Journal of Biosciences and Medicines, 2025, 13(1), 77-83
https://www.scirp.org/journal/jbm
ISSN Online: 2327-509X
ISSN Print: 2327-5081

Effect of Percutaneous Catheterization and Negative Pressure Drainage in the Treatment of Giant Pancreatic Pseudocyst

Shenglin You, Hankun Yuan, Xijuan Tan, Qiyi Luo, Libai Lu, Zongjiang Luo, Yuan Lu, Jianchu Wang

Department of Hepatobiliary Surgery, Affiliated Hospital of Youjiang Medical University for Nationalities, Baise, China
Email: 1293151369@qq.com

How to cite this paper: You, S.L., Yuan, H.K., Tan, X.J., Luo, Q.Y., Lu, L.B., Luo, Z.J., Lu, Y. and Wang, J.C. (2025) Effect of Percutaneous Catheterization and Negative Pressure Drainage in the Treatment of Giant Pancreatic Pseudocyst. *Journal of Biosciences and Medicines*, **13**, 77-83.
https://doi.org/10.4236/jbm.2025.131007

Received: December 3, 2024
Accepted: January 11, 2025
Published: January 14, 2025

Abstract

Bcakground: Pancreatic pseudocyst (PPC) is a common complication arising from acute or chronic pancreatitis, trauma, or pancreatic duct obstruction. When acute fluid collection persists for 4 - 6 weeks and is encapsulated by a fibrous wall, it is classified as a pancreatic pseudocyst. While PPC is generally asymptomatic in many patients, it can manifest with persistent abdominal pain, dyspepsia, intra-cystic infection, and potentially lead to gastrointestinal obstruction in some cases. Although smaller PPCs may resolve spontaneously, larger PPCs tend to be refractory to absorption and often necessitate surgical intervention to prevent complications such as intracystic hemorrhage. Objective: To explore the efficacy of percutaneous catheterization with negative pressure in the treatment of large pancreatic pseudocysts. Methods: The cases of large pancreatic pseudocysts treated in our hospital from 2004 to 2022 were retrospectively collected, and the general condition, operation time, drainage time, feeding time, postoperative complications, hospital stay, cost and follow-up of the patients were analyzed. Results: A total of 132 patients with large pancreatic pseudocysts were collected. The average operation time was 32.4 ± 2.1 min; The retention time of the drainage tube was 30 ± 1.8 days in the percutaneous negative pressure drainage group; The postoperative feeding time was no fasting after local anesthesia drainage; Postoperative complications (bleeding, infection, pancreatic leakage, recurrence, anastomotic leakage, etc.): Two of the 132 patients had recurrent cysts, which were cured by re-puncture and negative pressure drainage. The length of hospital stay was 6 ± 1.1 days; The cost was 11,200 ± 1300 yuan; Follow-up: The follow-up time ranged from 1 to 3 years, and the patients had no discomfort. Conclusion: Percutaneous catheterization and negative pressure drainage can effectively treat large pancreatic pseudocysts. Compared with other treatment methods,

it is simple and effective, the postoperative recovery of patients is faster, the physical damage is less, the hospital stay is shorter, and the cost is lower.

Keywords

Giant Pancreatic Pseudocyst, Percutaneous External Drainage, Treatment Method

1. Introduction

Pancreatic pseudocysts (PPCs) stand as one of the principal complications following acute pancreatitis, occasionally arising also from chronic pancreatitis [1]. Although many PPCs are asymptomatic, some can trigger persistent abdominal pain, bleeding, malabsorption, intracystic infection, and even obstructions in the digestive tract [2]. While smaller PPCs (diameter < 6 cm) are often absorbed spontaneously by the body, larger ones (diameter > 10 cm) typically fail to resolve and necessitate surgical intervention [3]. Traditional treatments for PPCs include both internal and external drainage; however, historical perspectives favored internal drainage as the primary treatment, fearing that external drainage might lead to pancreatic leakage and recurrence, thus diminishing its role in PPC management. Since 2004, our hospital has employed percutaneous catheter negative pressure drainage for large PPCs with considerable success, amassing substantial expertise in the process. The following report details our experiences and outcomes with this approach.

2. Materials and Methods

2.1. Patient Selection Criteria

Included in this study were 132 patients diagnosed with giant pancreatic pseudocysts admitted to the Affiliated Hospital of Rightjiang National Medical College between 2004 and 2022. All selected patients presented with varying degrees of refractory abdominal pain, digestive tract obstruction, etc., identified as having pancreatic pseudocysts via ultrasound and CT scans, and confirmed as giant pancreatic pseudocysts without contraindications for surgery. Among them, there were 95 males and 37 females, with an average age of (45.91 ± 3.07) years old, and pseudocyst sizes averaging (14.24 ± 2.06) cm.

2.2. Method

Negative Pressure Drainage via Percutaneous Catheter Placement: The procedure began with real-time image guidance using either ultrasound or CT to determine the appropriate puncture site. Local anesthesia was administered at the puncture location, carefully avoiding major abdominal vessels and organs such as the stomach, spleen, and intestines. Using a needle, the pseudocyst was punctured, and upon confirming fluid exit, the needle core was withdrawn. A drainage catheter

was then inserted into the base of the cyst, secured in place, and all cystic fluid aspirated using a 50 mL syringe. The catheter was connected to a negative pressure drainage ball, initiating the negative pressure drainage process (Figure 1 and Figure 2).

Figure 1. A 75-year-old female patient presented with a large pancreatic pseudocyst in the left upper abdomen identified via magnetic resonance imaging (MRI); She was successfully treated with percutaneous catheter negative pressure drainage. MRI revealed a massive cystic mass in the upper abdomen.

Figure 2. Depicts the puncture tube and the negative pressure drainage device used in the treatment.

2.3. Outcome Measures and Evaluation Standards

General patient condition, mean operative time, healing period, drainage duration, resumption of diet, occurrence of postoperative complications (hemorrhage, infection, pancreatic fistula, recurrence, anastomotic leakage, etc.), length of hospital stay, cost, and follow-up status were recorded.

2.4. Statistical Analysis

Statistical analyses were performed using SPSS software. Normally distributed

quantitative data were expressed as (mean ± standard deviation). Comparisons of categorical variables were analyzed using the chi-square (χ^2) test. A p-value less than 0.05 indicated statistically significant differences.

3. Results

Of the 132 patients with giant pancreatic pseudocysts included in the study: Average operative time: 32.4 ± 2.1 minutes; drainage catheter retention period: 30 ± 1.8 days; postoperative resumption of diet: No fasting necessary post-peripheral drainage surgery under local anesthesia; incidence of postoperative complications (bleeding, infection, pancreatic leakage, recurrence, anastomotic leakage, etc.): Two patients experienced recurrence of the pseudocyst, which was resolved through subsequent percutaneous catheter negative pressure drainage; length of hospital stay: 6 ± 1.1 days; cost: 11200 ± 1300 yuan; follow-up situation: Follow-up periods ranged from 1 to 3 years, with no discomfort reported by followed patients.

4. Discussion

Pancreatic pseudocysts result from the stimulation effect of exudates from pancreatitis on surrounding fibrocytes, leading to proliferation of fibrous tissue encapsulating the exudate, eventually forming a cyst-like structure. They differ from true pancreatic cysts due to the absence of epithelial cells lining their walls [4]. Some patients with pancreatic pseudocysts present asymptomatically and can be managed conservatively, with spontaneous absorption of the cyst contents possible over extended periods—Up to 12 weeks [5] [6]. However, patients with giant pancreatic pseudocysts often suffer from refractory abdominal pain, malabsorption, intracystic infections, and digestive tract obstructions, symptoms unlikely to self-resolve. These individuals exhibit higher complication rates (53%) and generally require surgical intervention [7]. As understanding of pancreatic pseudocysts advances, treatment approaches have increasingly trended toward minimally invasive techniques. Common surgical options for pancreatic pseudocysts include: Internal drainage: 1) After the pseudocyst wall matures (typically after 6 weeks), internal drainage can be performed. Roux-en-Y gastrojejunostomy is commonly used for this purpose, with direct anastomosis of the cyst to the gastric posterior wall if located appropriately. Such surgeries can now be accomplished using laparoscopic or endoscopic methods. 2) External drainage: Historically viewed as associated with high complication rates and recurrence in the ninth edition of the textbook of surgery, this method is less frequently utilized. It serves primarily as a rescue measure for infected pseudocysts resistant to percutaneous drainage attempts or in cases of cyst rupture.

If opting for laparoscopic internal drainage to treat patients, they must wait until the cyst has matured before undergoing the procedure, enduring ongoing discomfort from the cyst during this period while also facing risks of rupture, bleeding, and infection [8]. In instances of acute cyst rupture, emergency surgery is

typically required [9] [10]. Though laparoscopic internal drainage often results in shorter durations of catheter placement in uncomplicated cases [11], this approach inflicts greater physical harm to the patient, prolongs hospitalization, and delays recovery relative to percutaneous catheter external drainage. For those undergoing percutaneous catheter negative pressure drainage, there's less emphasis on the maturity of the cyst wall, allowing earlier intervention once diagnosed with a pancreatic pseudocyst and ruled out for surgical contraindications. For infected pseudocysts, percutaneous drainage not only achieves curative goals but also serves as a temporary stabilization measure prior to definitive surgery when the patient's condition allows [12]. In our study, we did not merely perform conventional percutaneous drainage but added a negative pressure component to enhance the drainage of cyst fluid. We hypothesized that negative pressure would promote adhesion of the cyst walls, effectively eliminating the space enclosing the cyst fluid. Utilizing ultrasound or CT guidance ensured accurate placement of the catheter deep within the cyst [13], optimizing fluid evacuation and minimizing secondary injury to the patient. Percutaneous catheter negative pressure drainage can be conducted under local anesthesia, whereas laparoscopic surgery requires general anesthesia—a factor prohibitive to certain patients with contraindications to general anesthesia, increasing procedural risk and imposing additional financial strain on families. Our investigation revealed that the cost of treating patients with percutaneous catheter negative pressure drainage averaged (11,200 ± 1300) yuan.

Some scholars argue that percutaneous drainage is closely associated with the occurrence of pancreatic fistulas. Although percutaneous drainage is simple to perform, it is not recommended for patients with pancreatic duct abnormalities, communication between the cyst and the main pancreatic duct, or a high risk of pancreatic fistula, especially in cases of chronic pancreatitis combined with pseudocyst formation [14]. However, in our study, none of the 132 patients undergoing percutaneous catheter negative pressure drainage developed a pancreatic leak.

Laparoscopic surgery for pancreatic pseudocysts has gained wide acceptance due to its small incision size, cosmetic benefits, rapid postoperative recovery, significant therapeutic effects, and lower incidence of complications [15]. However, laparoscopic procedures, particularly laparoscopic internal drainage of pancreatic pseudocysts, demand high technical proficiency from surgeons [16]. In contrast, percutaneous catheter negative pressure drainage presents fewer requirements for operator skill, making it accessible to a wider range of practitioners, including resident physicians.

Endoscopic drainage, introduced recently, represents another treatment option for pancreatic pseudocysts, characterized by minimal invasiveness, fewer complications, and a low mortality rate. When considering endoscopic drainage for patients with pancreatic pseudocysts, assessments involve: Distinguishing between cystic tumors and other pancreatic cystic lesions, Evaluating the presence of solid components within the cyst, Determining the anatomical relationship between the

cyst and adjacent organs, and Identifying underlying causes [17]. While endoscopic drainage can effectively drain cystic fluid, the technique itself is complex, requiring advanced skills, specialized equipment, and can cause damage to the stomach or other organs, thereby elevating the risk of adverse events. These factors add complexity to the treatment strategy and limit its accessibility compared to percutaneous catheter negative pressure drainage.

In summary, the notion that external drainage leads to frequent recurrences or pancreatic fistulas in the management of pancreatic pseudocysts warrants further investigation. Based on our study, percutaneous catheter negative pressure drainage proves to be an effective treatment for giant pancreatic pseudocysts, presenting with lower operational complexity, expedited patient recovery, and minimal bodily harm. Consequently, encountering giant pancreatic pseudocysts clinically, we advocate prioritizing percutaneous catheter negative pressure drainage as the initial therapeutic choice. This study adopted a retrospective design without a control group. Future research incorporating alternative treatment modalities for pancreatic pseudocysts may yield more compelling results.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Wang, Y., Omar, Y.A., Agrawal, R. and Gong, Z. (2019) Comparison of Treatment Modalities in Pancreatic Pseudocyst: A Population Based Study. *World Journal of Gastrointestinal Surgery*, **11**, 365-372. https://doi.org/10.4240/wjgs.v11.i9.365

[2] Zerem, E., Hauser, G., Loga-Zec, S., Kunosić, S., Jovanović, P. and Crnkić, D. (2015) Minimally Invasive Treatment of Pancreatic Pseudocysts. *World Journal of Gastroenterology*, **21**, 6850-6860. https://doi.org/10.3748/wjg.v21.i22.6850

[3] Wang, J.C., Pu, J., Li, L.B., Wei, J.B., Wei, Z.H., Ma, R.H. and Wei, B.N. (2006) Handling Approaches and Timing of Giant Pancreatic Pseudocysts. *World Chinese Digestive Journal*, No. 21, 2142-2145. (In Chinese)

[4] Zhao, Z.J., Tang, C.X., Feng, B., Yang, K.Q. and Wan, J. (2017) Report of 11 Cases of Laparoscopic Internal Drainage of Pancreatic Pseudocyst into the Jejunum. *Chinese Journal of Minimally Invasive Surgery*, **17**, 942-944.

[5] Duncan, J.G., Imrie, C.W. and Blumgart, L.H. (1976) Ultrasound in the Management of Acute Pancreatitis. *The British Journal of Radiology*, **49**, 858-862. https://doi.org/10.1259/0007-1285-49-586-858

[6] Imrie, C.W. and Shearer, M.G. (1991) The Diagnosis and Management of Pancreatic Pseudocyst. In: Johnson, C.D. and Imrie, C., Eds., *Pancreatic Disease: Progress and Prospects*, Springer, 299-309. https://doi.org/10.1007/978-1-4471-3356-8_26

[7] Duolkun, M.M., Liu, Y.Q., Wu, Z.Y. and Nur, M.M. (2004) Exogastric Drainage for Giant Pancreatic Pseudocyst: An Experience of 18 Cases. *Xinjiang Medical*, No. 6, 82-83. (In Chinese)

[8] Oglevie, S.B., Casola, G., van Sonnenberg, E., D'Agostino, H.B., OLaoide, R. and Fundell, L. (1994) Percutaneous Abscess Drainage: Current Applications for Critically Ill Patients. *Journal of Intensive Care Medicine*, **9**, 191-206. https://doi.org/10.1177/088506669400900404

[9] Ishigaki, S., Kuwae, M., Ishii, M., Asakura, T., Ueda, S. and Betsuyaku, T. (2019) Black Pleural Effusion Caused by Pancreatic Pseudocyst Rupture. *Clinical Case Reports*, **7**, 385-386. https://doi.org/10.1002/ccr3.1994

[10] Guo, F., Wu, J., Peng, Y., Tu, M., Xiao, B., Dai, C., *et al.* (2017) Black Pleural Effusion Due to Pancreatic Pseudocyst: A Case Report. *Medicine*, **96**, e9043. https://doi.org/10.1097/md.0000000000009043

[11] Adams, D.B. and Anderson, M.C. (1992) Percutaneous Catheter Drainage Compared with Internal Drainage in the Management of Pancreatic Pseudocyst. *Annals of Surgery*, **215**, 571-578. https://doi.org/10.1097/00000658-199206000-00003

[12] Torres, W., Evert, M., Baumgartner, B. and Bernardino, M. (1986) Percutaneous Aspiration and Drainage of Pancreatic Pseudocysts. *American Journal of Roentgenology*, **147**, 1007-1009. https://doi.org/10.2214/ajr.147.5.1007

[13] Tan, J.H., Chin, W., Shaikh, A.L. and Zheng, S. (2020) Pancreatic Pseudocyst: Dilemma of Its Recent Management (Review). *Experimental and Therapeutic Medicine*, **21**, Article No. 159. https://doi.org/10.3892/etm.2020.9590

[14] Ma, J.Y., Du, Y.Q., Wang, K.X., *et al.* (2023) Interpretation of Expert Consensus on Endoscopic Diagnosis and Treatment of Pancreatic Pseudocyst (2022). *Chinese Journal of Pancreatic Diseases*, No. 3, 161-164. (In Chinese)

[15] Way, L., Legha, P. and Mori, T. (1994) Laparoscopic Pancreatic Cystgastrostomy: The First Operation in the New Field of Intraluminal Laparoscopic Surgery. *Surgical Endoscopy*, **29**, 235-247.

[16] Long, G., Gao, Y., Li, A.D., Lü, L.W. and Li, Z.T. (2021) Laparoscopic Surgery for Pancreatic Pseudocyst. *Chinese Journal of Endoscopic Surgery* (*Electronic Edition*), **14**, 248-253. (In Chinese)

[17] Dumonceau, J., Delhaye, M., Tringali, A., Arvanitakis, M., Sanchez-Yague, A., Vaysse, T., *et al.* (2019) Endoscopic Treatment of Chronic Pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) Guideline—Updated August 2018. *Endoscopy*, **51**, 179-193. https://doi.org/10.1055/a-0822-0832