

## Pancreatic pseudocyst: A bibliographic review

Pseudocisto pancreático: Uma revisão bibliográfica

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### Abstract

**Introduction:** Pancreatic pseudocyst is a complication related to acute pancreatitis, chronic pancreatitis, and other aggressions to the pancreatic parenchyma, leading to the formation of fibrotic tissue. **Methodology:** This article aims to review, in the scientific literature of the main databases, information on pancreatic pseudocysts, highlighting the anatomical aspects. **Discussion:** The pseudocyst is a peripancreatic fluid collection rich in various pancreatic enzymes, with the potential to develop complications such as infection, hemorrhage, gastric obstruction, or biliary obstruction. In 90% of cases, it resolves spontaneously without therapeutic assistance when smaller than 5 cm, but in larger cases, surgical intervention may be necessary. Its formation results from inflammatory events in the pancreatic parenchyma, whether acute or chronic, which facilitate enzyme leakage and the rupture of associated ducts, leading to fibrosis and cystic tissue formation. The main surgical procedures available for treatment include endoscopic drainage, percutaneous drainage, endovascular therapy, and open surgery. **Conclusion:** Pancreatic pseudocyst has the potential for severity depending on risk factors such as a size greater than 6 cm and the presence of necrosis, which may evolve with complications, requiring surgical approaches that include endoscopic, endovascular, and open surgery alternatives, depending on the comorbidities and clinical indications of each patient.

**Keywords:** Pancreatic pseudocyst; Therapeutics; Surgical Procedures Operative.

### Resumo

**Introdução:** O pseudocisto pancreático é uma complicação referente à pancreatite aguda, pancreatite crônica e outras agressões ao parênquima pancreático, que formam um tecido fibrótico. **Metodologia:** Este artigo tem como objetivo revisar, na literatura científica das principais bases de dados, informações sobre os pseudocistos pancreáticos, destacando os aspectos anatômicos. **Discussão:** O pseudocisto é uma coleção peripancreática, fluida, rica em diversas enzimas pancreáticas com o potencial de complicação com infecção, hemorragia, obstrução gástrica ou das vias biliares, sendo em 90% dos casos regressivo espontaneamente sem auxílio terapêutico quando menor que 5cm ou nos casos de tamanhos maiores a necessidade de intervenção cirúrgica. Sua formação decorre devido aos eventos inflamatórios do

parênquima do pâncreas, seja agudo ou crônico, que facilita o extravasamento das enzimas e a ruptura dos ductos associados, resultando em fibrose e formação cística do tecido associado. Os principais procedimentos cirúrgicos disponíveis para a terapêutica são drenagem endoscópica, drenagem percutânea, terapia endovascular e cirurgia aberta. Conclusão: O pseudocisto pancreático possui potencial de gravidade conforme fatores de risco, como o tamanho acima de 6 cm e a presença de necrose, os quais podem evoluir com complicações, as quais fazem a necessidade de abordagens cirúrgicas que dispõe de alternativas endoscópicas, endovasculares e cirurgia aberta, conforme as comorbidades e indicações clínicas de cada paciente.

**Palavras-chave:** Pseudocisto pancreático; Terapêutica; Procedimentos Cirúrgicos Operatórios.

## Resumen

Introducción: El pseudocisto pancreático es una complicación relacionada con la pancreatitis aguda, la pancreatitis crónica y otras agresiones al parénquima pancreático, que conducen a la formación de tejido fibrótico.

Metodología: Este artículo tiene como objetivo revisar, en la literatura científica de las principales bases de datos, información sobre los pseudocistos pancreáticos, destacando los aspectos anatómicos. Discusión: El pseudocisto es una colección peripancreática de líquido, rica en diversas enzimas pancreáticas, con el potencial de desarrollar complicaciones como infección, hemorragia, obstrucción gástrica u obstrucción de las vías biliares. En el 90% de los casos, se resuelve espontáneamente sin asistencia terapéutica cuando es menor de 5 cm, pero en casos de mayor tamaño, puede ser necesaria la intervención quirúrgica. Su formación se debe a eventos inflamatorios en el parénquima pancreático, ya sean agudos o crónicos, que facilitan la fuga de enzimas y la ruptura de los conductos asociados, lo que resulta en fibrosis y formación quística del tejido. Los principales procedimientos quirúrgicos disponibles para el tratamiento incluyen el drenaje endoscópico, el drenaje percutáneo, la terapia endovascular y la cirugía abierta. Conclusión: El pseudocisto pancreático tiene un potencial de gravedad según factores de riesgo, como un tamaño superior a 6 cm y la presencia de necrosis, que pueden evolucionar con complicaciones, requiriendo enfoques quirúrgicos que incluyen alternativas endoscópicas, endovasculares y cirugía abierta, dependiendo de las comorbilidades e indicaciones clínicas de cada paciente.

**Palabras clave:** Pseudoquiste pancreático; Terapéutica; Procedimientos Quirúrgicos Operatorios.

## 1. Introduction

Pancreatic pseudocysts are formed by the accumulation of pancreatic secretions limited by fibrous tissue, with little or no necrosis (Pausawasdi et al., 2021). They are consequences of acute pancreatitis, chronic pancreatitis or other pancreatic lesions and usually appear after 1 month of pancreatitis symptoms (Koo et al., 2024), but can vary between 2 and 6 weeks (Pan et al., 2015). Pseudocysts present several symptoms such as pain, bloating, bleeding in the gastrointestinal tract, nausea and vomiting, but there are also cases in which they do not manifest any symptoms (Ardengh et al., 2020).

Regardless of the etiology related to pancreatitis, pancreatic pseudocysts have an incidence that varies between 1% and 4.5% and affect 1 in every 100,000 adults. When the manifestation of pseudocysts is related to alcoholic pancreatitis, this etiology is responsible for approximately 78% of cases. It is also important to emphasize that pseudocysts are more common in patients with chronic pancreatitis and have an incidence of 30% to 40% (Koo et al., 2024). Regarding cases involving patients with acute pancreatitis, approximately 20% reported developing necrosis of the pancreatic parenchyma as a consequence of this accumulation of fluid that involves the formation of pseudocysts (Li et al., 2020).

To classify pancreatic pseudocysts, it is possible to use the classification according to D'Egidio and Schein (1991), in which they are divided into three types, type I being post-necrotic pseudocysts derived from acute pancreatitis, type II being those post-necrotic ones originating from chronic pancreatitis without ductal stenosis. And, finally, type III characterizing pseudocysts that originate from chronic pancreatitis associated with ductal stenosis and communication between the pseudocyst and duct (Koo et al., 2024).

Approximately 8% to 70% of cases of pancreatic pseudocysts resolve spontaneously within about 4 weeks. The intervention is intended for those who have not regressed with traditional treatment, who increase in size rapidly and who are related to continuous symptoms (Marino et al., 2021). Initially, treatment was done by open surgery, cystogastrostomy or cystojejunostomy, and, for patients who had some contraindication, percutaneous drainage was considered. Despite this, this treatment mechanism increases the risk of morbidity and mortality when compared to open surgery (Thakur & Dhiman, 2023).

In recent years, with the development of laparoscopic surgery, the use of endoscopic suturing and stapling techniques has expanded the possibilities of approach in the treatment of pseudocysts. It is worth mentioning that the laparoscopic technique and the open surgical technique present similar resolution results and, the former, also allows a reduction in the patient's recovery time (Thakur & Dhiman, 2023; Almerie & Kerrigan, 2021), in addition to achieving a success rate of over 90%, with resolution rates of around 70% and a recurrence rate of around 15% (Mimery et al., 2020).

Currently, endoscopic treatment is the preferred approach that uses the most modern technique for drainage of pseudocysts with this indication. Endoscopic drainage can be performed using a transmural or transpapillary approach, in which the transmural is the most appropriate for a pseudocyst that is directly adjacent to the gastroduodenal wall (Koo et al., 2024; Patel et al., 2019). Endoscopic transmural drainage is usually performed under endoscopic ultrasound guidance and is usually done by implanting one or two plastic stents or a metal stent. (Alonso et al., 2021; Patel et al., 2019).

This article aims to review, in the scientific literature of the main databases, information on pancreatic pseudocysts, highlighting the anatomical aspects.

## **2. Methodology**

This study is a narrative bibliographic review of the literature (Rother, 2007; Snyder, 2019) and, it is a qualitative study (Pereira et al., 2018), written from the PUBMED database using the keywords “Surgical”, “Treatment” and “Pancreatic pseudocyst”, with the time filter in the last 5 years (2019-2024) which resulted in 269 articles, of which 28 articles were used as a source of information and the remaining 241 articles were discarded for not having the keywords in the title, abstracts unrelated to the topic, case reports, studies in animal models or with online access restrictions.

## **3. Results and Discussion**

### **3.1 Anatomy of the pseudocyst**

Pancreatic pseudocyst is a peri-pancreatic fluid collection encapsulated and with a round or oval appearance, well-defined and thin fibrous tissue. It does not have a true epithelial layer and its fluid collection is rich in amylase and other pancreatic enzymes. It does not contain solid material, however, under special conditions, such as hemorrhage or infected cysts, the phenotype of pseudocysts may appear more complex (Tan et al., 2021; Guo et al., 2021).

Most pancreatic pseudocysts regress spontaneously. Small pseudocysts (<5 cm) are expected to regress spontaneously in more than 90% of cases. Pseudocysts that become symptomatic, exceeding the period of conservative treatment and have growth evolution beyond 6 cm, generally require therapeutic intervention (Koo et al., 2024; Gurakar; Faghih & Singh, 2019).

The revised classification of acute pancreatitis distinguishes pancreatic fluid collections into pancreatic pseudocysts and isolated pancreatic necrosis, based on the presence of necrosis and the inflammatory response. The fibrous wall of both types of collections forms over more than 4 weeks, being crucial in determining management. Although spontaneous resolution is possible, it diminishes after 4 weeks, increasing the risk of complications. Therefore, surgical intervention is more effective when performed after this period, when the collections are more stabilized, and the acute inflammatory response has been minimized (Li et al., 2020; Gurakar; Faghih & Singh, 2019).

The revised classification of acute pancreatitis distinguishes pancreatic fluid collections (PFCs) into pancreatic pseudocysts (PPCs) and isolated pancreatic necrosis (WON), based on the presence of necrosis and the inflammatory response. The fibrous wall of both types of collections forms over more than 4 weeks, which is crucial for determining management. Although spontaneous resolution is possible, it diminishes after 4 weeks, increasing the risk of complications. Therefore, surgical intervention is most effective when performed after this period, when the collections are more stabilized and the acute

inflammatory response has been minimized (Li et al., 2020; Gurakar; Faghieh & Singh, 2019). These time-based approaches are essential to optimize treatments and reduce the risks of serious complications associated with pancreatic fluid collections (Li et al., 2020).

### 3.2 Risk Factors

Pancreatic pseudocysts affect 1 in 100,000 adults per year, and their incidence ranges from 1.0% to 4.5% among patients with pancreatitis, regardless of etiology. Furthermore, pseudocysts tend to be more prevalent in chronic pancreatitis compared to acute pancreatitis (Koo et al., 202; An et al., 2021).

The etiology of pancreatic pseudocysts is closely related to that of pancreatitis, since this condition is the main cause of pseudocyst formation. In countries where alcohol consumption is high, alcoholic pancreatitis stands out as the most common cause of pancreatic pseudocysts, accounting for 59% to 78% of cases. However, it is important to emphasize that alcohol consumption, although an important factor for pancreatitis, does not directly increase the predisposition to pseudocyst formation. In other words, alcohol does not have a direct effect on the development of pseudocysts, but rather on pancreatitis, which in turn can result in the formation of these cysts (Koo et al., 2024; Sahoo; Naik & Nayak, 2021).

Acute pancreatitis, characterized by inflammation of the pancreas, can cause extravasation of pancreatic fluid due to damage to pancreatic cells and rupture of the ducts. This fluid, rich in digestive enzymes, leaks into the tissues surrounding the pancreas, creating a collection that, over time, can be encapsulated, forming a pseudocyst. During acute pancreatitis, inflammation can lead to dilation of the pancreatic ducts and increased intraductal pressure, resulting in rupture and leakage of pancreatic fluid into the surrounding tissues (Koo et al., 2024; Poddar et al., 2021).

In chronic pancreatitis, persistent inflammation and ongoing damage to the pancreas can cause obstruction of the pancreatic ducts due to fibrosis and scarring, resulting in the accumulation of pancreatic enzymes and fluid, which leads to the formation of pseudocysts. In chronic pancreatitis, the pancreatic ducts can become obstructed due to fibrosis, leading to stasis of pancreatic juice, which eventually leaks into the peripancreatic tissue, forming a pseudocyst. Another mechanism that leads to the formation of pseudocysts is obstruction of the pancreatic duct. This obstruction can be caused by several factors, such as gallstones, stricture (narrowing of the pancreatic ducts), or protein plugs that block the normal flow of pancreatic juice (Habashi & Draganov, 2019; De et al., 2021).

As a result, there is an increase in pressure within the pancreatic duct, which can lead to localized rupture of the ducts or pancreatic capsule. When this occurs, pancreatic fluid, which contains digestive enzymes, leaks into surrounding tissues, such as the retroperitoneum, and begins to cause autodigestion of the surrounding tissue, resulting in the formation of an encapsulated collection of fluid, or pseudocyst (Habashi & Draganov, 2019).

Trauma to the pancreas, whether from blunt trauma (such as car accidents) or penetrating trauma, can cause direct injury to the organ. Such trauma can disrupt the integrity of the pancreatic ducts and allow extravasation of enzymes and pancreatic fluid into the peripancreatic tissue. The collection of fluid that forms after trauma can encapsulate over time, creating a pseudocyst. Surgical interventions on the pancreas or adjacent organs can also result in pseudocysts. Manipulation of the pancreas during surgery can also cause damage to the pancreatic ducts or pancreatic tissue, leading to leakage of pancreatic fluid into the surrounding spaces (Thakur & Dhiman, 2023; Sahoo; Naik & Nayak, 2021). Over time, this fluid accumulates and can form a pseudocyst. In addition, surgery can cause obstruction of the pancreatic ducts, aggravating the formation of pseudocysts (Thakur & Dhiman, 2023; Sahoo; Naik & Nayak, 2021).

### **3.3 Complications**

#### **3.3.1 Infection**

Translocation of bacteria from the gastrointestinal tract, secondary infection of an intracystic hematoma, or iatrogenic infection after ERCP can cause infection of a pancreatic pseudocyst. Surgery has long been the gold standard for management of the condition, but endoscopic treatment is currently advocated in the literature because ultrasound-guided internal drainage of the infected pseudocyst has proven to be safer and more effective (Patel et al., 2019; Cherdantsev et al., 2023). In situations of hemodynamic instability, in which the patient is not suitable for surgical or endoscopic drainage, external drainage can be performed (Koo et al., 2024). Furthermore, studies indicate that endoscopic drainage has fewer complicating factors than surgical drainage, demonstrating a morbidity in adults of up to 35% and mortality of up to 10% (Patel et al., 2019).

#### **3.3.2 Hemorrhage**

Hemorrhage is another frequent complication of pancreatic pseudocysts that is associated with high morbidity and mortality and unfavorable outcome. The mechanisms of hemorrhage include variceal bleeding, hemobilia, intraperitoneal hemorrhage, and intracystic hemorrhage, converting the pseudocyst into a pseudoaneurysm. To differentiate between true and pseudoaneurysms, one of the criteria is the intensity of the contrast in the aneurysm cavity. In a true aneurysm, it is close in density to the aorta, while in a pseudoaneurysm, the intensity is lower than the density of the aorta (Patel et al., 2019; Park; Kim & Chon, 2021; Minghetti et al., 2019).

The presence of signs of bleeding makes it possible to perform catheter angiography to confirm the diagnosis and plan therapeutic embolization, hence the importance of interventional radiology in identifying both the location of the source of bleeding and the therapeutic angioembolization of the bleeding vessel to achieve hemostasis (Koo et al., 2024; An et al., 2021). Among the complications of gastrostomy formation by interventional radiology, they are reported as 0–5%, including peritonitis in up to 3% of the cases described (Patel et al., 2019).

#### **3.3.3 Biliary obstruction**

Patients with chronic pancreatitis, who are the majority of those with pancreatic pseudocysts, commonly have other causes of obstruction of the intrapancreatic common bile duct, the most prominent being fibrotic stenosis. However, pancreatic pseudocysts close to the head of the pancreas can cause obstruction of the common bile duct, leading to obstructive jaundice. Therefore, drainage of the pseudocyst alone may be insufficient to relieve biliary obstruction. In this case, ERCP is widely used in this situation to meticulously delineate the anatomical changes of the pancreatic duct, as well as the common bile duct, with the option of biliary stent. In cases of biliary obstruction due to compression caused by the pseudocyst, surgery is indicated, in which cystoduodenostomy is one of the methods used (Koo et al., 2024; Zheng et al., 2021).

#### **3.3.4 Gastric outlet obstruction**

Large pancreatic pseudocysts causing external compression are a well-established cause of gastric outlet obstruction in the literature. Endoscopic drainage is a possible option and is currently the gold standard treatment modality. However, if there is inexperience with endoscopic treatment on the part of the team or if the patient has recurrence or failure of endoscopic therapy, surgical drainage may be considered as the best option (Park; Kim & Chon, 2021).

### **3.4 Clinical management**

To select the treatment for pancreatic pseudocyst and the best therapeutic approach, symptoms, location, size, pancreatic pathology and degree of dilation of the main pancreatic duct must be considered (Tan et al., 2021). However, not all patients

present typical symptoms, during the initial phase of natural progression of pancreatic pseudocyst, which lasts six weeks, is when spontaneous resolution is most likely to occur. After this initial phase, pseudocysts were previously associated with higher risks of complications, requiring interventional treatment (Tan et al., 2021, Alonso et al.: 2021; Felsenreich et al., 2020).

However, several recent studies have emphasized that minimally symptomatic, asymptomatic pancreatic pseudocysts with no infected necrosis identified by computed tomography or ultrasound can be treated conservatively, without the need for interventional treatment, regardless of size, location, and extension; it is estimated that 40% of these cases resolve spontaneously (Alonso et al., 2021). Surgery, traditionally chosen as the basis of treatment for pancreatic pseudocysts, is currently reserved only for selected situations, due to the low morbidity of minimally invasive endoscopic modalities that provide clinical success (Tan et al., 2021).

Patients most likely to undergo the intervention procedure are those with complicated pseudocysts such as compression of the main veins; compression of the main bile duct; associated with pancreatic ascites or pancreatic-pleural fistula; gastric or duodenal obstruction; infected pancreatic pseudocyst; or hemorrhage in the pancreatic pseudocyst (Tan et al., 2021). In addition to symptomatic pseudocyst such as a feeling of fullness, nausea, vomiting, severe abdominal pain and/or back pain or upper gastrointestinal bleeding. And finally, asymptomatic pseudocysts larger than 6 cm without any regression for more than 6 weeks (Tan et al., 2021).

Surgical treatment has been used for more than a decade and continues to be an option when well indicated for pancreatic pseudocyst. Surgical treatment of pancreatic pseudocyst involves internal drainage to the stomach, duodenum, and jejunum, external drainage, and resection. The laparoscopic procedure can be performed using an anterior or posterior approach; the use of these two techniques is based on the technical experience of the operator (Tan et al., 2021; Szakó et al., 2020). In the anterior approach, a 4 cm anterior gastrostomy is performed with a harmonic scalpel to access the gastric mucosa, and a laparoscopic ultrasound probe is used to identify the location of the pseudocyst behind the gastric mucosa. After confirming the location, a harmonic scalpel is used to create a cystogastrostomy opening to drain the pseudocyst, and the anterior gastrostomy is then closed (Tan et al., 2021).

In the posterior approach, a harmonic scalpel is used to divide the gastrocolic ligament, facilitating entry into the lesser sac and access to the pancreas. A laparoscopic ultrasound probe is then used to localize the pseudocyst, and a cystogastrostomy is performed with a stapler between the cyst and the posterior gastric wall (Tan et al., 2021). This posterior technique is more difficult than the anterior; however, visualization of the pseudocyst is clearer and the surgeon is able to remove a larger portion of the pseudocyst to allow for an adequate fragment to rule out malignancy (Tan et al., 2021).

The availability of institutional resources and surgeon expertise, as well as the technical factors of the pseudocyst, are essential in making treatment decisions. Treatment requires a multidisciplinary approach involving a team composed of surgeons, gastroenterologists, and interventional radiologists (Koo et al., 2024). In addition, other trained health specialists, such as dietitians, are also another key part of the clinical care team for the patient, ensuring supportive treatment and successful clinical management (Koo et al., 2024).

Symptoms associated with pancreatic pseudocysts, such as nausea and early satiety, can affect nutritional status. For patients who can tolerate the diet, a low-fat diet consisting of small, fractionated meals is the most recommended. Enteral nutrition is safer than parenteral nutrition. Medications such as antiemetics are prescribed according to the patient's clinical judgment (Koo et al., 2024). Some studies have indicated a role for somatostatin analogues, such as octreotide, in reducing pancreatic secretions, acting in the resolution of the pseudocyst; however, the evidence for octreotide is still limited (Koo et al., 2024).



### **3.5 Procedures**

#### **3.5.1 Endoscopic drainage**

Endoscopic drainage of pseudocysts was initiated in the 1980s and is well described in the literature. Since then, it is the preferred and most performed approach for pseudocyst drainage, as it is a less invasive option than surgery and does not require an external drain, while achieving similar cyst resolution results with surgery (Thakur & Dhiman, 2023; Garg et al., 2019). A recent study revealed no difference in treatment success, adverse events, and recurrence between the endoscopic and laparoscopic approaches, but the procedure time, intraoperative blood loss, hospital stay, and associated costs of endoscopic treatment were considerably lower than those of laparoscopic treatment, suggesting that endoscopy has greater advantages in the treatment of pseudocyst (Thakur & Dhiman, 2023; Garg et al., 2019; Hao et al., 2021). Patients with persistent symptoms and the presence of complications are indicated for drainage of a pancreatic pseudocyst. Relative contraindications for endoscopic drainage are a distance of more than 1 cm between the gastric or duodenal wall and the cyst wall or the presence of varices or large intervening vessels. Endoscopic drainage can be performed using a transmural or transpapillary approach, with transmural being preferable and suitable for a pseudocyst that is directly adjacent to the gastroduodenal wall (Koo et al., 2024; Patel et al., 2019). Endoscopic transmural drainage is typically performed under endoscopic ultrasound guidance and is usually done by implanting one or two plastic stents or a metal stent. The transpapillary approach is most recommended when there is communication between the pseudocyst and the main pancreatic duct or when the initial transmural approach has failed (Alonso et al., 2021; Patel et al., 2019).

#### **3.5.2 Percutaneous drainage**

Using guided imaging exams such as tomography and ultrasound, pancreatic pseudocysts can be drained externally, using a percutaneous pigtail catheter in the pseudocyst cavity. The drain can be inserted into the region until clinical and radiological improvement, in addition to observing the amount and content of the drainage. If there is the presence of stenosis of the main pancreatic duct or cysts containing solid material, percutaneous drainage is contraindicated (Koo et al., 2024; Patel et al., 2019). Furthermore, if there is communication between the pseudocyst and the pancreatic duct or an obstruction downstream of the main duct, there is a high risk of pancreatic fistula formation and percutaneous drainage should be avoided in these situations (Patel, et al., 2019; He, et al., 2021). In cases of severe sepsis, with hemodynamic instability for surgery, percutaneous drainage is a viable alternative, as it does not require waiting for the pseudocyst wall to mature (Gupta & Bhandari, 2024; Patel et al., 2019).

The chance of fistula formation can be reduced by performing the single-stage procedure, as the gastrostomy created can heal, in addition to avoiding the use of gastropepy devices (Koo et al., 2024). Among the disadvantages of percutaneous drainage are prolonged external pancreatic fistula and the occurrence of infection at the catheter puncture site (Koo et al., 2024; Gupta & Bhandari, 2024). Recent comparative studies between percutaneous and endoscopic drainage have demonstrated a lower clinical success rate and higher recurrence with percutaneous drainage, in addition to the risk of creating a cutaneous cyst fistula, therefore not being the treatment of choice for the approach of pancreatic pseudocysts, with the exception of unstable patients with no indication for surgical or endoscopic approach (Gupta & Bhandari, 2024; Patel et al., 2019).

#### **3.5.3 Endovascular therapy**

Pseudoaneurysm and pseudocyst may coexist in some patients, causing profuse bleeding and possibly leading to death. The importance of imaging to diagnose this hemorrhage and initiate intervention is crucial in this condition (Koo et al., 2024). Endovascular embolization of hemorrhage in the pseudocyst cavity is usually performed using the “sandwich technique”

proximal and distal to the erosion zone, to exclude retrograde filling, in addition to stent implantation. If embolization is not effective, emergency surgery is indicated to achieve homeostasis in these cases (Koo et al., 2024).

### 3.5.4 Surgery

Surgical drainage has historically been the traditional method, performed by an open approach, and currently there are less invasive laparoscopic techniques that provide similar results to the open approach, being useful in patients with unfavorable anatomy (Patel et al., 2019; Ye et al., 2021). The method of choice of the surgical approach is influenced by several issues, such as the location, size, extent of inflammation, vascular complications and the presence of ductal ectasia of the pseudocyst (Koo et al., 2024; Ye et al., 2021). Surgical techniques can usually be divided into internal drainage, resection of the pancreatic parenchyma and, in rare situations, external drainage (Koo et al., 2024).

Internal drainage is the preferred method for cases of uncomplicated pseudocysts. It is performed by creating a communication between the pseudocyst cavity and the stomach, duodenum or jejunum, called cystogastrostomy, cystoduodenostomy or cystojejunostomy, respectively (Koo et al., 2024, Gupta & Bhandari, 2024). Patients who have cholecystitis or choledocholithiasis as a possible underlying cause of pancreatitis may undergo cholecystectomy at the same surgical time as internal drainage of the pseudocyst (Koo et al., 2024).

If, despite endoscopic and/or percutaneous intervention, the patient presents recurrent pseudocysts, surgical drainage is indicated (Koo et al., 2024). Additionally, pseudocysts with associated duodenal stenosis, bile duct stricture, and pancreatic ductal abnormalities such as strictures or a dilated main pancreatic duct are also indications for surgical drainage (Koo et al., 2024). There are no significant differences evidenced in the literature regarding morbidity and mortality rates between cystogastrostomy, Roux-en-Y cystojejunostomy, or cystoduodenostomy procedures (Koo et al., 2024).

## 4. Conclusion

A pancreatic pseudocyst is a fluid collection formed in the pancreatic tissue, surrounded by a capsule of fibrous tissue. This fluid, rich in enzymes such as amylase, does not contain epithelial cells and usually originates after a pancreatic injury, such as in acute or chronic pancreatitis. The pseudocyst wall develops over several weeks and, in some cases, may be complex due to infection or hemorrhage. Although most pseudocysts are small and have the possibility of spontaneous resorption, larger or symptomatic ones, measuring more than 6 cm, usually require interventional treatment. The classification of pancreatitis distinguishes pseudocysts from pancreatic necrosis, and management of these conditions is most effective after a stabilization period of four to six weeks, when the risk of complications decreases.

The development of pseudocysts is closely linked to pancreatitis, with alcoholic pancreatitis being the main cause in areas with high alcohol consumption. During an episode of acute pancreatitis, inflammation of the pancreas causes digestive enzymes to leak into the surrounding tissues, which eventually form a fluid collection. In chronic pancreatitis, obstruction of the pancreatic ducts due to fibrosis leads to fluid accumulation and the formation of pseudocysts. In addition, trauma or surgical interventions on the pancreas can also cause the formation of these cysts. Diagnosis is mainly made by imaging tests, and the choice of treatment varies according to the size, location and presence of complications, such as infections or bleeding.

Among the most frequent complications of pseudocysts are infection, hemorrhage, biliary obstruction and gastric emptying obstruction. Infection can arise due to bacterial translocation or after surgical interventions, and is treated with drainage, which can be done endoscopically or by surgery. Hemorrhages, often associated with pseudoaneurysms, can be treated by endovascular embolization. Biliary obstruction, caused by compression of the bile duct by the pseudocyst, may require surgical or endoscopic drainage. Treatment of pseudocysts depends on their progression and the patient's symptoms. Although



endoscopic drainage is the preferred approach due to its less invasiveness, surgery is still necessary in complicated cases, such as severe infection, hemorrhage, or bile duct obstruction.

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