



RESEARCH ARTICLE

SINGLE LAYER PANCREATICOJEJUNOSTOMY (PJ) IN SURGERY FOR CHRONIC CALCIFIC PANCREATITIS – A SINGLE CENTRE OBSERVATIONAL STUDY

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ABSTRACT

Chronic pancreatitis is characterized by progressive, inflammatory and irreversible fibrosis of the pancreas. Surgical intervention is warranted in a significant number of patients and the surgical options can broadly be classified into drainage, resection and hybrid procedures. Pancreaticojejunostomy anastomosis following these procedures is conventionally done in two layers. In our centre, we routinely perform a single layer anastomosis. This study, which involved 102 patients, shows that single layer modification is as effective as the conventional double layer anastomosis in terms of morbidity, mortality and pain relief.

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INTRODUCTION

Chronic pancreatitis is characterized by progressive, inflammatory and irreversible fibrosis of the pancreas which can give rise to pain, pancreatitis associated local complications, exocrine and endocrine insufficiency (Elsevier Saunders, 7<sup>th</sup> edition). Most patients are managed conservatively. The indications for surgery are intractable pain, complications like pseudocyst, biliary and duodenal obstruction, vascular complications and malignant transformation. Surgical management of chronic calcific pancreatitis has evolved from simple duct drainage to duodenum preserving pancreatic head resection. Numerous technical modifications have been adopted to improve the outcome of various procedures.

Background of the study

Conventionally, reconstruction following pancreatic drainage or resection procedure is done in two layers<sup>2</sup>. A single layer pancreaticojejunal reconstruction is routinely being done in our institute. While most of the available literature favours a two layered anastomosis, only few studies are available with regard to single layered anastomosis.

Since the pancreas is firm to hard in chronic pancreatitis, We consider a single layer anastomosis will be as safe as a double layer anastomosis.

Aim of the Study

To analyze the outcomes of single layered pancreaticojejunostomy anastomotic technique in relation to morbidity and mortality and also to analyze the indications for surgery, type of surgical procedure, pain relief and postoperative complications in patients with chronic calcific pancreatitis as secondary endpoints.

MATERIALS AND METHODS

This is a retrospective study done by analysing prospective data at Rajiv Gandhi Government General Hospital, Chennai by the Institute of Surgical gastroenterology between June 2011 and October 2015. 102 patients with chronic calcific pancreatitis underwent single layer PJ after Head coring procedure for intractable abdominal pain. The diagnostic workup includes measuring serum amylase, lipase, CA19- 9 and ultrasonography (USG), upper gastrointestinal endoscopy, portal venous Doppler, computed tomography (CT) scan, and magnetic resonance cholangio pancreatography (MRCP). These patients presented to us with a typical history of epigastric pain radiating to the back. Ducts that are less than 5

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mm in diameter at the neck are considered as non dilated or small ducts. Main duct was considered as dilated if it measured greater than 7 mm in its maximal diameter. Exocrine function of the pancreas was assessed by the presence or absence of steatorrhea. Steatorrhea is defined as frequency of more than three stools per day with nauseating smell and greasy consistency. Pain was assessed using visual analogue scale (VAS) and frequency of pain attacks along with analgesic requirement. Surgery was offered to those patients who had visual analogue scale pain score more than 8.

### Exclusion Criteria

Patients with active disease or acute exacerbation based on elevated amylase and lipase and also those with elevated CA 19-9 were excluded from study group. Patients who failed to maintain abstinence and those with less than 6 months of post operative follow up were excluded from the study.

### Surgical Procedure

The head coring procedure was performed exactly as described by Frey and Smith. In most cases, we identified the duct by aspiration method. After laying open the major duct, Coring was done at the head and uncinata process of the pancreas using diathermy and harmonic scalpel and it was continued without breaching the posterior pancreatic capsule. Types of surgical procedures performed included Frey's procedure, Izbiki procedure, lateral pancreaticojejunostomy. The amount of tissue cored was measured in grams. After perfect hemostasis, a Roux-en-Y single layer pancreaticojejunostomy was constructed using a continuous 2-0 prolene. All the cored out pancreatic tissue was sent for histopathological examination.

### Description of the Anastomotic Technique

Single layer anastomosis starting at the inferior border of the pancreas, at a point approximately 2 cm medial to the corner of the laid open duct, is carried laterally to include the tail and from there on proceeds medially along the superior border and completed just 1 cm medial to the corner of the laid open duct. Another suture, starting from the same site of the first suture is used to carry through the anastomosis medially along the inferior border, encompass the head, including the cored out pancreatic margin and turn back along the upper border to finish at the point of completion of the earlier suture line. This anastomosis is generally performed in a continuous fashion. Interval between bites is maintained at 3mm and the distance of the bite from the mucosal edge of the bowel wall is kept at 5mm. The pancreatic full thickness bites includes pancreatic capsule and adequate purchase of the parenchyma. Including the duct mucosa on the pancreatic side is generally avoided in order to avoid inadvertent occlusion of the minor pancreatic ducts, except however in places where the pancreatic parenchyma is too thin for an adequate purchase. Intestinal continuity is reestablished by means of an end-to-side stapled or sutured jejunostomy. The mesenteric and mesocolic windows are closed to prevent internal herniation. All the cored out pancreatic tissue was sent for histopathological examination. Most patients were discharged by 8<sup>th</sup> postoperative day after suture removal.

**Results of our study:** Totally 102 patients were studied. 77 (74.5%) were males and 25 (24.5%) were females. In males

from 13 to 62 years of age were studied (mean 39.56) and in females age range was 15-57 (mean 29.04). 63 patients had consumed alcohol (61.8%). Dilated duct >7mm diameter was seen in 92.1% of the patients. Commonest clinical presentation was abdominal pain in all 102 patients (100%). In analysis of severity of pain in a scale of 1 to 10, patients were asked to express their pain score. Pain scores of 8 and 9 were most common (Tab.1) Median pain score was 8(IQR 1).

**Table 1. Preoperative Pain score**

		pain score			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5	3	2.9	2.9	2.9
	6	8	7.8	7.8	10.8
	7	9	8.8	8.8	19.6
	8	42	41.2	41.2	60.8
	9	40	39.2	39.2	100.0
	Total	102	100.0	100.0	

94 (92.2%) patients complained of back pain and 100 (98%) patients had developed reasonable weight loss. On studying the complications UGI bleed was present in 3(2.9%) patients. Jaundice due to bile duct obstruction was present in 11(10.8%) patients. Portal hypertension (PHT) manifested by varices or ascites or splenomegaly was present in 9(8.8%) patients. None of our PHT patients had bled out of varices. 9(8.8%) developed pseudocyst. Steatorrhea was seen in 7(6.9%) patients. Diabetes Mellitus (DM) was present in 11 patients (11.8%) and all the diabetic patients had preexisting DM and our study didn't reveal any new onset of Diabetes in the follow up period of upto 4 years. Table 2 shows the type of surgical procedures done for specific patients.

**Table 2. Type of Surgical procedure performed**

Surgical procedure		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Declined surgery	2	2.0	2.0	2.0
	Freys	88	86.3	86.3	88.2
	IZBIKI	2	2.0	2.0	90.2
	LPJ	10	9.8	9.8	100.0
	Total	102	100.0	100.0	

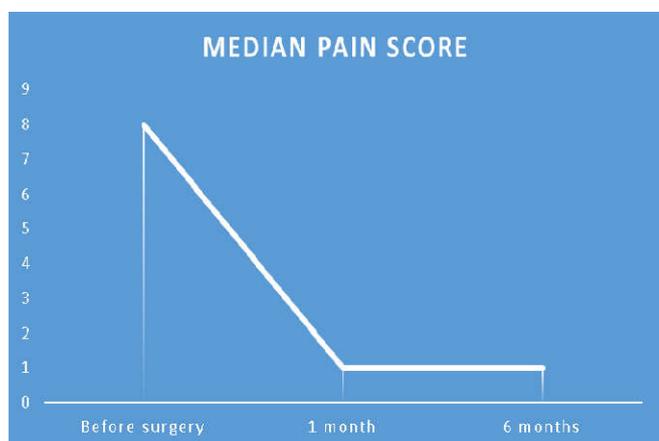
Out of 102 patients two patients were put on conservative treatment as they were not medically fit for surgery. 5 patients also underwent distal pancreatectomy and splenectomy along with Frey's as they had multiple impacted stones in the tail and splenic vein thrombosis and sinistral PHT. Cholecystectomy was done in 3 cases due to associated cholelithiasis. Choledochoduodenostomy was also added in one patient who had CBD obstruction due to severe pancreatitis. Blood loss ranged between 100 to 350 ml (Average: 183.7ml with 95% CI 170.58-196.81) We took an average of 2 hours and 56 minutes for surgery. Range was 2 hours to 3.3 hours [95% CI- 2.9(2hr 54 mts)- 2.98 (2hr 58 mts)]. Average Weight of Cored Tissue was 5.98 gms (95% CI – 5.68 – 6.27). 15 (14.6%) patients developed Wound Infection and 9 patients needed blood transfusion (8.7%). Drains were routinely placed in all our patients and drain removal was done at the earliest on 5<sup>th</sup> day. We removed drains on 9<sup>th</sup> day for all patients except for one patient who needed drainage tube (DT) upto 11<sup>th</sup> day due to grade B leak. We define the leak by the following definition: "Value of DT amylase 3 times more than that of the Sr. amylase on the 3<sup>rd</sup> postoperative day" and we classified our

leaks as per ISGPF classification. In our series Type A leak was seen in 26 patients and type B leak was present in 1 patient. We routinely measure DT amylase and Sr.amylase on 3<sup>rd</sup> and 5<sup>th</sup> post operative days. All our patients with leak settled with conservative management. On following up the patients complete pain relief was present in 82% of patients and decreased pain relief was seen in 8%. Ten percent of the patients didn't have any pain relief.

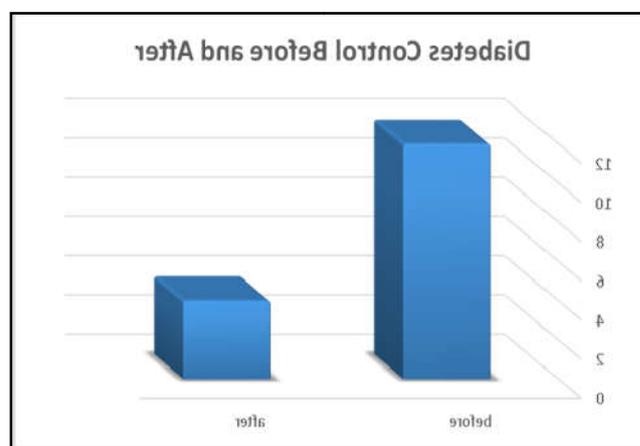
which is statistically significant (<0.001) (Fig.3). Finally the mortality in our study is nil. The morbidity rate of a conventional double layered pancreaticojejunostomy is 19% and after a follow up period of 24 months, 95 % of patients experienced pain relief (Tab.3). These values are comparable with single layered anastomotic technique performed in our study with morbidity rate of 18% and pain relief in 90% of patients.

**Table 3. Comparison of post operative variables between conventional double layered anastomosis and single layered pancreaticojejunostomy anastomosis**

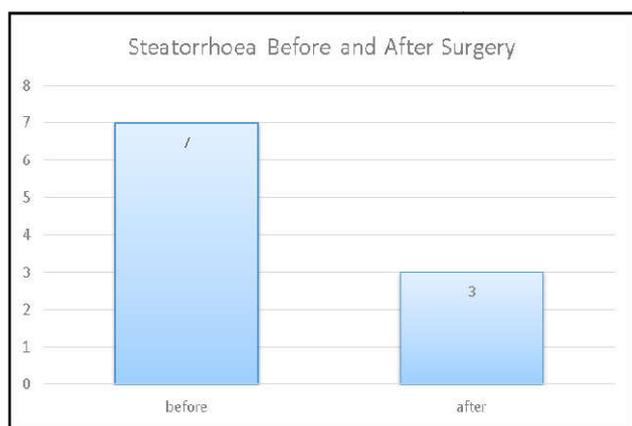
	Two layered pancreaticojejunostomy <sup>6a</sup>	Single layer pancreaticojejunostomy
Operating time (min)	230 ± 79	165 ± 45
Blood loss (mL)	111 ± 79	183 ± 13
MORBIDITY		
Pancreatic fistula, B and C	0	1
Postoperative hemorrhage	1	1
Pulmonary infection	2	1
Abdominal infection	4	15
Mortality	0	0
Postoperative hospital stay (days)	8.3 ± 3.1	7.0 +/-4.0
Pain relief	95%	90%



**Fig. 1. Median pain score**



**Fig. 3. Diabetes Control**



**Fig. 2. Steatorrhea**

Median pain score before surgery was 8, (IQR -1). All patients who had pain relief (90%) showed their pain score coming down to 1 upto 6th month after surgery (Fig.1). 5 patients relapsed showing pain score of 4 after 6 months. Mean duration of stay was 7 days. Out of 7 patients who had steatorrhea before surgery, 3(50%) had resolution of steatorrhea which is statistically significant, (p value - <0.01) (Fig.2). As for as the control of Diabetes Mellitus was considered, out of 12 patients 4 patients had a control (36.7%)

**DISCUSSION**

In chronic pancreatitis progressive inflammation and fibrosis not only affects the duct, it also decrease the number and function of acinar cell and islet cell resulting in both exocrine and endocrine function insufficiency. Diagnosis of CP is based on history of abdominal pain and radiologic confirmation of fibrosis and calcification of the gland (Maj Aditya, 2012). In CP ,pain is the most common symptom and presents in a heterogeneous pattern ranging from relapsing episodes to persistent pain of varying severity . The etiopathogenesis of pain seems to be multifactorial and complex and its mechanism remains unclear and debated (Demir, 2011; Sakorafas, 2007 and Chauhan, 2010). Various theories proposed to explain the cause of pain includes intraductal or interstitial hypertension, neurogenic theory, central sensitization theory, Acute exacerbation of CP and local complications of CP (Sakorafas, 2007). This multifactorial etiology of pain may explain why one therapeutic method for the management of pain does not work in all patients and in different stages of the disease. CP can lead to impairment of quality of life, inability to work, and very rarely decrease life expectancy (Mayerle, 2007). Optimal treatment requires a multidisciplinary team to follow a systematized and a well structured therapeutic plan. Main aim of the treatment in CP

patients are to relieve pain and preserve endocrine and exocrine function, control of pancreatitis associated complications and improvement in quality of life. Although medical treatment and endoscopic intervention are primarily offered to these patients, approximately 40-75% will ultimately require surgery during the course of their disease (Layer, 1994 and Di Sebastiano, 2006). Severe pancreatic type of pain, inability to work, early retirement and analgesic addiction and is the main indication of surgery in CP (Sakorafas, 2007). Endoscopic drainage involves sphincterotomy, dilatation of strictures and removal of stones and has success rate of 30-100% (Rosch, 2002).

Nealon *et al* suggested early operative drainage before the development of irreversible functional impairment in patients with CP with dilatation of MPD (Nealon, 1993). A prospective, Randomized trial conducted by Dite *et al* comparing Endoscopic and surgical therapy for chronic pancreatitis concluded that surgery is superior to endotherapy for long term pain reduction, however endotherapy can be offered as a first line treatment and its equivalent to surgery for short term pain control (Dite, 2003). Cahen *et al* found that patient undergoing surgery had lower Izbicki pain score (25 vs 51%,  $p < 0.001$ ) and better SF 36 score ( $P = 0.007$ ) compared to endotherapy. At the end of follow up, complete or partial pain relief was achieved in 32% of endoscopy arm compared with 75% of patients undergone surgery ( $P = 0.007$ ). This study concluded that surgical drainage of the pancreatic duct was more effective than endoscopic treatment in patients with obstruction of the pancreatic duct due to CP (Djuna, 2007). LPJ (Partington-Rochelle) offers good short term pain relief in 61-91% patients. However pain recurred with 3-5 years in upto 30% patients. The main cause of failure in this surgery was lack of adequate decompression of proximal ducts in Head of pancreas and presence of head mass (Mannell, 1988; Taylor, 1981 and Frey, 1994). In 1987, Frey described a novel procedure which combines partial resection of the head of the pancreas (resection) with lateral pancreaticojejunostomy (drainage). This hybrid procedure dealt both removal of epicenter of pain by partial resection of the pancreatic head and decompress both ducts of santorini and ducts in the uncinata process. This LR-LPJ provides good pain relief with a modest increase in endocrine and exocrine insufficiency and a significant increase in weight (Frey, 1994). Falconi *et al*. studied on long term results of Freys procedure for CP showed that the percentage of pain free patients was 94.7%, 93.7%, 87.5%, and 90% at 1, 2, 3 and 4/5 years after surgical operation respectively. Both body mass index and quality of life showed statistically significant improvements at all follow up intervals (Massimo Falconi, 2006). In a 9 year follow up study published by Strate *et al*. in 2005, Both (Frey's Vs Beger) procedure showed equivalent mortality, quality of life, pain, exocrine and endocrine insufficiency (Tim Strate, 2005). But another RCT comparing Frey's procedure with Beger found that Frey's procedure was associated with lower complication rate (9 % Vs 15%) (Izbicki, 1995). A single layer anastomosis, can be as safe and effective as a two layer anastomosis. Theoretically, lesser suture means lesser minor ducts incorporated, and hence a lesser chance of post operative pancreatic leak and a better chance of pain relief. At the same time it also decrease the OR time significantly as shown in this study. Single layer anastomosis is also associated with less injury to adjacent organs. The morbidity and mortality rates are comparable between single and double layer Pancreaticojejunostomy anastomosis which can be clearly seen

in our study. The cost benefit of using less suture material is an added advantage of a single layer anastomosis

## Conclusion

The firmness of the pancreatic parenchyma in chronic pancreatitis ensures a single layer anastomosis, if performed meticulously, can be as safe and effective as a two layer anastomosis. Lesser suture means lesser minor ducts incorporated, and hence a lesser chance of post operative pancreatic leak and a better chance of pain relief. At the same time it also decrease the OR time significantly as shown in this study. Single layer anastomosis is also associated with, albeit theoretically, less injury to adjacent organs. The morbidity and mortality rates are comparable between single and double layer Pancreaticojejunostomy anastomosis. Hence, We strongly recommend single layer anastomosis while performing Frey's procedure in Chronic pancreatitis. But it needs further validation by Randomized trial. Even though the cost benefit that is accrued with the usage of less suture material is miniscule with regard to a single patient, the long term benefits of such a measure in government funded institutions like ours cannot be overemphasized.

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