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SURGICAL ENDOSCOPY
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Laparoscopic pancreatic surgery in patients with chronic pancreatitis

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Abstract
Background: In recent years, technological advances and technical refinements to laparoscopic instruments have encouraged some surgeons to explore the application of laparoscopic methods to benign disorders of the pancreas. The aim of this report was to evaluate the feasibility and outcome of laparoscopic pancreatic surgery in patients with chronic pancreatitis.
Methods: One group of five patients with disease of nonalcoholic origin localized in the body–tail of the pancreas underwent distal pancreatectomy with preservation of the splenic vessels; a second group of six patients with symptomatic pancreatic pseudocysts (alcoholic origin in four cases and idiopathic in two cases) underwent laparoscopic transgastric drainage. For distal pancreatectomy and spleen salvage, the patient's positioning was half-lateral decubitus with the left side up. Four ports were used. A comparison was made with 41 patients with chronic, pancreatitis who underwent conventional open distal pancreatectomy. For the patients with laparoscopic distal pancreatectomy, the mean operative time was 4 h (range 3–5).
Results: There were no pancreatic-related complications, but one patient was reoperated for perforation of duodenal ulcer. The mean hospital stay was 6 days and the mean time to resume normal daily activities was 3 weeks. Laparoscopic pseudocyst drainage was performed in four patients via laparoscopic anterior gastrostomy and two patients via laparoscopic intraluminal cystogastrostomy. The mean operative time was 100 min (range 60–160). There was no morbidity. The mean hospital stay was 5 days, and the mean time to resume normal daily activities was 2 weeks.
Conclusion: This study provides information about the possibilities of performing laparoscopic surgery in patients with chronic pancreatitis. Laparoscopic distal pancreatectomy with preservation of the splenic vessels and laparoscopic transgastric drainage are feasible and safe techniques. They offer obvious advantages, such as reduction of the parietal damage to the abdomen, a shorter hospital stay, and an earlier postoperative recovery than can be obtained with conventional open pancreatic resection.

Key words: Pancreas — Chronic pancreatitis — Laparoscopy — Transgastric drainage — Distal pancreatectomy — Splenic vessels preservation

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Laparoscopy was initially introduced in the field of pancreatic surgery for the staging of pancreatic cancer. In 1911, Bernheim reported the use of diagnostic laparoscopy in a patient with a pancreatic mass and stated that the presence of liver metastases precluded the possibility of any curative surgical attempt [6]. Cuschieri et al. [11] in 1978 and Warshaw et al. [39] in 1986 also performed laparoscopic staging for the detection of metastases and tumor ingrowth.

In recent years, technological advances and accumulated experience with laparoscopic procedures for the management of upper gastrointestinal tract and biliary tree diseases have made it possible to attempt laparoscopic pancreatic surgery. Recently, there have been reports of limited series of laparoscopic procedures for the management of patients with inflammatory disorders of the pancreas and benign pancreatic tumors [10, 16].

The aim of this report was to evaluate the feasibility and outcome of laparoscopic pancreatic surgery in patients with chronic pancreatitis. In addition, all patients who underwent distal pancreatectomy for chronic pancreatitis at our hospital were reviewed to determine the clinical outcome obtained with the conventional open procedure.

Fig. 1. The patient's placed in half-lateral position with the left side up. Four 10–12-mm trocars are inserted in the abdominal wall 3–4 cm above the umbilicus, on the xiphoid area, subcostally on the midaxillary line, and subcostally on the midclavicular line.

Materials and Methods

From February 1998 to October 2000, we used the laparoscopic approach in five consecutive patients (three male and two female) with distal chronic pancreatitis, Their mean age was 39.5 years (range 23–52). The etiology was obstructive pancreatitis. Abdominal pain for ≥6 months was the main complaint in all patients, and it was partially alleviated with the use of nonopiate analgesics. Multiple hospital readmissions due to exacerbation of the abdominal pain with increased serum amylase > 1000 UI/L (normal value, 10–400) was observed in four patients. All patients had normal serum glucose. Computed tomography (CT) scan showed an enlargement of the body and tail of the pancreas in two patients; in the other patient, it revealed a 5-cm pseudocyst in the tail of the pancreas. Endoscopic retrograde cholangiopancreatography (ERCP) showed a complete a blockage it revealed in the Wirsung duct in one patient; in four other patients stricture in the pancreatic duct in the body–tail of the pancreas. A normal-sized (3–4-mm) Wirsung duct in the head of the pancreas was present in all patients.

During the same period, we used the laparoscopic approach in six patients (four male and two female) with pancreatic pseudocysts. Their mean age was 42 years (range 38–63). The etiology of the pseudocysts was chronic pancreatitis, alcoholic in four patients and idiopathic in two patients. No inflammatory masses or pancreatic calculi were observed on CT scans.

ERCP failed to show a communication between the pancreatic duct and the pseudocysts. There were two pseudocysts in the head and four in the body of the gland. Their mean size was 8 cm (range, 7–10). Abdominal pain with a feeling of fullness after food intake for ≥ 3 months was the main complaint in all patients.

Technique for laparoscopic distal pancreatectomy

In our approach, the patient is placed in half-lateral position with the left side up and reverse Trendelenburg. The surgeon and assistant stand on the left of the patient; the camera person and the scrub nurse stand on the opposite side (Fig. 1). First, a carbon dioxide (CO_2) pneumoperitoneum was established. Abdominal pressure was monitored and maintained at < 14 mmHg. A 30° laparoscope was used in all cases. Four 10–12 mm trocars were inserted in the abdominal wall 3–4 cm above the umbilicus, on the xiphoid area, subcostally on the mid-axillary line, and subcostally on the mid-clavicular line.

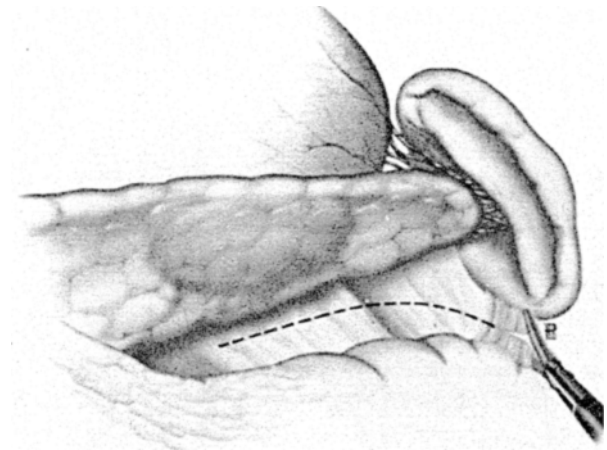


Fig. 2. Dissection of the lienorenal ligament and subjacent fascia lateral to the spleen. Section of the splenocolic ligament. The gastrocolic omentum is opened up widely to the level of the mesenteric vessels.

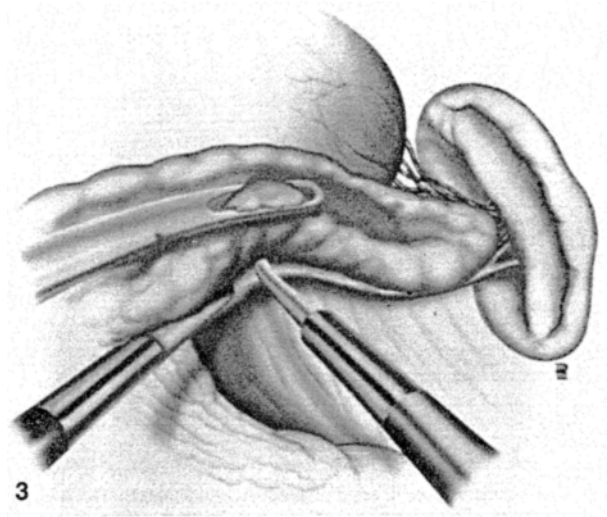
The first step of the surgery is to start with dissection of the lienorenal ligament and subjacent fascia lateral to the spleen (Fig. 2). The splenocolic ligament is divided using laparoscopic coagulating shears (harmonic scalpel; Ultracision; Ethicon, Sommersville, NJ, USA). The splenic flexure of the colon is mobilized downward. The body–tail of the pancreas is then visualized. The gastrocolic omentum is widely opened up to the level of the mesenteric vessels. Exposure of the anterior aspect of the pancreas is performed by dividing the adhesions between the posterior surface of the stomach and the pancreas. Care must be taken to preserve the short gastric vessels.

At this point, a clear demarcation between normal and abnormal pancreas is obtained. The limit of the resection was determined by the extent of the disease, which included 40–70% of the gland. The plan was to preserve the splenic vessels, and in all five cases a spleen-preserving distal pancreatectomy was performed. The inferior border of the pancreas was dissected, and the body and tail of the pancreas were completely detached from the retroperitoneum. This mobilization of the left pancreas allows the posterior wall of the gland to be visualized so that the splenic vein can be identified, easily. With gentle blunt dissection, the splenic vein is pushed away from the posterior pancreatic wall (Fig. 2). Visual magnification through the laparoscope permits excellent control of the small pancreatic veins, which are coagulated using a Ligasure device (Tyco Healthcare, US Surgical, Norwalk, CT, USA) or clipped with titanium clips (Fig. 3). A tunnel is created between the splenic vein and the pancreas. Through this space, the splenic artery is identified by careful blunt dissection with a curved dissector (see Fig. 2). In some cases, because of the fibrosis, it took some time to surpass the superior border of the pancreas above the splenic artery.

The pancreas is then transected with a 30-mm endoscopic linear stapler (endoGIA; US Surgical, Conn) (Fig. 4). Usually, two applications of the stapler are necessary. The midbody of the pancreas is then grasped and retracted anteriorly with a 5-mm forceps, and traction is applied to expose the small branches of the splenic artery and vein, which are coagulated using a Ligasure device (Fig. 5). The dissection is continued laterally to the splenic hilium. Using a nonpermeable nylon bag, the specimen is then extracted through an enlarged trocar incision. A sylastic drain is placed in the pancreatic bed near the pancreatic stump.

Technique for laparoscopic transgastric drainage

Patients were placed supine with general endotracheal anesthesia. A 10-mm trocar was introduced at the umbilicus. A 0° angle laparoscope



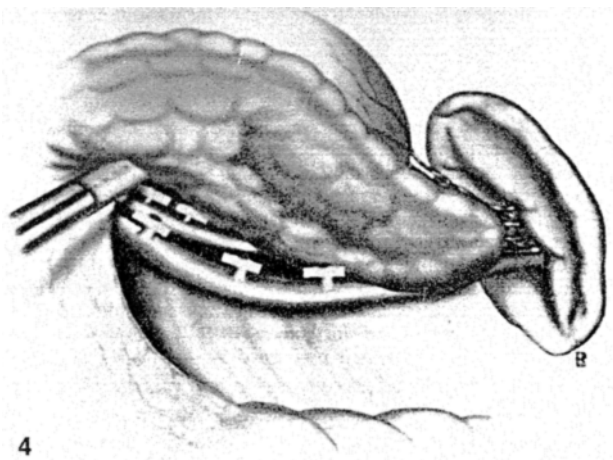
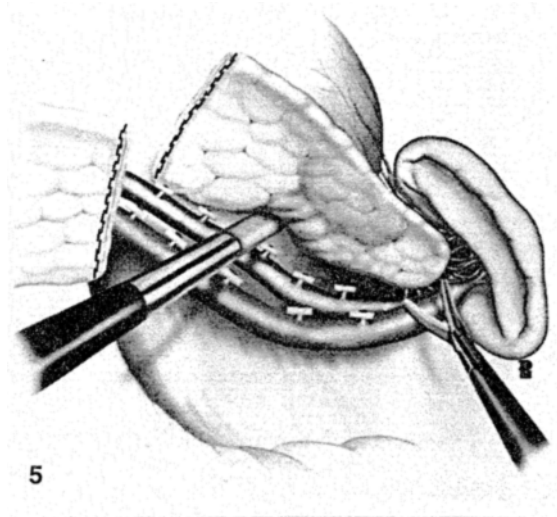


Fig. 3. Complete detachment of the body and tail of the pancreas from the retroperitoneum. Mobilization of the left pancreas allows visualization of the posterior wall of the gland, where the splenic vein is identified. The splenic vein is pushed away from the posterior pancreatic wall.

Fig. 4. A tunnel is created between the splenic vein and the pancreas; the splenic artery is identified. Small branches of the splenic artery and the splenic vein are either clipped with titanium clips or coagulated.



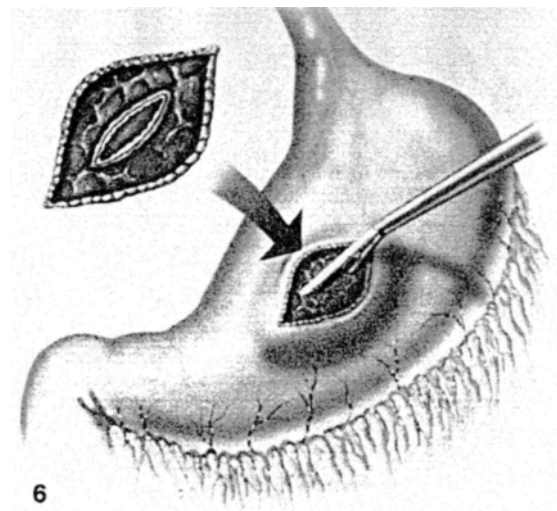


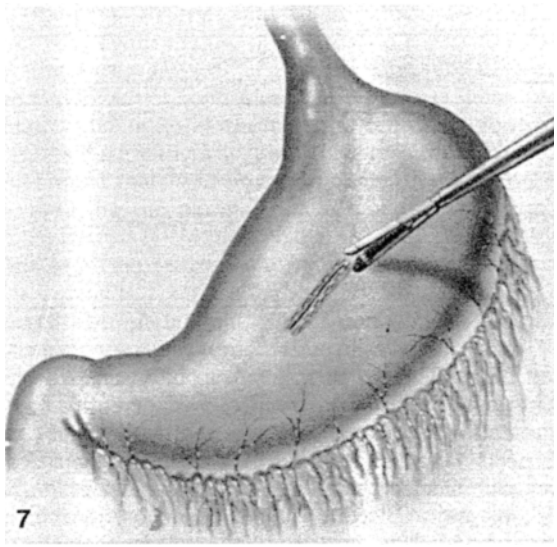
Fig. 5. The pancreas is transected with an endoscopic 30-mm linear stapler. The midbody of the Pancreas is then grasped and retracted anteriorly, and traction is applied to expose the tiny vessels from the splenic vessels to the pancreatic parenchyma, which are then either coagulated or clipped.

Fig. 6. Laparoscopic anterior gastrostomy. The anterior wall of the stomach was opened using a Harmonic scalpel. The use of electrocautery communicates the pseudocyst cavity with the stomach; the opening is enlarged using a Harmonic scalpel. A cystogastrostomy anastomosis is performed with an endoGIA 30-mm linear stapler.

was used. Two 10–12-mm trocars were placed, one under the xiphoid process and another under the left costal margin. Another 10–12-mm trocar was inserted under the right costal margin when necessary. In all cases, the pancreatic pseudocysts were located using intraoperative ultrasound (7.5-MHz probe, 10 mm in diameter; B-K Medical, Gentolfe, Denmark), thus allowing identification of the most appropriate pseudocyst–gastric apposition (Figs. 6–9). In addition, in two patients, the pseudocysts' position was confirmed by puncture of the pseudocysts with a Veress needle. This maneuver facilitates the aspiration of pseudocyst fluid for culture and cytological analysis. The injection of radiopaque contrast under fluoroscopic control allows identification of the site for gastric drainage.

In two patients with pseudocysts in the head of the pancreas, laparoscopic intraluminal cystogastrostomy was performed. Under laparoscopic guidance, two balloon-tipped trocars were placed in the anterior wall of the stomach through gastrotomies (Fig. 6). Once the balloons were inflated inside the gastric lumen, low-pressure insufflation was applied to one of the trocars. A 0° laparoscope and the use of laparoscopic ultrasound allowed the position of the pseudocyst to be identified (see Fig. 6). The pseudocysts were penetrated using electrocautery. The insertion of the gastroscope into the cyst allows the surgeon to lyse loculations and to identify the area for pancreatic pseudocyst biopsy. The cystogastrostomy was performed using a 30-mm endoscopic linear stapler device (endoGIA; US Surgical) (Fig. 7). The openings of the stomach were closed with endocorporeal sutures.

In four patients with pancreatic pseudocysts in the body of the pancreas, cystogastrostomy was performed through a laparoscopic anterior gastrotomy. In this approach, an opening 3.5 cm in length was made in the anterior wall of the stomach using the harmonic scalpel to obtain direct access to the posterior gastric wall (Fig. 9). Electrocautery is used to communicate the pseudocyst cavity with the stomach, as confirmed by a rapid loss of fluid through the entry site. The opening is enlarged using the Harmonic scalpel. The cystogastrostomy was performed with an endoGIA 30-mm linear stapler (see Fig. 6). Finally, the anterior gastric wall was closed with an endoGIA stapler (US Surgical) (Fig. 7).



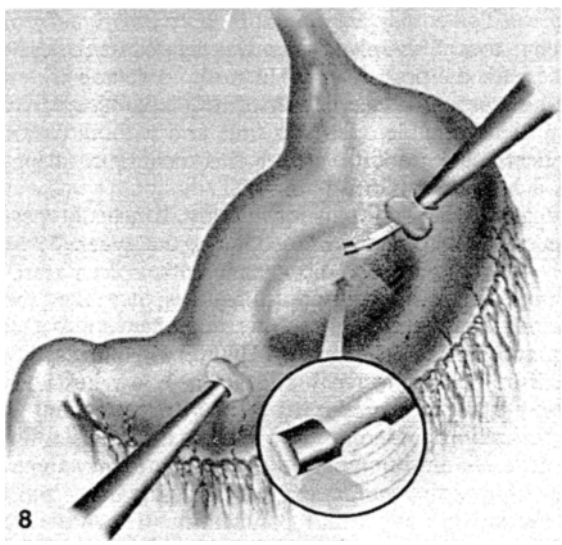


Fig. 7. Closure of the anterior gastric wall with an endoGIA 30-mm linear stapler.
Fig. 8. Laparoscopic intraluminal cystogastrostomy. Two balloon-tipped trocars are placed in the anterior wall of the stomach. A 0° laparoscope and laparoscopic ultrasound are used to identify the position of the pseusocyst.

Conventional open distal pancreatectomy

The medical records of 41 patients who underwent distal pancreatectomy for chronic pancreatitis using the open approach between January 1984 and January 2000 were reviewed. The etiology of chronic pancreatitis was alcoholic in 26 cases and postobstructive pancreatitis in 15 patients. Ultrasonography, ERCP, and CT determined that the disease was largely confined to the distal pancreas. In all patients, the indication for operation was abdominal pain. Twelve patients had an inflammatory tumor in the corpus–distal region of the pancreatic gland, 14 patients had pseudocysts in the tail of the pancreas, and 15 patients had stenosis of the pancreatic duct. The limit of the resection was determined by the extent of the disease and usually included 40–60% of the volume of the pancreas. Due to inflammatory adhesions and subsequent alterations of the splenic artery, spleen preservation was not posible in 25 patients. In 16 patients, distal pancreatectomy was performed without splenectomy and preservation of the splenic vessels. Twenty-five patients needed blood transfusion (median of 4 U of washed red blood cells) intraoperatively, 15 patients underwent distal pancreatectomy with splenectomy, and 10 patients had a spleen-salvage distal pancreatectomy.

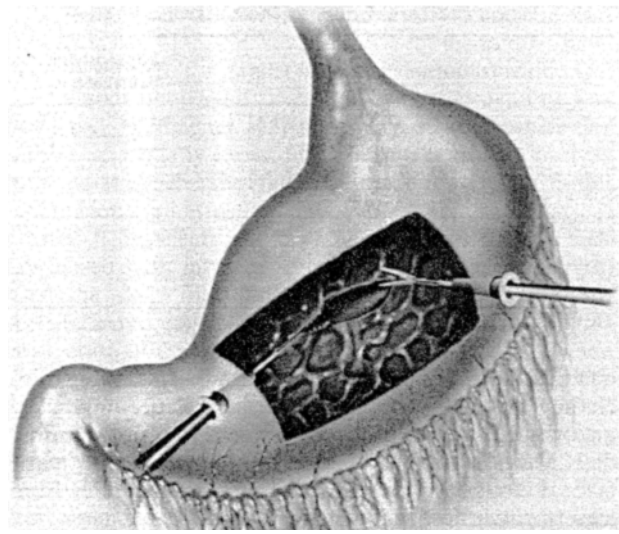


Fig. 9. Laparoscopic intraluminal cystogastrostomy. Using a harmonic scalpel, a wide communication is created between the pseudocyst and the stomach.

Results

For patients with distal pancreatectomy and spleen salvage with splenic vessels preservation, the mean operative time was 4 h (range 3–5). The mean blood loss was 450 ml (range 300–800). One patient was reoperated 4 days after surgery for perforation of a duodenal ulcer; a simple closure of the duodenal ulcer was performed through a midline incision. All patients were started on oral fluids 24 h after surgery and resumed a solid diet thereafter. The mean hospital stay was 6 days (range 5–14). The mean time to resume daily activities was 3 weeks (range 3–4). At 3 months after operation, all patients were in the normal range for serum glucose. All patients are now pain-free, with a mean follow-up of 13 months (range 12 months–2.6 years).

For the group of patients with laparoscopic transgastric drainage; the operative times for the two patients undergoing laparoscopic intraluminal cystogastrostomy were 120 and 150 min, respectively. No complications were observed, and the patients were discharged 4 days after surgery. The mean operative time in the group of patients undergoing laparoscopic anterior gastrotomy was 100 min (range 60–120). No complications were observed. The mean hospital stay was 4.5 days (range 3–5). All patients resumed normal daily activities within 2 weeks after laparoscopic surgery and are now free of symptoms. The mean follow-up was 6 months (range 12 months–2.6 years).

In the group of patients who underwent distal pancreatectomy via the open approach, the early postoperative complications were pulmonary-insufficiency in 15 patients and pancreatic fistula in five patients. The

Table 1. Patient data for three approaches to chronic pancreatitis

	Laparoscopic distal pancreatectomy	Conventional open distal pancreatectomy	Laparoscopic transgastric drainage
No. of patients	5	41	6
No. of patients with intraoperative blood transfusion (%)	—	25 (60%)	—
Splenic preservation (%)	100	39	100
Morbidity (%)	20	48	—
Mean hospital stay (days)	6	12	4.5
Mean time to resume normal daily activities (wk)	3	>5	2

mean hospital stay was 12 days (range 10–22 days) including patients with and without splenectomy. The majority of patients needed > 5 weeks to resume normal daily activities (Table 1). After a follow-up of > 5 years, 80%; of the patients are pain-free, but 60% suffer from latent or manifest diabetes mellitus.

Discussion

More than a decade ago, Pacher et al. [24] and Fitzgibbons et al. [14] managed the transected pancreas following distal pancreatectomy with the aid of a stapling device. Since that time, mechanical staplers have offerred a quick and easy method to perform pancreatic transection. Using this technology, as well as vascular staplers, Soper et al. were able to establish the safety and efficacy of laparoscopic distal pancreatectomy in an animal model, with no evidence of pancreatic leaks or fistulae [31].

In 1994 the first attempt to apply laparoscopic surgery to the surgical management of chronic pancreatitis was made by Gagner and Pomp [17] who performed a pylorus-preserving pancreaticoduodenectomy successfully in a 30-year-old woman with chronic pancreatitis. Delayed gastric emptying complicated the postoperative course, so that nasogastric tube drainage was needed for 20 days. The patient was discharged in good conditions on the 30th postoperative day. However, the procedure proved to be time-consuming: The operative time was 10 h. The authors concluded that, although it was technically feasible, the laparoscopic Whipple procedure did not promise to improve the postoperative outcome or shorten the postoperative period.

As Cuschieri has emphasized, the likely benefit of laparoscopic surgery over conventional open surgery is dependent on the ratio of access trauma to procedural trauma [12]. In pancreaticoduodenectomy, the access trauma comprises only a small component of the total operative insult to the patient; therefore, this operation could be done via the laparoscopic approach only when the postoperative course of the patient showed a better outcome than could be obtained with the current open approach.

At present, laparoscopic pancreaticoduodenectomy is not an option in patients with chronic pancreatitis and a mass in the head of the pancreas. However, in 1996 Cuschieri et al. described the technique they used to perform laparoscopic distal 70–80% pancreatectomy with en bloc splenectomy in a group of seven patients with intractable pain due to chronic pancreatitis [13]. The patients were placed in a supine position and five access ports were used—one in the umbilical area and two on each side in the subcostal region. To minimize the risk of major bleeding during the subsequent dissection and to reduce the size of the spleen, the splenic artery was ligated first, at a point close to its origin from the celiac axis. The splenic vein was ligated at the confluence with the portal vein. The authors demonstrated that this operation can be performed laparoscopically within an acceptable operating time and without major complications. In addition, with this technique, all patients achieved sustained pain relief.

In general, distal pancreatectomy is usually performed en bloc, along with resection of the spleen. Most of the time, the en bloc distal pancreatic–spleen resection is performed for technical reasons; it makes the operation short and easy but does not offer any special advantage effect for the patient [1]. Overwhelming sepsis after distal pancreatectomy and splenectomy has been reported [9]. Spleen-preserving distal pancreatectomy is a technically demanding and more time-consuming procedure. In addition, splenic preservation is sometimes not possible in patients undergoing distal pancreatectomy for chronic pancreatitis because the pancreatic tissue is firmly and densely adherent to the splenic vessels [1]. However, when spleen preservation was attempted in patients with chronic pancreatitis, the spleen was salvaged successfully in 25 of 74 patients (34%) by Schoenberg et al. [29] and 22 of 26 patients (85%) by Govil and Imrie [18]. These results compare favorably with the 8% rate of splenic preservation reported by Sakarofas et al. [28] and the 20% rate reported by Rattner et al. [26]. In the present report, spleen salvage was performed successfully in 39% of patients undergoing distal pancreatectomy via the open approach. As an alternative method, Warshaw has described a technique for distal pancreatectomy and conservation of the spleen that divides the splenic artery and vein but preserves the short gastric vessels [38]. This technique of spleen salvage has also been applied in various reports of laparoscopic distal pancreatic resection [8, 34, 37].

In this series, laparoscopic distal pancreatectomy with spleen salvage was performed successfully while also preserving the splenic vessels. We believe that the magnified view afforded by the laparoscopic approach facilitates the separation of the splenic artery and vein from the pancreatic parenchyma and the identification

of the small arteries and veins, which are then easily controlled with the use of laparoscopic instruments such as the harmonic scalpel and the Ligasure device. The procedure can be considered safe because there were no deaths and none of the patients required blood transfusions during their hospital stay. In our experience, the advantage that laparoscopic pancreatic resection offers in reducing the parietal damage in the abdomen then extends to a hospital stay that is reduced to < 1 week and an earlier return to normal activity, within 3 weeks. These results compare favorably with those for the patients who underwent conventional open distal pancreatectomy, in whom the mean hospital was 12 days and postoperative recovery required > 5 weeks.

The management of patients with chronic pancreatic pseudocysts > 6 cm in diameter includes percutaneous drainage [19], surgical decompression [7, 19, 23, 32, 36, 41] by external or internal drainage (into the stomach or jejunum), and pancreatic resection. The success or failure of each of these therapeutical options is sometimes difficult to interpret in the current literature, especially when it is not clear whether the pseudocysts were the result of acute or chronic pancreatitis and whether there is a communication between the pseudocysts and the Wirsung duct.

In recent years, endoscopic drainage has been proposed as a minimally invasive alternative [3, 35]. CT scans allow the identification of pancreatic pseudocysts bulging into the stomach or duodenum lumen that are amenable to minimally invasive methods. Endoscopic drainage can be performed using transpapillary cyst drainage or transmural techniques (endoscopic cystogastrostomy and endoscopic cystoduodenostomy) [27]. Transpapillary cyst drainage is technically demanding, but in selected cases successful drainage was achieved in 84% of patients with a 9% recurrence rate over a mean follow-up of 2 years [2]. Transmural pseudocyst drainage mimics the technique used in open surgery to drain the pseudocyst into the stomach or duodenum. In a collective series, endoscopic cystogastrostomy and endoscopic cystoduodenostomy achieved successful drainage in 82% and 89% of cases and a recurrence rate of 18% and 6%, respectively [3]. Perforation occurred less often with endoscopic cystoduodenostomy (4%) than with endoscopic cystogastrostomy (18%). Bleeding that required surgery due to the opening of a large vessel occurred in 7% of patients after endoscopic cystogastrostomy and 3% after cystoduodenostomy [3]. Recently, Beckingham et al. [4] reported the long-term outcome of endoscopic drainage of pancreatic pseudocysts in 34 patients selected for this method [35]. The etiologies were chronic pancreatitis in 20 patients, acute pancreatitis in four patients, and trauma in 10 patients. Pseudocysts associated with chronic pancreatitis were drained successfully in 75% of cases and therewere no recurrences at 4-year median follow-up. Thick-walled pseudocysts (> 1 cm) and pseudocysts located in the tail of the pancreas were associated with technical failures. When these criteria are followed, endoscopic transmural drainage can be recommended as a safe technique in < 50% of pancreatic pseudocysts [4].

The principles of both open and endoscopic drainage have been adopted by laparoscopic surgeons for the management of pancreatic pseudocysts. Since the first reports in 1994 [15, 41], several different techniques have been described for laparoscopic pseudocyst drainage. First, laparoscopic intraluminal cystogastrostomy was described by Gagner [15] and Way et al. [40]. In this technique, radially expanding 5-mm trocars are inserted into the stomach, allowing the introduction of a 5-mm laparoscope and instruments. A cystogastrostomy is created using electrocautery. The holes in the stomach are closed with intracorporeal sutures. Trias et al. [33] used the same intraluminal approached, but they inserted 12-mm cannulas with a balloon, allowing the introduction of the endostapler device and creating a wide cystogastrostomy. After removing the cannulas, both gastric holes were closed with staples.

Second, laparoscopic anterior cystogastrostomy was initially described by Meltzer and Amaral [21], later reported by Holeczy and Danis [20], and more recently recommended by Smadja et al. [30]. An anterior gastrostomy is performed to allow easy access to the posterior wall of the stomach. Once the cystogastric interface is located, the pseudocyst cavity is penetrated using electrocautery. Both cystogastrostomy and anterior gastric wall closure are performed using an endoscopic linear stapler.

Third, laparoscopic posterior cystogastrostomy was described by Morino et al. [22] and more recently by Park et al. [25]. This technique uses the "lesser sac" approach; the anastomosis is performed between the pseudocyst and posterior wall using an endoscopic linear stapler.

Before deciding on one of these techniques, ERCP should be performed to obtain information on the anatomy of the main pancreatic duct. In some series, a pseudocyst communication with the Wirsung duct was found in 44–68% of cases [35]. Pancreatic duct strictures and calculi are not infrequent findings in patients with chronic pancreatitis. Endoscopic ultrasound is another valuable imaging technique in the management of pancreatic pseudocyst because it allows identification of the area of the pseudocyst–gastric or the pseudocyst–duodenum apposition, excludes the presence of pseudoaneurysms, and differentiates pseudocysts from cystic neoplasms with increased accuracy [3].

We believe that when pseudocysts, independent of their size, are associated with an inflammatory mass in the head of the pancreas or a large duct in the head of the gland with calculi, they should be treated with pancreatic head resection. In addition, patients with ductal strictures in the body of the pancreas and a distal pancreatic pseudocyst are best treated by distal pancreatectomy. The laparoscopic approach using the internal drainage of pseudocysts, should be reserved for pseudocysts > 5–6 cm that are located in the head or body of the pancreas. Communication with the main pancreatic duct does not exclude laparoscopic internal drainage, except in patients with obvious multiple pancreatic duct strictures. Nevertheless, in patients with chronic pancreatitis and continued alcohol abuse, the persistent changes may lead to the development of pancreatic inflammation, mass lesions, or duct dilatation due to obstruction. In these patients, laparoscopic

internal drainage may not be a definitive treatment; indeed more radical surgery may be needed in the course of the disease. For patients who may require reoperation, initial use of the laparoscopic approach confers the possibility of an easier reoperation.

Conclusion

In summary, laparoscopic surgery in patients with chronic pancreatitis seems to offer all of the advantages of a minimally invasive approach in terms of cosmetic results, hospital stay, and postoperative recovery. Clinical experience with the laparoscopic approach in patients with distal chronic pancreatitis is rather limited, but given the excellent results achieved thus far with this procedure, we believe that it will soon become a viable option for selected groups of patients. Moreover, both laparoscopic intraluminal cystogastrostomy and laparoscopic anterior cystogastrostomy are safe and effective methods to treat symptomatic patients with pseudocysts of the pancreas. The main benefit of a minimally invasive method using the laparoscopic approach lies in the excellent visualization of the structures, so that complications such as bleeding and perforation can be avoided. Furthermore, the use of a stapling device to create the cystogastrostomy not only prevents hemorrhage from the anastomosis site but also provides a wide opening, which prevents recurrence of the pseudocysts. Based on the prompt recovery and early resumption of normal daily activities seen with these patients, the laparoscopic approach appears to be highly advantageous. In the future, prospective studies comparing endoscopic management with the laparoscopic approach will determine which patients are most likely to benefit from one or the other of these minimally invasive methods of treating pancreatic pseudocysts. The cost–benefit issue can also be expected to play a significant role in the decision-making process (Fig. 9).

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