

Totally laparoscopic pancreas-sparing duodenectomy

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Abstract Pancreas-sparing duodenectomy (PSD) is a practical surgical procedure for patients with duodenal adenoma, which is difficult to resect endoscopically. We describe how we performed a totally laparoscopic PSD to resect a duodenal adenoma in a 64-year-old woman, who had been referred for treatment of a 50-mm villous polypoid mass in the second portion of the duodenum. We performed end-to-side anastomosis between the common duct of the bile and pancreatic ducts and the jejunal limb intracorporeally following the duodenal resection. A biliary leak developed, but resolved spontaneously and the patient was discharged on postoperative day (POD) 22. The surgical margin was free of neoplastic change. Although there is limited experience and appropriate indications must await future studies, this case demonstrates that laparoscopic PSD is feasible, safe, and effective for selected patients.

Keywords Laparoscopy · Pancreas-sparing duodenectomy · Laparoscopic pancreas-sparing duodenectomy · Duodenal adenoma

Introduction

Pancreaticoduodenectomy (PD), originally designed for malignancies of the duodenum, is also commonly performed for potentially malignant lesions. However, recent advances in diagnostic imaging and the surgical anatomy of the pancreatoduodenal region now permit pancreas-

sparing duodenectomy (PSD) [1–9]. Although PSD is an attractive option for patients with disease of the duodenum without pancreatic involvement, the surgical technique is made challenging by the close anatomical relationship between the pancreas and the duodenum. Recent technological innovations, improved surgical skills, and the extensive experience of surgeons have widened the applications of laparoscopic peripancreatic resection, including PSD, remarkably [10–18]. We report how we performed totally laparoscopic PSD for a duodenal adenoma, representing the first description of this laparoscopic procedure.

Patient and methods

Patient

A 64-year-old woman was referred to us for the evaluation and treatment of a duodenal lesion. Endoscopic examination revealed a 50-mm villous polypoid mass in the second portion of the duodenum, involving the major and minor papilla. Although multiple endoscopic biopsies did not disclose any malignancy, the patient underwent a laparoscopic PSD because focal cancer could not be excluded. The patient was informed of the possible advantages and complications of the new experimental method and that conversion to open surgery may be required. She signed informed consent, choosing this method instead of conventional surgery. The procedure received local ethical review board approval.

Laparoscopic resection

The patient was placed supine with her legs apart. Trocars were inserted at the same sites as for laparoscopic

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pancreaticoduodenectomy [14, 15]. A 12-mm trocar was placed via the umbilicus, through which CO₂ gas was delivered. Pneumoperitoneum was controlled electronically to a pressure of 10 mmHg. The other four trocars were inserted in the left lumbar quadrant (12 mm), the right lumbar quadrant (12 mm), the left midclavicular subcostal line (5 mm), and the right midclavicular subcostal line (5 mm), respectively. After cholecystectomy, the gastocolic ligament was divided and the omental bursa was opened. After dissecting between the duodenum and colon and mobilizing the hepatic flexure of the colon caudally, the proximal duodenum was separated from the pancreatic head. Dissection proceeded distally towards and immediately proximal to the minor papilla of Vater, where the pancreas had dense adhesions to the duodenum. The minor pancreatic duct was isolated with the surrounding pancreatic parenchyma, then tied and divided extraduodenally (Fig. 1). The Treitz ligament was dissected and the duodenum was Kocherized. The first jejunal limb was sectioned just distal to the duodenojejunal ligament using a laparoscopic stapler. The sectioned proximal jejunum was then passed behind the mesenteric vessels. Dissection between the pancreatic parenchyma and the duodenum was performed to the major papilla of Vater, where the pancreas was also densely adhered to the duodenum. The pancreatic parenchyma, which included the common bile duct and the major pancreatic duct, was divided extraduodenally, while placing the duodenum on tension to the patient's right (Fig. 2). Finally, the proximal duodenum was transected at a site just distal to the pylorus using a laparoscopic stapler.

Laparoscopic reconstruction

Common ductal-plasty of the bile and pancreatic ducts was performed, resulting in one anastomotic orifice (Fig. 3). The

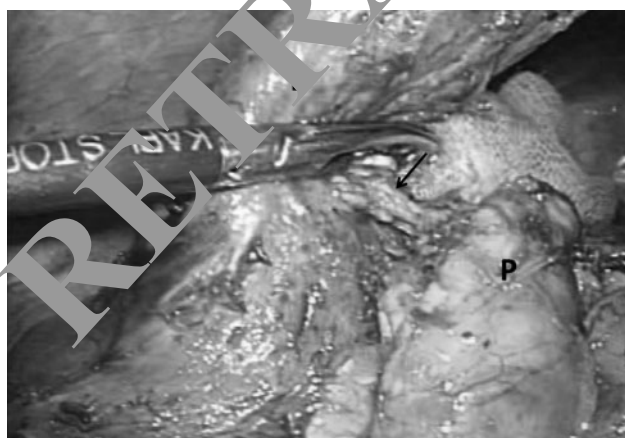


Fig. 1 The proximal duodenum (D) was separated from the pancreatic head (P), and the minor pancreatic duct (arrow) was isolated extraduodenally with the surrounding pancreatic parenchyma

distal end of the jejunum was delivered through a window in the transverse mesocolon and end-to-side anastomosis was done without a stenting tube between the common duct and the jejunal limb, using a 5-0 monofilament absorbable running suture intracorporeally (Fig. 4). A navel incision was extended to 2.5 cm and covered with a Lap Protector (Hakko Shoji, Tokyo, Japan). Through this incision, the specimen was extracted and an end-to-side duodenojejunostomy was performed using an open method (Fig. 5). A drainage tube was placed over the pancreatic head. The resected duodenal specimen contained a 55 × 45-mm tumor with macroscopically free margins (Fig. 6).

Results

The procedure took 241 min with 70 ml blood loss. No blood transfusion was required. The nasogastric tube was removed on postoperative day (POD) 1 and oral intake was

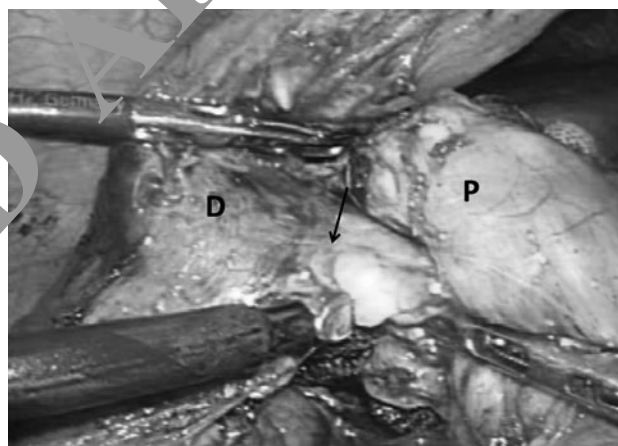


Fig. 2 The major pancreatic duct (arrow) with the surrounding pancreatic parenchyma was divided extraduodenally

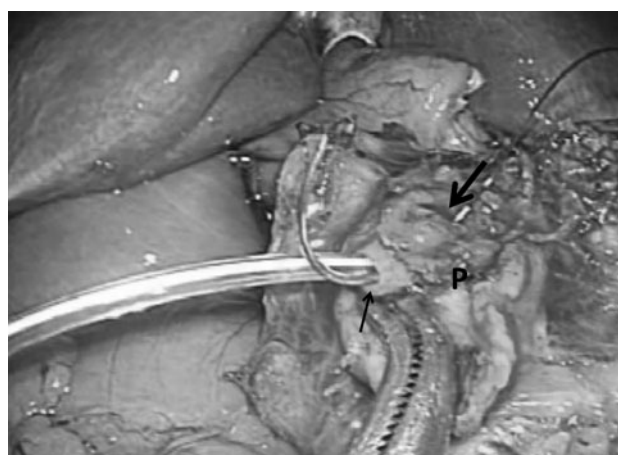


Fig. 3 The common ductal-plasty of the bile duct (thick arrow) and pancreatic duct (arrow). A stent tube was inserted into the pancreatic duct

resumed on POD 4. The abdominal drainage tube was not removed until POD 24 because of a biliary leak and postoperative pancreatic fistula (Grade A), which resolved spontaneously. The patient was discharged on POD 32.

Histological examination revealed tubular adenoma with moderate to severe atypia. No neoplastic change was found at the surgical margin of the duodenum.

Discussion

The rising prevalence of upper gastrointestinal endoscopy has resulted in an increasing number of reports on duodenal

adenoma. However, the endoscopic resection of duodenal adenomas is made difficult by the anatomical features of the duodenum, and the long distance to the lesion. PSD is a feasible option for diseases of the duodenum without pancreatic involvement, such as familial adenomatous polyposis syndrome, villous adenoma, and duodenal trauma [3–5, 9]. In the present case, multiple endoscopic biopsies did not disclose any malignancy, and preoperative images did not demonstrate any swollen lymph nodes or pancreatic involvement. Moreover, because the tumor surrounded the major papilla and was too extensive to be removed locally, we decided that PSD was well indicated. Minimally invasive surgery is widely accepted as an alternative to conventional open surgery in many gastrointestinal fields, especially for premalignant conditions. Two previous reports described laparoscopic pancreas-sparing infra-ampullary duodenectomy to remove a benign peptic stricture of the fourth portion [19] and an early cancer involving the third portion, respectively [20].

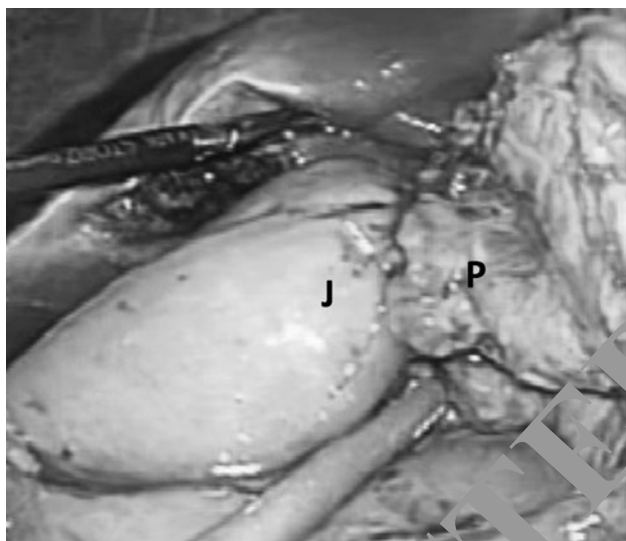


Fig. 4 An end-to-side anastomosis was made between the common duct and the jejunum (J). P pancreatic head

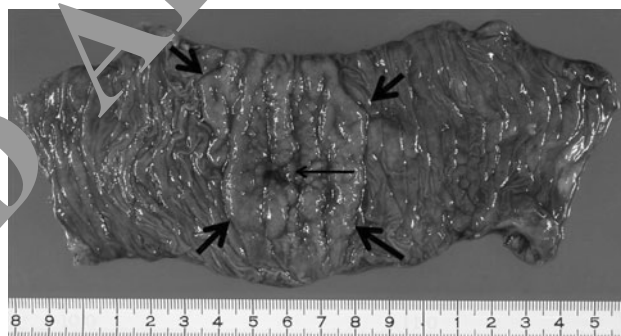
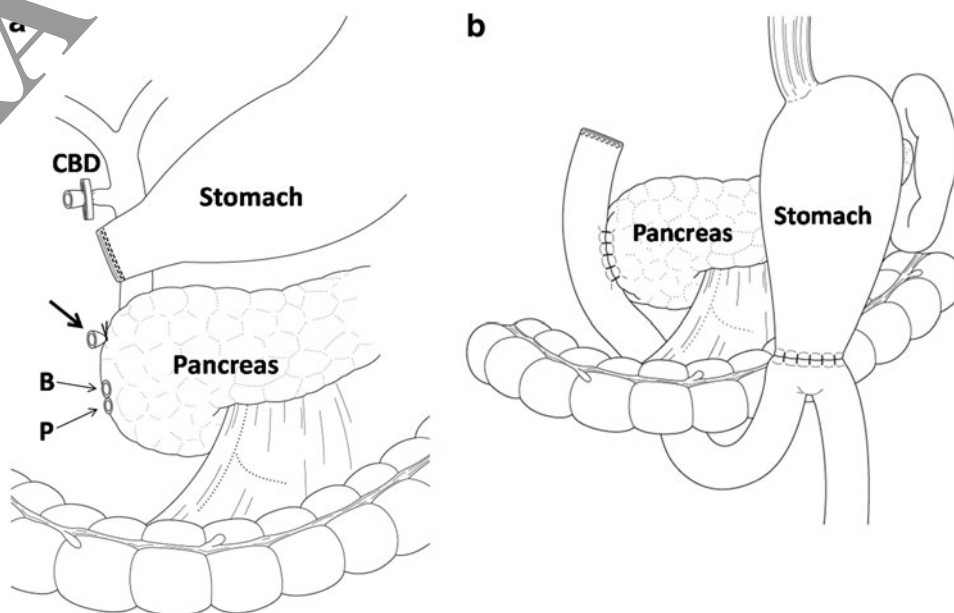


Fig. 6 The resected duodenal specimen contained a 55 × 45-mm villous tumor (thick arrows) surrounding the major papilla (arrow)

Fig. 5 Illustrations show the laparoscopic resection (a) and reconstruction (b). The minor pancreatic duct (thick arrow) was tied and divided. The common bile duct (B) and major pancreatic duct (P) were divided extraduodenally. An end-to-side anastomosis was created without a stenting tube between the common duct and the jejunal limb



However, few cases of pancreas-sparing total or supra-ampullary duodenectomy have been reported. Pancreas-sparing infra-ampullary duodenectomy is a relatively easy procedure because the pancreas is attached, but not adherent to the duodenum, distal to the ampulla; thus, the infra-ampullary duodenum can be detached easily from the pancreas [7]. In contrast, the pancreas has dense adhesions to the duodenum proximal to the ampulla [1], but separation can be achieved by parenchymal dissection of the pancreatic head attached to the duodenal wall, using laparoscopic coagulation shears and dividing the minor pancreatic duct. Laparoscopic reconstruction between the common duct and the jejunum is easier in PSD than in pancreaticojejunostomy in PD, because the common duct wall is thick and not as fragile as the intrapancreatic duct. Although a severe pancreatic fistula did not ensue in our patient, she experienced a bile leak, which prolonged her hospital stay. As in open reconstruction, care should be taken to avoid tearing the common duct.

Although experience is limited and a study on a large series of these rare tumors is unlikely, this case suggests that laparoscopic PSD is feasible, safe, and effective for highly selected patients. However, the benefits of this procedure are yet to be proven. Obviously, not only adequate experience in pancreatic surgery, but also expertise in laparoscopy is mandatory and the careful selection of patients is essential for successful application of this procedure.

Conflict of interest There is no conflict of interest.

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