



Outcome of Longitudinal Pancreatico-Jejunostomy on Pain Control and Pancreatic Function in Chronic Pancreatitis

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Abstract

Background: Outcome of drainage operation for chronic pancreatitis are variable. The present study is taken to observe effect of longitudinal pancreatico-jejunosomy (LPJ) on pain control and pancreatic function in chronic pancreatitis in our setting. **Material & Methods:** Thirty-three patients who underwent LPJ for symptomatic chronic pancreatitis for one year period presented with abdominal pain (100%), steatorrhea (30.3%), diabetes (66.7%) and weight loss (78.8%). Definitive diagnosis was made on the basis of ultrasonography and MRCP findings. LPJ (Partington-Rochelle) operation was done in all patients. Pain (using visual analogue scale), glycemic status (using FBS, 2hABF, HbA1c), body weight, serum zinc levels (as a marker of exocrine function), and serum insulin level (as a marker of endocrine function) were measured immediately after admission and 3 months after operation. **Results:** Three months after operation pain was completely disappeared in 23 (69.7%) patients, it persisted in different grade in 10 (30.3%) patients and the pain reduction rate was significant. Twenty two patients who had diabetes prior to surgery, their glycemic status significantly decreased and serum insulin level significantly increased (preoperative; 7.1 ± 5.1 μ U/L, postoperative; 14.3 ± 4 μ U/L) in 22 patients with DM after surgery. Serum zinc level increased (preoperative; 80.8 ± 24.5 μ g/dl, postoperative; 85.3 ± 24.7 μ g/dl) 3 months after surgery but the difference was not significant ($p=0.571$). However the body weight of all patients were significantly increased after operation. **Conclusions:** LPJ reduces abdominal pain and improves both exocrine and endocrine function in patient with chronic pancreatitis. Serum zinc levels can be considered as a tool of exocrine function.

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Received: 24 January 2022

Revised: 26 March 2022

Accepted: 05 April 2022

Published: 22 April 2022

Keywords:- Chronic pancreatitis, LPJ, Pain control, pancreatic function.

INTRODUCTION

Longitudinal pancreatico-jejunostomy (LPJ) is indicated for the treatment of symptomatic chronic pancreatitis with pancreatic duct obstruction and a dilated main pancreatic duct usually more than 7 mm in diameter. But the outcomes of LPJ for the treatment of chronic pancreatitis are variable. Nealon et al.^[1] reported that early operative drainage before the development of irreversible functional impairment in patients with chronic pancreatitis and associated dilation of the main pancreatic duct delay the progressive loss of pancreatic function. Prinz et al.^[2] published a report with 100 patients with chronic pancreatitis who underwent drainage operation. They found 80% patient had substantial improvement or complete resolution of pain. Thirty percent patient who had diabetes prior to operation, 16% had no diabetes after operation. Only 18% patients needed pancreatic enzyme for controlling steatorrhea. Sato et al.^[3] observed only a minimum improvement of fat absorption after LPJ. Izbicki et al.^[4] also concluded that an early surgical or endoscopic drainage for the hypertensive pancreatic duct system would delay onset of exocrine or endocrine insufficiency. As the results of pancreatic function after LPJ is variable, this study is taken to recheck the outcome of pain control and pancreatic function after LPJ. Pancreatic juice contains zinc in high concentrations as a constituent of metallo-enzymes, such as carboxypeptidase and carbonic anhydrase. It has been suggested that the pancreas plays a major role in zinc homeostasis.^[5] Zinc

deficiency is recorded in patients with chronic pancreatitis, and observed that it correlates with exocrine and endocrine insufficiency.^[6] It has also been reported a positive correlation of erythrocyte zinc and elastase 1 levels in patients with CP, the latter being a measure of pancreatic exocrine function.^[6] Dutta et al. have shown increased zinc excretion in patients with pancreatic exocrine insufficiency.^[7] Taking all above published data in consideration, serum zinc level measurement is taken as an indicator of exocrine function in the present study. Serum insulin level is measured for assessing endocrine function. Visual analogue scale is taken for assessing pain control.^[8,9,10,11,12,13]

MATERIAL AND METHODS

This is a cross sectional prospective study which was done in the Department of Hepatobiliary Pancreatic and Liver Transplant Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, from July 2018 to June 2019 with 33 patients who underwent LPJ for symptomatic chronic pancreatitis. There were 11 males and 22 females and the age was mean 31 (± 13) years. Patients were presented with abdominal pain (n=30, 100%), steatorrhea (n=10, 30.3%), diabetes (n=22, 66.7%) and weight loss (n=26, 78.8%). Diagnosis was confirmed by ultrasonography and MRCP. The MRCP findings were; multiple stones in main pancreatic duct (n=31, 93.9%), presence of parenchymal calcification (n=9, 27.3%), dilated main pancreatic duct (10.2 ± 3.4 mm), and positive pancreatic atrophy (n=15, 45.5%). After taking all necessary preparation, LPJ

(Partingtong-Rochelle) operation was done in all patients. Per-operatively 10ml bupivacaine was injected in the loose areolar tissue around celiac trunk as a measure of chemical neurolysis for relieving upper abdominal visceral pain. Pain was measured using visual analogue scale (VAS) immediately after admission and 3 months after operation and it was labeled as mild (VAS; 1-3), moderate (VAS; 4-6) and severe (VAS; 7-10). Glycemic status of each patient was determined by measuring fasting blood sugar level (FBS), blood sugar level 2 hours after break-fast (2hABF) and glycosylated hemoglobin (HbA1C) level at immediately after admission and 3 months after operation. Body weight was taken immediately after admission and 3 months after operation. The blood samples were taken pre-operatively and 3 months after operation for measurement of serum zinc and serum insulin level. Statistical analysis was done by computer based statistical software (SPSS) version 20. It was done by paired t-test for quantitative variables and Chi square test for categorical variables.

RESULTS

Stones were cleared completely in 23 (69.7%) patients except 9 who had parenchymal calcification and one who had stones in the uncinata process. There was no mortality after surgery but morbidity occurred in 7 patients (wound infection; 4, Melaena; 2, Diarrhoea; 1). Three months after operation pain was completely disappeared in 23 (69.7%) patients, but pain persisted in different grade in 10 (30.3%) patients. Twenty two (66.7%) patients had severe pain, 8 (24.2%) had moderate pain

and 3 (9.1%) had mild pain before surgery. Three months after operation only one (3.0%) patient had severe pain and 3 (9.1%) patients had moderate and 6 (26.1%) patients had mild pain. The pain reduction was significant ($p=0.023$) three months after surgery when compared to preoperative level [Table 1]. Twenty two patients had diabetes prior to surgery; the fasting blood sugar levels of them were 10.3 ± 4.1 mmol/L, two hours after breakfast blood sugar levels were 13.9 ± 5.9 mmol/L and glycosylated hemoglobin (HbA1c) were $8.8\pm 2.5\%$. Three months after surgery the fasting blood sugar, two hours after breakfast blood sugar and glycosylated hemoglobin (HbA1c) levels of 22 patients were 6.2 ± 0.9 mmol/L, 9.2 ± 1.6 mmol/L and $6.2\pm 0.7\%$ respectively. Glycemic status was significantly ($p<0.05$) decreased 3 months after surgery when compared to pre-operative levels [Table 2]. Serum insulin levels were measured in all patients, it was 7.1 ± 5.1 μ U/L in 22 patients with DM and 8.4 ± 11.5 μ U/L in 11 patients without DM. Serum insulin levels were significantly ($p<0.05$) increased in patients with DM (14.3 ± 4 μ U/L) and it was similar in patients without DM (9.9 ± 4.5 μ U/L) three months after surgery [Table 3]. Serum zinc level was measured in all patients as marker of exocrine function of pancreas. The normal serum zinc level is 80 to 120 μ g/dl (reference value). Serum zinc level was 80.8 ± 24.5 μ g/dl in all patients before operation and it increased to 85.3 ± 24.7 μ g/dl 3 month after operation, but the difference was not significant ($p=0.571$). However the body weight of all patients were significantly ($p<0.05$) increased after operation [Table 4].

Table 1: Pain after LPJ in patients with chronic pancreatitis (N=33).

Variables	Preoperative data		Data 3 months after LPJ		P value
	N	%	N	%	
Mild Pain	3	9.09	9	27.27	0.023
Moderate Pain	8	24.24	3	9.09	
Severe pain	22	66.67	1	3.03	
Total	33	100	13	39.39	

Table 2: Glycemic status after LPJ in 22 diabetic patients with chronic pancreatitis.

Variables	Preoperative data	Data 3 months after LPJ	P value
FBS (mmol/L)	10.3±4.1	6.2±0.9	0
2hABF (mmol/L)	13.9±5.9	6.2±0.10	0.002
HbA1c (%)	13.9±5.10	6.2±0.11	0

Table 3: Serum insulin levels and insulin requirement for DM management before and after LPJ.

Variables	Preoperative data	Data 3 months after LPJ	P value
CP with DM (n=22)	7.1±5.1	14.3±4.	0
CP without DM (n=11)	8.4±11.5	9.9±4.5	0.739
Insulin requirement for DM management	22.4±7.2	16.8±3.6	0

Table 4: Serum Zinc level and changes of body weight after LPJ in patients with chronic pancreatitis.

Variables	Preoperative data	Data 3 months after LPJ	P value
Zinc level (µg/dl)	80.8±24.5	85.3±24.7	0.571
Body weight (kg)	48.9±8.4	51.8±8.3	0

DISCUSSION

Partington-Rochelle procedure was done in our setting. Our study showed that abdominal pain was completely disappeared in 70% patients 3 months after surgery.^[14,15] In their study Nealon et al.^[16] showed that surgical drainage procedure relieved abdominal pain in 86% patients and prevented recurrent acute exacerbations in 91% patients. Sato et al.^[3] reported 90% reduction of abdominal pain after drainage procedure. Tanaka et al.^[17] reported in a study that abdominal pain relieved in 97% patients during long-term follow up. Several studies showed that short-

term pain relief is about 80% after LPJ operation.^[18,19,20,21,22] Results of all these published studies including our's are similar and support the improvement of pain control after LPJ operation. Since the loss of functional pancreatic tissue is absent in LPJ operation exocrine and endocrine functions are seemed to be well preserved after LPJ but overall improvement in these parameters are variable.^[2,20] The present study shows that the patient who had diabetes, their glycemic status significantly reduced after LPJ. The patient who needed insulin after operation, their insulin requirement reduced than preoperative

amount. The serum insulin levels were markedly increased after LPJ in patient with diabetes. All these findings of the present study support the improvement endocrine function of LPJ operation in chronic pancreatitis. In their study, Prinz et al.^[2] reported that 30% of patients who had diabetes prior to operation, disappeared in 16% patients and persisted in 14% after operation. Abhishek et al.^[23] reported the improvement of endocrine function after LPJ. Some authors recommended that early decompression of pancreatic duct improved the endocrine as well as exocrine function after LPJ.^[4,17,20] These published articles did not check serum insulin concentration which was measured in the present study that strongly supported our statement of improvement of endocrine function after LPJ in chronic pancreatitis. Assessment of exocrine function of pancreas is a challenging job. Because fecal fat estimation,^[23,24] serum elastase estimation or para-aminobenzoid acid (PABA) tests for assessing exocrine function are cumbersome and costly procedure.^[25,26] Pancreatic juice contains high concentration of zinc and zinc deficiency influences pancreatic function. It assumes that zinc deficiency could be due to pancreatic exocrine insufficiency as evidenced by the direct correlation between erythrocyte zinc and pancreatic stool elastase 1 level.^[6] An animal study showed the ultrastructural

REFERENCES

1. Nealon WH, Thompson JC. Progressive loss of pancreatic function in chronic pancreatitis is delayed by main pancreatic duct decompression. A longitudinal prospective analysis of the modified

changes of pancreatic acinar cells in rats fed with a zinc-deficient diet. They showed the destruction of zymogen granules and lysosomes indicating that zinc has a role in maintaining the structural integrity of pancreatic acinar cells.^[27] On the basis of this fact serum zinc levels is checked in the present study as assessing tool of exocrine function. The interesting finding of the present study is that serum zinc level is increased 3 months after surgery when compare to preoperative levels. This finding supports the improvement of exocrine function after LPJ operation. Another auxiliary finding that supports the improvement of exocrine and endocrine is significant increment of patient's body weight after LPJ operation.

Limitations of the study

This study has some limitations, such as its cross sectional prospective study, small sample size and lack of long-term follow-up.

CONCLUSIONS

In conclusion, this short-term observation study shows that LPJ improves abdominal pain and both exocrine and endocrine function in patient with chronic pancreatitis. Serum zinc levels can be considered as a tool of exocrine function. The long-term prospective study will be required for final comment.

puestow procedure. *Ann Surg.* 1993;217(5):458-66. doi: 10.1097/0000658-199305010-00005.

2. Prinz RA, Greenlee HB. Pancreatic duct drainage in 100 patients with chronic pancreatitis. *Ann Surg.* 1981;194(3):313-320. doi:10.1097/0000658-198109000-00009



3. Sato T, Noto N, Matsuno S, Miyakawa K. Follow-up results of surgical treatment for chronic pancreatitis. Present status in Japan. *Am J Surg.* 1981;142(3):317-23. doi: 10.1016/0002-9610(81)90338-x.
4. Izbicki JR, Bloechle C, Knoefel WT, Rogiers X, Kuechler T. Surgical treatment of chronic pancreatitis and quality of life after operation. *Surg Clin North Am.* 1999;79(4):913-44. doi: 10.1016/s0039-6109(05)70051-7.
5. McClain CJ. The pancreas and zinc homeostasis. *J Lab Clin Med.* 1990;116: 275-276.
6. Girish BN, Rajesh G, Vaidyanathan K, Balakrishnan V. Zinc status in chronic pancreatitis and its relationship with exocrine and endocrine insufficiency. *JOP.* 2009;10(6):651-6.
7. Dutta SK, Procaccino F, Aamodt R. Zinc metabolism in patients with exocrine pancreatic insufficiency. *J Am Coll Nutr.* 1998;17(6):556-63. doi: 10.1080/07315724.1998.10718803.
8. Partington PF, Rochelle RE. Modified Puestow procedure for retrograde drainage of the pancreatic duct. *Ann Surg.* 1960;152(6):1037-1043. doi:10.1097/00000658-196012000-00015
9. DUVAL MK Jr. Caudal pancreatico-jejunostomy for chronic relapsing pancreatitis. *Ann Surg.* 1954;140(6):775-85. doi: 10.1097/00000658-195412000-00001.
10. PUESTOW CB, GILLESBY WJ. Retrograde surgical drainage of pancreas for chronic relapsing pancreatitis. *AMA Arch Surg.* 1958;76(6):898-907. doi: 10.1001/archsurg.1958.01280240056009.
11. Whipple AO. Radical Surgery for Certain Cases of Pancreatic Fibrosis associated with Calcareous Deposits. *Ann Surg.* 1946;124(6):991-1006.
12. Traverso LW, Kozarek RA. Pancreatoduodenectomy for chronic pancreatitis: anatomic selection criteria and subsequent long-term outcome analysis. *Ann Surg.* 1997;226(4):429-35. doi: 10.1097/00000658-199710000-00004.
13. Beger HG, Büchler M. Duodenum-preserving resection of the head of the pancreas in chronic pancreatitis with inflammatory mass in the head. *World J Surg.* 1990;14(1):83-7. doi: 10.1007/BF01670550.
14. Frey CF, Amikura K. Local resection of the head of the pancreas combined with longitudinal pancreaticojejunostomy in the management of patients with chronic pancreatitis. *Ann Surg.* 1994;220(4):492-504. doi: 10.1007/BF02348284.
15. Izbicki JR, Bloechle C, Broering DC, Kuechler T, Broelsch CE. Longitudinal V-shaped excision of the ventral pancreas for small duct disease in severe chronic pancreatitis: prospective evaluation of a new surgical procedure. *Ann Surg.* 1998;227(2):213-219. doi:10.1097/00000658-199802000-00010
16. Nealon WH, Matin S. Analysis of surgical success in preventing recurrent acute exacerbations in chronic pancreatitis. *Ann Surg.* 2001;233(6):793-800. doi: 10.1097/00000658-200106000-00009.
17. Tanaka M, Matsumoto I, Shinzeki M, Asari S, Goto T, Yamashita H, et al. Short- and long-term results of modified Frey's procedure in patients with chronic pancreatitis: a retrospective Japanese single-center study. *Kobe J Med Sci.* 2014;60(2):E30-6.
18. Delcore R, Rodriguez FJ, Thomas JH, Forster J, Hermreck AS. The role of pancreaticojejunostomy in patients without dilated pancreatic ducts. *Am J Surg.* 1994;168(6):598-601. doi: 10.1016/s0002-9610(05)80129-1.
19. Ebbelhøj N, Borly L, Bülow J, Rasmussen SG, Madsen P, Matzen P, et al. Pancreatic tissue fluid pressure in chronic pancreatitis. Relation to pain, morphology, and function. *Scand J Gastroenterol.* 1990;25(10):1046-51. doi: 10.3109/00365529008997633.
20. Nealon WH, Thompson JC. Progressive loss of pancreatic function in chronic pancreatitis is delayed by main pancreatic duct decompression. A longitudinal prospective analysis of the modified puestow procedure. *Ann Surg.* 1993;217(5):458-66. doi: 10.1097/00000658-199305010-00005.
21. Schnelldorfer T, Lewin DN, Adams DB. Operative management of chronic pancreatitis: longterm results in 372 patients. *J Am Coll Surg.* 2007;204(5):1039-45. doi: 10.1016/j.jamcollsurg.2006.12.045.
22. Wilson TG, Hollands MJ, Little JM. Pancreaticojejunostomy for chronic pancreatitis. *Aust N Z J Surg.* 1992;62(2):111-5. doi: 10.1111/j.1445-2197.1992.tb00007.x.
23. Adams DB, Ford MC, Anderson MC. Outcome after lateral pancreaticojejunostomy for chronic pancreatitis. *Ann Surg.* 1994;219(5):481-7. doi: 10.1097/00000658-199405000-00006.



24. Bo-Linn GW, Fordtran JS. Fecal fat concentration in patients with steatorrhea. *Gastroenterology*. 1984;87(2):319-22.
25. Girish BN, Rajesh G, Vaidyanathan K, Balakrishnan V. Fecal elastase1 and acid steatocrit estimation in chronic pancreatitis. *Indian J Gastroenterol*. 2009;28(6):201-5. doi: 10.1007/s12664-009-0079-z.
26. Turecka-Kulesza E, Długosz J, Gabryelewicz A. Wartość testu NBT-PABA w diagnostyce przewlekłego zapalenia trzustki [Diagnostic value of the NBT-PABA test in chronic pancreatitis]. *Pol Arch Med Wewn*. 1990;84(6):363-9.
27. Koo SI, Turk DE. Effect of zinc deficiency on the ultrastructure of the pancreatic acinar cell and intestinal epithelium in the rat. *J Nutr*. 1977;107(5):896-908. doi: 10.1093/jn/107.5.896.

Source of Support: Nil, Conflict of Interest: None declared