Commentary

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10.1 Selection

While most patients with uncomplicated chronic pancreatitis (CP) can be managed conservatively, operative treatment offers good results in carefully selected patients, especially those who have intractable pain and are at risk for opioid dependency. Operative intervention should only be undertaken when conservative measures including endoscopic interventions have been exhausted. In the alcohol-induced group, patients should be required to undergo a rehabilitation programme before operative intervention is undertaken.

When counselling patients for operation, several factors should be stressed. First, while the reported success rate is 70–80 %, there are substantial risks associated with these operations, and complete or substantial, clinically improve pain relief cannot be guaranteed in the individual patient. Second, pancreatic function, in particular steatorrhoea, occurs frequently even after parenchymal-preserving operations, and the risk of endocrine dysfunction is greatest when a distal pancreatectomy is required. Third, abstinence from alcohol and cessation of smoking are crucial factors that determine the long-term success of operative treatment of chronic pancreatitis.

10.2 Pre-operative Evaluation

Operative procedures for chronic pancreatitis are technically complex and should only be undertaken by surgeons with specialised training in pancreatic surgery working in a multi-disciplinary team. A careful evaluation of the patient's psychologic and social profile, as well as fitness for operative intervention should be undertaken. All patients need assessment of their nutritional status and the degree of pancreatic insufficiency. Some patients will benefit from hospitalisation if they have poorly controlled diabetes, malnutrition, or intractable pain. The response to aggressive supportive therapy may help to select appropriate candidates for operative intervention.

A complete, detailed evaluation of the morphologic status of the pancreas is imperative. Multi-slice CT and in selected cases CT angiography are the most important imaging investigations. MRI/MRCP is often useful to delineate further the changes in the pancreatic and bile ducts. In addition, specific care should be taken to identify associated portal hypertension related to splenic and portal vein occlusion which may have an important bearing on the decision to

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Table 10.1 The most common surgical options for chronic pancreatitis (Bornman et al. 2010)

Procedures	Indications
Resection:	
Pancreatoduodenectomy	Suspicion of malignancy
Distal pancreatectomy	Disease confined to the body and tail of the pancreas
Duodenal preserving resection of the head of the pancreas	Inflammatory mass of the head of the pancreas with or without a dilated pancreatic duct
Pancreatico-jejunostomy	Dilated pancreatic duct without inflammatory mass in the head of the pancreas

operate and the choice of operative procedure. ERCP is now used much less frequently as part of the work-up for operative treatment but may be helpful in combination with EUS and biopsy in patients in whom there is concern about an underlying malignancy. CA 19-9 may help to identify patients with cancers, but false positive values occur frequently, even in the absence of associated obstructive jaundice.

10.3 Surgical Approach

Current operative strategy is based on the principle of maximum preservation of exocrine and endocrine pancreatic function. This strategy involves a paradigm shift away from the standard resection procedures, such as the classic pancreatoduodenal resection, to lesser resections which preserve pancreatic parenchyma and duodenal integrity, such as the Frey operation and its hybrid modifications. Table 10.1 provides a basic outline of the choice of operative procedures based predominantly on the changes in the pancreatic parenchyma and ducts (Bornman et al. 2010). With the exceptions of patients in whom there is concern about a malignancy or when there is predominant disease in the tail of the pancreas, the authors prefer the Frey operation, including those patients with associated complications. The key components of this operation include preservation of the pancreatic neck as well as the capsule of the pancreas of the posterior pancreatic head (Anderson and Frey 2010) which provides the following advantages over the other parenchyma preserving procedures:

1. The operation avoids dissection outside the confines of the pancreas which decreases the risk of both arterial and portal venous injuries.
2. It is the safest operation in the presence of segmental portal hypertension.
3. Compared to the Beger operation, it is technically easier, less hazardous, and achieves the same results in terms of pain relief and parenchymal preservation (Strate et al. 2005).

10.4 Technical Details of the Frey Procedure

A bilateral sub-costal incision is our preferred approach when combined with a fixed mechanical retractor which provides excellent exposure.

10.4.1 Exploration of the Pancreas

Full exposure of the pancreas is obtained utilising the following steps:

(i) Full Kocherisation of the duodenum and pancreatic head is important to ensure an effective and safe coring out of the head of the pancreas.

(ii) An ultrasound dissector is a useful tool for dissection, particularly in the presence of active inflammation.

(iii) The lesser sac is entered by dividing the gastro-colic omentum outside the gastro-epiploic vascular arcade. The opening into the lesser sac should be extended far enough to the left to expose the entire body and tail of the pancreas. To the right, mobilisation of the hepatic flexure of the colon allows optimal exposure of the head of the pancreas.

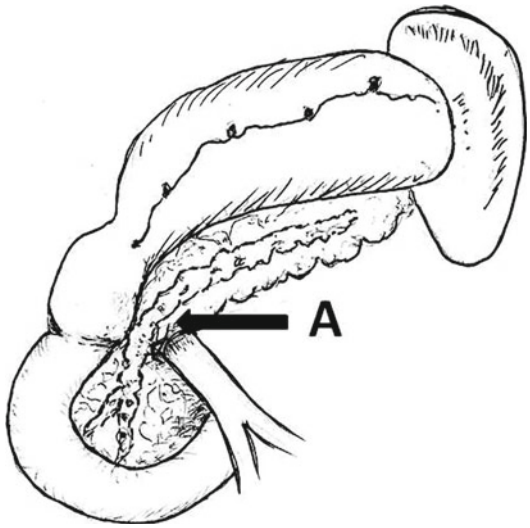

Fig. 10.1 Exposure of the pancreas neck inferior to the duodenum [A]

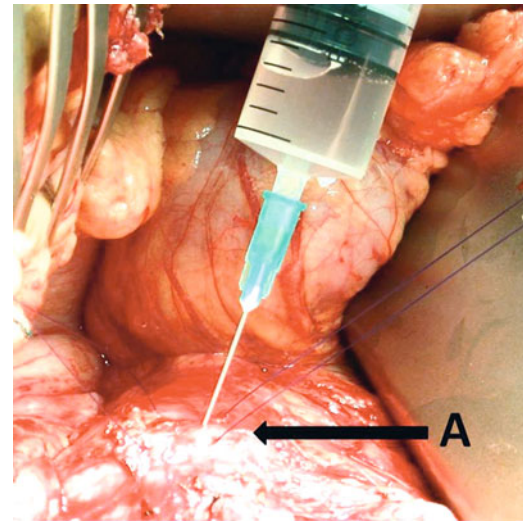

Fig. 10.2 Aspiration of the pancreatic duct between two stay sutures [A]

(iv) Adhesions between the posterior wall of the stomach and the neck, body, and tail of the pancreas should be divided carefully to expose the superior and inferior borders of the pancreas. In addition, it is useful to divide the gastro-hepatic ligament in the region of the antrum and to place a tape around the antrum for rostral traction of the stomach.

(v) Further exposure of the head and in particular the uncinate process is achieved by dissecting in the groove between the right border of the superior mesenteric vein and the uncinate process.

(vi) It is important that both the rostral and caudal neck of the pancreas is exposed adequately to safeguard against vascular injuries, in particular the SMV during incision of the pancreatic duct towards the head (Fig. 10.1). To achieve this, it may be necessary to divide the gastro-epiploic vascular pedicle where it emerges at the inferomedial border of the first part of the duodenum and to expose the SMV caudal to the inferior border of the pancreatic neck. We then ligate the gastro-duodenal artery at this stage with 3/0 monofilament suture where it crosses the anterior surface of the pancreas.

10.4.2 Identifying the Pancreatic Duct

Identification of the pancreatic duct is best done in the neck of the pancreas. The following techniques facilitate identification of the duct.

(i) Palpation and ballottement with the right index finger while gently squeezing the neck of the pancreas between the index finger and thumb of the left hand may locate the dilated duct. Often, a trough-like depression is evident.

(ii) While performing the above manoeuvre, a 17 gauge needle and syringe are used to confirm the lumen of the main pancreatic duct (Fig. 10.2). When this is achieved, it is important not to aspirate too much fluid, because this may decompress the duct and hamper the ability to fillet open the duct.

(iii) With the needle still in the duct localising the position of the duct, two 3/0 monofilament stay sutures are placed above and below the puncture site which will facilitate exploration of the pancreatic duct.

(iv) While pulling up on the two stay sutures, a diathermy needle is use to cut down alongside the needle until the duct is entered.

(v) Even with the needle in the duct, the pancreatic duct can be missed; cutting too deeply may result in bleeding from the underlying

splenic vessels. This disaster can be avoided by gently probing with a curved dissector to locate the duct which usually lies more superficial in the pancreas than anticipated.

(vi) Intra-operative ultrasonography can be a useful tool when it is difficult to indentify the pancreatic duct.

10.4.3 Exploration of the Pancreatic Duct

The pancreatic duct is explored first in the direction of the tail. Filleting of the duct distally is done with a diathermy blade, cutting between the blades of a curved dissector positioned inside the duct. The ductotomy is accomplished in short increments, and placement of haemostatic and stay sutures assists with further exposure of the pancreatic duct. The surgeon should make all attempts to remove as many pancreatic duct calculi as possible (Fig. 10.3a,b). Calculi in side ducts may be particularly difficult to extract and often need to be crushed before removal. It may be difficult to explore and open the entire duct due to strictures, stones, and narrowing of the duct toward the tail of the pancreas. Detailed pre-operative imaging of the pancreatic duct will guide the surgeon during this stage of the operation. Intra-operative ultrasonography may be useful to indentify the pancreatic duct pathology. In some instances, a cut down into the parenchyma will help to get across a stricture into the distal duct. Although the general recommendation is to explore and incise the entire duct to the tail, this manoeuvre may not be feasible and may be potentially dangerous in some cases. If there are no strictures or stones in the tail, it may not be necessary to extend the exploration to the very end of the pancreatic tail.

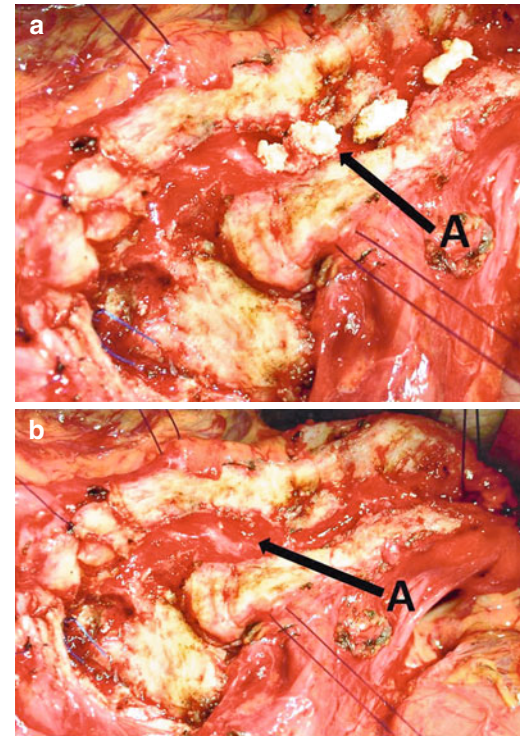

Fig. 10.3 (**a**) Multiple calculi in main duct and (**b**) as many as possible of the calculi are removed from the main and side ducts [A]

10.4.4 Coring Out of the Head

This part of the operation is often the most difficult. Mature judgement and experience are necessary to achieve the objectives of the operation while minimising the risks of bleeding and injury to surrounding structures. The placement of sutures at the planned margin of the resection in the head and uncinate process is useful to avoid injury to the duodenum and to achieve haemostasis (Fig. 10.4). Holding the head of the pancreas in the surgeon's hand during this stage of the operation is of great assistance in guiding the dissection. The safest method of opening the proximal aspect of the pancreatic duct in the head of the gland and performing the coring out procedure is with the guidance of a curved dissector positioned in the main pancreatic duct (Fig. 10.5). As in the dissection in the body of the pancreas, the dissection in the neck and head of the pancreas proceeds incrementally with the placement of haemostatic sutures as the duct is gradually opened and the forceps is advanced.

The coring out procedure is done in a piecemeal fashion using a diathermy blade with a blend setting (Fig. 10.6). The objective is to open and decompress all the side ducts with removal of any stones present (Figs. 10.6 and 10.7). The extent of the resection will vary, but as little pancreatic

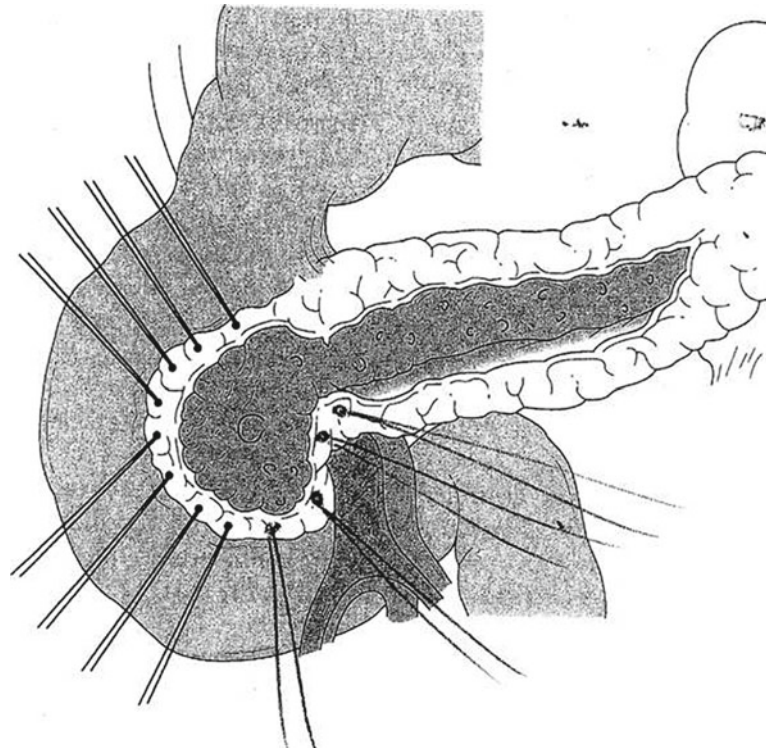

Fig. 10.4 Placement of haemostatic sutures at the envisaged resection margins in the head to avoid injury to the duodenum and surrounding vascular structures

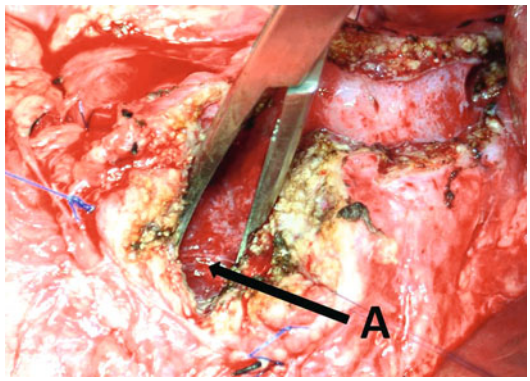

Fig. 10.5 Exploring the pancreatic duct towards the head by cutting down with diathermy between the blades of a curved forceps [A]

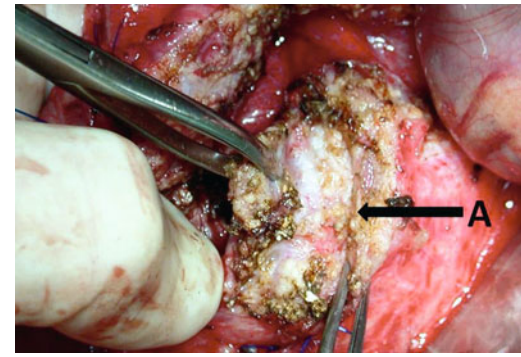

Fig. 10.6 Coring out of the head and uncinate process with diathermy blade [A] while holding the pancreatic head in the surgeon's hand

tissue as possible should be left behind, being careful not to break through the capsule posteriorly or to injure the bile duct (Fig. 10.8). It is not so much the amount of pancreatic tissue that is removed but the remnant that is left behind that matters. Palpation with the fingers behind and the thumb in front of the head of the pancreas provides the best way of judging the safety, adequacy, and depth of the resection. Meticulous haemostasis must be achieved at this stage of the operation using diathermy and suture ligation.

10.4.5 Pancreatico-Jejunostomy

A Roux-en Y limb is fashioned from the proximal jejunum about 20 cm distal to the duodeno-jejunal

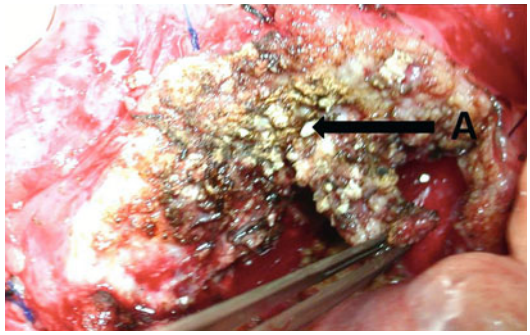

Fig. 10.7 Studded side-duct calculi in the head and uncinate process of the pancreas [A]

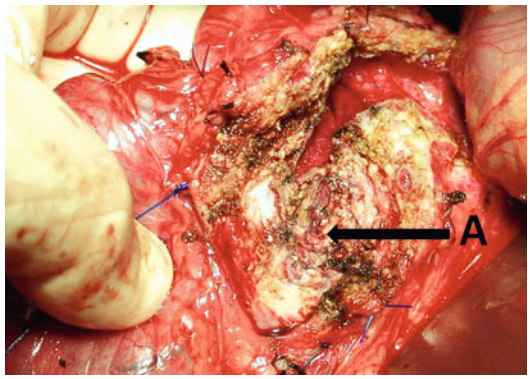

Fig. 10.8 Coring out of the head of the pancreas leaving as little as possible of the diseased pancreas [A]

junction using a staple device. The Roux limb is brought retrocolically through the right transverse mesocolon near the hepatic flexure. This approach provides the best site for the position of the jejunal limb for the pancreatic anastomosis and when bile duct drainage is also necessary.

Judging the length of the jejunal incision for the pancreatic anastomosis is important. There is a tendency to make the incision in the jejunum too long, in which case technical difficulties may occur with the pancreatic anastomosis. As a rule of thumb, the initial enterotomy in the jejunum should be slightly less than and not exceed the length of the opened pancreatic duct as measured from the neck to the tail (Fig. 10.9). In most instances, this initial length should be adequate to complete the pancreatico-jejunostomy.

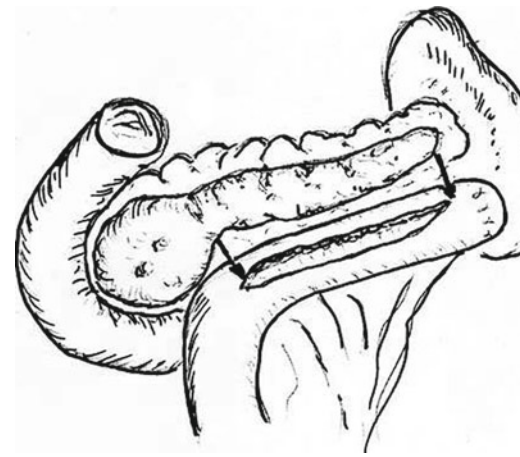

Fig. 10.9 The length of the incision into the jejunal limb is measured from the neck to the tail of the pancreas

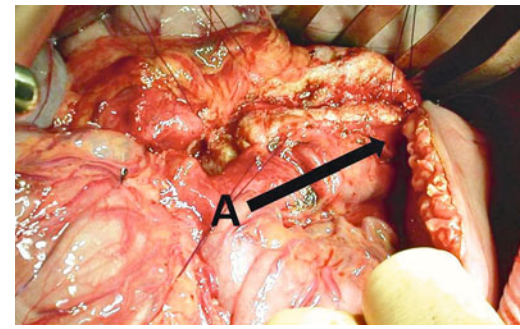

Fig. 10.10 The pancreatico-jejunostomy is carried out with a continuous monofilament 3/0 suture starting at the apex of the incision into the tail of the pancreas [A]

The anastomosis is performed with a single, continuous, 3/0 monofilament suture starting at the apex of the incision into the pancreatic duct in the tail (Fig. 10.10). The first suture for the inferior part of the anastomosis is placed from inside-out through the jejunum and outside-in through the pancreas. For the anterior layer, the suture is placed outside-in through the pancreas and inside-out through the jejunum. The two short ends are then tied together. The inferior anastomosis is first completed with careful placement of the sutures while the jejunal loop is gently pulled inferiorly and laterally to provide maximum exposure. When possible, the anastomosis can be done to the edge of the pancreatic duct, but this is not essential or advisable if the pancreatic duct is situated deeply in the pancreatic parenchyma and

when the gland parenchyma is hard. The anterior anastomosis is completed in a similar fashion. Interrupted buttressing sutures may be required to ensure a water tight anastomosis.

We then place a suction drainage system in the lesser sac near the anastomosis.

10.4.6 Frey Procedure in Patients with Associated Complications

(i) *Intra pancreatic pseudocyst*: The Frey procedure is also suitable for patients in whom there is an associated intra-pancreatic pseudocyst in conjunction with a dilated pancreatic duct. In such cases, the procedure may be started in the head especially when the pancreatic duct is not grossly dilated. The coring out procedure is easier in the presence of a cyst; if biliary obstruction is present, the coring out process will usually be sufficient to decompress the biliary obstruction, thereby obviating the need for a formal biliary bypass.

(ii) Associated bile duct obstruction: Bile duct obstruction in chronic pancreatitis is often low grade and has a benign natural history. In such patients, no additional biliary drainage procedure is usually required when a Frey procedure is performed for pain. A biliary bypass is only indicated when there is a high grade stricture as evidenced by persistent obstructive jaundice with or without cholangitis or in the absence of jaundice, when there is a grossly dilated bile duct with markedly increased Alkaline Phosphatase and Gamma Glutamyl Transferase activities. The best operative procedure to decompress the bile duct obstruction is by a hepatico-jejunostomy using the same Roux limb as used for the pancreatico-jejunostomy; the biliary anastomosis should be distal to the pancreatic anastomosis. We remove the gallbladder during this operation to avoid later complications related to gallbladder stasis. In some cases, the bile duct may be entered during the coring out procedure in which case, the edges of the open bile duct can be marsupialised to the surrounding pancreatic tissue and drained enterically via the pancreatico jejunostomy.

There is a subgroup of patients with minimal pain in whom jaundice is the predominant reason for operative intervention. The decision to perform a Frey procedure in addition to the biliary bypass remains controversial. Those in favour argue that a substantial number of these patients will develop severe pain and that the addition of the Frey procedure does not add much to the risks of the operation; however, there should be a low threshold not to proceed with a Frey procedure if there are adverse factors such as a small pancreatic duct, the presence of an active inflammatory process, or associated segmental portal hypertension.

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