Original Article

Outcome of Lateral Pancreato-Jejunostomy in Chronic Pancreatitis- Our Experience in two tertiary care hospitals

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Abstract

Background: Abdominal pain, one of the major symptoms of chronic pancreatitis, is believed to be caused by obstruction of the pancreatic duct system by stones or strictures. This results in increased intraductal pressure and parenchymal ischemia. Surgical decompression of the duct and ductal drainage can achieve best pain relieve and slow the progression of the disease. We awant to share our experience of surgical drainage of pancreatic duct in chronic pancreatitis in our hospital.

Methodology: We studied 37 cases of Chronic Pancreatitis operated in two hospitals between January 2010 and January 2019. Patients were selected with pre-operative ultrasonography, MRCP. Dilatation of the main pancreatic duct by at least 7 mm proximal to the obstruction were recruited for operation. We did Roux-Y lateral pancreato-jejunostomy (LPJ) for patients with obstruction of the pancreatic duct due to stricture or intraductal stones or both. We did additional distal pancreatectomy in case of stone in the tail area for 2 cases. We did one Frey's operation for stone and fibro-calcification of the head. We evaluated their symptoms, their duration, post-operative hospital stays and complications following surgery. We studied their pain control, recurrence and mortality during this period. We followed these patients for more than 5 years.

Results: We found 28 out of 37 patients got complete remission of the abdominal pain with no progression of their disease. Ultrasonic evidence of chronic pancreatitis has improved or resolved. Ductal diameter has decreased. They did not develop diabetes nor malabsorption. One had a recurrence of stone in the head within a year. Four died during this follow-up period. One died 2 months after LPJ due to massive gangrene of the small intestine distal to LPJ and jejuno-jejunostomy and subsequent short bowel syndrome. Other two developed carcinoma of the pancreas within one year and six months after LPJ respectively. Rate of pain free survival is about 75% and recurrence is 5%. Mortality during this follow up period is about10%

Conclusion: In our small series, we found that surgery if done early, can have good remission of abdominal pain and can slow the progression of chronic pancreatitis in majority of patient. Patient with chronic calcific pancreatitis and diabetes are likely to have unfavorable outcome even after decompressive surgery.

Key words: Pancreatic duct obstruction, Pancreatic duct stone, Lateral Pancreato-jejunostomy.

Introduction

Chronic pancreatitis is a progressive inflammatory disease of varied etiology characterized by destruction of pancreatic parenchyma and subsequent fibrosis.[1] There is an increased incidence in recent years. Its pathogenesis remains unknown. Alcohol is a major etiological factor in most industrialized countries.[2] Pancreatic duct calcifications are common in patients with chronic pancreatitis, and up to 90% of patients with alcoholic chronic pancreatitis have such stones during long-term follow-up.[3] Pancreatic duct calculi can lead to an outflow obstruction of the pancreatic duct, resulting in upstream hypertension, increased parenchymal pressure, and ischemia. Pain is the predominant symptom in most patients with chronic pancreatitis.[4] The etiology of pain is multifactorial, although ductal hypertension caused by stones or strictures is believed to be the major cause of pain in patients with chronic pancreatitis.[4-9] Removal of pancreatic duct stones decreases the pain. Additionally, restitution of pancreatic duct flow improves physiological function of the pancreas.[10-12]

A pancreatic duct obstruction due to main pancreatic duct stones can often be relieved by surgical or

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endoscopic techniques or extracorporeal shock wave lithotripsy (ESWL). Removing pancreatic stones endoscopically is less invasive compared to surgery but is more likely to be successful when the stone burden is small and located only in the main duct.[13-15] ERCP based extraction is a critical treatment for pancreatic duct stone. There is high possibility of acute pancreatitis following pancreatic duct cannulation.[8-10] Moreover, endoscopic removal has limitation in dealing with huge load of impacted stone and pancreatic duct stricture. Endoscopic extraction is also not able to achieve adequate drainage of the duct in a situation of multiple duct stricture. Pancreatic cancer may further complicate long standing disease, which should be treated by pancreatic resection.

Different surgical procedures can be chosen according to the location of the stones in the pancreatic duct. If the stones are mainly located in the body of the pancreas, they can be treated with Puestow-Gillesby procedure (pancreatico-jejunostomy), which is often used in patients with significant dilation of the pancreatic duct. Though Puestow –Gillesby first described this operation, but Partington –Rochelle modified this operation and performed long length LPJ. This operation is still known as Puestow operation. Resection of the tail of the pancreas with or without splenectomy is done if the stones are located in the tail of the pancreas. Sometimes the stones are found in the head of the main duct of the pancreas. In that case excision of the head is done with preservation of the duodenum and CBD. This is called Beger's procedure. Excision of the duct of Wirsung and Santorini in the head with long length LPJ is called Frey's operation. Some extreme cases require pancreato-duodenectomy (Whipple's procedure).

Pathophysiology

Pancreatic juice is supersaturated with calcium. Calcium is kept in solution by HCO_3, citrate, and pancreatic stone protein (PSP), and these factors are lower in patients with chronic pancreatitis.[16] Alcohol and chronic pancreatitis decrease the secretion of PSP, which causes the crystallization and deposition of calcium carbonate and the formation of stones.[17] (Fig.-8). Pancreatic duct strictures cause stagnation of pancreatic juice and enhance the formation of pancreatic stones. Hypercalcemia may cause a rise in the level of calcium in pancreatic juice, which accelerates the formation of pancreatic stones in patients with hyperparathyroidism. Calcium precipitates as $CaCO_3$. These stones are radio-opaque and readily visible on plain x-ray unlike gall stone. (Fig-1)

Fig-1: *Stones are seen in the head, body and tail of the pancreas*

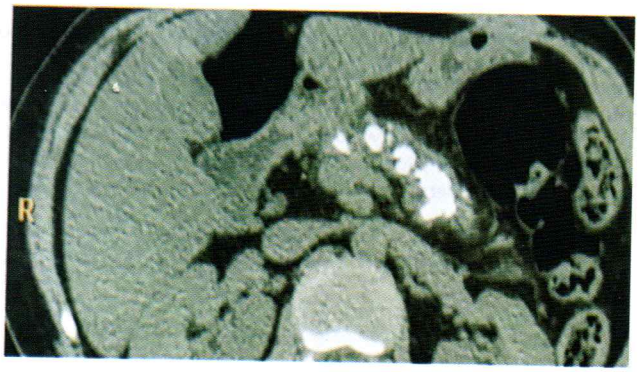

Fig-2 :*Stones are seen in the MPD on limited CT*

Fig-3: *Stones are seen on MRCP*

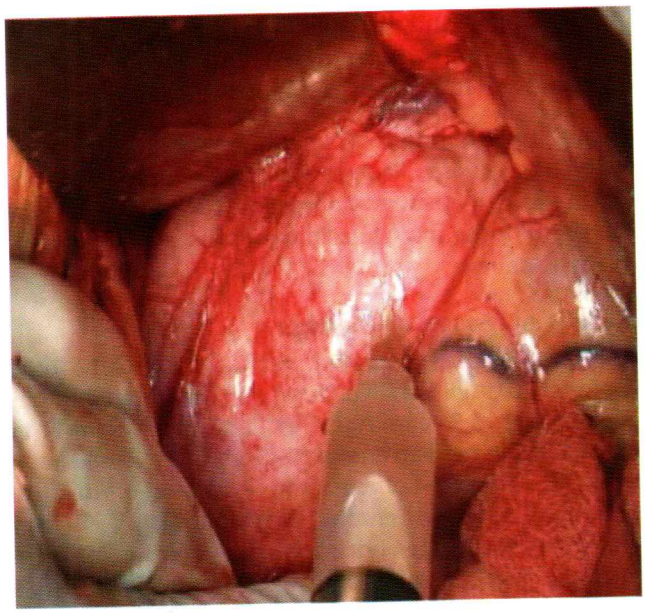

Fig-4: *Obstructed MPD is located by aspiration at operation*

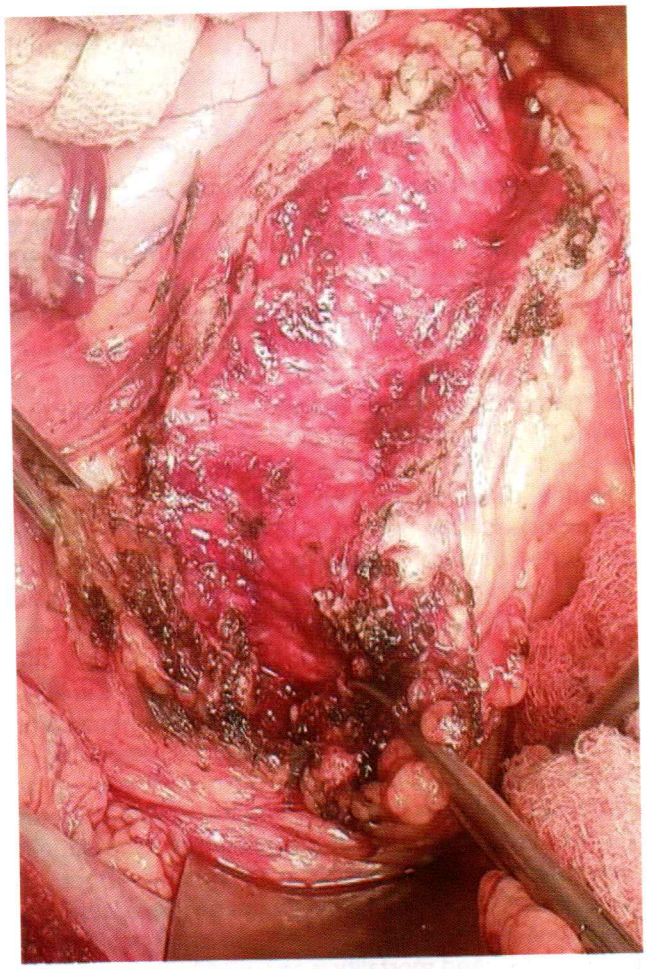

Fig-5: *Pancreatic duct is laid open*

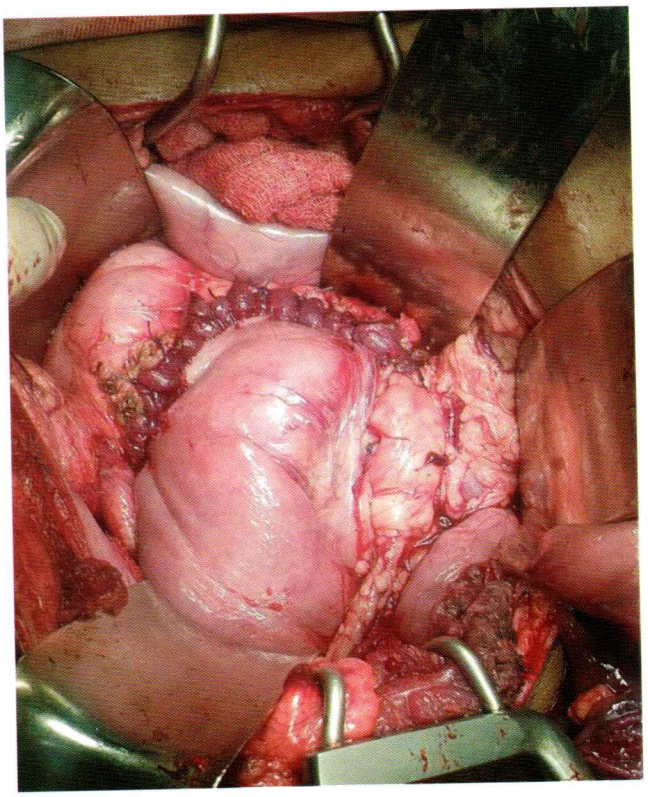

Fig-6: *Pancreato-jejustomy*

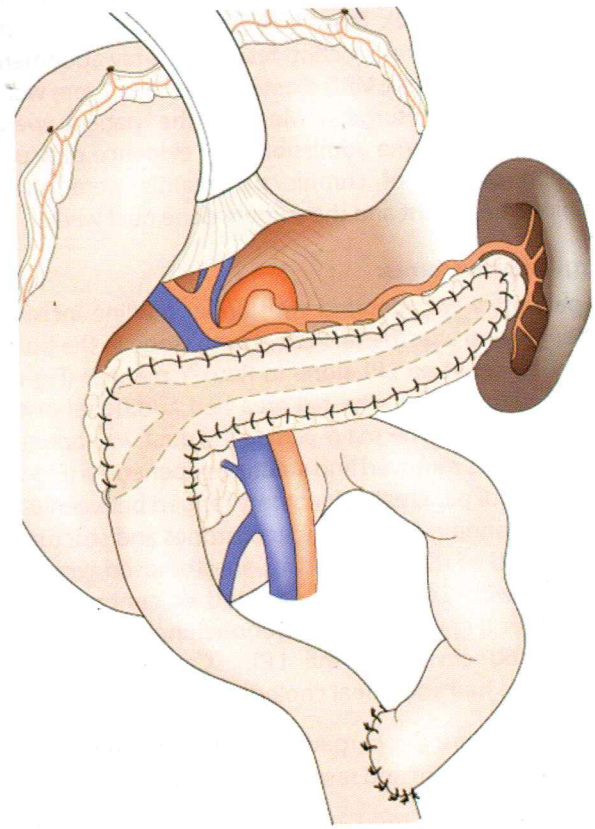

Fig-7: *LPJ*

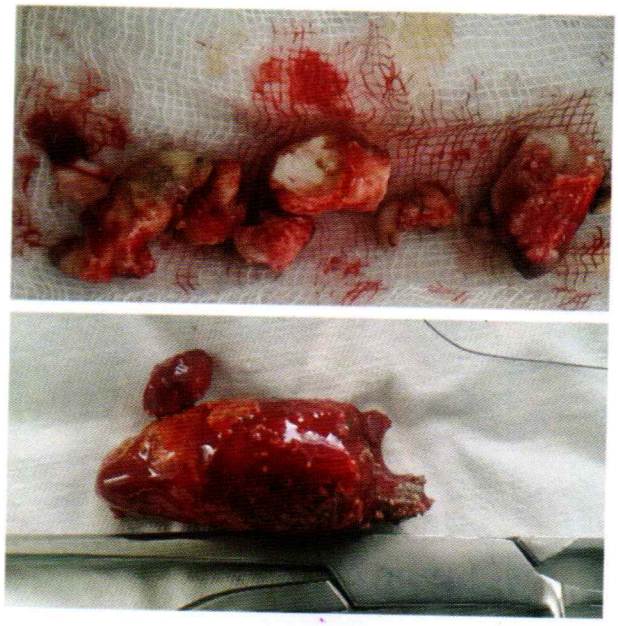

Fig-8: *Pancreatic stones*

Methodology

Set ups and Patients:

Any patient diagnosed by Ultrasonography with dilated MPD with or without pancreatic duct stone were recruited for the study (Fig-2). They were further evaluated with CBC, Creatinine, Liver function test, plain X-ray abdomen, MRCP, serum calcium. MPD diameter less than 7 mm were not selected for surgery. Most of the patient were operated in the same admission. Any evidence of acute infection on top of chronic pancreatitis were given antibiotic treatment and the surgery done next week.

Surgical procedures:

All patients were operated with upper midline incision under general anesthesia. Patient with stone in the body and head area had LPJ alone in Roux-Y manner (Fig-6). Patient with stone in the tail area had additional distal pancreatectomy. The main pancreatic duct was opened until all stones removed and strictures opened up (Fig-5). The length of pancreato-docotomy ranged between 6 to 10 cm depending upon number of stones and strictures. Roux-Y limb of the jejunum was anastomosed with the pancreas with 2/0 vicryl interrupted or continuous in single layer (Fig-6&7) Roux-Y jejuno-jejunal anastomosis is done 60 cm down the LPJ. Concomitant CBD obstruction had additional choledoco-jeunostomy.

All patients were discharged on complete remission of post-operative pain and resumption of normal diet.

Follow up- Patients were scheduled to be seen one week after discharge and 6 weeks and 6 months and 2 years after surgery. They were evaluated for persistent pain, malabsorption and diabetes. USG of the abdomen and plain X-ray were done to see the condition of the pancreas and recurrence of stone.

Follow up treatment- Tramadol or paracetamol were given as analgesic**.** Pancreatic supplement enzyme was given only if patient complaints of steatorrhea or persistent loose stool. Insulin therapy was continued for diabetic patient.

Results and Follow up Findings

Out of 37 cases operated between Jan 2012 until October 2019. 28 are alive. Duration of symptoms ranges from 7 days to 5 years. Age of patient ranges from 11 to 60 years with median age of 31 years. Male: female ratio was 2:3. Sixteen patients had evidence of mild to moderate degree of chronic pancreatitis on USG. They had neither diabetes nor malabsorption. 8 cases were diabetic and had symptoms of malabsorption such as steatorrhea and weight loss. All of them required pancreatic enzyme supplement and insulin therapy. The average diameter of the main pancreatic duct (MPD) was 13.8mm and ranges from 7to26mm. The mean operation time for pancreato-jejunostomy alone was one hour and 45 minutes ranging from 1 hour 25 min to 2 hour35 minutes. Median post operative hospital stay was 8.5 days ranging from 7 to 13 days. There was no death within 30 days of surgery in our series.

There was one case of recurrence in the head area after one year. She did not require further surgery. Three patients died during follow up period. Two of them developed malignancy. One developed adenocarcinoma of the pancreato-jejunal anastomotic site within one year of surgery detected on re-laparotomy, which was found to be inoperable. He died within 6 months of re-laparotomy. Second patient developed intestinal obstruction within 3 weeks of surgery. He was re-operated and found to have gangrene of small intestine distal to the LPJ anastomotic site. He had undergone massive resection of jejunum and ileum. He developed pancreatic fistula postoperatively. His fistula closed spontaneously. But he died of short bowel syndrome within two months of the second surgery. Third patient developed carcinoma in the head of the pancreas within 6 months of LPJ. Palliative choledocho-jejunostomy was done with another loop of the jejunum to relieve his jaundice. He died after 3 months. Other 28 patients were seen on follow up or contacted over phone and found to be without diabetes and not requiring pancreatic supplement. One patient needs regular analgesic for pain control. Other 15 patients are free from pain and do not need analgesic. So, rate of pain free survival in our series in a10 year follow up is about 75%. And mortality is about 10%. Recurrence of stone is about 5%.

Table-1. Pathology, procedure done and outcome

Per -operative findings	Operation done	Outcome during follow up period
32 had Stone in the body	Puestow operation Roux-Y lateral pancreato-jejunostomy (LPJ)	28 are alive no pain 3 died (3-Ca pancreas and one-short bowel syndrome) 1 recurrence in the head
1 Fibro calcification and stone in the head of the pancreas	Frey's operation and LR- LPJ	Alive
2 Stone in the head, body and tail	Distal pancreatectomy and LPJ	Alive
2 MPD stone and obstructed CBD due to peri-ampullary stricture.	Choledoco-jejunostomy and LPJ	Alive

Discussion

Diagnoses and evaluations of chronic pancreatitis and pancreatic stones are done by plain x-ray examinations, ultrasonography, computed tomography (CT), endoscopic retrograde cholangiopancreatography (ERCP) and magnetic resonance cholangio- pancreatography (MRCP). As the first choice for diagnosis of the disease, ultrasonography is economical. MRCP can precisely reveal pancreatic duct stones, pancreatitis, pancreatic tumor, pancreatic cyst. MRCP is of instructive significance for treatment, especially surgical therapy. MRCP has become the best method for the diagnosis and treatment of pancreatic duct stone in recent years. Due to non-availability and financial reason, we solely depended on plain x-ray and ultrasonography for selection of our patients. Later we started doing CT scan before surgery. We found CT is very helpful as pre-operative investigation before LPJ.

Different surgical procedures can be chosen according to the location of the stones in the pancreatic duct.7 When the stones are mainly located in the head of pancreas, endoscopic drainage and removal of the stones is usually the first choice of treatment. If it fails, surgical procedure should be applied. If the stones are mainly located in the body of the pancreas, they can be treated with Puestow-Gillesby procedure or Lateral pancreato- jejunostomy (LPJ), which is often used in patients with significant dilation of the pancreatic duct. Resection of the tail of the pancreas or combined resection with or without splenectomy is done if the stones are located in the tail of the pancreas. Sometimes the stones are found in the head of the pancreas. Local excision of the head and lateral pancreato-jejunostomy (LR- LPJ) becomes the choice of treatment. This is called Frey's operation.

We performed the Partington-Rochelle modification of LPJ in all cases. One of our cases had additional spleen preserving distal pancreatectomy for presence of stone in the tail area. He had pain in the left hypochondrium. We did Frey's operation for one patient. This patient had stone and severe fibro-calcification of the head.

We did simultaneous Choledochojejunostomy in two of the patients for concomitant CBD obstruction due to severe fibro-calcific stricture at the lower end of the bile duct. Ths. patient came with severe jaundice. Serum bilirubin was about 16 mg/dl. CBD and pancreatic duct were anastomosed with the Y limb of the jejunum in a series manner. Jaundice came down to 3 mg within a week and completely cleared in two weeks time.

Two patients died of adenocarcinoma of the pancreas at the anastomotic site. This was detected on laparotomy one year and 6 months respectively after LPJ. We did not take biopsy of the pancreas at the time of first surgery nor we could do CT scan. So, it is difficult to know if this patient had malignancy of the pancreas at the time of LPJ. That is why routine biopsy of the pancreas, if possible frozen section should be done for all patient at the time of LPJ. Another surprising finding is that both these patients had hugely dilated MPD, highest in our series 26mm each. Probably this suggests longer duration of obstructed duct in chronic pancreatitis and subsequent development of malignancy. Pre-operative CT could have helped in detection of pancreatic cancer.

The third mortality was due to massive intestinal resection and short bowel syndrome. This patient had a biliary stent and pancreatic duct stent, which were inserted 3 months before the surgery in an Abu Dhabi hospital. These stents were all removed during LPJ. He developed acute intestinal obstruction within 3 weeks after surgery. Re-laparotomy was done and massive

gangrene of the small bowel distal to the pancreato-jejunostomy was seen and resection done. Later he developed short bowel syndrome and died 3 months after the second surgery. As none of our patients developed this type of complication in postoperative period, we think that pancreatic stent related infection or toxicity was responsible for this massive gangrene of the intestine. So, we recommend that all stents should be removed sometime before the surgery endoscopically and should be treated with antibiotic. Moreover, this patient was severely diabetic. He had severe degree of chronic pancreatitis and malabsorption, requiring pancreatic supplement prior to operation.

Because the pathogenesis of pancreatic stone is unknown, improvement of symptoms is a major goal. However, the management of pancreatic duct stones continue to evolve, and it is dependent on the available facilities.[18] Treatments including surgical, endoscopic techniques, laser lithotripsy, extracorporeal shock wave lithotripsy (ESWL), balloon stenting, and medications are effective.[18] The success of endoscopic intervention as a less invasive procedure in the treatment of pancreatic stones is partly due to the improvement of endoscopic techniques. However, pancreatic duct stones approximately 5 mm or greater are often not amenable to conventional management with sphincterotomy, stricture dilation, or stone retrieval with basket.[19] In this setting, Salahis been found to be a very successful modality which historically had been used exclusively in the treatment of renal stones, with an ability to fragment large stones.[20]

In one study endoscopic therapy and surgical drainage was compared. They found that complete or partial pain relief was achieved at the end of follow-up in 32% of patients in the endoscopy group and 75% of patients in the surgery group ($P = 0.007$).[21] Compared to the endoscopic approach, surgical risks are often the major concern in surgical intervention for pancreatic stones, which may be associated with operative morbidity and mortality. Fortunately, unacceptable procedure-related risk of surgical intervention seems to be not higher than that of endoscopic techniques, laser lithotripsy, and ESWL.[22]

Conclusion

Successful removal of pancreatic duct stones and drainage of the pancreatic duct can reduce pain and improve pancreatic function in majority of patients. Patient with chronic calcific pancreatitis and diabetes are unlikely to have favorable outcome even after decompressive surgery. CT scan, MRCP or frozen section biopsy should be done to exclude pancreatic carcinoma before doing decompressive surgery.

References

1. Etemad B, Whitcomb DC. Chronic pancreatitis: diagnosis, classification, and new genetic developments. Gastroenterology. 2001; 120:682–707.]
2. Feldman M, Friedman LS, Brandt LJ. Sleisenger and Fordtran's gastrointestinal and liver disease. 9th ed. Philadelphia, PA: Saunders Elsevier; 2010.
3. Ammann RW, Muench R, Otto R, Buehler H, Freiburghaus AU, Siegenthaler W. Evolution and regression of pancreatic calcification in chronic pancreatitis: a prospective long-term study of 107 patients. Gastroenterology. 1988; 95:1018–1028.]
4. Steer ML, Waxman I, Freedman S. Chronic pancreatitis. N Engl J Med. 1995; 332:1482–1490.]
5. Mitchell RM, Byrne MF, Baillie J. Pancreatitis. Lancet. 2003; 361:1447–1455.
6. Ohara H, Hoshino M, Hayakawa T, et al. Single application extracorporeal shock wave lithotripsy is the first choice for patients with pancreatic duct stones. Am J Gastroenterol. 1996; 91:1388–1394.
7. Ebbehoj N, Borly L, Bulow J, Rasmussen SG, Madsen P. Evaluation of pancreatic tissue fluid pressure and pain in chronic pancreatitis: a longitudinal study. Scand J Gastroenterol. 1990; 25:462–466.
8. Karanjia ND, Reber HA. The cause and management of the pain of chronic Rebar Clin North Am. 1990; 19:895–904.]
9. Kloppel G. Pathology of chronic pancreatitis and pancreatic pain. Acta Chir Scand. 1990; 156:261–265.
10. Nealon WH, Townsend CM, Jr, Thompson JC. Operative drainage of the pancreatic duct delays functional impairment in patients with chronic pancreatitis: a prospective analysis. Ann Surg.1988; 208:321–329.
11. Greenlee HB, Prinz RA, Aranha GV. Long-term results of side-to-side Arana J Surg. 1990; 14:70–76.
12. Adler DG, Lichtenstein D, Baron TH, et al. The role of endoscopy in patients with chronic pancreatitis. Gastrointestinal Endos. 2006; 63:933–937.
13. Sherman S, Lehman GA, Hawes RH, et al. Pancreatic ductal stones: frequency of successful endoscopic removal and improvement in symptoms. Gastrointest Endosc. 1991; 37:511–517.]

14. Adamek HE, Jakobs R, Buttmann A, Adamek MU, Schneider AR, Riemann JF. Long term follows up of patients with chronic pancreatitis and pancreatic stones treated with extracorporeal shock wave lithotripsy. Gut. 1999; 45:402–405.]

15. Delhaye M, Arvanitakis M, Verset G, Cremer M, Deviere J. Long-term clinical outcome after endoscopic pancreatic ductal drainage for patients with painful chronic pancreatitis. Clin Gastroenterol Hepatol. 2004; 2:1096–1106.]

16. Rao KN, Van Thiel DH. Pancreatic stone protein: what is it and what does it do? Dig Dis Sci.1991; 36: 1505–1508.]

17. Tanaka T, Miura Y, Ichiba Y, Itoh H, Dohi K. Experimental pancreatolithiasis: association with chronic alcoholic pancreatitis. Am J Gastroenterol. 1992; 87:1061.

18. DevereJ, Delhaye M, Cremer M. Pancreatic duct stones management. Gastrointest Endosc Clin N Am 1998;8: p163- 179.

19. Lehman GA. Role of ERCP and other endoscopic modalities in chronic pancreatitis. Gastrointest Endosc 2002;56: p237-240.

20. Guda NM, Freeman ML, Smith C. Role of extracorporeal shock wave lithotripsy in the treatment of pancreatic stones. Rev 56: p 2005;5: p73-81

21, Djuna L. Cahen, Dirk J. Gouma, Yung Nio, Erik A. J. Rauws, Endoscopic vs Surgical drainage of pancreatic duct in Chronic pancreatitis. N Engl J Med 2007;356: p676-84.

22. Fang WL, Shyr YM, Su CH, Chen TH, Wu CW, Lui WY. Long-term follow-up study of surgical treatment for pancreatic stones. Hepatogastroenterology 2007;54: p246-249.