Laparoscopic pancreatic surgery

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Abstract
In the past, in the pancreas, a minimally invasive technique was only used for diagnostic laparoscopy in evaluating periampullary malignancy. Recent advances in operative techniques and instrumentation have empowered surgeons to perform virtually all procedures in the pancreas, including the Whipple procedure. Some of these procedures represent the most sophisticated application of minimally invasive surgery, and their outcomes are reportedly better than those of conventional open approaches. In addition to the evaluation of resectability in periampullary malignancy, palliative procedures, including biliary bypasses and gastrojejunostomy, can be performed laparoscopically. Although it is reportedly feasible to perform a Whipple procedure laparoscopically, no benefit of the laparoscopic approach over the conventional open approach has been documented. Laparoscopic distal pancreatectomy, with or without preserving the spleen, is technically easier than the Whipple procedure, and is more widely accepted. Indications for laparoscopic distal pancreatectomy include cystic neoplasms and islet-cell tumors located in the pancreatic body or tail. Complications of acute and chronic pancreatitis may be treated with the use of surgical laparoscopy. When infected necrotizing pancreatitis is identified, surgical intervention for drainage and debridement is required. According to the type and location of infected necrotizing pancreatitis, three laparoscopic operative approaches have been reported: infracolic debridement, retroperitoneal debridement, and laparoscopic transgastric pancreatic necrosectomy. When internal drainage is indicated for a pseudocyst, a minimally invasive technique is a promising option. Laparoscopic pseudocyst gastrostomy, cyst jejunostomy, or cyst duodenostomy can be performed, depending on the size and location of the pseudocyst. Especially when a pseudocyst is located in close contact with the posterior wall of the stomach, it is best drained by a pseudocyst gastrostomy, which can also be done with the use of an intragastric operative technique.

Key words Minimally invasive surgery · Pancreas · Pancreatic neoplasm · Acute pancreatitis

Introduction
Laparoscopic pancreatic surgery represents the most advanced application of surgical endoscopy currently in use. In the past, in the pancreas, diagnostic laparoscopy for evaluating periampullary malignancies was virtually the only pragmatic application of a minimally invasive technique. Recent advances in technology and techniques have opened the gates widely to a wide range of applications of minimally invasive surgery in patients with pancreatic disorders.

Laparoscopic staging of pancreatic cancer
Laparoscopic techniques can now be used for diagnosis, staging, and therapeutic procedures. Some surgeons prefer to perform diagnostic laparoscopies in virtually all patients with pancreatic cancer. Accurate staging facilitates the selection of patients for resection and for neoadjuvant therapy, and allows for selective planning for best palliation.

For exploration of the pancreas, a laparoscopic Babcock forceps grasps the greater curvature of the stomach, retracting it upward. The gastrocolic ligament is dissected below the gastroepiploic vessels, and the lesser sac is entered (Fig. 1). Through a 10-cm window, the body and tail of the pancreas are inspected for possible seeding. It is also possible to inspect the upper part of the lesser sac, by creating a window over the left caudate lobe, and to assess local invasion. Laparoscopic ultrasonography is essential for further examination. Small metastases dispersed throughout the liver, which are frequently associated with pancreatic cancer, may only be detected by laparoscopic intracorporeal ultra-
Ultrasonography may unveil tumor invasion to the portal vein, the superior mesenteric artery, and the superior mesenteric vein. Laparoscopy-guided fine-needle aspiration or biopsy of the pancreatic lesion is usually done to confirm the diagnosis. In some cases, a laparoscopic Kocher maneuver is performed to evaluate duodenal and vena caval involvement. The ligament of Treitz is inspected for mesojejunum involvement, and regional nodes in the paraduodenal and pericholedochal areas are sampled. A branch of the middle colic vein can be followed to the mesenteric vein to exclude portomesenteric vein involvement. Using all these maneuvers, it is reportedly possible to exclude more than 90% of unresectable lesions, thus obviating unnecessary laparotomy in patients with advanced disease.

**Laparoscopic palliative procedures for pancreatic cancer**

Laparoscopic cholecystojejunostomy and Roux-en-Y hepaticojejunostomy have been performed with great success to palliate jaundice. Alternatively, after transhepatic catheterization of a segment II or III bile duct, the left lobe of the liver and the lesser curvature of the stomach are perforated under fluoroscopic and laparoscopic guidance. Anastomosis between the biliary tree and the stomach is maintained with a gastrostomy tube placed across the tract. After 2 weeks, the tube is removed, and patency of the tract is preserved with a metallic stent.

Laparoscopic gastro-jejunostomy can be performed alone or with biliary bypass. A laparoscopic gastric bypass is sometimes added after an endoscopic biliary prosthesis is inserted. A loop of proximal jejunum is grasped and pulled up to the stomach. Two stay sutures are placed, fixing the loop to the stomach. A linear stapler is introduced and fired, creating a wide anastomosis. The entry hole is then closed with laparoscopic suturing.

Bilateral thoracoscopic splanchnecotomy may also be added to control intractable pain requiring opiate analgesia.

**Pancreatic resection**

Despite its retroperitoneal location, exposure and mobilization of the pancreas can be achieved in the vast majority of patients and does not usually pose major technical problems, provided the surgeon is experienced in advanced laparoscopic techniques and in pancreatic surgery.

**Laparoscopic Whipple procedure**

The laparoscopic technique for a Whipple procedure is a modification of the technique of Longmire and Traverso; namely, a pylorus-preserving pancreatoduodenectomy. Although only limited data are available, laparoscopic pancreatoduodenectomy for periampullary cancer has been, reportedly, disappointing and no benefit from the laparoscopic approach over the conventional open approach has been documented. In addition, there are real concerns that an oncologically adequate operation (with extended lymphadenectomy) for cancer of the head of the pancreas is not possible by the laparoscopic approach.

**Distal pancreatectomy**

Laparoscopic distal pancreatectomy for chronic pancreatitis and cystic tumors appears to confer benefit over the equivalent open operation by accelerating recovery and return to full activity of the patient after surgery. Laparoscopic resection is indicated for benign disease and low-grade malignancy, and no local recurrence is reported. The main morbidity continues to be the occurrence of a fistula (15%), which is identical to the rate in the equivalent open operation. Distal pancreatic resection with spleen preservation is preferred.