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Review Article

Surgical Options in the Management Of Chronic Pancreatitis

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ABSTRACT

Although surgical treatment is considered as last resort for pain pallation in chronic pancreatitis (CP), medical and endoscopic treatments are often insufficient to alleviate symptoms in advanced CP cases. Nearly 50% of all CP patients will require surgical.

Keywords: Surgical treatment; Chronic pancreatitis; Pain pallation

INTRODUCTION

Intervention, especially for pain palliation during their illness [1]. pain pallation to the treatment of chronic pancreatitis have progressed with the better understanding of the pathophysiological development of CP. Appropriate patient selection contributed to the increase in the benefit of surgery in the treatment of chronic pancreatitis [2].

In this section, with the help of current algorithms and guidelines, we aim to shed light on when, how and for what purpose to perform surgical treatment in CP.

WHEN TO CONSIDER SURGERY?

Consensus on surgical indications can be expressed as [3,4]:

i. Conditions where abdominal pain becomes unbearable

ii. Severe complications (bile duct obstructions, portal hypertension with portal vein thrombosis, necrotic pancreas and pancreas fistula)

iii. Suspected of malignancy

SHOULD ENDOSCOPIC OR SURGICAL TREATMEN BE PREFERRED?

The aim of surgical treatment for chronic pancreatitis is to alleviate symptoms and protect the pancreatic parenchyma as much as possible. However, supportive treatment of chronic pancreatitis in early period is important improve exocrine functions. Treatment of endocrine insufficiency is provided by nutritional supplement. When patients require additional treatment beyond these initial supportive measures. They are usually referred to gastroenterologists for endoscopic treatment. Typically, patients without proximal pancreatic duct stenosis, without an inflammatory mass, or with pancreatic pseudocysts may fail first for endoscopic treatment and may only be candidates for surgical evaluation if endoscopic treatment fails. If endoscopic interventions have failed in the treatment of symptoms and ductal obstruction after one year or local complications develop, surgical intervention should be considered before nutritional or metabolic disorders occur. Pancreatic parenchyma loss due to ductal obstructionis progressive and irreversible. Besides persistent pancreatic pain can also cause narcotic dependence over time. Therefore, it is desirable that the pancreas surgeon be present in the patient's follow-up from the early period. The success of surgery for chronic pancreatitis depends on determining the appropriate time during follow-up of patients [5].

Cochrane Database Cystematic Interpretation [6]: Three prospective randomized trials with low bias in study content identified. Two studies compared endoscopic intervention with surgical intervention [7,8]. The total of two studies included 111 participants, 55 in the endoscopic group and 56 in the surgical group. Compared with the endoscopic group, the surgical group had a higher rate of participants who had pain symptoms relieved, both in the mid-long term follow up (2-5 years risk ratio (RR)) 1.62, 95% confidence interval ((CI) 1.22-2.15) and in long-term follow up (≥ 5 years (RR) 1.56, 95% CI 1.18-2.05). Surgical intervention was effective in improving quality of life and preserving exocrine pancreatic function at moderate to long term follow up(2-5 years). However, it was not effective in long-term follow-up (≥ 5 years). Although the number of participants did not allow reliable evaluation of this, no significant difference was found in terms of significant postoperative complications or mortality. Another study involving 32 participants compared surgical intervention

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with conservative treatment [9]. There were 17 participants in the surgical group and 15 participants in the conservative group. In conclusion, surgical intervention was effective in pain relief. The study had methodological limitations and the number of participants was relatively low. This review of patients with obstructive chronic pancreatitis and enlarged pancreatic duct showed taht surgery was superior to endoscopy in terms of pain relief. Morbidity and mortality did not differ between thw two intervention methods.

Guidelines Recommendations

1. United Europe Gastroenterology (HaPanEU) Evidence-based guidelines fort he diagnosis and the treatment of chronic pancreatitis [10]:

i. Surgery is superior to moderate and long-term pain relief in patients with painful CP (Class 2 B).

ii. Early surgical intervention is also more suitable fort he relief pain (Class 2 B).

2. UK National Instittute of Health and Clinical Excellence (NICE Guide) [11]: Consider surgery (open or minimally invasive) as a first-line treatment in adults with painful chronic pancreatitis causing obstruction of the main pancreatic duct.

3. Europen Gastrointestinal Endoscopy Association (ESGE) Guidelines [12]: It recommends endoscopic treatment and / or extra corporeal shock wave lithotripsy (ESWL) as first-line therapy for painful uncomplicated CP with obstructed main pancreatic duct at the head / trunk of the pancreas. Clinical response should be assessed at 6-8 weeks; İf it does not seem satisfactory, the patients situation should be re-dicussed ina multidisciplinary team and surgical options should be considered (Class 1).

4. International Working Group (IAP- APA- JPS- EPC) Consensus Report For Chronic Pancreatitis [13]: Two titles should be mentioned here.

i. Is endoscopic treatment effective for the treatment of pain CP?

The best candidates for successful treatment of painful CP with primary care endoscopic treatment are patients with single stone and /or single stenosis at the head of the pancreas and in the early stage of disease. (Quality rating: Moderate, Recommendation: Strong)

ii. When is the most appropriate surgical treatment?

Surgical treatment is feasible in patients which had ≥ 5 endoscopic procedures and have not yet undergone opioid treatment for pain treatment within 2-3 years of diagnosis or onset of symptoms (Quality Rating: Low; Recommendaiton: Weak)

WHAT IS MORBIDITY AND MORTALITY?

Although there is no difference between endoscopic and surgical methods, the number of patients is not enough to say this [6-10].

WHAT IS THE EFFET OF SURGERY ON QUALITY OF LIFE?

When the long-term quality of life-related studies are examined in patients with CP, the quakity of life index is higher in patients who have undergone surgery in the earlier onset on disease (Less than 3 years) compared to those with delayed surgery [14,15].

SURGICAL OPTIONS

Decompression techniques

Duval procedure: Pancreatic tail resection and end-to-end or end-to-side pancreaticojejunostomy is performed between the residual pancreas and jejunum to provide retrograde drainage of the pancreatic duct. However, this method only applies if there is dilatation of the entire canal in the occlusion of the head of pancreatic duct. The disadvantage of this method is that it is likely to cause stenosis of te postoperative pancreatic duct stump, so recurrence of pain symptoms is common. Therefore, this metod is rarely used in clinical practice [16,17] (Figure 1).

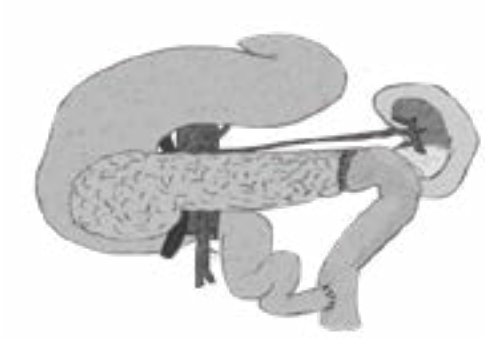

Figure 1: Duval Procedure.

Puestow-gillesby procedure: Puestow and Gillesby propsed Puestow-Gillesby procedure fort he resolution of recurrent multiple pancreatic duct strictures. In this procedure, the spleen and pancreatic tail are resected and the pancreatic duct is opened longitudinally. Side-by-side pancreaticojejunostomy is then performed between pancreatic duct and jejunum to drain the pancreatic fluid and reduce the incidence of late stenosis. The Puestow-Gillesby procedure is mainly used in case of multiple stenosis or Stones in the pancreatic duct [18] (Figure 2).

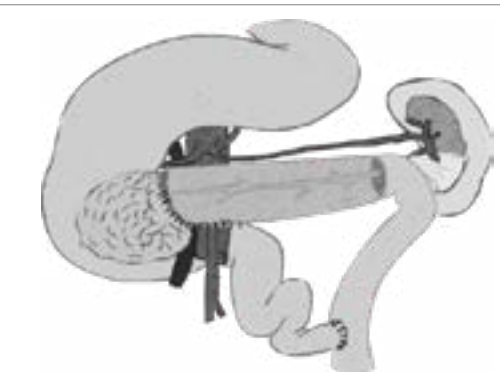

Figure 2: Puestow-Gillesby Procedure.

Partington-rocelle procedure: Partington and Rochelle procedure is a modification of the Puestow-Gillesby procedure.In this technique, the entire pancreatic canal is opened longitudinally and the whole canal is connected to the jejunum side by side as pancreaticojejunostomy. Pancreatic tail and spleen are preserved. Partington-Rochelle procedure is the most commonly used decompression in clinical practice for CP because it maintains maximum pancreatic tissue and minimizes the effect on thendocrine-exocrine functions of the pancreas. In a randomized controlled trial, pancreaticojejunostomy (Partington-Rochelle procedure) has been shown to be more advantageous in improving quality of life and relieving pain over endoscopic drainage. The incidence of

postoperative mortality and morbidity has been reported to be 3% and 20% lower in patients undergoing the Partington-Rochelle procedure than in the Puestow-Gillesby procedure, respectively. In short-term follow-up, the reduction in pain symptoms after this decompression was approximately 75%. However, long-term follow up results are far from ideal [19,20] (Figures 3-5).

Figure 3: Pancreatic fluid aspiration.

Figure 4: Excision of pancreatic stones after pancreatectomy.

Figure 5: Side-by-side pancreaticojejunostomy.

Resection techniques

Pancreaticoduodenectomy: In 1946, Whipple underwent proximal PD surgery to treat patients with chronic calcified pancreatitis[21]. For more than half a century, the Whipple procedure as been used as an effective treatment for pain and complications in CP. According to the results of threee large-scale clinical studies, decrease in pain symptoms recorded in 71%-89% of patients and the postopreative mortality rate was less than 5% in patients who underwent Whipple operation within 4-6 years [22-24] (Figures 6 and 7).

Figure 6: Whipple Procedure.

Figure 7: Traditional Whipple Procedure, sequential anastomosis.

Pylorus-preserving pancreaticoduodenectomy (Traverso-longmire): Considering the normal physiology of gastric emptying, Traverso and Longmire did not undergo subtotal gastrectomy, thus improving postoperative nutrition by maintaining gastric digestion and absorbtion [25,26]. The resection range of the pyloric protective PD (PPPD) procedure is basically the same as the coventional Whipple procedure. The duodenum is resected 2 cm distally from pylorus. Right gasttric artery, main gastroduodenal artery and accompanying vagal nerve, also the right gastroepiploic artery are preserved. In addition, the stomach, pylorus and bulbus 1.5-2 cm below the pylorus are also protected. It is reported that 90% of the patients have resolution in long-term pain symptoms after PPPD procedure [27,28]. Transient gastric emptying disorders have been reported as majör complications [28] (Figure 8).

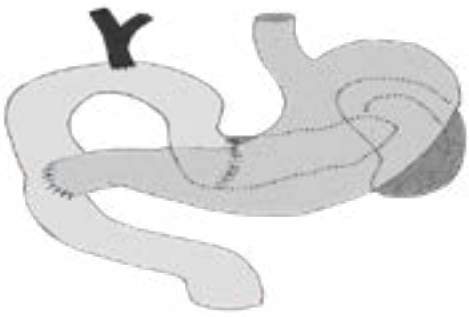

Figure 8: Pylorus-Preserving Pancreaticoduodenectomy.

Distal pancreatectomy: Distal pancreatectomy (DP) is usually performed in patients with CP in the presence of rupture of te pancreatic duct, suspected malignant tumor, or when te diameter of the main pancreatic duct is less than 5 mm. The classic resection range of the distal pancreas includes the pancreas body and the

pancreas tail. One of the most common complications after distal pancreatectomy is panceatic stump fistula. Thiscomplication occurs in approximately 70% of patients with DP [29,30] (Figure 9).

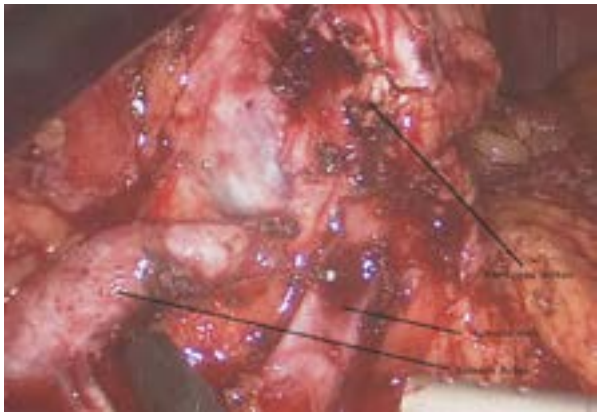

Figure 9: Distal Pancreatectomy Protection Spleen.

Middle segment pancreatectomy: When the lesion is in the pancreas neck and proximal part Middle segment pancreatectomy (MSP) is the third method that can be applied in addition to the Whipple procedure and distal pancreatectomy. There is literatüre information about the first application of MSP with pancreaticojejunostomy in 1957 by Guillemin and Bessot in a apatient with CP [31]. The advantages of MSP are the preservation of the majority of normal pancreatic tissue, low incidence of postoperative endocrine and exocrine insufficiency, maintenance of digestive system and spleen [32]. Warsaw et al. Reported that they did not observe diabetes mellitus as a complication in patients with CP undergoing MSP [33]. According to a study of 207 cases by Roggin et al. Postoperative recurrence rate of OSP was 33% and pancreatic fistula rate was 22.2% [34] (Figure 10).

Figure 10: Middle Segment Pancreatectomy.

Total pancreatectomy: TP has been largely abandoned by surgeons because it is associated with high complication rates, mortality and loss of pancreatic function. TP is indicated in cronic pancreatitis only when entire pancreas function . TP is indicated in chronic pancreatitis only when the entire pancreas is involved and consequently loss of pancreatic function and development of insülin-dependent diabetes. There is no risk of surgical complications such as pancreatic fistula and anastomotic leakage. However, it causes uncontrolled diabetes, which is difficult to manage and cure [35](Figures 11 and 12).

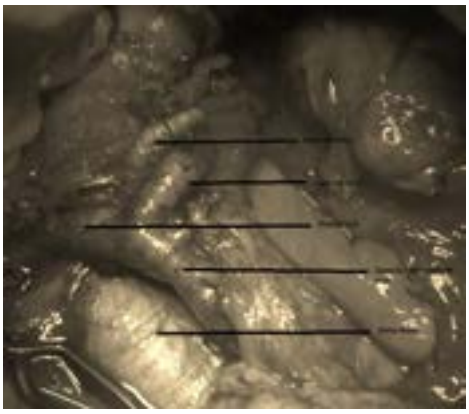

Figure 11: Surgical area after total pancreatectomy.

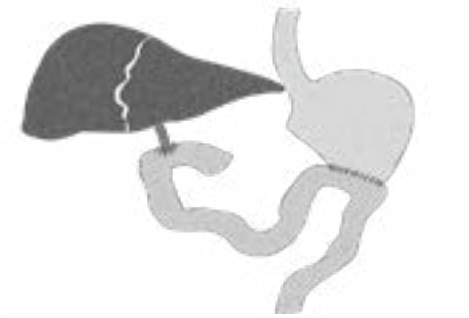

Figure 12: Sequential anastomosis after total pancreatic resection

Total pancreatectomies with islet auto-transplant (TPIAT): Since its description in 1977, approximately 1.000 cases of total pancreatectomy with islet auto-transplant have been reported in the literatüre [36,37]. During TPIAT, the entire pancreas is removed and the source of the pain is treated directly, while the patient's own islet cells are re-inserted into the portal circulation to maintain their function [37].

Indications for TPIAT respectively:

(1) chronic narcotic dependence,

(2) impaired quality of life,

(3) no reversible cause of chronic pancreatitis,

(4) unresponsive to maximal medical, endoscopic and some times surgical therapy and

(5) inadequate islet cell function (non-diabetic).

Patients must have all the indications at once. TPIAT is thougt to be the most effective in pediatric group with small canal disease, hereditary pancreatitis [37].

V incision: In the variant described by Izbicki, patients with small canal pancreatitis with small pancreatic duct diameter ≤ 7 mm and no inflammatory mass at the head of the pancreas are treated by decompression of the pancreatic side branches[38,40]. In Izbicki's original group of 13 patients, with endocrine and exocrine function preserved, 12 were completely free of symptoms after surgery, 2 had postoperative complications [39]. There was no hospital mortality. No reports of this procedure exist in larger numbers of cases.

Decompressions techniques with resection

Beger procedure: Beger Procedure can be expressed as resection of

pancreatic head while preserving duodenum. Key steps of surgery include transection of the pancreatic neck through the portal vein, resection of the pancreattic mass, preservation of the posterior branch of the gastroduodenal artery to maintain perfusion of the duodenum, preservation of the common bile duct to maintain the effect of decompression in the duodenum and common bile duct. The proximal pancreatic duct is ligated and the distal end is used for pancreaticojejunostomy. Choledochojejunostomy can be performed if there is obstruction in the distal common bile duct. The advantage of DPPHR is the maintenance of physiological funcitons of the stomach, duodenum and common bile duct. In some experienced centers, mortality rates are low at 3%-0% and recurrence rates range from 15%-32% [40,41]. The DPPHR procedure achieves 75%-95% success in long-term pain pallation [42] (Figure 13).

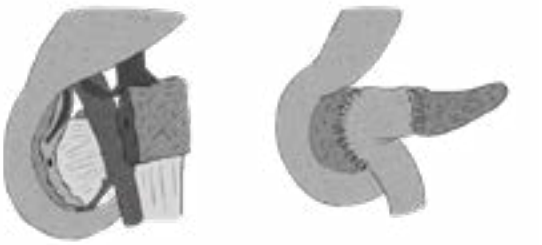

Figure 13: What distinguishes the Beger procedure from other resection procedures is the resection of head of the pancreas until the portal vein becomes naked.

Frey procedure: Frey procedure can be expressed as modified DPPHR method [43]. frey procedure is a combination of Beger and Partington-Rochelle procedures. The resection range of the pancreas head is samll in the Frey procedure compared to the Beger procedure. In addition, when combined with side-by-side pancreaticojejunostomy, pancreatic fluid can be drained through the pancreatic duct towards the pancreatic tail. Frey procedure may be considered when patients with CP have duct obstruction in the head and tail and concurrently present small inflammatory masses in the head of the pancreeas. The Frey procedure cannot be performed if there is no stenosis in the distal pancreatic duct and there are large inflammatory masses in the head of the pancreas[44]. A retrospective, randomized controlled trial showed that the recurrence rate after the Frey procedure was lower than PPPD (19%,53% respectively). Another study showed that the recurrence rate after the Frey procedure was lower than the Beger procedure (22%, 32% respectively). The rate of endocrine insufficiency following the Frey procedure was lower than PPPD in the 7- year period (86%, 96% respectively). The rate of endocrine insufficency after Frey Procedure in 8-year period was also lower than Beger procedure (78%, 88% respectively) [45,46] ` (Figure 14).

Figure 14: One of the most important differences from the Partington-Rochelle procedure is the opening of the pancreatic duct at the level of head of the pancreas and resection of the pancreas laterally. Only incision cannot be opened. Next anastomosis is performed side by side with jejunum.

Berne modification: In 2001, in order to correct portal hypertension in some patients with CP, Gloor et al. Changed the Beger and frey procedures to create berne procedure [47]. Pancreatic tissue resection at the portal vein level is difficult due to portal hypertension or inflammation. This resection is not performed in the Berne procedure. Te berne procedure has a pancreatic head resection interval similar to te Beger procedure. The pancreas neck is preserved and Roux-en-Y anastomosis is performed between the pancreas head and jejunum. Farkas et al. Reported a 10 month follow up study on 30 patients wo underwent the Berne procedure and found no severe complications [48]. A study on 100 patients with Cp who were surgically treated with the Berne procedure showed a low postoperative mortality rate (1%) and a low postoperative complication rate (16%) [49] (Figure 15).

Figure 15: In the Berne modification, the complete veining of the portal vein by pancreatic resection, as in the Beger procedure, is not present to avoid bleeding. A small amount of pancreatic tissue is left on the porta.

Imaizumi modification: In 2009, hatori et al. first proposed a modified beger procedure called the Imaizumi procedure. The Imaizumi procedure is combination of the Beger procedure and DPPHR. The Imaizumi procedure is particularly useful in treatment of patients with CP wit choledochal obstruction. Compared with the Berger procedure, the Imaizumi procedure is more effective in the treatment of common bile duct stenosis in patients with CP with intrapancreatic bile duct involvement. 90% of patients had a decrease in pain symptoms. In addition, compared to the PPPD procedure, rate of exocrine and endocrine pancreatic insufficiency after the Imaizumi procedure was low, but no significant difference was found between the postoperative complications and mortality rates between the two.İmaizumi procedure is a useful surgical treatment in patients with CP who have pancreatic head mass and bile duct stenosis [50] (Figure 16).

Figure 16: Resection includes common bile duct and pancreas head. Then pancreatic and hepatic duct anastomosis is applied sequentially.

Hamburg modification: In 1998, Izbicki et al. modified te Frey procedure and developed the Hamburg procedure [51] This procedure is applicable to patients with CP who have thin pancreatic ducts smaller than 3 mm in diameter. A large portion of the head of pancreas is resected, and the central part of the uncinate is included. Pancreatic tissues are resected in V form. This procedure is safe and effecive; can significantly improve postoperative quality of life and provide pain pallation [52] (Figure 17).

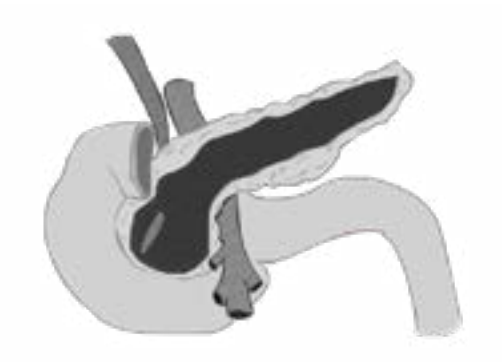

Figure 17: The Hamburg modification is derived from the Frey procedure, and the complete cleaning of the insideof the pancreas (wider resection than the frey procedure) is based on side-by-side pancreaticojejunostomy with little tissue left out.

WHICH CRITERIA SHOULD WE USE WHEN DECIDING SURGICAL PROCEDURE?

In order to explain this issue, we have to able to asnwer some questions

What is the definiton of pancreatic head growth?

Surgical procedure will be chosen according to this definition. Normally, the size of the head of the pancreas is variable, but ≥ 4 cm in diameter on CT or MRI is generally considered to be increased. This diameter should be measured in antero-posterior direction on cross-sectional views [53].

What is the definition of main pancreatic duct dilatation?

In adult patients, a 5 mm main canal diameter in to pancreatic body is considered suitable for drainage. Therefore, this 5 mm threshold is proposed as the definition of a dilated main pancreatic duct. However, it should be remembered that there is less consensus about the definiton of dilatation in the main pancreatic duct than the definiton of growth in the head of the pancreas.In case of dilatation of the pancreatic ducts, all authors mention only the maximum diameter. No authors provide information about the length or location of the dilated segments or the parenchymal thickness [54].

Which surgical technique should be used in patients with large pancreatic head?

Duodenal Protective Pancreatic Head Resection (DPPHR) shows that they are equally effective in relieving postoperative pain compared to traditional pancreaticodunodenectomy. Both techniqyes are comparable in terms of endocrine and exocrine insufficiency. However, quality oflife is significantly higher in duodenal protective pancreatic head reseciton than in conventional pancreaticoduodenectomy. The modified DPPHR procedures, Beger and Berne procedures, are equal in terms of pain palliation, postopreative morbidity and mortality, but in terms of operation time and hospital stay Berne procedure is muc shorter than tha Beger procedure. In terms of pain pallation, no significant difference was found in bot groups according to the average 15-years long-terme follow up results. There was no significant difference between long- term follow up of DPPHR modifications. However, neither the duodenal protective techniques nor the traditional pancreaticoduodenectomy hast stopped the progression to endocrine and exocirne failure after chronic pancreatitis[55-60].

In the Cochrane Database systematic data review report fort is patient group, poor quality evidence suggest that DPPHR may have a shorter hasopital stay tan PD: There is currently no evidence of a difference in mortality, complications or quality of life between DPPHR and PD, based on evidence of flow or very low quality[61].

What should be the surgical technique in apatient with severe pain, dilatation of the main pancreatic duct and normal pancreas head?

For these patients, a lateral pancreaticojejunostomy (Partington-Rochelle procedure) wit the Roux-n-Y loop and the Frey procedure provide nearly equal pain control. However, there is no literatüre information that can make clearrecommendations fort he surgical technique to be preferred in these patients. Both the lateral pancreaticojejunostomy with the Roux-en-Y loop the Frey procedure seem to provide equal pain control in paitents who have normal pancreatic head with dilatation of the pancreatic duct[62].

Japanese surgical treatment algorithm for chronic pancreatitis (Figure 18)

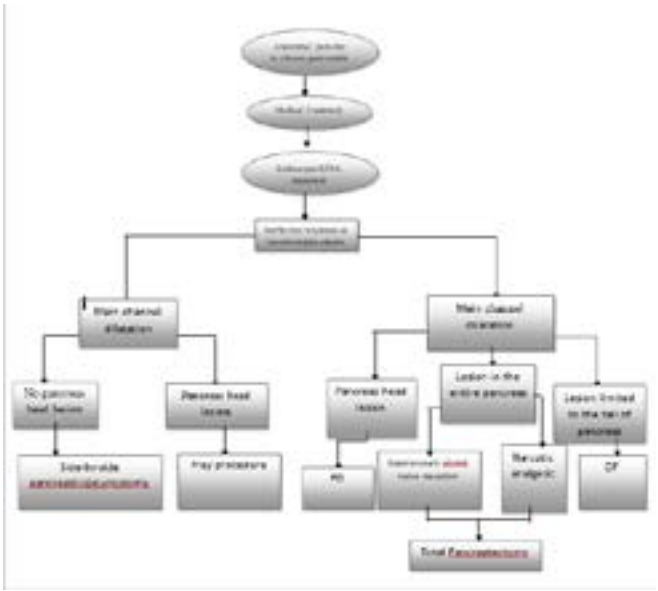

Figure 18: Japanese surgical treatment algorithm for chronic pancreatitis (64)

CONCLUSION

In the management of patients with CP, when deciding surgical treatment or endoscopic treatment, or when deciding which surgery to perform, instead making individual decisions, a multidisiplinary team should evaluate the patient.

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