approval. Written informed consent for all treatments was obtained from the patient.

Disclaimer: Toshihiro Tanaka is one of the Editorial Board members of Interventional Radiology. This author was not involved in the peer-review or decision-making process for this paper.

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