International Surgery Journal
Ambore V et al. Int Surg J. 2023 Dec;10(12):1934-1939
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20233675

Original Research Article

Comparative study of surgical management of chronic pancreatitis

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Received: 04 October 2023
Revised: 13 November 2023
Accepted: 17 November 2023

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ABSTRACT

Background: Chronic pancreatitis is a chronic inflammatory disease, characterised by irreversible, progressive destruction of pancreatic tissue, with progressive fibrosis of pancreas, leading to progressive loss of both exocrine and endocrine function. Chronic pancreatitis is characterised by the patient complaining of relentless pain abdomen with its radiation to the back, the history of persistent vomiting, which forces the patient to take. The surgical procedure can be carried out either via open approach or laparoscopically. The purpose of this thesis is to study the various methods of how surgical management can be provided to the patients and to compare the outcomes of these methods in terms of the length of the patient's hospital stays and various intra op and post op complications.
Methods: A total of 50 patients suffering from chronic pancreatitis undergoing elective pancreaticojejunostomy in Grant government medical college, Mumbai during the time period of October 2020 to September 2022 were included in this prospective cohort study.
Results: The mean age of the study population was 36.6 years, and significant improvement was seen in laparoscopic method with mean blood loss of 104 ml, initiation of enteral nutrition of 4 days and average length of hospital stay being 8 days.
Conclusions: This work significantly advances our understanding of various operative techniques of pancreatojejunostomy laparoscopic and open. This study aims to study the various advantages and disadvantages of one technique over the other.

Keywords: Chronic pancreatitis, Surgical treatment, Laparoscopic pancreatojejunostomy

INTRODUCTION

The outcome of inflammation of the gland is decided by whether the gland was previously normal or not. This distinction remains blurred. In acute pancreatitis, the normal architecture of the gland is restored after the acute attack, whereas in chronic pancreatitis, restoration of normal glandular architecture is not possible, and it does not take place. Early in the disease, the pancreas appears to be normal. As the disease progresses, with more and more clinical and subclinical attacks of acute pancreatitis, the pancreas turns oedematous, indurated and enlarged. The main pancreatic duct of wirsung may still be normal in architecture or might have developed slight dilatations.[1] In the chronic setting the pancreas is down sized to a cord like structure which is no more than 2-3 cm wide. The edge of a chronically inflamed pancreas is rounded. It is rubbery or hard in consistency. Ductal stones are frequently present. The duct varies in size from a few millimetres to a few cm in diameter. The calcification in pancreas is usually restricted to the ducts, hence the diameter of the duct can be made out by using plain radiographs also.[2]

Drainage operations in chronic pancreatitis Drainage operations can be classified into three types: Pancreaticojejunostomy (most frequently employed), Pancreaticogastrostomy, Sphincterotomy and sphincteroplasty.

Pancreatico jejunostomy

This procedure is to be done when the ductal diameter at the level of the body and the head is more than or equal to 7-8 mm. Puestow and Gillesby unroofed the main pancreatic duct from the tail to just beyond the neck of the pancreas. The body and tail of the gland are then implanted into the open end of a Roux loop of jejunum. Partington and Rochelle modification opened the pancreatic duct as widely as possible, with extension of the incision into the head and uncinate process. A side-to-side pancreaticojejunal anastomosis is then created between the open pancreas and a Roux loop of jejunum, the advantage being, none of the pancreas is resected and the spleen remains in place.[2] Pancreaticojejunostomy described by Frey and Smith resembles conventional pancreaticojejunostomy, but the head of the gland is cored out rather than simply incised before anastomosis to the Roux loop of jejunum.

Technical considerations and results in pancreaticojejunostomy

A prior ERCP should be done to study ductal architecture. Information about the duct size is best sought by an MRCP or a Contrast enhanced CT. The success of drainage surgery is due to the associated pancreatic 'fasciotomy' and relief of ischemic pain. Not to forget that the one of the major indications for a surgery in chronic pancreatitis is intractable pain. During surgery, the duct in opened as widely as possible and all contained calculi are removed meticulously. PJ has an appreciably lower operative mortality and morbidity than does pancreatic resection. Pancreaticogastrostomy: Instead of a jejunostomy, a gastrostomy can also be done as a drainage procedure.

Resection operations in chronic pancreatitis

Distal pancreatectomy: Distal pancreatectomy can be divided into procedures preserving in 80-95% pancreatectomy and <80% pancreatectomy. Major portions of the head and uncinate process are excised, as well as the body and tail of the gland. In <80% pancreatectomy, the greatest amount of the pancreas that is removed is the neck, body, and tail, and a small portion of the head.

Partial pancreaticoduodenectomy

The major indications for partial pancreatoduodenectomy with removal of the head of the gland are, disease that is appreciably more advanced in the head than in the body and tail and absence of pancreatic duct dilatation. ERCP and CT of the pancreas are invaluable in making this assessment.

Secondary indications for resectional procedures of the right half of the pancreas, duodenum, and distal bile duct include biliary or duodenal obstruction/stricture/ischaemia. The various partial pancreaticoduodenectomy procedures available are the standard Whipple procedure, the pylorus and The Beger procedure reported first in 1980, involves a less extensive resection of the head of the pancreas with preservation of the duodenum and distal bile duct, thus avoiding duodenal or gastric and biliary anastomoses. Arranged in decreasing levels of magnitude of resection, the variants of partial pancreatecomy procedure are the standard Whipple operation, the pylorus-preserving procedure (Longmire-Traverso), and the duodenum-preserving or Beger procedure.

Total pancreatoduodenectomy

Total pancreatectomy is an operation of last resort in that it is a procedure for patients who have not responded to medical management and in whom previous operative approaches have failed. On this basis it is an appropriate operation to undertake, but only after careful assessment, and due recognition that the patient will need life-long monitoring.

Laparoscopic approach to operative interventions for the treatment of chronic pancreatitis

Laparoscopic trocars position of laparoscopic longitudinal pancreaticojejunostomy has been illustrated in the figure below. We used five trocars (Figure 3). Severe adhesion between the posterior wall of the stomach and the anterior surface of the pancreas is often observed in patients with chronic pancreatitis. In these procedures, it is important to obtain a sufficient working space and ensure an adequate laparoscopic view.

Laparoscopic trocars position of laparoscopic longitudinal pancreaticojejunostomy is about the same with laparoscopic distal pancreatectomy. We used five trocars, as indicated in the figure. Severe adhesion between the posterior wall of the stomach and the anterior surface of the pancreas is often observed in patients with chronic pancreatitis. Such adhesion has been released with the use of several laparoscopic devices including laparoscopic coagulating shears (SonoSurg; Olympus, Tokyo), a vessel-sealing instrument (LigaSure; Covidien, Norwalk, CT), and an ultrasonically activated scalpel (Harmonic ACE; Ethicon, Cincinnati, OH). In these procedures, it is important to obtain a sufficient working space and ensure an adequate laparoscopic view. To maintain the exposure of the pancreas, the stomach is taped using sutures in two places, and then the stomach is fixed to the abdominal wall. We called this method of retraction of the stomach the "stomach-hanging method" It is often difficult to secure an adequate laparoscopic

surgical field at the pancreatic tail. In this case, we used an endoscopic surgical spacer (Securea; Hogy Medical Co., Tokyo) to make the surgical space with appropriate isolation of the stomach and mesocolon without grasping organs.[3] The objective of this study is to compare and contrast laparoscopic and open pancreaticojejunsotomy and to the study the possible advantages and disadvantages one technique has over the other.

METHODS

Study design, location, timeline and duration

It was Prospective Cohort study carried out at tertiary care centre, Grant Government medical college, Mumbai. Total duration of study was 2 years from October 2020 to September 2022.

Patients with chronic pancreatitis aged 18-65 yrs from our tertiary care institution will be screened and selected to undergo modified lateral pancreaticojejunostomy. After obtaining valid written informed consent They will undergo either the conventional open procedure or the laparoscopic procedure according to the inclusion and exclusion participant. 50 patients of chronic pancreatitis will be screened during the study period

Selection criteria

Age between 18-65 years. Diagnosis of chronic pancreatitis, based on clinical symptoms and morphologic changes (e.g., calcifications and ductal changes) detected by imaging studies; pancreatic functional insufficiency; or both. Obstruction of the pancreatic duct due to stenosis, intraductal, extraductal or both, with dilatation of the duct by at least 7 mm proximal to the obstruction, as determined by Magnetic Resonance Cholangio Pancreatography, Abdominal Computed Tomography, or both Severe, recurrent pancreatic pain insufficiently relieved by non-narcotic analgesics or requiring opiates and Patients who are willing to give consent.

Exclusion criteria

Exclusion criteria were; Enlargement of the pancreatic head >4 cm, Contraindications to surgery, American Society of Anesthesiologists class IV, Severe portal hypertension, Gastrectomy with Billroth II reconstruction, other pancreatitis-related complications requiring surgery, Previous pancreatic surgery, Suspected pancreatic cancer with Life expectancy <2 yr, Pregnancy and Patients not willing to give consent.

Null hypothesis

Null hypothesis states that both method of performing pancreaticojejunostomy open and laparoscopic are similar in their outcomes.

Alternate hypothesis

Alternate hypothesis states that both the methods - open and laparoscopic of pancreaticojejunostomy don't have similar outcomes.

RESULTS

In our study, of surgical management of chronic pancreatitis, has included only pancreaticojejunostomy done via both open and laparoscopic method. Distal pancreatectomy was not performed for any of the 50 participants of the study, as none of them required the same for their management. Of the total sample size of 50 participants, 23 underwent laparoscopic technique and 27 underwent open method. This is 46% of the population underwent laparoscopy and 54% underwent open surgery. Statistical software used was Statistical process control.

Table 1: Age distribution of the study.

Mean age (years)	Group		Unpaired t test
	Laparoscopic Surgery	Open Surgery	
	35.5	37.7	0.5213

Table 2: Gender distribution of the study.

Gender	Method Adopted N (%)		Total N (%)
	Laparoscopic Surgery	Open Surgery	
Male	14 (61)	13 (48)	27 (54)
Female	9 (39)	14 (52)	23 (46)
Total	23 (100)	27 (100)	50 (100)

Chi Square=0.52, p value=0.47 (Insignificant)

Table 3: Blood loss.

Mean blood loss (ml)	Method Adopted		Unpaired t test
	Laparoscopic Surgery	Open Surgery	
	104	122.6	0.0000013

Haemorrhage is the most common complication encountered intraoperatively. On an average the blood loss encountered during laparoscopy was 104 ml, while the blood loss seen in open surgery was 123 ml. On applying the chi square test, p value 0.011. Hence, this is significant. Alternate hypothesis is true, that is, there is a difference in the intraoperative efficacy of open and laparoscopic pancreaticojejunostomy. Blood loss encountered during laparoscopic dissection is lesser.

On an average open surgery lasts for 260 mins, while laparoscopic surgery lasts for 317 mins, p value calculated using the Chi square test was 0.000000000002. This means that the difference is significant and not by chance. The alternate hypothesis accepted and null hypothesis refuted. There is a difference between the two

operative methods for the formation of a lateral pancreaticojejunostomy. The various intraoperative complications which were encountered intraoperatively are; Difficult anastomosis, Difficulty to identify the MPD, Iatrogenic perforation and technical difficulty. The frequency of their occurrence has been tabulated. Appropriate test of statistical analysis was used. P value obtained was 0.10472. Null hypothesis was accepted. However, one should keep in mind that the study is being undertaken in a tertiary care hospital with high volume of patients, with the procedure being done by trained hands.

Table 4: Duration of procedure.

Procedure duration (minutes)	Group	
	Laparoscopic Surgery	Open Surgery
	317	260

P value (t Test) = 0.000000000002 (significant).

Table 5: Intraoperative complications.

Type of complications	Number of cases		Total
	Laparoscopic Surgery	Open Surgery	
Difficult anastomosis	1	-	1
Difficulty to identify the MPD	3	-	3
Iatrogenic perforation	-	1	1
Nil	14	27	41
Technical difficulty	4	-	4

P value (Chi Test) = 0.10472 (insignificant).

Table 6: Post-operative complications.

Type of complications	Groups		Total
	Laparoscopic Surgery	Open Surgery	
Nil	22	20	42
Pancreatic fistula	-	1	1
Paralytic ileus	-	2	2
Wound gape	-	5	5

P value (Chi Test) = 0.265488 (insignificant).

The post-operative complications which are expected post pancreaticojejunostomy includes the following; Pancreatic fistula formation, Anastomotic leak, Paralytic ileus and Wound gape. P value at the end of the Chi test is 0.265, which implies that the null hypothesis should be accepted and that there is no difference in the possibility of development of post-operative complications irrespective of the operative techniques used. By using appropriate test for statistical analysis, the p value obtained was 0.0005. Hence, the alternate hypothesis has been accepted. Laparoscopic method has been found to be better than open method in terms of the postoperative day of starting oral feeds.

Table 7: Time of starting oral feeds.

Day of starting oral feed	Group	
	Laparoscopic Surgery	Open Surgery
	4	5

P value (t Test) = 0.000550524 (significant).

Table 8: Post-operative endocrine function.

Post op-endocrine insufficiency	Group		Total
	Laparoscopic Surgery	Open Surgery	
Improved	6	4	10
New onset	5	7	12
Status quo	-	4	4
Worsened	11	13	24
Total	22	28	50

Chi Square = 0.4787

Table 9: Post-operative improvement in pain.

Post op-endocrine pain	Group		Total
	Laparoscopic Surgery	Open Surgery	
Improved	16	19	35
Status quo	6	8	15
Total	22	27	50

Chi Square = 0.734

Length of hospital stay

The p value of the comparative study applied turns out to 0.007. This is significant. Hence the alternate hypothesis has been accepted, that is there is a difference between the two operative methods with the minimally invasive technique being considered by better at least in terms of the length of hospital stay.

The p value calculated after applying the appropriate test of statistical analysis is 0.55, which is not significant. Hence there is no statistically proven significance in the findings of open and laparoscopic techniques of repair. Post-operative pain relief was obtained in 35 of the 50 patients who enrolled in the study. 15 of the patients out of 50 was found to no significant improvement in pain relief. One has to also bear in mind that the patients who are complaining of same pain profile at the end of the procedure are also the same patients who developed post-operative complications. P value on application of chi square test is 0.734. This value signifies that there is no statistical significance between the 2 modes of surgery.

DISCUSSION

A total of 50 patients participated in the study. Of 50 patients, 23 underwent laparoscopic method of surgery

and 27 underwent open method of surgery. This accounts for 46% of the cases being done through the laparoscopic route and 54% of the cases being done via the open technique. Average age of a patient undergoing laparoscopic pancreaticojejunostomy was 35.5 years and the average age of a patient undergoing open surgery was 37.7 years. This can be compared to a mass retrospective study conducted in the Institute of post graduate medical education and research, Delhi, 2019 wherein the median age of surgery was found to be 31 for open and 32 for laparoscopic technique.[4] In terms of gender distribution, 27 males (54%) and 23 (46%) females underwent the above mentioned procedures. Quoting the mass study conducted at the Institute of post graduate medical education and research, Delhi, 2019, 63% of the population who underwent either of the two procedures were males.

In terms of blood loss, by comparing the two techniques there is a clear difference between the amount of blood loss encountered in the 2 modalities. On an average 104 ml was observed in patients who underwent laparoscopic pancreaticojejunostomy. Open method was met with a blood loss of 127 ml. This can be compared to the blood loss of 100ml, 120ml for laparoscopic and open surgeries as reported by senthilnathan et al.[5] However, a confounding factor of the study can be the fact that laparoscopic techniques are undertaken by experienced hands only. Comparing the two operative techniques, the average time taken for the completion of laparoscopic method was 317 mins, while that of open surgery was 260 mins. The difference turned out to be statistically significant and not due to any bias. Tantia et al and Senthilnathan et al reported an operation time of 220-277 min for LLPJ and 271-377 min for patients with additional surgical procedures.[6,7] However, Palanivelu et al reported operation time from 110 to 225 min, which was lower than that of our study.[7,10]

Various intraoperative complications which were encountered during our study. Among the patients who underwent laparoscopy, difficult anastomosis was encountered in 1 patient, difficulty to identify the MPD was seen in 3 patients, technical difficulty was encountered in 4 patients. Among the patients who underwent open repair -Iatrogenic perforation occurred in one patient. On comparing the two groups however, the difference was found to be insignificant. This means that 2 techniques have similar complication profile, and either of the two method can be adopted when the surgery is being performed by trained professionals in high volume centres.

In a study undertaken by IPGMER, Delhi, 4 participants of either group developed intra operative complications. Post-operative complications which were encountered within 3 months of the procedure. In our study, patients developed paralytic ileus, one developed wound gape and one patient developed pancreatic fistula. There is no statistical difference between the two surgical techniques. In a study conducted by IPGMER, Delhi 6 patients of laparoscopic study and 4 patients of open study, reported post-operative complications. The complication profile in our study, is better as compared this above mentioned study.

Oral feeds were started on the 4th day of surgery on an average in patients of laparoscopic pancreatico-jejunostomy. While in case of patients who underwent open pancreaticojejunostomy, the oral feeds were started on day 5. There is statistical significance in this finding. Length of hospital stay before discharge was found to be on an average 8 in case of laparoscopic cases, while being 10 in case of open surgeries. According to Adolf et al the range of hospital stay is 3-12 days for either mode of procedure and this is in keeping with the result of our study.[8] Post-operative weight gain was calculated in patients after 3 months. It was noticed that patients who underwent laparoscopic method showed an average weight gain of 4.2 kgs while, those patients who underwent open surgery had 3.9 kg weight gain.

Diabetic control appeared to have improved in 6 patients who underwent laparoscopic approach. Diabetic control seemed to improve in 4 patients who underwent open surgery. 5 patients who underwent laparoscopic surgery developed new onset diabetes while 7 patients who underwent open surgery developed new onset endocrine insufficiency. In 11 patients who underwent laparoscopic surgery, the diabetic control was found to have worsened, while the diabetic control of 13 patients who underwent open surgery worsened. In our series, most of the patients did not show improvement in endocrine and exocrine functions of the pancreas, rather a significant proportion of patients showed deterioration of these functions. Similar to our study, Adolf et al reported long-term pain relief in 93% of patients, but there was no improvement in endocrine and exocrine functions. However, Palanivelu et al and Sielezneff et al reported improved or static endocrine and exocrine functions following surgery. In none of the patients who underwent surgery did the pain worsen after the surgery.[9] Pain relief improved in 16 patients who underwent laparoscopic repair and 19 patients who underwent opens surgery.

The post-operative pain relief remained the same in 6 patients who underwent laparoscopic surgery and 8 patients who underwent open surgery. This was found to be of no statistical significance. Schnelldorfer et al reported the experience of 372 patients, out of which only 50% the patients had significant pain control, 62% of the patients returned to work.[10] Hence, laparoscopic method can be preferred over the open technique. However, this study is limited by the fact that the procedures were performed by trained hands in a high-volume centre where apt, state of the art technology is available, such as vessel sealer like ligasure cautery, ultrasound energy using harmonic scalpel and an adequate viewing screen. Hence, the findings can be affected by the surgical skill of the surgeon involved and various technical difficulties.

CONCLUSION

The two methods of pancreaticojejunostomy are comparable to each other. However, the laparoscopic method, has its advantages over the open technique in terms of lesser amount of blood loss encountered, faster onset of enteral nutrition and lesser duration of hospital stay. Intra and post-operative complication profile are similar for both methods. Post-operative endocrine insufficiency at the end of 6 months are similar for both techniques. Post-operative pain relief at the end of 3 months are also similar in both.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Ambore V, Vismaya KB, Rashid R. Comparative study of surgical management of chronic pancreatitis. Int Surg J 2023;10:1934-9.