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Original Research Article

Laparoscopic management of pancreatic pseudocyst: a prospective study

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ABSTRACT

Background: Pancreatic pseudocysts can be defined as localized fluid collections that have a nonepithelialized wall consisting of fibrous and granulation tissue. These pseudocysts usually appear several weeks after the onset of pancreatitis. Advancement in the management of pseudocyst with laparoscopic drainage provides a good alternative or supplement to the surgical treatment of pancreatic pseudocyst. The purpose of this study is to evaluate the feasibility, effectiveness and outcome of Laparoscopic drainage.
Methods: It was a prospective interventional hospital based study carried out among 32 indoor cases of pancreatic pseudocysts operated using laparoscopic procedures admitted under department of general surgery in a tertiary healthcare teaching institute during study period. Cases of pancreatic pseudocysts were evaluated with detailed history, clinical signs and symptoms, the duration and investigations. Details of laparoscopic, its indications, peculiarities, complications rates, recurrence rate and outcome was analyzed.
Results: Single and multiple pancreatic pseudocysts were found in 26 (81.25%) and 6 (18.75%) patients and the most common site was found to be body of pancreas (59.37%). Obstructive jaundice (18.50%) and gastric outlet obstruction (15.63%) were the most common complications seen. The common procedures undertaken in the studied cases were laparoscopic cystogastrostomy (65.62%) followed by laparoscopic cystojejunostomy (12.50%) and laparoscopic external drainage (12.50%). Common complications in studied cases were found to be pain (15.65%), fever (12.5%) and external fistula (6.25%).
Conclusions: Laparoscopic technique for treatment of pancreatic pseudocysts is safe, efficacious, feasible and is associated with fast recovery. These techniques should be preferred over open surgical drainage.

Keywords: Pancreatic pseudocyst, Laparoscopic techniques, Cystojejunostomy, Outcome

INTRODUCTION

Pancreatic pseudocyst can be defined as a localized amylase rich fluid collection having nonepitheliazed wall. It's called pseudocyst because it lacks true epithelial lining. It is usually formed as a result of leakage of pancreatic juice causing intense inflammatory reaction resulting into encapsulation of the involved area by granulation and fibrous tissue.[1] The incidence of pancreatic pseudocyst is low ranging from 0.5 to 1 per 100000 adults. Its incidence is higher in patients with acute (6% to 18.5%) or chronic pancreatitis (20% to 40%). The common causes of pancreatic pseudocyst increase acute or chronic pancreatitis and abdominal trauma.[2] The Atlanta classification consists of four distinct disease entities: acute fluid collections that develop early in the course of acute pancreatitis and do not yet have a cyst wall; acute pancreatic. Pseudocysts, which arise as sequel of acute pancreatitis or trauma, and whose wall consists of granulation tissue and extracellular matrix; chronic pancreatic pseudocysts, which arise as sequel of chronic pancreatitis and are

likewise surrounded by a wall; pancreatic abscesses, which are intra-abdominal collections of pus immediately adjacent to the pancreas, without any large areas of necrosis.[3]

While many small pseudocysts may disappear on their own the larger one particularly in patients with chronic pancreatitis are more likely to remain and may present with symptoms such as abdominal pain, weight loss, palpable mass and anorexia.[4] Cyst fluid analysis can be done in cases where there is ambiguity in between pancreatic pseudocyst and pancreatic tumors.[5]

The diagnosis is usually confirmed on the basis of imaging. They are easy to be picked up on ultrasound where they are seen as anechoic or hypoechoic lesions with internal echoes suggesting presence of debris within the lesion.[6] On computerized tomography they appear as circumscribed peripancreatic fluid collection having a low attenuation. The walls of the lesion may show enhancement.[7] Though MRI is usually not required but if done they are seen as peripancreatic lesion showing lesions which are hypointense on T1 and hyperintense on T2 weighted imaging sequences.[8] The management of pancreatic pseudocyst may depend on size, number and presence of complications such as obstructive jaundice and infection. Small cysts (5-6 cms) may resolve on their own hence can be managed conservatively while the patient is kept under follow up and serial ultrasounds are done.[9] The surgical drainage is indicated in cases having large pseudocyst (>6 cms), infected cyst or presence of sepsis and cases in which pseudocyst is causing mass effects such as obstructive jaundice or gastric outlet obstruction.[10]

Surgical management of pancreatic pseudocyst may consist of open surgical drainage, laparoscopic surgical drainage or endoscopic drainage. There is no established method of choice for drainage of pseudocysts of pancreas and various procedures have been reported to be having their unique advantages and disadvantages.[11] Traditionally, pancreatic pseudocyst had been managed by surgical internal drainage but recently, less invasive techniques have become available. Treatment of pancreatic pseudocyst has changed with time from surgical interventions, conservative management and less invasive procedures.[12] There had been several studies in the literature warning of serious, life threatening complications related to conservative non-interventional treatment of pancreatic pseudocysts. However surgical or other interventional drainage methods are associated with significant morbidity, advancement in the management of pseudocyst with laparoscopic drainage provides a good alternative or supplement to the surgical treatment of pancreatic pseudocyst.[13]

The purpose of this study was to evaluate the feasibility, effectiveness and outcome of laparoscopic drainage.

METHODS

It was a hospital based prospective interventional study carried out among 32 indoor cases of pancreatic pseudocyst operated using laparoscopic procedures admitted under department of general surgery in a tertiary healthcare teaching institute situated in an urban area. Institutional ethical committee approved the study and informed consent was taken from all the participants**.** The patients were included in this study on the basis of a predefined inclusion and exclusion criteria. The data was collected from cases using pre-designed, semi-structured, pre-validated proforma, in which history, clinical findings, investigation reports, details about surgical procedures performed were incorporated. A detailed history was taken from all the patients. History of pancreatitis in past, history of abdominal trauma or alcohol consumption was specifically asked for. A detailed clinical examination was done in all the cases. Complete blood count, serum amylase and serum lipase levels were done in all the cases. Ultrasonography was done in all the cases with an aim to determine the number, size, volume, wall thickness, location of pancreatic pseudocyst, the extent of pancreatic parenchymal disease, the nature of main pancreatic duct and its relation to the cyst, the presence of portal hypertension, venous occlusion, arterial anomalies and pseudoaneurysm. Computerized tomography was done only in selected cases. All patients underwent laparoscopic drainage (such as cystogastrostomy, cysto-duodenostomy, cystojejunostomy, laparoscopic external drainage). Procedure indications, peculiarities, complications rates, recurrence rate and outcome were evaluated in all the studied cases. Patients were followed up at least for 6 months after discharge.

For statistical purposes p value less than 0.05 was taken as significant. SSPE 16 software was used for statistical analysis.

Inclusion criteria

Inclusion criteria were patients presenting in Government Medical Hospital with pancreatic pseudocyst operated by laparoscopic technique or converted to open technique; symptomatic pseudocyst; pancreatic pseudo cyst bigger than 6 cm in major diameter; non resolving pancreatic pseudocyst for 6 weeks; patients above 18 years of age; consenting patients for study.

Exclusion criteria

Exclusion criteria were non consenting patients; acute fluid collection; post pancreatic trauma pseudocyst; pancreatic pseudocysts operated primarily by open technique, or by means other than laparoscopy.

Technique of surgery

Patient was put in modified lithotomy position. After creation of pneumoperitnonium a 10 mm 30° telescope is

placed at umbilicus, a right 5 mm and left 10 mm or 12 mm midclavicular ports placed as working ports. A 5 mm subxiphoid port is placed for retracting left lobe of liver if necessary. 12 mm port was used for insertion of endo G.I. staplers in patients in whom anastomosis between posterior wall of stomach and cyst wall and closure of anterior gastrotomy was done by endo G.I. staplers. Position of the cyst was confirmed by needle aspiration and aspirate is sent for biochemical and cytological analysis before performing anterior gastrotomy. Anterior gastrotomy was done by displacing body of stomach laterally by diathermy scissors or harmonic scalpel. A circumferential incision was made taking full thickness of wall of stomach with the cyst wall with the help of harmonic or diathermy scissor. Subsequently scope was introduced into the pseudocyst and debridement was done and necrotic material was removed and normal saline wash was given. Hemostasis was secured and continuous intracorporeal suturing done between posterior stomach wall and cyst wall with barbed sutures and V-lock. Nasogastric tube is placed into cyst cavity. Anterior wall of stomach closure was performed in 1 or 2 layers by linear stapling devices. Stapling device used was 45 cm Ethicon-Echelon 6.5-Blue cartridge. Peritoneum is lavaged and abdominal drain no.32 drain is placed at Morrison's pouch and fixed externally to skin with silk 2-0 r/c. Trocars were then removed under vision and ports were closed. In some cases cystojejunostomy or external drainage was done by appropriate techniques.

RESULTS

Out of 32 studied cases there was a significant male preponderance. There were 28 (87.50%) males and 4 (12.50%) females with a M: F ratio of 1:0.14 (Figure 1).

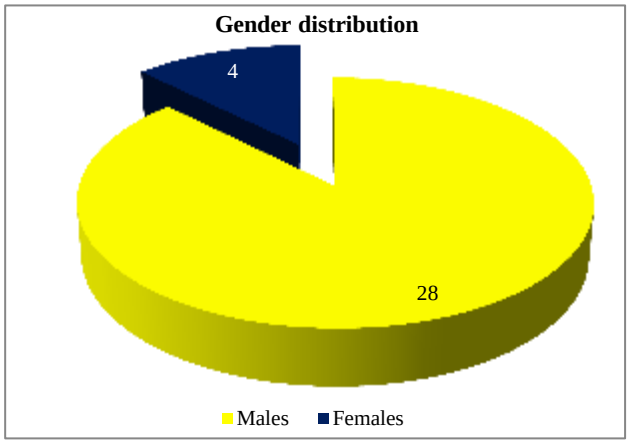

Figure 1: Gender distribution of studied cases.

The most commonly affected age group was found to be between 31-40 years (34.37%) followed by 21-30 years (28.12%) and 41-50 years (15.62%) (Figure 2).

The analysis of etiological factors showed that the most common etiology was pseudocyst following acute pancreatitis (78.13%). In remaining 7 cases 4 (12.57%) cases were due to chronic pancreatitis whereas 3 cases (9.3%) were seen following biliary pancreatitis (Table 1).

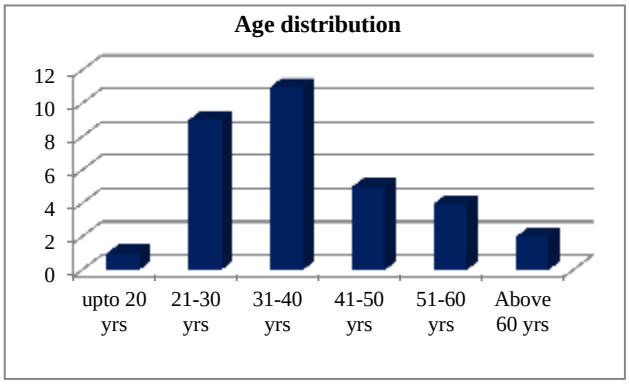

Figure 2: Age distribution of the studied cases.

Table 1: Etiology of pseudocyst formation in studied cases.

Etiology	Number	Percentage (%)
Post-acute pancreatitis	25	78.13
Post chronic pancreatitis	4	12.57
Post biliary pancreatitis	3	09.30
Total	32	100

Table 2: Personal history of the studied cases.

Personal history		Number of participants	Percentage (%)
Alcoholism		28	87.5
Smoking		11	34.37
Diet	Mixed	22	68.75
	Vegetarian	10	31.25

It was observed that 28 (87.5%) patients had a history of chronic alcoholism while 11 (34.37%) patients had history of smoking. The analysis of diet showed that 22 (68.75%) of study participants were having mixed pattern of diet, while 10 (31.25%) study participants were having strict vegetarian pattern of diet (Table 2).

Table 3: Clinical features in patients with pancreatic pseudocyst.

Clinical features	Number of participants	Percentage (%)
Pain in abdomen	31	96.87
Lump in abdomen	31	96.87
Fever	5	15.62
Nausea/vomiting	15	46.87
Weight loss	20	62.50

The clinical presentation of cases of pancreatic pseudocyst observed as per the present study was as given in Table 5. Almost all patients (31 cases) with PP

presented with abdominal pain and lump in abdomen (31). 15 cases (46.87%) had complaints of nausea and vomiting. 12 cases (37.5%) complained of weight loss (Table 3).

Table 4: General examination findings in the studied cases.

General examination	Number of participants	Percentage (%)
Febrile	3	9.37
Raised RR	1	3.12
Pallor	3	9.37
Icterus	6	18.75
Tenderness	3	09.37
Hypertension	4	12.5

Among the 32 patients with pancreatic pseudocyst, it was found that 3 (9.37%) were febrile, 1 patient (3.1%) was having raised respiratory rate, 3 cases (9.37%) were having pallor whereas 6 cases (18.75%) of PP presented with icterus In local examination, 3 cases (9.37%) had tenderness. It was found that 4 cases (12.5%) presented with hypertension (Table 6) rest all had blood pressure within normal range (Table 4).

Table 5: Hematological investigations in the studied cases.

Blood investigations	Parameter	Number of patients	%
Hemoglobin	<10	4	12.5
	>10	28	87.5
Total leucocyte count	<12000	27	84.37
	>12000	5	15.62
BSR	<200	29	90.62
	>200	3	9.37
Serum bilirubin	<1.5 mg	26	81.25
	➢ 1.5 mg	6	18.75
Serum lipase	Low	10	31.25
	Raised	22	68.75

4 (12.5%) cases presented with hemoglobin less than 10 mg/dl (anemia), while 28 cases were having hemoglobin more than 10 mg/dl. In 5 cases presented with PP, raised TLC was observed (more than 12000), same cases presented with fever. Rest of the cases were having TLC less than 12000. Random blood sugar estimation was done among the cases of PP, it was found that 3 cases were having BSR more than 200 mg/dl. Serum bilirubin estimation was also done, 6 cases were found with serum bilirubin more than 1.5 mg. Serum lipase values were found to be elevated in majority of cases (68.75%), which is considered to be suggestive of pancreatitis (Table 5).

The analysis of imaging findings showed that 26 cases (81.25%) were having single pseudocyst whereas 6 cases (18.75%) were found to be having multiple pseudocysts. majority (59.37%) of PP were located in body of pancreas, whereas 21.88% PP were located in head of the pancreas. In 2 (6.25%) cases PP were located in tail, in 2(6.25%) cases in transverse mesocolon and in another 2(6.25%) cases it was located pararenal space. Majority of the patients (93.75%) had cyst wall thickness of more than 5 mm whereas only 2 (6.25%) patients had cyst wall thickness of less than 5 mm. In majority of the patients (43.75%) maximum diameter of the cyst was found to be 10-15 cms (Table 6).

Table 6: Imaging findings in the studied cases.

Parameters	Imaging findings	Number of patients	%
Number	Single	26	81.25
	Multiple	6	18.75
Location	Body	19	59.37
	Head	7	21.88
	Tail	2	06.25
	Transverse mesocolon	2	06.25
	Pararenal	2	06.25
Cyst wall thickness	Less than 5 mm	2	6.25
	More than 5 mm	30	93.75
Maximum diameter of cyst	6-10 cm	11	34.37
	10–15 cm	14	43.75
	15–20 cm	4	12.50
	More than 20 cm	3	09.38

Table 7: Complication of pseudocyst in the studied cases.

Type of complications		No of patients	%
Obstructive jaundice	Extrinsic compression	4	12.5
	Chronic pancreatitis	2	6.25
Gastric outlet obstruction due to compression		5	15.63
Infection		4	12.5
Intracystic bleed		1	3.12
Total		16	50

6 out of 32(18.75%) patients were having jaundice. Out of these 6 patients, 4 patients had obstructive jaundice due to extrinsic compression, i.e. pseudocyst larger in size and located in head region causing compression over common bile duct externally, leading to narrowing of the CBD lumen and leading to obstructive jaundice. The other complications seen were Gastric outlet obstruction due to compression (15.63%), infection (12.5%) and intracystic bleed (3.12%) (Table 7).

In 27 out of 32 patients (84.38%) patients, the aspirated fluid was non infected, while in 4 out of 32 patients (12.50%), it was infected. Patients with infected fluid were managed by laparoscopic external drainage procedure (Table 8).

Table 8: Intraoperative transgastric aspiration of cyst fluid in studied cases.

Type of fluid aspirated	No. of cases	Percentage (%)
Non infected	27	84.38
Infected	4	12.50
Blood	1	03.12
Total	32	100

Table 9: Operative interventions in the studied cases.

Procedure	No .of cases	Percentage (%)
Laparoscopic cystogastrostomy only	21	65.62
Laparoscopic cystojejunostomy	4	12.50
Laparoscopic cystogastrostomy + cholecystojejunostomy	2	06.25
Laparoscopic external drainage	4	12.50
Laparoscopic converted to open for intracystic bleed	1	03.12
Total	32	100

Table 10: Intraoperative difficulty, number of ports and drains used.

Parameters		Number of patients	Percentage (%)
Intraoperative difficulty	Large cyst needing partial needle decompression prior to cystogastrostomy.	3	9.38
	Intra-operative bleeding	1	3.12
No of ports used	3 (one 10 mm + two 5 mm)	19	59.37
	4 (one 10 mm + three 5 mm)	4	12.50
	3 (one 10 mm + one 12 mm + one 5 mm)	9	28.12
Drain	No drain kept	23	71.88
	Peritoneal drain kept	5	15.62
	External drainage for infected cyst	4	12.50

Table 11: Average post-operative hospital stay.

Type of patients	Average post-operative hospital stay (days)
Non infected cyst	5
Infected cyst	7
Cyst with intra cyst bleeding	7

Table 12: Post-operative complications in the studied cases.

Complications	Number of participants	Percentage (%)
Fever	4	12.5
Pain	5	15.65
Anastomosis leak	0	0
Hematemesis	0	0
Recurrence	0	0
External fistula	2	6.25
Total	11	34.37

Laparoscopic cystogastrostomy was done in 21 (65.62%) cases. These were the cases with non-infected transgastric aspirate. 2 out of the 6 patients with jaundice had CBD narrowing due to chronic pancreatitis leading to fibrosis. In these patients in addition to cystogastrostomy, cholecysto-jejunostomy had to be done to relieve obstructive jaundice. In remaining 4 patients of jaundice, the cause was external compression by large cyst, so drainage of cyst removed the compression factor thereby

relieving jaundice. The mean operative time was found to be 193.9 minutes (Table 9).

In 3 (9.38%) due to large size of the cyst partial needle decompression was done prior to cystogastrostomy so as to be able to manipulate the instrument. In majority of the patients (59.37%) 3 ports (one 10 mm + two 5 mm) were used and in 23 (71.88%) no drain was needed to be kept. Peritoneal drain was kept in 5 patients, 3 out of 4 of which were managed by cystojejunostomy and two patients in whom in addition to cystogastrostomy, cholecystojejunostomy was done. External drainage was done in 4 patients in whom intraoperative transgastric aspirate revealed infected fluid (Table 10).

In post-operative period, patients were started oral feeding on an average 3.2 days. Time taken in average days for peritoneal drain removal was 3.4 days. Post-operative hospital stay was longer in patients with infected pseudocysts and in pseudocysts with intracystic bleeding, average 7 days, whereas in patients with non-infected pseudocysts, average post-operative hospital stay was 5 days (Table 11).

In early postoperative period the most common complication was found to be pain (15.65%) followed by fever (12.5%) and external fistula (6.25%). There was no evidence of anastomotic leak, hematemesis, and recurrence. There was no mortality (Table 12).

Table 13: Qualitative outcome of management at 3 months and 6 months post-operatively.

Outcome	Parameter	Number of cases	Percentage (%)
Outcome at 3 months	Pain relief	27	84.37
	Weight gain	18	56.25
	Recurrence	0	0
	External fistula	2	6.25
	Mortality	0	0
Outcome at 6 months	Pain relief	30	93.75
	Weight gain	25	78.12
	Recurrence	0	0
	External fistula	0	0
	Mortality	0	0

The outcome was evaluated at 3 months and 6 months. At 3 months follow-up there was complete pain relief in 27 (84.37%) patients whereas weight gain was observed in 18 (56.25%) patients. 2 patients were found to have external fistula (6.25%). AT 6 months follow up there was healing of external fistula in both the patients and pain relief was present in 30 (93.75%) patients. Weight gain was noticed in 25 (78.12%) patients. There was no mortality noted in any of the patients up to 6 months follow up (Table 13).

DISCUSSION

The present study was conducted to study the effectiveness and outcome of laparoscopic management of pancreatic pseudocyst cases admitted under department of general surgery in a tertiary healthcare teaching institute in Maharashtra.

In the present study number of male cases outnumbered number of female cases, 87.5% cases of PP were males and rest were female cases. Crisanto et al, in their study enrolled 23 males and 15 female cases.[14] Similar findings were notes by Khaled et al reports 28 male and 12 female subjects in their study.[15] However Simo et al, they found more female study participants (10 out of 15 subjects) and Hauters et al also reported 5 male and 7 females among their study participants.[16,17]

Majority of cases of PP were found to be between 21-40 years of age group followed by 40-60 years, which shows that incidence of PP was common in adult age group. In the present study, the incidence of PP was found less common below 20 years and above 60 years of age. Crisanto et al, in their study found mean age of participants as 38.8 years.[14] Khaled et al reported 55 years as a mean age of study subjects.[15] Hauters et al observed that the median age of 46 years (range: 30-72).[17] Similarly study by Simo et al reported that the median age of the cohort was 49.5±12 years (range = 18-71).[16]

In the present study, 78.13% cases of PP were found to be associated with post-acute pancreatitis, 12.5% cases were associated with post-chronic pancreatitis, whereas in 9.3% cases pancreatitis was biliary in origin. Study conducted by Park et al, reports that 54% cases had biliary origin while 18.5% were due to alcoholism.[18] Hamza et al, reports 46% biliary and 29% cases due to alcoholism.[19] Similar findings were observed by Hauters et al and Mori et al.[17,20]

In the present study, it was found that 87.5% cases had a history of chronic alcoholism, 34.37% cases gave history of smoking. This indicates that the occurrence of PP was more among those who had history of alcoholism and smoking. 68.75% cases of PP were consuming mixed diet pattern. Crisanto et al, in their study found that 29% cases gave history of alcoholism.[14] Park et al found history of

alcoholism in 18.5% cases, while Hamza et al, Mori et al and Hauters et al found that 30% cases had history of alcoholism.[14,15,19,20] It was observed that almost all of the cases of PP presented with pain in abdomen and lump in the abdomen (96.87%), followed by weight loss in 62.5% cases and Nausea- vomiting in 46.87% cases. Fever was observed in 15.62% cases of PP. Crisanto et al in their study reported that out of 17 cases, 15 complained of pain, 6 cases reported with early satiety, 3 cases reported with weight loss and 2 cases reported with infected pancreatic pseudocyst.[14]

Out of the 32 cases, 65.62% cases, only laparoscopic cystogastrostomy was done. These were the cases with non-infected transgastric aspirate. 2 out of the 6 patients with jaundice had CBD narrowing due to chronic pancreatitis leading to fibrosis. In these patients in addition to cystogastrostomy, cholecysto-jejunostomy had to be done to relieve obstructive jaundice. In remaining 4 patients of jaundice, the cause was external compression by large cyst, so drainage of cyst removed the compression factor thereby relieving jaundice. 2 patients with cyst located in transverse mesocolon and 2 cases with cyst in para-renal region were managed by cystojejunostomy. The mean operative time in our study was found to be 193.9 Minutes. In the study conducted by Crisanto et al the cases were managed using laparoscopic drainage procedures (laparoscopic cystogastrostomy).[14] The mean operative time was found to be 177 minutes which is nearby to the operative time reported in the present study. The pancreatic pseudocysts were resolved in 16 out of 17 cases. There was a single patient with recurrence which was managed by repeat drainage. Hauters et al in their study reports that the median operative time was 100 min (range: 80–300).[17] Laparoscopic PP surgery was successfully completed in 16 patients and median size of the cysto-enterostomy was found to be 3 cm (range: 2–5). In 11 patients PP contained necrotic debris. The median post-operative hospital stay was found to be 6 days (range: 4–24). No mortality or morbidity was recorded.

The outcome of patients in our study was found to be comparable to the studies conducted by Hauters et al and Crisanto et al.[14,17]

CONCLUSION

Symptomatic pseudocyst of pancreas more than 6 cm of size and more than 6 weeks duration needing surgical management can be effectively managed by laparoscopic surgery. Laparoscopic management is preferred modality in terms of better prognosis, pain relief and weight gain. As the present study reports very less number of post-operative complications (recurrences, bleeding, fistula, leaks, infections, wound gaping etc.), and lesser post-operative length of hospital stay, it has been found that laparoscopic drainage of pancreatic pseudocyst is feasible and effective procedure with good outcome.

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