Cross-sectional Study

Outcome of surgery for chronic pancreatitis related pancreatic ascites and pancreatic pleural effusion

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A B S T R A C T

Background: An internal pancreatic fistula involves an abnormality in the way that the pancreas communicates with organs and spaces within the body. This is usually due to a disrupted pancreatic duct or psuedocyst leakage (Ascitic or pleural fluid amylase level >1000 S units/dl and fluid protein level >3 g/dl). The study aims to report our experience with surgery for chronic pancreatitis-related pancreatic ascites and pancreatic pleural effusions.
Methods: All the patients, who underwent surgical intervention for pancreatic ascites and pancreatic pleural effusion between August 2007 and December 2020 in the Department of Surgical gastroenterology, Institute of Postgraduate Medical Education and Research, Kolkata, India were retrospectively reviewed.
Results: Of the total 14 patients, 10 (71.4%) were men with a median age of 40 (4–49) years. The median interval between onset of symptoms of CP and diagnosis of IPF was 27 (3–60) months. All patients had a history of chronic abdominal pain and 5 (35.7%) had a prior history of hospitalization for pain. Eleven patients (78.5%) presented with abdominal distension and 3 (21.4%) patients had respiratory distress. Six (42.8%) patients had undergone endotherapy before surgery. Contrast-enhanced computed tomography detected pancreatic pseudocyst in 10 (71.42%) patients. The most commonly performed operation was lateral pancreaticojejunostomy (n = 11, 78.5%). Seven postoperative complications developed in 4 (28.5%) patients. After a median follow-up of 60 (6–86) months, no patient developed recurrence of pancreatic ascites or pleural effusion.
Conclusion: In the experienced hand, surgery can be performed with acceptable perioperative morbidity and mortality and long-term satisfactory outcomes.

1. Introduction

Pancreatic ascites and pancreatic pleural effusions are also known as internal pancreatic fistula (IPF) are rare yet well-recognized complications of chronic pancreatitis (CP). It accounts for less than 1% of all complications of CP. It is more common in ethanol-related CP [1]. It occurs either due to disruption of the pancreatic duct or leakage from a pseudocyst. Anterior ductal disruption and leakage into the peritoneal cavity lead to pancreatic ascites whereas the posterior disruption into retroperitoneal space causes pancreatic pleural effusion [2]. These are associated with considerable morbidity and mortality. There are multiple treatment modalities including conservative medical management, endotherapy, and surgical intervention. Nowadays, the majority of the patients can be managed by medical management along with endotherapy. Surgery is indicated after failure of medical and endoscopic therapy. Our center is one of the Surgical gastroenterology referral centers where patients with failed conservative management or endotherapy are referred for surgical intervention. The aim of the study is to report our experience with surgery for CP-related pancreatic ascites and pancreatic pleural effusions.

2. Methodology

This is a retrospective observational study. Data of all patients who underwent surgical intervention for pancreatic ascites and pancreatic pleural effusion between August 2007 and December 2020 were retrieved from our prospectively maintained GI Surgery database. All patients who underwent surgical intervention for internal pancreatic fistula (IPF) in the background of chronic pancreatitis in our institution were included in the present study. Patients who developed IPF due to other causes (traumatic, due to acute pancreatitis) were excluded.

This study was approved by an institutional ethics committee (Memo number: IPGME&R/RAC/271, dated- 15/12/2021). Informed patient consent was waived by the ethics committee as the data was anonymized and the retrospective nature of the study. This study is registered at Thai Clinical Trials Registry and was conducted in accordance with the Declaration of Helsinki (TCTR20220101004). The study has been reported in line with the STROCSS criteria [3].

2.1. Diagnosis

Diagnosis of chronic pancreatitis (CP) was made based on clinical features and the identification of pancreatic ductal and/or parenchymal changes (calcification, atrophy, ductal dilatation, stricture, pseudocyst in relation to pancreas) on triphasic computed tomography (CT) scan of the abdomen. IPF was diagnosed by clinical findings, biochemical parameters, and radiological investigations. Clinical suspicions were raised when a patient, who is a known case of CP presented with abdominal distension, an increase in the size of a pseudocyst, or respiratory distress. Ascitic or pleural fluid amylase level >1000 S units/dl and fluid protein level >3 g/dl was highly suggestive of IPF. To delineate pancreatic ductal anatomy and the possible site of disruption either Endoscopic Retrograde Cholangiopancreatography (ERCP) or Magnetic Resonance Cholangiopancreatography (MRCP) were used.

2.2. Treatment

The line of management was decided by a multidisciplinary team including gastroenterologists, radiologists, and gastrointestinal surgeons. Patients were initially advised to stay nil orally. Depending upon the clinical conditions, few patients needed repeated paracentesis or thoracocentesis under aseptic precautions. Octreotide 100 microgram thrice daily subcutaneously was given to reduce the secretions. Nutrition was maintained either by TPN or by nasojejunal feeding. Non-operative treatment was continued for 2–3 weeks. If there was no improvement after 2 weeks of medical management, endotherapy was tried. If there was no improvement within 7 days of endotherapy, surgery was performed. Depending upon the ductal anatomy and associated parenchymal pathology, surgery was performed either a lateral pancreaticojejunostomy or a Frey procedure.

2.3. Definitions

Chronic pancreatitis was defined based on Marseille criteria of 1984. Death during the hospital stay or within 90 days after the intervention was the definition of perioperative mortality utilized. Postoperative complications were graded using the Clavien-Dindo classification [4]. Pancreatic fistulae, post pancreatectomy hemorrhage, and delayed gastric emptying were defined and classified according to the criteria of the International Study Group on Pancreatic Surgery (ISGPS) [5–7]. Diabetes mellitus (DM) was defined as fasting blood sugar more than 126 mg/dL and serum glycosylated hemoglobin A1c (HbA1c) of more than 6.5%.

2.4. Statistical analysis

Quantitative variables were expressed as mean ± standard deviation or median with range. Dichotomous variables were expressed as a percentage.

3. Results

During the study period, 411 patients with CP underwent surgical intervention in our department. Of these 411 patients, 14 (3.4%) patients received surgery for pancreatic ascites and pleural effusion (study group). Ten (71.4%) of them were men with a median age of 40 (4–49) years. Alcohol abuse was identified in 8 (57.14%) patients and the remainder had idiopathic CP. Six (42.8%) patients were smokers. Diabetes was confirmed in 1 (7.1%) patient preoperatively. One (7.1%) patient was hypertensive. None of the patients had clinical features of exocrine pancreatic insufficiency at the time of diagnosis. The median interval between onset of symptoms of CP and diagnosis of IPF was 27 (3–60) months. All patients suffered from chronic abdominal pain and 5 (35.7%) had a prior history of hospitalization for pain. Eleven patients (78.5%) presented with abdominal distension and 3 (21.4%) patients had respiratory distress. Six (42.8%) patients had undergone endotherapy before surgery. The mean hemoglobin level was 10.14 ± 2.33 g/dL and the mean serum albumin level was 2.6 ± 0.55 mg/dL. Two (14.2%) patients had previously undergone surgery. One of them had peptic ulcer surgery and another had Roux-en-Y cystojejunostomy.

Contrast-enhanced computed tomography detected pancreatic pseudocyst in 10 (71.42%) patients. Choledochal cyst was detected in 1 (n = 1,7.1%) patient. Pancreatic calcification was detected in 9 (64.2%) patients and left-sided portal hypertension in 3 (21.4%) patients. The mean diameter of the main pancreatic duct was 5.61 ± 2.98 mm. ERCP (Fig. 1) was done to determine the site of pancreatic duct disruption in 6 (42.8%) patients. In 1 patient no ductal leak could be visualized and pancreatic duct could not be cannulated in 1 patient. MRCP (Fig. 2) could diagnose the site of ductal disruption in 8 (57.1%) patients. Overall, ductal disruption was documented in 12 (85.7%) patients.

The type of surgery performed is presented in Table 1. The most commonly performed operation was lateral pancreaticojejunostomy (n = 11,78.5%). Additional procedures like cholecystectomy (n = 1,7.1%), choledochal cyst excision (n = 1,7.1%), and cystojejunostomy (n = 2,14.2%) were also performed. The median operating time was 210 (169–301) minutes. The median intraoperative blood loss was 250 (100–500) ml. Three (21.4%) patients required intra-operative blood transfusion. Seven postoperative complications developed in 4 (28.5%) patients. Two patients (14.2%) developed type B pancreatic fistula. Both the patients were managed conservatively. Two patients (14.2%) developed PPH. One of them (7.1%) required re-exploration and ligation
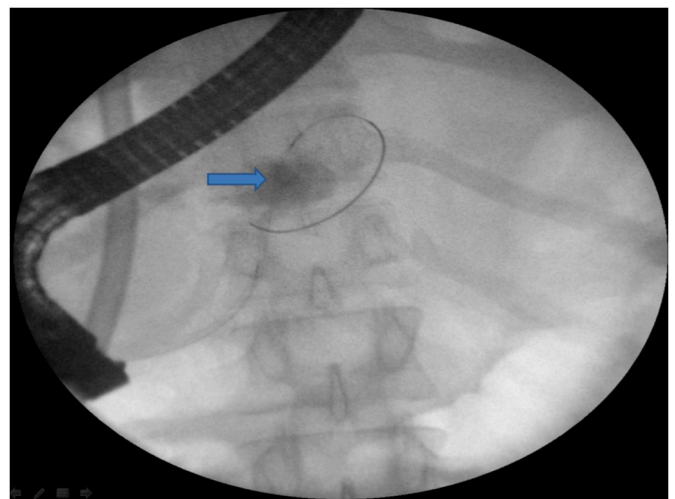

Fig. 1. Endoscopic retrograde cholangiopancreatography showing disruption of pancreatic duct.
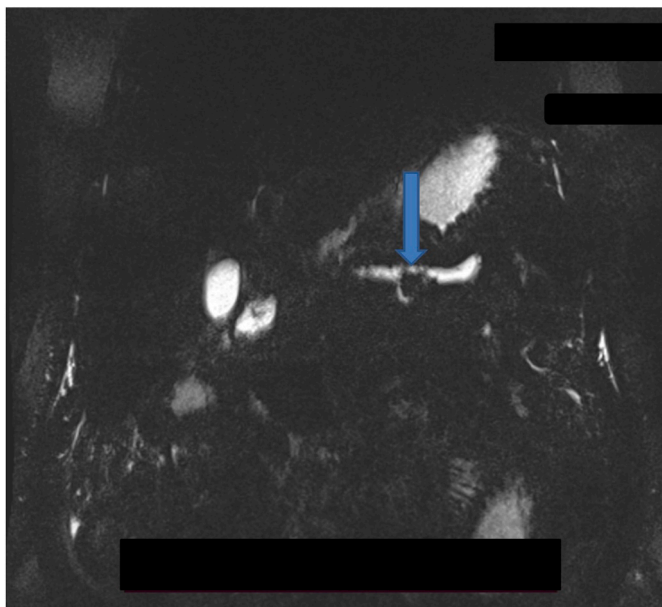
Fig. 2. Magnetic resonance cholangiopancreatography showing disruption of pancreatic duct.

Table 1
Details of Surgical procedures performed (n = 14).

Procedures to control CP and IPF	n (%)
Lateral pancreaticojejunostomy	11 (78.5)
Frey procedure	3 (21.4)
Additional procedures	
Choledochal cyst excision	1 (7.1)
Cholecystectomy	1 (7.1)
Cystojejunostomy	2 (14.2)

(CP: chronic pancreatitis, IPF: Internal pancreatic fistula).

of bleeder on the 3rd postoperative day. The other 3 complications were chest infection, central line sepsis, and drug-induced thrombocytopenia. All three patients were managed medically. The median postoperative hospital stay was 10 (7–22) days. There was no surgery-related mortality.

One patient was lost to follow-up. After a median follow-up of 60 (6–86) months, no patient developed pancreatic ascites or pleural effusion. Four patients (30.7%) developed new-onset DM. EPI developed in one patient. Incomplete pain relief occurred in one (7.6%) patient. Two patients (15.2%) required surgery for an incisional hernia and for symptomatic cholelithiasis.

4. Discussion

The term 'internal pancreatic fistula' (IPF) was coined by Cameron et al., in 1976 [8]. It comprises of pancreatic ascites and pancreatic pleural effusion and both are now well-recognized complications of chronic pancreatitis (CP) accounting for approximately 7.3% of cases of chronic pancreatitis [9]. In our current study, it was found in 3.4% of patients with CP. IPF occurs due to disruption of the main pancreatic duct or a leak from associated pseudocyst in the absence of acute pancreatitis [10–12]. A ruptured pseudocyst is present in present in up to 80% of patients with pancreatic ascites or effusion [13]. Similarly in the present study, pseudocyst was found in 71% of patients. If there is anterior ductal disruption into the peritoneal cavity, pancreatic ascites develop, whereas a posterior ductal disruption into the retroperitoneal space tracks the pancreatic secretions through the path of least resistance (usually the aortic or esophageal hiatus) into the pleural cavity.

Left-sided pleural effusion is more common, although it can involve any side [14]. In our study, all the 3 patients with pancreatic pleural fistula had involvement of the left side.

The diagnosis of IPF requires a high index of suspicion. A good number of these patients are alcoholic who presents with distension of the abdomen. Apparently, this may give an impression of ascites secondary to cirrhosis. But a long-standing history of recurrent abdominal pain gives a clue in the direction of pancreatic ascites and needs to be evaluated. Abdominal or pleural fluid needs to be sent for amylase and albumin estimation. Amylase level >1000 S units/100 ml and albumin level >3g/100 ml is required to establish the diagnosis. A normal serum amylase level essentially does not rule out the diagnosis of IPF as it occurs in a setting of sub-clinical pancreatitis.[g] Moreover, the mere presence of elevated serum amylase does not signify acute pancreatitis. This may occur due to passive absorption of pancreatic amylase from the pleural or peritoneal surface [15]. Lipsett et al. had shown elevated serum amylase levels in 88% of their study population [15].

The next challenge is to demonstrate ductal disruption, its site, and character. This can be achieved either by endoscopic retrograde cholangiopancreatography (ERCP) or magnetic resonance cholangiopancreatography (MRCP). ERCP is also a therapeutic option. Although computed tomography helps is useful in identifying CP (calcification, ductal dilatation, ductal stone, parenchymal atrophy), pseudocyst, ascites, and/or pleural effusion and anatomical relation of the fluid collection in relation to pancreas [16]. Decreased signal intensity in T1 weighted fat suppression images of MRI demonstrates early fibrotic changes in CP better than CT images.

Several techniques can be used for the management of pancreatic ascites and pleural effusion. Initial management with conservative therapy has considerable support in the literature. Conservative management includes gastrointestinal rest, octreotide, and total parenteral nutrition. Repeated paracentesis and thoracocentesis, along with chest tube drainage are an integral part of conservative management that encourages serosal apposition and healing of the fistulous tract. In addition to the healing of the fistula, conservative treatment, particularly TPN has another advantage. It minimizes or reverses catabolism in these chronically malnourished patients so that the patient can withstand surgery better if at all necessary. In a study by Segal et al., the authors have reported successful usage of octreotide (somatostatin analog) in the treatment of pancreatic ascites where 9 out of 10 patients had shown resolution of ascites in 22 ± 3 days [17]. Multiple other studies had reported an overall success rate of 25–60% with the combination of these treatment modalities [18–22]. However, prolonged conservative therapy may lead to complications and even unexpected death. Most investigators currently recommend a 2 to 3-week period of nonoperative management followed by surgery if there is no response [23].

Endoscopic therapy is another line of management and requires a great deal of expertise, especially in difficult scenarios like ductal stones and strictures, disconnected pancreatic duct, previous gastrointestinal surgeries, pancreatic divisum, and narrow ducts. Several endoscopic techniques are useful for these cases. Pancreatic sphincterotomy, insertion of naso pancreatic drainage (NPD) tubes, stenting of the pancreatic duct, and embolization of fistula are some of such procedures [24,25].

In our study, all the patients received conservative management (for a period of 2–3 weeks) with or without endotherapy before surgery. All the patients who received endotherapy (n = 6, 42.8%) had a failure of intervention, hence requiring surgical management. The high failure rate of endotherapy in our study may be due to more advanced disease as well as lack of expertise for the management of such patients.

Depending on the ductal anatomy and associated features, the type of surgery is decided. The aim of the surgical procedure is not merely to drain the collection but also to take care of the underlying pathology. For patients with ductal diameter >7 mm (large duct disease), lateral pancreaticojejunostomy is deemed necessary. The site of disruption of

the pancreatic duct should be incorporated in the anastomosis. Pseudocyst eradication happens with just LPJ which corrects the duct disorder [21,26]. For patients having nondilated ducts, the site of the fistula within the gland becomes important. For a fistula near the pancreatic tail or body, distal pancreatectomy with or without splenectomy is done. Splenic preservation can be difficult in these cases as the local inflammation can result in increased operative blood loss. If there is a ductal disruption near the pancreatic head, head resection can be avoided due to a higher risk of morbidity and mortality. Fistula enterostomy can be done in these cases and it is reported to be successful in 77–100% of cases [14,27,28]. In our current study, the most commonly performed operation was LPJ (n = 11,78.5%). There was zero 90-day mortality and only one patient developed re-bleeding in the perioperative period.

The study has some strengths and limitations. The strength is that it is one of the largest surgical case series with no perioperative mortality and good long-term outcome. The drawbacks are: 1) it is a retrospective study spanned over a period of 14 years; 2) it is purely a surgical series. No comparison was made between surgery and other modalities of management; 3) it is a single-center experience. Our experience only showed that surgery can be performed with acceptable perioperative morbidity and mortality. Future studies, preferably multicenter studies with a comparison between surgery and other modalities would be required to assess the superiority of surgery over others.

5. Conclusion

Pancreatic ascites and pancreatic pleural effusion are rare complications of chronic pancreatitis with high rates of mortality if left untreated and considerable morbidity. Reasonable outcomes can be obtained with expeditious management. Although conservative management and endotherapy are the first-line treatments, surgery still plays an important role particularly if these fail or are not feasible. In the experienced hand, surgery can be performed with acceptable perioperative morbidity and mortality and long-term good results.

Ethical approval

This study was approved by institutional ethics committee (Memo number: IPGME&R/RAC/271, dated- 15/12/2021).

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Nil.

Author contribution

Arkadeep Dhali: Conception, design of the study, acquisition of the data, drafting the manuscript, final approval of the version to be submitted.

Sukanta Ray: Conception, design of the study, acquisition of the data, writing, drafting the manuscript, final approval of the version to be submitted.

Tuhin Subra Mandal: Acquisition of the data, final approval of the version to be submitted. Somak Das: Acquisition of the data, final approval of the version to be submitted.

Avik Sarkar: Acquisition of the data, final approval of the version to be submitted.

Sujan Khamrui: Acquisition of the data, final approval of the version to be submitted.

Gopal Krishna Dhali: Acquisition of the data, final approval of the version to be submitted.

Consent

Informed patient consent was waived of by the ethics committee as

the data was anonymized and retrospective nature of the study.

Registration of research studies

This study is registered at Thai Clinical Trials Registry and was conducted in accordance with the Declaration of Helsinki (TCTR20220101004).

Guarantor

Dr. Sukanta Ray acts as guarantor for the article and accepts responsibility for the work.

Declaration of patient consent

Informed patient consent was waived of by the ethics committee as the data was anonymized and retrospective nature of the study.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Declaration of competing interest

None declared.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2022.103261.

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