



'Head-first Approach' for small duct chronic pancreatitis

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Abstract

Small duct pancreatitis is a rare variant of chronic pancreatitis characterized by a main pancreatic duct (MPD) measuring less than 5 mm. Traditionally, resectional procedures have been advocated as a treatment for small duct pancreatitis. However, these procedures are associated with worse post-operative results and a gradual functional decline over the long term. Parenchyma-preserving hybrid extended drainage procedures have been shown to provide more comprehensive pain relief, improved functional outcomes, and enhanced quality of life (QOL). However, the identification of the MPD in these patients presents a technical challenge. We describe the 'head-first approach' for the identification of the MPD in patients with small duct pancreatitis undergoing extended drainage procedures. The study includes patients of small duct pancreatitis who underwent the extended drainage procedure during a 6-year period from April 2017 to March 2023. During the study period, 41 patients underwent surgical management for chronic pancreatitis. Thirty-two patients underwent an extended drainage procedure, with pain being the indication for surgery in all cases. Twelve of these patients had small duct disease. The 'head-first approach' for identification of the MPD was successfully employed in all 12 patients. The median blood loss during surgery was 180 mL, and the median duration from the beginning of head coring to the identification of the duct was 45 min. Of the 32 patients, post-operative bleeding was seen in 4, external pancreatic fistula was observed in 2, and superficial surgical site infection was seen in 2 patients. All four patients with bleeding were managed conservatively with blood transfusions, and no re-explorations or re-interventions were required. There were no mortalities in this cohort. The 'head-first approach' for pancreatic duct identification is a safe and feasible technique to enable an extended drainage procedure with all the advantages of a parenchyma-preserving procedure for surgical palliation of pain in small duct chronic pancreatitis.

Keywords Pancreas · Pancreatitis · Chronic pancreatitis · Pancreaticojejunostomy

Introduction

Surgery for chronic pancreatitis is categorized into three major groups; drainage alone, resectional procedure, and procedures combining both drainage and resection [1]. Intractable pain is the most common indication for surgery in chronic pancreatitis [1]. Suspicion of malignancy, presence of local complications like common bile duct (CBD) stenosis, duodenal stenosis, pseudocysts, and internal pancreatic fistula from other indications for surgery. Drainage

procedure like a longitudinal pancreaticojejunostomy is indicated in those chronic pancreatitis with a dilated main pancreatic duct (MPD) and a normal sized pancreatic head. Chronic pancreatitis with enlarged head are managed with a hybrid procedure combining drainage and resection such as the Frey, Beger or the Berne procedure. Resections like pancreaticoduodenectomy or pylorus-preserving pancreaticoduodenectomy are indicated where there is a suspicion of malignancy.

A main duct diameter of more than 5 mm is considered dilated pancreatic duct [1]. Small duct pancreatitis is a rare variant of chronic pancreatitis distinguished by aMPD measuring less than 5 mm [2]. Traditionally, resectional procedures have been advocated as a treatment for small duct pancreatitis [3, 4]. However, these procedures are associated with worse post-operative results, along with functional decline and diminished quality of life (QOL) indicators over the long-term [5, 6]. Recent evidence suggests

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that parenchyma-preserving hybrid procedures provide more comprehensive pain relief, improved functional outcomes, and enhanced QOL [1, 2, 7]. The parenchyma-preserving extended drainage technique, as described by Frey et al., involves identifying the pancreatic duct early in the procedure before proceeding with head coring [8]. In cases of small duct chronic pancreatitis, this step poses significant challenges due to the induration and increased vascularity of the gland, making duct identification more difficult. In this context, we describe our technique for identifying the pancreatic duct through ‘head-first approach’ in cases of small duct chronic pancreatitis.

Description of surgical technique

The patient is placed in a supine position with hands tucked by the side after induction of general anesthesia and placement of an epidural catheter. An “L”-shaped incision is

made in the left upper quadrant (Xiphoid to supraumbilical region and then to left anterior axillary line), deepened to peritoneal cavity to enable an unimpeded access to the area of interest. Preliminary exploration of the peritoneal cavity is performed. Cattell-Braasch maneuver and full Kocherization are performed. The mesocolon is taken down until the right margin of the superior mesenteric vein (SMV) is visualized. The SMV marks the boundary of the left extent of head coring of the pancreas. The lesser sac is entered by dividing the gastrocolic omentum below the gastroepiploic arcade (Fig. 1a). The adhesions of the posterior wall of the stomach to the anterior pancreatic capsule are released. The right gastroepiploic vein is looped, ligated, and divided. The gastrocolic trunk is carefully dissected, looped, and secured by suture ligation in continuity. One must be cognizant of the anatomic variations of the gastrocolic trunk and also avoid providing undue traction to prevent inadvertent bleeding [9]. Now the colon is completely detached from the anterior capsule of the pancreas, exposing the head and

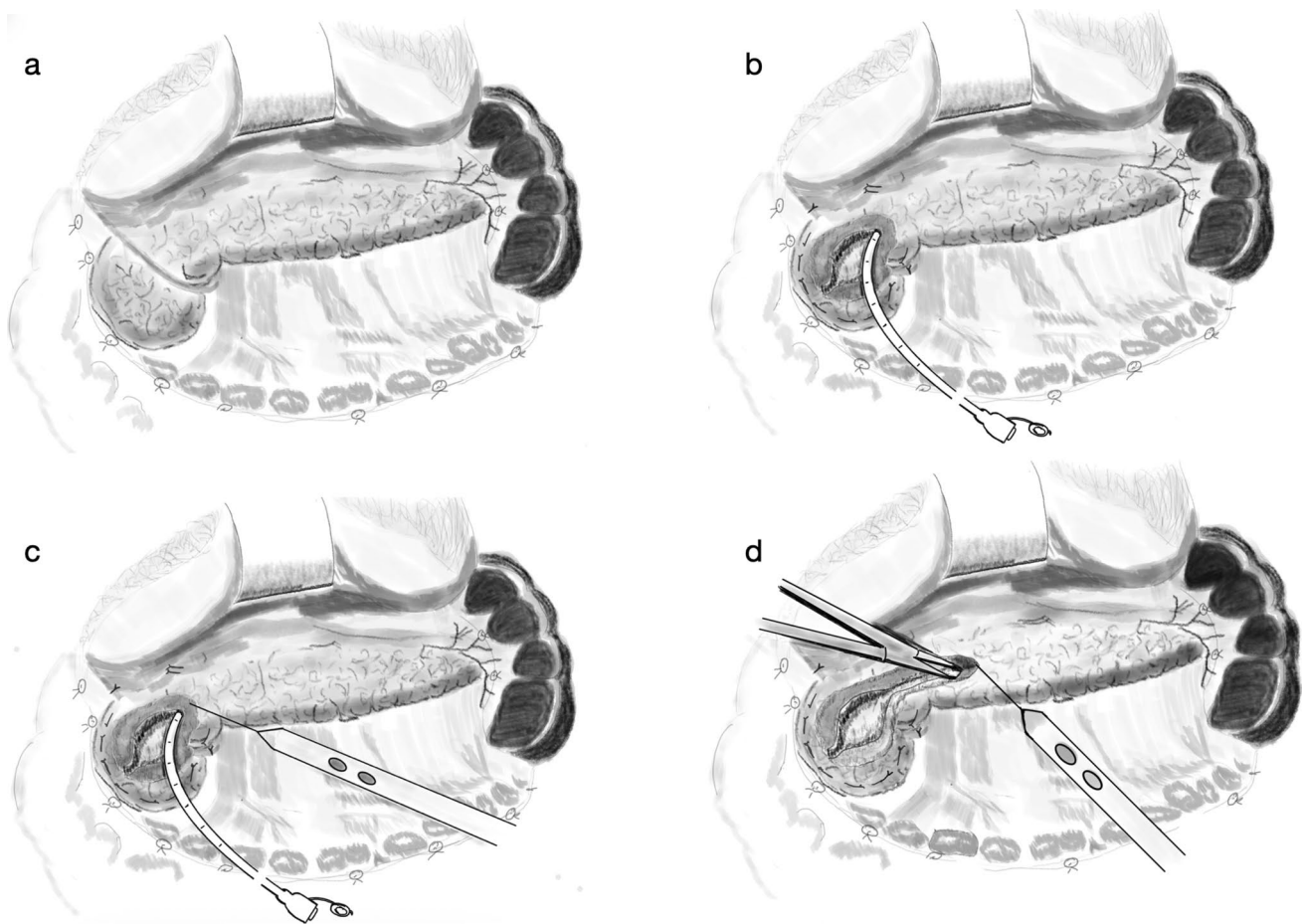


Fig. 1 Illustrations demonstrating head-first approach for small duct chronic pancreatitis (a) Exposure of the lesser sac (b) Identification of the main pancreatic duct by head-first approach (c) Passage of appropriate size feeding tube into the main pancreatic duct prevents

occlusion of the duct while placing homeostatic sutures (d) A right-angled forceps is used to open up the main pancreatic duct in the body and tail of the pancreas

uncinate process of the pancreas. The attention is now turned to the gastroduodenal artery in the retroduodenal region. The artery is looped and ligated in continuity with a silk 2–0 ligature. If inflammation precludes a safe dissection of the artery, it is ligated using a monofilament ligature on needle (prolene 3–0). The right gastroepiploic artery is ligated and divided, thereby freeing the superior part of the head of the pancreas. Essentially, we want to individually loop the right gastroepiploic vessels since the artery comes from the gastroduodenal artery close to the superior border of the head of the pancreas, whereas the vein courses toward the inferior border to enter the gastrocolic trunk.

Thus, the superior and inferior borders of the pancreas are defined. Now the surgeon, standing on the right side of the patient, has the entire pancreatic head in his hand and is able to appreciate the bulk of the pancreatic tissue at the head region. Few hemostatic sutures with polypropylene 3–0 stitch are taken along the pancreatic duodenal groove (approx 5 mm from the groove) in preparation for the head coring. Now with the left hand posterior to the head of the pancreas, the surgeon initiates the head coring, staying aware of the possibility of encountering the common bile duct (CBD) at the supero-lateral aspect of the head and must remain around 5 mm away from the SMV in the medial aspect. All bleeders encountered are carefully ligated using a polypropylene 4–0 stitch. The left hand of surgeon helps in control of bleeding by tamponade provided, viz, thumb anteriorly in the head cored region and other fingers behind the pancreatic head to offer counter pressure. Release of the thumb by surgeon with coordinated suctioning by the assisting surgeon using a fine-tipped suction, helps in the placement of hemostatic sutures. In addition, the assisting surgeon gives the requisite traction on the suture while the surgeon proceeds with placement of two or three bites around the bleeder. The head-coring procedure is done in a meticulous fashion with control of each bleeder diligently. No attempt is made to cut a large chunk to avoid several bleeders that may be troublesome to control. Small slivers of tissue helps in easy control of bleeders and prevent unnecessary excessive blood loss. Care is taken not to enter the posterior capsule of the pancreas; the posterior extent of the head coring is limited to the duct of Wirsung. All the tissue in the crucial triangle between the CBD, duct of Wirsung and the SMV is cored out. As head-coring progresses superiorly and to the left toward the pancreatic neck, there is a small gush of pancreatic juice when the duct is opened (Figs. 1b and 2a). Now with the duct identified at the head region a feeding tube of appropriate size is passed into the distal duct (Figs. 1c and 2b). Placement of this tube helps in placing hemostatic sutures in the vicinity without occluding the duct. Next, a right-angled forceps or a probe is used to open the rest of the pancreatic duct in the body and the tail region of the pancreas (Figs. 1d, 2c, and d). The rest of the procedure i.e.,

creation of a Roux limb of jejunum, pancreaticojejunostomy, and jejunojejunostomy, is carried out in the usual manner.

During the 6-year period from April 2017 to March 2023, 41 patients underwent surgical management for chronic pancreatitis. An informed consent was obtained from all of them prior to the surgery. Among them, there were 33 males and 8 females, with a median age of 32 years. Of these patients, three underwent distal pancreatectomy with splenectomy for disease affecting the body and tail (two cases) and due to a disconnected duct (one case), three patients underwent Whipple pancreaticoduodenectomy for a suspected malignancy in the head region (head mass), three patients underwent biliary drainage in the form of hepaticojejunostomy for CP-related biliary stricture, and the remaining 32 patients underwent an extended drainage procedure. Pain was the indication for surgery in all of these cases.

Twelve of these patients had small duct disease. The ‘head-first approach’ for identification of the MPD was employed in all patients undergoing the extended drainage procedure. The MPD was successfully identified in all cases within this cohort of small duct pancreatitis using this approach. The median blood loss during surgery was 200 mL, and the median duration from the beginning of head coring to the identification of the duct was 45 min.

Post-operative bleeding occurred in two patients. CT angiography did not reveal any evidence of active bleeding in both of these patients. They were managed conservatively with blood transfusions, and no re-explorations or re-interventions were required. One patient required three pint PRBC transfusions whereas the other required two pints of red blood cells. External pancreatic fistula was observed in one patient, necessitating prolonged drainage. Superficial surgical site infection was observed in two patients. There were no mortalities in this cohort.

Long-term follow-up was available for all patients, with telephonic interviews conducted on March 1, 2024. All patients reported being pain-free. Among the cohort, 11 patients reported excellent pain relief following the procedure. One patient required readmission for medical management of pain. In addition, four patients required long-term pancreatic enzyme supplementation due to exocrine insufficiency, while six patients required diabetic medications for endocrine insufficiency.

Discussion

Chronic pancreatitis is a progressive inflammatory and fibrosing disease of the pancreas, resulting in irreversible changes to the parenchyma and the ductal system leading to deteriorating function and recurring pain. Surgical indications in chronic pancreatitis include intractable pain, head mass when a malignancy cannot be ruled out, local complications

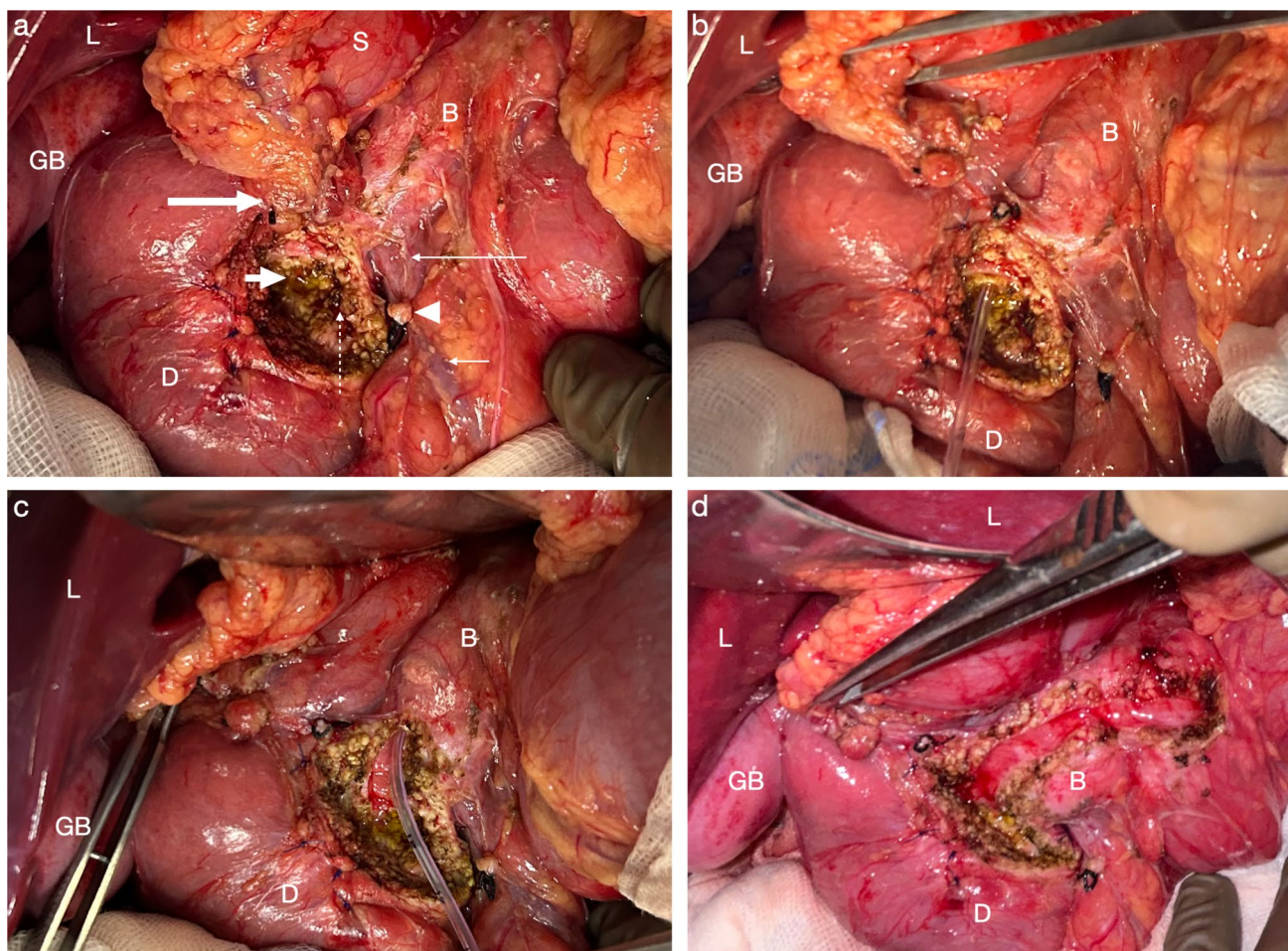


Fig. 2 Operative photographs demonstrating the head-first approach for small duct chronic pancreatitis (a) Identification of the main pancreatic duct by head-first approach (b) Cannulation of the main pancreatic duct using an appropriate size feeding tube (c) Main pancreatic duct opened along its long axis (d) Main pancreatic duct progressively opened along the body of the pancreas. L liver, S Stomach, GB Gallbladder, B Body of the pancreas, D Duodenum, Long

line arrow—SMV, Short line arrow—Colic branch of the gastrocolic trunk, Arrowhead—Gastroepiploic vein (tied), Short block arrow—Gush of pancreatic juice seen on opening the pancreatic duct, Broken line arrow—Hemostatic suture with polypropylene 4-0, Long block arrow—Gastrocolic artery (divided) from the GDA along with gastrocolic vein (divided) from the gastrocolic trunk

in the form of CBD stricture, duodenal stenosis, pseudocysts leading to compressive symptoms of early satiety. Small duct disease is a rare variant of chronic pancreatitis where the MPD is < 5 mm (some groups have considered MPD < 3 mm as a cut-off for small duct pancreatitis) [1–3, 7]. Traditionally, disease in which the pancreatic duct is dilated have been treated with drainage procedures, and those in which the MPD is < 5 mm have been treated with resectional procedures [3, 4]. It is an interesting fact that even a small duct, 3 mm, or 4 mm when opened up leads to opening up of 9.4 mm or 12.56 mm of circumference of the ducts, respectively. Such a width available would not pose a difficulty in performing a pancreaticojejunal anastomosis. The problem, therefore, appears to lie in the technical difficulty of identifying the duct. Tradition dictates identifying the pancreatic duct in the body using various methods (as described

below) and then extending it toward the head region, which is particularly challenging in small duct pancreatitis. It is likely that the technique described herein has been used by experienced surgeons but does not find a clear description in most operative procedure texts.

The MPD is identified during surgery for chronic pancreatitis by various methods and techniques such as digital palpation, needle aspiration of the pancreatic juice, longitudinal division of the parenchyma in the gland's axis till the duct is encountered, palpation of previously placed pancreatic stents, if any, amputation of the tail of the pancreas to expose the tail ducts which then can be used to track the proximal system, needle pancreatogram, and use of adjuncts such as intraoperative ultrasound [2, 10].

The woody indurated nature of the gland, which is also vascular compared to an atrophic gland with dilated duct,

makes identification of the duct either by palpation and needle probing or longitudinal division difficult in cases of small duct pancreatitis. Moreover, the smaller caliber tail ducts make them difficult to locate and cannulate which may force a larger part of the tail to be resected to identify the ducts. Therefore, head resectional procedures have been preferred over drainage in small duct pancreatitis. However, standard resectional procedures such as Beger's procedure are associated with increased operative time, blood transfusion requirements, surgical morbidity, along with exocrine and endocrine insufficiency on follow-up in more than half the patients [5, 6, 11]. Moreover, recent evidences suggest that the pain relief is better with extended drainage procedure like Frey's procedure, as are the functional outcomes [2, 7, 12]. Thereby, suggesting that a hybrid drainage procedure is possibly the procedure of choice in small duct pancreatitis. The head-first approach described here helps achieve the above by identification of the MPD, which is a technical challenge in patients with small duct pancreatitis. Also, this does not prolong the surgical duration or affect the flow of the surgery as head coring is an essential component of an extended drainage procedure.

Advantages

Usual attempts at identification of the duct by using the traditional methods like palpation, needle aspiration of the pancreatic juice, and longitudinal incision in the body region may not be successful in all. Moreover, adjuncts like intraoperative ultrasound may not be available at all facilities. Though the above-mentioned technique can be employed for all cases of chronic pancreatitis, it is particularly valuable for patients with a bulky pancreas and a non-dilated pancreatic ductal system.

Limitations

First, while dealing with vascular glands encountered in small duct pancreatitis, efforts to control bleeding during head coring can sometimes inadvertently obscure the MPD. Precise care should be taken when positioning the sutures to achieve hemostasis. It would be advisable to core the region around the bleeder to a reasonable extent while manually applying pressure to control the bleeding before suturing. Second, non-identification or the inability to delineate the MPD is a rare possibility that we have not encountered. In such a case, when all attempts have failed, fileting the ventral pancreas into a longitudinal V-shaped gutter, akin to the description by Izbicki et al., might be an option [7]. Alternatively, in a head dominant disease, consider draining

the cored head of the pancreas into the Roux limb of the jejunum.

In conclusion, head-first approach for pancreatic duct identification is safe and feasible technique to enable an extended drainage procedure with all the advantages of a parenchyma-preserving procedure for surgical palliation of pain in small duct chronic pancreatitis.

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Data availability Data will be made available on request.

Declarations

Conflict of interest Authors have no competing interests to declare.

Compliance with Ethical Standards, Research involving human participants and/or animals, and Informed consent Compliance with ethical standards was maintained and informed consent was obtained from all patients.

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