

How I Do It

Laparoscopic single-branch resection of the pancreas for  
intraductal papillary mucinous neoplasm

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**Abstract**

Although laparoscopic pancreatic resections have become more common, laparoscopic minimally invasive and function-preserving pancreatic resections have not been widely accepted. Branch-type intraductal papillary mucinous neoplasm (IPMN) has a low-grade malignant potential and shows a favorable prognosis. In branch-type IPMN, minimal resection techniques with preservation of the pancreatic functional reserve have advantages over the more conventional pancreaticoduodenectomy. We describe herein laparoscopic single-branch resection of the pancreas for branch-type IPMN. This surgical procedure is a novel and an ideal minimally invasive method for the resection of branch-type IPMN. In addition, our endoscopic naso-pancreatic drainage (ENPD) tube-guided technique is useful for precise resection of the tumor and for the prevention of pancreatic fistula.

Keywords: pancreas, laparoscopic, single-branch resection, IPMN, ENPD, pancreatography.

## **Introduction**

Intraductal papillary mucinous neoplasm (IPMN) of the pancreas is characterized by dilatation of the main and/or branch pancreatic ducts, mucin hypersecretion, and intraductal papillary growth.<sup>1-3</sup> IPMNs are classified into three types, a main pancreatic duct type, a branch type, and a mixed type based on imaging studies or histological features. The branch-type IPMN has a low malignant potential and shows a favorable prognosis. Therefore, several new surgical procedures for minimal resection of the pancreas with pancreatic functional reserve have been introduced, including duodenum-preserving pancreatic head resection,<sup>4, 5</sup> ventral pancreatectomy,<sup>6</sup> inferior head resection of the pancreas,<sup>7</sup> and single-branch resection of the pancreas.<sup>8</sup> Single-branch resection is the ultimate minimally invasive surgical procedure for minimal resection of the pancreas because it requires no reconstruction of the main pancreatic duct or common bile duct and inflicts no damage to the surrounding normal pancreatic parenchyma.<sup>8</sup> In addition, laparoscopic pancreatic surgery has been accepted as a minimally invasive surgery for pancreatic diseases, especially benign or low-grade malignant

tumors. We report herein a case of successful laparoscopic single-branch resection for the branch-type IPMN of the head of the pancreas.

### **Patient and Technique**

A 50-year-old woman was referred to our hospital for further evaluation of a cystic tumor in the uncinate process of the pancreas. She presented with abdominal discomfort and back pain. Upon admission, there were no abnormal findings in the laboratory data. The endocrine pancreatic function, as determined by a 75-g oral glucose tolerance test, and the exocrine function, determined by a pancreatic function diagnostic (PFD) test, were within normal range. Abdominal US and computed tomography (CT) showed a multilobular cystic lesion, 40 mm in diameter, in the uncinate process of the pancreas. Endoscopic retrograde pancreatography (ERP) showed a cystic lesion communicating with the main pancreatic duct. The main pancreatic duct showed no dilatation and abnormality. In addition, no mural nodules were noted in the cyst. The cytology of the pancreatic juice was negative for malignant cells. Consequently, the cystic lesion was diagnosed as a branch-type intraductal papillary mucinous neoplasm (IPMN), and the patient was considered a candidate for surgery.

Under general anesthesia, we placed a 5F-size endoscopic naso-pancreatic drainage (ENPD) tube (Olympus, Tokyo Japan) for

intraoperative pancreatography prior to surgery. The ENPD tube was inserted deep into the main pancreatic duct through the orifice using an endoscopic technique.

The patient was placed in a supine position, and the patient angle was adjusted as needed by rotation of the operating table. The first 12-mm trocar for a laparoscope was inserted at the umbilicus using an open technique, and a pneumoperitoneum was set at 8 mm Hg. Four additional trocars were inserted: two 12-mm trocars level with the right and left midclavicular lines, and two 5-mm trocars level with the right and left anterior axillary lines. The first step was to expose the head and body of the pancreas by opening the lesser sac. The gastrocolic ligament was divided with a LigaSure (Valleylab, Boulder, CO, USA). The Kocher maneuver was performed with complete exposure of the pancreatic head and the uncinate process of the pancreas. The uncinate process was then dissected off along the right lateral aspect of the superior mesenteric vein using a LigaSure. The cystic tumor was dissected along the border of the tumor and the surrounding normal pancreatic parenchyma using a regular hook electrocautery device (Fig. 1). At the final step of subsequent pancreatic parenchymal

transection, the communicating pancreatic duct was fully exposed and encircled with a radiopaque marker filament, which was obtained from surgical gauze. Using this marker with intraoperative pancreatography through the ENPB tube (Fig. 2), the communicating branch between the cystic lesion and the main pancreatic duct was carefully evaluated, and the cystic tumor was then dissected at the optimal cutting point of the pancreatic branch duct. The pancreatic branch duct was then ligated by a 3-0 non-absorbable monofilament suture. After removal of the cystic tumor, pancreatography was performed and revealed no injury to the main pancreatic duct or leakage from the transected pancreatic branch ducts. Because a mixture of indigocarmine and contrast material was used for the pancreatography, we were able to detect any minor pancreatic leakage as a blue spot at the cut surface of the pancreas and appropriately close the leaking points with sutures. The surgical specimen was removed through an umbilical incision inside a retrieval bag. Intraoperative frozen section histological examination of the dissected pancreatic duct revealed a disease-free margin. The ENPD tube was removed perioperatively. The operating time was 253 min, and blood loss

was 5 ml. Histological diagnosis was intraductal papillary mucinous adenoma of the pancreas. The postoperative course was uneventful, and the patient was discharged home on the 4th postoperative day with no endocrine or exocrine pancreatic insufficiency.



## **Discussion**

The development of various laparoscopic instruments and techniques has enabled laparoscopic pancreatic surgery, not only distal pancreatectomy but also pancreaticoduodenectomy.<sup>9-11</sup> Furthermore, Machado et al.<sup>12</sup> have reported that laparoscopic resection of uncinate process of the pancreas is a safe and feasible surgical procedure for organ preservation. In contrast, we introduced laparoscopic single-branch resection of the pancreas for the branch-type IPMN in the present case. The branch-type IPMN of the pancreas shows a more favorable prognosis than invasive ductal adenocarcinoma of the pancreas. In benign or low-grade malignant IPMN, complete tumor resection is sufficient for a cure. Therefore, laparoscopic single-branch resection of the pancreas is an ideal minimally invasive surgical procedure for the branch-type IPMN because single-branch resection of the pancreas results in the complete presentation of the normal pancreas parenchyma without any organ reconstruction. Single-branch resection of the pancreas was proposed by Sata et al.<sup>8</sup> as a minimally invasive operation for branch-type IPMN. The presence of invasive carcinoma is a contraindication for

single-branch resection of the pancreas. In addition, it is important to confirm that the surgical margin at the communicating branch duct is free of dysplastic epithelium. In the present case, we used ENPD tube for intraoperative pancreatography to detect the communicating branch duct and the anatomical relationship between the cystic mass and main pancreatic duct for determining the resection line at the communicating branch duct, and to avoid injury of the main pancreatic duct. The preoperative insertion of an ENPD tube in the main pancreatic duct can demonstrate a repeated intraoperative pancreatography. In addition, we used a mixture of a dye and contrast medium for the intraoperative pancreatography, which allowed us to directly identify the pancreatic leakage as a visible blue point by detecting the dye leakage. Thus, the insertion of an ENPD tube was useful to determine the certain resection line of the pancreas, and to avoid pancreatic leakage.<sup>13</sup>

In conclusion, ENPD tube-guided laparoscopic single-branch resection of the pancreas, without reconstruction of the pancreatobiliary tract, is the most ideal, least invasive pancreatic resection for the branch-type IPMN.

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**Figure legends**

**Fig. 1.** The cystic tumor was dissected along the border of the tumor and the surrounding normal pancreatic parenchyma. The arrowhead indicates the cystic tumor.

**Fig. 2.** Intraoperative pancreatography using an ENPD tube demonstrates a communicating duct between the main pancreatic duct and cystic lesion. The arrowhead indicates the communicating duct.

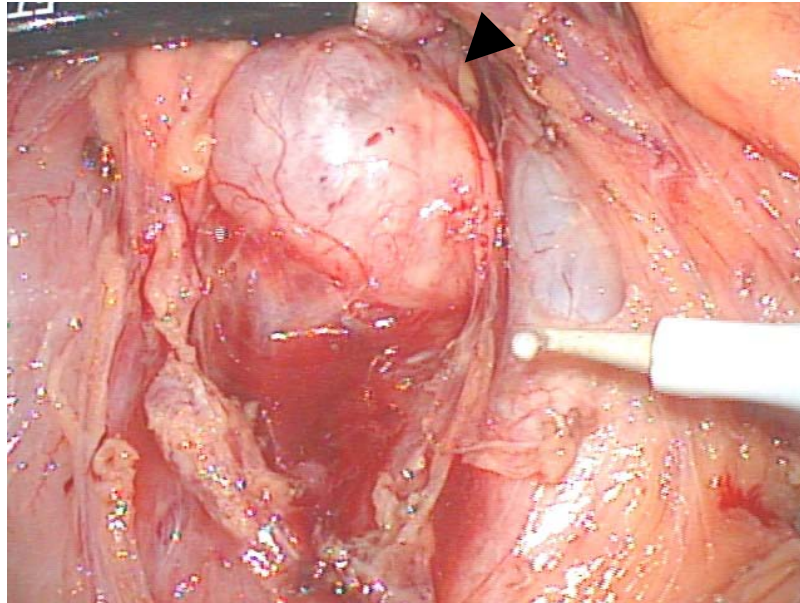


Fig. 1

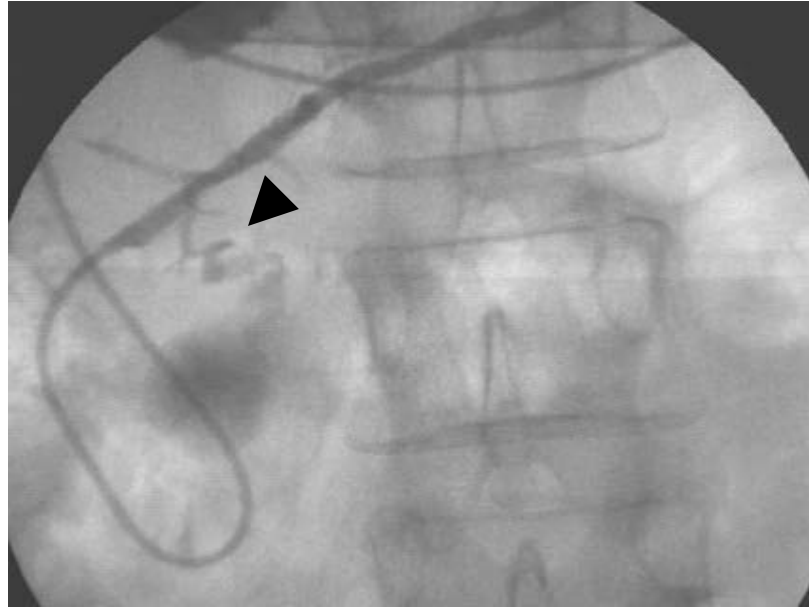


Fig. 2