Chirurgia (2024) 119: 598-604
No. 5, September - October

http://dx.doi.org/10.21614/chirurgia.2938

Laparoscopic "Roux-en-Y" Fistulojejunostomy for Persistent External Pancreatic Fistulas

Florin Zaharie[1,2], Dan Valean[1], Roxana Zaharie[1,2], Roman Taulean[1,2], Emil Mois[1,2], Calin Popa[1,2], Alin Fetti[1,2], Andra Ciocan[1,2], Nadim Al Hajjar[1,2]

[1]Departme of Surgery, O. Fodor Regional Institute of Gastroenterology and Hepatology, Cluj-Napoca, Romania
[2]Iuliu Haţieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania

***Corresponding author:**
Roxana Zaharie, M.D.
O. Fodor Regional Institute
of Gastroenterology and Hepatology
Cluj-Napoca, Romania
E-mail: zahariedeliaroxana@gmail.com
ORCID ID: 0000-0002-8622-3787

Abbreviations:
PEPF: persistent external pancreatic fistula;
DPDS: disconnected pancreatic duct syndrome;
EPF: external pancreatic fistula;
RYFJ: "Roux-en-Y" fistulo-jejunostomy;
ERCP: Endoscopic Retrograde Cholangio-Pancreatography;

Rezumat

Fistulo-jejunostomia pe ansă în Y a la Roux pe cale laparoscopică pentru tratamentul fistulelor pancreatice externe persistente

Context: Fistulele pancreatice externe persistente după pancreatită acută reprezintă o complicaţie relativ rară, într-o eră a tratamentului endoscopic şi minim invaziv, care poate prezenta o rată ridicată de morbiditate. Deşi majoritatea cazurilor necesită tratament chirurgical, posibilitatea unei abordări minim invazive încă nu a fost stabilită. Acest articol evidenţiază un caz în care fistula pancreatică externă persistentă a fost gestionată laparoscopic, indicând paşii esenţiali, precum şi urmărirea postoperatorie.
Raport de caz: Prezentăm cazul unui pacient de 55 de ani care a dezvoltat pancreatită acută biliară, gestionată fără succes prin metode endoscopice, şi care a suferit o necrosectomie laparoscopică. În plus, pacientul a dezvoltat o fistulă pancreatică externă persistentă, pentru care s-a efectuat o fistulojejunostomie laparoscopică pe ansă în Y a la Roux, cu o recuperare postoperatorie bună şi un follow-up adecvat.
Concluzie: În ciuda rarităţii procedurii, fistulojejunostomia laparoscopică pe ansă în Y a la Roux poate fi considerată o alegere eficientă în cazurile de fistule pancreatice externe persistente, luând măsurile de precauţie adecvate şi cu o selecţie corectă a cazurilor.

Cuvinte cheie: fistulojejunostomia, laparoscopic, fistule pancreatice externe persistente, minim-invaziv

Received: 17.12.2023
Accepted: 02.09.2024

Abstract

Background: Persistent external pancreatic fistulas post-acute pancreatitis are a relatively rare complication, in an era of endoscopic and minimally invasive treatment, which can present a high rate of morbidity. Although most of the cases require surgical treatment, the possibility of a minimally invasive approach is yet to be established. This article highlights a case in which persistent external pancreatic fistula (PEPF) was managed laparoscopically, indicating the key steps, as well as the postoperative follow-up.

Case report: We present the case of a 55-year-old patient who developed acute gallstone pancreatitis, which was unsuccessfuly managed through endoscopic methods, and who underwent laparoscopic necrosectomy. Furthermore, the patient developed persistent external pancreatic fistula for which a laparoscopic Roux-en-Y fistulojejunostomy was performed with good postoperative recovery and follow-up.

Conclusion: Despite the scarcity of the procedure, laparoscopic Roux-En-Y Fistulojejunostomy can be considered an effective choice in the cases of persistent external pancreatic fistulas by taking the right precautions and with adequate case selection.

Key words: fistulojejunostomy, laparoscopic, persistent external pancreatic fistula, minimally invasive

Introduction

Pancreatic fistula is a well-known complication with a relatively high incidence, ranging from 5 to 30 percent, which can be secondary to pancreatic trauma, surgery or acute pancreatitis (1). Approximately 35% of the patients with acute pancreatitis can develop fluid collections, through various mechanisms. which can lead to fistulas (2). Moreover, pancreatic necrosis following acute pancreatitis can lead to ductal epithelium necrosis and disruption of the pancreatic flow which leads to the presence of disconnected pancreatic duct syndrome (DPDS).

The disconnected segment maintains its exocrine function, which leads to the accumulation of fluids, that can develop into an external pancreatic fistula (EPF). When EPF persists for more than 6-8 weeks, it is considered a PEPF. Usually, non-surgical treatment leads to spontaneous closure of the PEPF in more than half of the cases, while in more severe cases, endoscopic management may be required (3). In cases where the non-surgical treatments fail, surgical approach is mandatory. To avoid pancreatic resections, internal drainage via pancreatico-jejunostomy, fistulo-gastrostomy or "Roux-en-Y" fistulo-jejunostomy (RYFJ) should be attempted (4).

Although laparoscopic approach may offer several advantages, such as faster postoperative recovery, minimal scarring, as well as a faster social reintegration of the patients, there is a difficulty in achieving an adequate learning curve in pathologies with a low incidence. Thus, there is scarcity in the current literature regarding the laparoscopic approach in PEPF. This case report highlights the key-steps, as well as the preoperative planning of the laparoscopic "Roux-en-Y" fistulojejunostomy, discussing also other possibilities of treatment, postoperative care, and follow-up.

Case Report

We present a case of a 55-year-old female patient with obesity grade II and no relevant pathological history, admitted for an acute gallstone pancreatitis, diagnosed with the aid of an abdominal ultrasound and a MRI cholangiopancreatography. During Endoscopic Retrograde Cholangio-Pancreatography (ERCP) 10 common gall stones were extracted, as well as a 6-7 mm stone, obstructing the Wirsung duct.

Moreover, a stent was placed in the common biliary duct and as a sequel to ERCP, the patient's condition improved, but still accused pain in the epigastrium.

Two abdominal CTs were performed, placing the complete diagnosis of acute pancreatitis Balthazar E, severity score 10/10 in evolution with central pancreatic necrosis and rupture of the Wirsung duct. The patient's condition worsened and was unsuccessfully managed endoscopically (ERCP) by billiary stent replacement. Therefore, surgical management was necessary and during the laparoscopic intervention 1.5 L of mild turbid ascites was partially drained. Multiple cytosteatonecrosis dots spread throughout the entire abdomen were found and retrograde cholecystectomy was performed. Edema of the gastroduodenocolic ligament was observed which required entering the omental pouch, where large necrotic, superinfected areas of the pancreas with persistent smell were found. Necrosectomy was performed, followed by multiple drainage of the omental bursa, subhepatic area, Douglas pouch and antibiotic therapy. A final ERCP was proceeded to remove the stent, also testing the vacuity of the common bile duct. Postoperative, the patient's condition improved. A daily serous, turbid liquid with increased pancreatic amylase activity was drained from the omental bursa, leading to the diagnosis of external pancreatic fistula with a fixed 300 ml/day output.The endoscopist initially tried to insert a stent but unsuccessfully because of the size and length of cephalic Wirsung duct. The next surgical intervention was performed 4 months after the first, at that time the external pancreatic fistula had an output of 300 ml/day.

Surgical Technique

The patient is placed into an anti-Trendelenburg position of 15 degrees, in a position similar to hiatal hernia surgery. The main surgeon will be positioned between the patient's legs, the camera operator will be located at the left side of the patient, with the screen located at the head of the patient. The assistant surgeon will be placed on the right side of the patient. Based on the patient's previous surgical history (laparoscopic necrosectomy), the optical 10 mm port was inserted in the sub umbilical area, to avoid possible adherences. The 10 mm work port as was inserted on the left midclavicular line, and two 5 mm ports were inserted on the right midclavicular line and in the right flank respectively.

After a careful inspection and removal of the adherences, we identify the fistulous tract (which formed around the drainage tube placed in the omental bursa) was identified and cleared from any remaining adherences, separating it from the abdominal wall. The separation has to be made as close to the abdominal wall as possible, and with minimal to no lesions to the matured tract (*Fig. 1 A,B*).

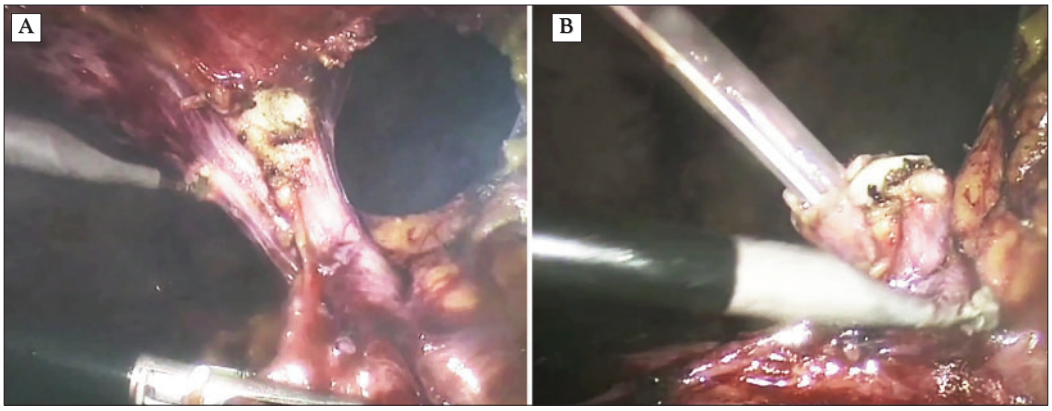

Figure 1. **(A)** Exposure of the fistulous tract. **(B)** Removal of the adherences.

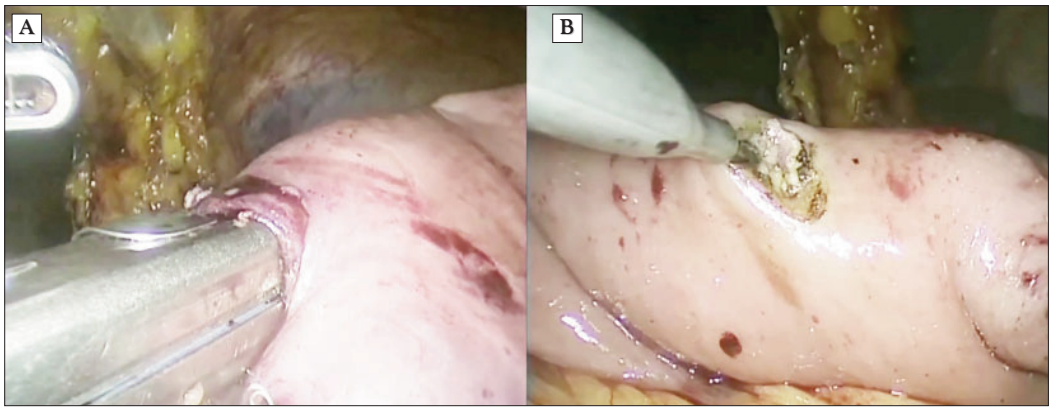

Figure 2. **(A)** Creating the Roux-en-Y loop. **(B)** Preparing the distal end of the anastomosis.

After careful preparation of the proximal end of the anastomosis, which is the fistulous tract, the first jejunal-loop is cut with a 45 mm standard stapler, and furthermore another stapler is used to create the base of the Roux-en-Y loop. The entero-enteral anastomosis is performed using an 60 mm/3.5 mm articulated stapler and the opening is closed using resorbable continuous sutures *(Fig. 2 A, B)*.

After the loop is created, an incision in the proximal part of the jejunal loop is made to prepare the end-to-side anastomosis. Furthermore, the segments are brought together and the manual end-to-side fistulo-jejunostomy is performed, using separate sutures. The anterior wall of the anastomosis can be reinforced with either the round ligament or the greater omentum, to minimize the risk of anastomotic leakage. In our case we used both structures, for better coverage *(Fig. 3 A, B)*.

Duration of the laparoscopic surgery was 220 minutes, with an estimated blood loss of 400 ml. Postoperative evolution of the patient was favorable, with no sign of complication after one year. Following abdominal MRI, CT and cholangiopancreatography between 7 and 21 days postoperatively, no abdominal collection or pancreatic necrosis was noticed. Moreover, there were no further biliary obstacles, the intestinal anastomosis as well as the remaining Wirsung duct showing no signs of leak. Further controls, at 18 and 24 months revealed that the patient had a complete recovery after the surgical intervention.

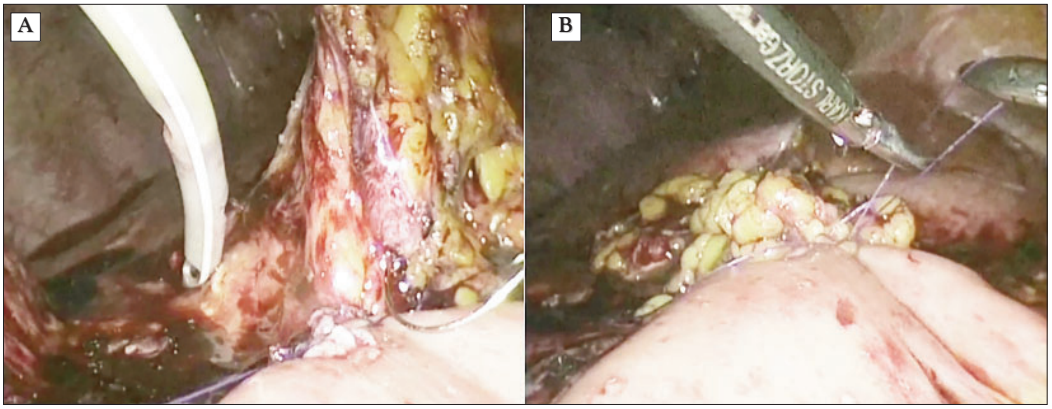

Figure 3. **(A)** End-to-side fistulo-jejunostomy; **(B)** Reinforcement of the anastomosis with the greater omentum.

Discussion

Due to the high rate of mortality in patients with previous surgical interventions, surgical intervention can be challenging and is associated with high morbidity and mortality (9). "Roux-en-Y" fistulojejunostomy is both feasible and advisable in this setting. Moreover, choosing this procedure over pancreatectomy minimizes the postoperative comorbidities which are related to the pancreatectomy, such as exocrine or endocrine insufficiency (8,11). Surgical solutions for persistent external pancreatic fistulas are challenging because dissection in inflamed and friable tissues is difficult, can lead to longer operative times, increased blood loss and extended hospitalization with attending higher treatment costs. Increased postoperative morbidity and mortality have been reported for distal pancreatectomy compared to FJ (9), including greater blood loss, increased transfusion requirements, and impaired endocrine function; at a median follow-up of 18 months, four of the patients who underwent a FJ developed a recurrent fluid collection (pseudocyst) requiring re-intervention. Notwithstanding, the authors concluded that distal pancreatectomy provided superior long-term resolution of DDP when compared to FJ (9).

Although the reported incidence of external pancreatic fistulas is relatively moderate, with a range of 10-40% (12,13), the chance of developing it after disconnected pancreatic duct syndrome is greater than 70% (5). It is therefore important to highlight the management of this relatively frequent, but often underestimated and under-reported complication. Neither the original (2005) nor the 2016 update of the ISGPF classification (12,14) mention external pancreatic fistulas specifically. Although most of the cases are resolved endoscopically and treated conservatively, surgery remains an alternative for persistent cases, with a high output of the fistula, or when the patient has a low quality of life because of it. Thus, it is very difficult to create a learning curve on a pathology with a low number of cases. Our experience consisted of 12 cases treated over the course of 15 years. Bassi et al reported 17 cases over the course of 14 years, Nair et al reported 8 cases over 4 years and Dhar et al reported 23 cases over 13 years that were solved through fistulojejunostomy, thus highlighting the limited number of cases.

In the current laparoscopic setting, it is very important to achieve an adequate maturation of the fistula tract, to have as much fibrous tissue as possible. This way, the risk of any adjacent lesions when performing the section of the fistula is smaller due to its resistance to any external factors. Thus, we can safely obtain a good anastomotic partner, with minimal tearing of the structures when performing the sutures. We recommend using separate sutures for better control and closure, thus minimizing the risk of anastomic leaks. Using continuous suture, may increase the risk of fistula tearing and can also create an incongruence in the edges of the anastomosis, however, further studies are required to fully support this statement.

The advantages of bypass techniques include preservation of pancreatic tissue, less intraoperative bleeding and reduction of operative time and postoperative complications. The two most performed bypass interventions are pancreato-jejunostomy and fistula-jejunostomy (12). Fistula-gastrostomy was reported in two series (15) (one and 2 patients respectively, the numbers being insufficient to obtain a conclusion. Pancreato-jejunostomy performed for ANP (11) has not been convincing because of the necessity of more aggressive dissection (the anterior aspect of the pancreas needs to be dissected totally to divide the main pancreatic duct longitudinally) that can lead to longer operative times, and higher blood loss, increasing the risks of post-operatory complications (10,15-17).

Several studies suggest that fistulojejunostomy with Roux-en-Y is the best option for intractable pancreatic fistula (10,11,17). It seems important to respect a sufficient delay for adhesions to soften, inflammation to subside, and the tract wall to thicken and mature

enough to allow a secure anastomosis. However, the period differs widely in the literature, ranging from 1.5-3 months. Several studies reported a safety period from 4-6 weeks to 3 months and even 6 months (7,11).

In some cases with small fistular output who have a prolonged conservative management it is recommended to perform the surgery to improve the quality of life. In addition, an inverse proportional correlation between the waiting time and the daily fistula output is highlighted meaning that fistulas with a higher length of conservative treatment are most likely to have a smaller daily output, thus prompting the surgery if in the early stages, the output is higher. This is also highlighted in several studies (18-20). Our aim was to achieve a high quality of life for the patient, with minimal postoperative recovery by including the benefits of laparoscopy in a procedure with an already high rate of post-treatment comorbidities.

We cannot conclude that laparoscopic RYFJ is feasible, due to the scarcity of cases that require surgery as well as the difficulty to standardize a surgery of this caliber, thus the impossibility of creating a learning curve. Further studies are required to validate this approach. Careful consideration must be taken in choosing adequate cases. Our patient had minimal comorbidities, as well as no previous postoperative scarring, because the necrosectomy was managed laparoscopically. From our experience, patients with a high degree of compliance without any previous open interventions, with an adequate maturation of the fistula tract are candidates for laparoscopic surgery, however we would like to support the fact that a high degree of experience in laparoscopic pancreatic surgery is required.

Conclusion

Laparoscopic Roux-en-Y fistulojejunostomy can be considered as an alternative method of treatment of the persistent external pancreatic fistula, having a great advantage in avoiding a pancreatic resection as well as the added benefits of the laparoscopic surgery The procedure presents with a low postoperative morbidity and mortality, with good mid-term results, requiring however an adequate case selection with minimal comorbidities, minimal abdominal scarring as well as an adequate time for fistula formation. In addition, laparoscopic treatment should be performed in tertiary centers, by surgeons with a good level of experience in laparoscopic pancreatic surgery.

Conflicts of Interest: none.

Ethical Statement

All of the procedures followed were in accordance with the ethical standards of the responsible on human experimentation and with the Helsinki Committee of Human Rights.

References

1. Machado NO, Disconnected Duct Syndrome: A Bridge to Nowhere. Pancreat Disord Ther. 2015;5(2):1-4.
2. Ramia JM, Fabregat J, Pérez-Miranda M, et al. Disconnected panreatic duct syndrome. Cir Esp. 2014;92(1):4-10. Spanish
3. Nair RR, Lowy AM, McIntyre B, Sussman JJ, Matthews JB, Ahmad SA. Fistulojejunostomy for the management of refractory pancreatic fistula. Surgery. 2007;142(4):636-42; discussion 642.e1. Erratum in: Surgery. 2008;143(2):301.
4. Uomo G, Molino D, Visconti M, Ragozzino A, Manes G, Rabitti PG. The incidence of main pancreatic duct disruption in severe biliary pancreatitis. Am J Surg. 1998;176(1):49-52.
5. Sandrasegaran K, Tann M, Jennings SG, Maglinte DD, Peter SD, Sherman S, et al. Disconnection of the pancreatic duct: an important but overlooked complication of severe acute pancreatitis. Radiographics. 2007;27(5):1389-400.
6. Nadkarni NA, Kotwal V, Sarr MG, Swaroop Vege S. Disconnected Pancreatic Duct Syndrome: Endoscopic Stent or Surgeon's Knife? Pancreas. 2015; 44(1):16-22.
7. Bassi C, Butturini G, Salvia R, Contro C, Valerio A, Falconi M, Pederzoli P. A single-institution experience with fistulojejunostomy for external pancreatic fistulas. Am J Surg. 2000 Mar;179(3):203-6.
8. Pearson EG, Scaife CL, Mulvihill SJ, Glasgow RE. Roux-en-Y drainage of a pancreatic fistula for disconnected pancreatic duct syndrome after acute necrotizing pancreatitis. HPB (Oxford). 2012;14(1):26-31.
9. Dhar VK, Sutton JM, Xia BT, Levinsky NC, Wilson GC, Smith M, et al. Fistulojejunostomy Versus Distal Pancreatectomy for the Management of the Disconnected Pancreas Remnant Following Necrotizing Pancreatitis. J Gastrointest Surg. 2017;21(7):1121-1127.
10. Voss M, Ali A, Eubanks WS, Pappas TN. Surgical management of pancreaticocutaneous fistula. J Gastrointest Surg. 2003;7(4):542-546.
11. Calu V, Duțu M, Pârvuleț u R, Miron A. Persistent pancreatic fistula after surgical necrosectomy for severe pancreatitis. Chirurgia (Bucur). 2012; 107(6):796-801.
12. 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(1):8-13.
13. 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(6):446-51; discussion 452.
14. Bassi C, Marchegiani G, Dervenis C, Sarr M, Abu Hilal M, Adham M, et al. The 2016 update of the International Study Group (ISGPS) definition and grading of postoperative pancreatic fistula: 11 Years After. Surgery. 2017; 161(3):584-591. Erratum in: Surgery. 2024;176(3):988-989.
15. Ihse I, Larsson J, Lindström E. Surgical management of pure pancreatic fistulas. Hepatogastroenterology. 1994;41(3):271-5.
16. Ho HS, Frey CF. Gastrointestinal and pancreatic complications associated with severe pancreatitis. Arch Surg. 1995;130(8):817-22; discussion 822-3.
17. Shibuya T, Shioya T, Kokuma M, Watanabe Y, Moriyama Y, Matsumoto K, et al (2004) Cure of intractable pancreatic fistula by subcutaneous fistulo-jejunostomy. J Gastroenterol. 2004;39(2):162-7.
18. Unegbu FC, Anjum F. Pancreatic Fistula. 2023 Jul 31. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024.
19. Meierhofer C, Fuegger R, Biebl M, Schoefl R. Pancreatic Fistulas: Current Evidence and Strategy—A Narrative Review. J Clin Med. 2023;12(15):5046.
20. Aziz H, Ahmad S, Jehan FS, Saif MW, Ahmad S. Management of refractory pancreatic fistula: A review of literature. Pancreas Open J. 2022;5(2):23-27.