

Laparoscopic transduodenal local resection of periampullary neuroendocrine tumor: A case report

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Core tip: There are few studies on laparoscopic transduodenal local resection. Only three cases have been reported in the English-language literature. We present our experience in laparoscopic transduodenal local resection in a case of periampullary neuroendocrine tumor. The successful outcome suggests that laparoscopic transduodenal local resection is a feasible procedure in selected patients with periampullary tumor.

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Abstract

Studies on laparoscopic transduodenal local resection have not been readily available. Only three cases have been reported in the English-language literature. We describe herein a case of 25-year-old woman with periampullary neuroendocrine tumor (NET). Endoscopic ultrasonography revealed a duodenal papilla mass originated from the submucosa and close to the ampulla. The periampullary tumor was successfully managed with laparoscopic transduodenal local resection without any procedure-related complications. Pathological examination showed a NET (Grade 2) with negative margin. The patient was followed up for six months without signs of recurrence. This case suggests that laparoscopic transduodenal local resection is a feasible procedure in selected patients with periampullary tumor.

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Key words: Laparoscopic surgery; Transduodenal local

INTRODUCTION

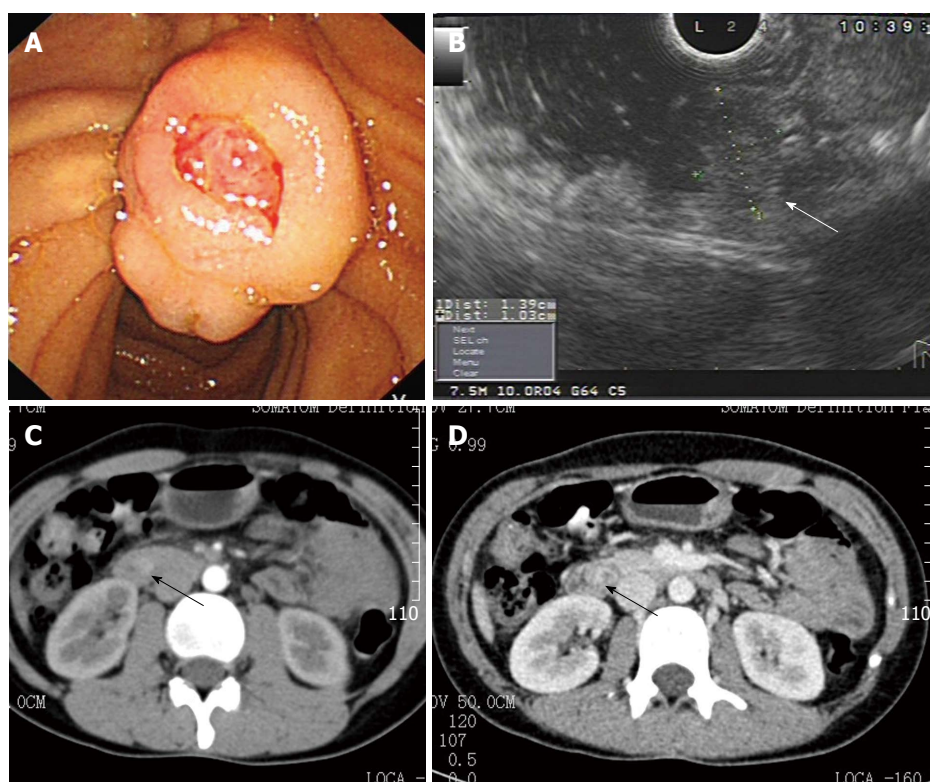
Halsted^[1] reported the first transduodenal local resection for a patient with adenocarcinoma of the ampulla of Vater. Compared with the traditional Whipple surgery, transduodenal local resection is an organ-preserving operation with low morbidity and mortality^[2]. Laparoscopic surgery has become widespread because of the improvement of laparoscopic equipment and techniques. However, studies on laparoscopic transduodenal local resection have not been readily available. Only three cases have been reported in the English-language literature (Table 1)^[3,4]. We herein present our experience in laparoscopic transduodenal local resection in a case of periampullary neuroendocrine tumor (NET).

CASE REPORT

A 25-year-old woman was admitted to our department because of recurrent melena for 5 mo. She had no fever,

Table 1 Reported cases of laparoscopic transduodenal local resection

Author	Age (yr)	Gender	Pathology	Size (cm)	Resection margin (cm)	Operative time (min)	Blood loss (mL)	Complication	Postoperative hospital stay (d)
Rosen <i>et al</i> ^[3]	75	Female	Villous adenoma	1.5-2.0	1.0	240	50	-	6
Ahn <i>et al</i> ^[4]	75	Female	Tubular adenoma	2.0 × 1.0 × 0.2	0.5	200	< 50	-	9
Ahn <i>et al</i> ^[4]	55	Male	Gangliocytic paraganglioma	1.0 × 0.9 × 0.7	0.4	250	< 50	-	8

**Figure 1** Periapillary tumor (arrow) was detected by gastroscopy, endoscopic ultrasonography, and computed tomography. A: Gastroscopy; B: Endoscopic ultrasonography; C, D: Computed tomography.

no abdominal pain, no nausea or vomiting, no diarrhea and no weight loss. She had anemic appearance, and other physical examinations were unremarkable. The laboratory tests showed reduced hemoglobin (7.7 g/dL) and fecal occult blood test was positive. Other laboratory tests, including renal and liver function tests and tumor markers (carcinoembryonic antigen, alpha fetoprotein, and carbohydrate antigens 19-9, 724, 242) were all within normal ranges. Gastroscopy showed a duodenal papilla mass (1.2 cm in diameter) with ulcer (Figure 1A). Endoscopic ultrasonography (EUS) revealed a duodenal papilla mass (1.0 cm × 1.4 cm) originated from the submucosa and close to the ampulla (Figure 1B). The pathologic report of the endoscopic biopsy showed small intestinal mucosa, chronic inflammation and focal activity. Computed tomography (CT) disclosed a 1.0 cm × 1.4 cm mass in the descending part of duodenum with rich blood supply (Figure 1C and D). According to the medical history and the imaging findings, the preoperative diagnosis was a periampullary tumor with bleeding [either

NET or gastrointestinal stromal tumor (GIST)]. Laparoscopic transduodenal local resection was performed.

The patient was placed in supine position under general anesthesia. The surgeon and the second assistant who held the laparoscope stood on the right side of the patient and the first assistant stood on the left. Carbon dioxide pneumoperitoneum was established (CO₂ at 15 mmHg) using a Veress needle. One initial 10-mm trocar was placed for the laparoscopy below the umbilicus. A 30-degree telescope was inserted to examine the peritoneal cavity to rule out metastatic disease. After general examination, the other four trocars (one 12 mm and three 5 mm) were inserted into the left upper flank, left flank, right upper flank, and right flank quadrants, respectively; and five trocars were arranged in a V-shape (Figure 2).

Dissection of Calot's triangle was performed carefully. After confirming the cystic artery and cystic duct, the cystic artery was clipped with a 10-mm disposable clip and divided. A small incision of cystic duct was made, and a cholangiogram catheter was inserted through

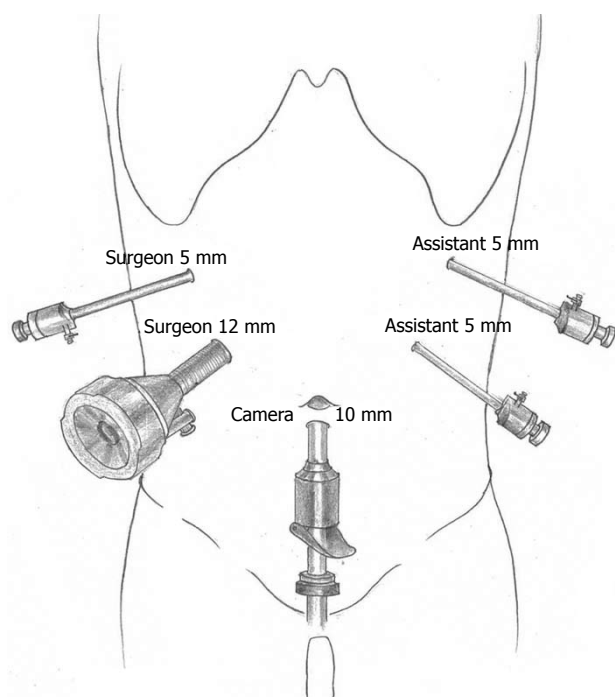


Figure 2 Location of trocars placement.

the cystic duct exiting into the duodenum through the papilla (Figure 3A). The duodenum was mobilized by the Kocher maneuver using harmonic scalpel (Harmonic Ace scalpel, Ethicon Endo-Surgery, Inc., Cincinnati, OH, United States) (Figure 3B). Two stay sutures were placed in the duodenal wall opposite the duodenal papilla, and a longitudinal incision (approximately 3.5 cm) of duodenal wall was made between the stay sutures using harmonic scalpel (Figure 3C). The periampullary tumor was then everted from this duodenotomy by a stay suture without directly manipulating it. The resection was performed circumferentially (inferior to superior) with the harmonic scalpel and electrocautery at a distance of 5 mm from the tumor (Figure 3D). The pancreaticobiliary duct was identified by the cholangiogram catheter passing through it (Figure 3E), and dissected proximally to ensure an adequate margin. Then the specimen was drawn into an endoscopic retrieval bag and removed through the umbilical incision. Intraoperative frozen section confirmed a NET with negative margin. The cut end of pancreaticobiliary duct was visualized within the resected area on the duodenal wall. Under the guidance of cholangiogram catheter, the pancreaticobiliary duct was sutured to the surrounding duodenal mucosa with interrupted 4-0 vicryl suture (Coated polyglactin 910 suture, Ethicon Products, Johnson and Johnson, New Jersey, United States) (Figure 3F). The duodenotomy was closed transversely with an endoscopic linear stapler (Endocutter 60 staple, white cartridge; Ethicon Endo-Surgery, Inc., Cincinnati, OH, United States) and interrupted 3-0 vicryl suture (Figure 3G). The gallbladder was then dissected from the liver bed using harmonic scalpel. The gallbladder was collected in an endoscopic retrieval bag and removed through the

umbilical incision. Two silicon drains were placed adjacent to the duodenum.

The operative time was 180 min and blood loss was 40 mL. The postoperative course was uneventful. The patient started to take semi-fluid on day 6 after surgery, and she was discharged on postoperative day 9. Postoperative pathology showed a NET (Grade 2). The tumor size was 1.3 cm × 0.6 cm × 0.6 cm with negative surgical margin (Figure 4). She was followed up by gastroscop and CT six months later without signs of recurrence and bleeding.

DISCUSSION

Duodenal NETs comprises up to 3% of all duodenal tumors and 2%-3% of all endocrine tumors^[5,6]. Approximately 20% of duodenal NETs occur in the periampullary region^[5]. Options for resection of small periampullary NETs include pancreaticoduodenectomy (PD), transduodenal local resection, and endoscopic resection^[6]. Although the mortality rate after PD (less than 4%) has been significantly decreased over recent decades, PD still carries a high morbidity rate ranging from 20% to 60%^[7-9]. Moreover, pancreatic exocrine insufficiency can affect more than 50% of patients, and diabetes can occur in more than 10% of the patients after PD^[10,11]. Endoscopic resection is an attractive method for treating benign periampullary tumors^[2]. But endoscopic resection can only be applied to small tumors without involving the ampulla and pancreatic and biliary ducts^[2]. Therefore, transduodenal local resection with low morbidity and mortality can be an intermediate treatment option between PD and endoscopic resection in the management of periampullary tumors^[2,12,13]. In our case, the periampullary tumor had rich blood supply and was close to the ampulla. A probable periampullary NET or GIST was diagnosed before operation. CT and EUS demonstrated the primary tumor, but no sign of locoregional lymph node or distant metastases. Therefore, transduodenal local resection was an optimal choice of treatment for the patient. The final pathological diagnosis was NET (Grade 2), so periodical follow-up after transduodenal local resection for surveillance of recurrence is indispensable.

Because of the complexity of the anatomy of the ampulla and the difficulties in rebuilding the pancreaticobiliary duct system, laparoscopic transduodenal local resection has developed very slowly. Since 2003, when Rosen *et al*^[3] reported the first case of laparoscopic resection of a periampullary villous adenoma, only three cases using this procedure have been reported in the English-language literature (Table 1)^[3,4]. The feasibility of this approach is supported by previous cases reported and our successful intraoperative and postoperative results. Compared with the open surgery, the laparoscopic transduodenal local resection is associated with a lower blood loss and perioperative morbidity, and shorter hospital stay, which showed its advantages as a minimally invasive operation (Tables 1 and 2)^[3,4,12-20]. However, although

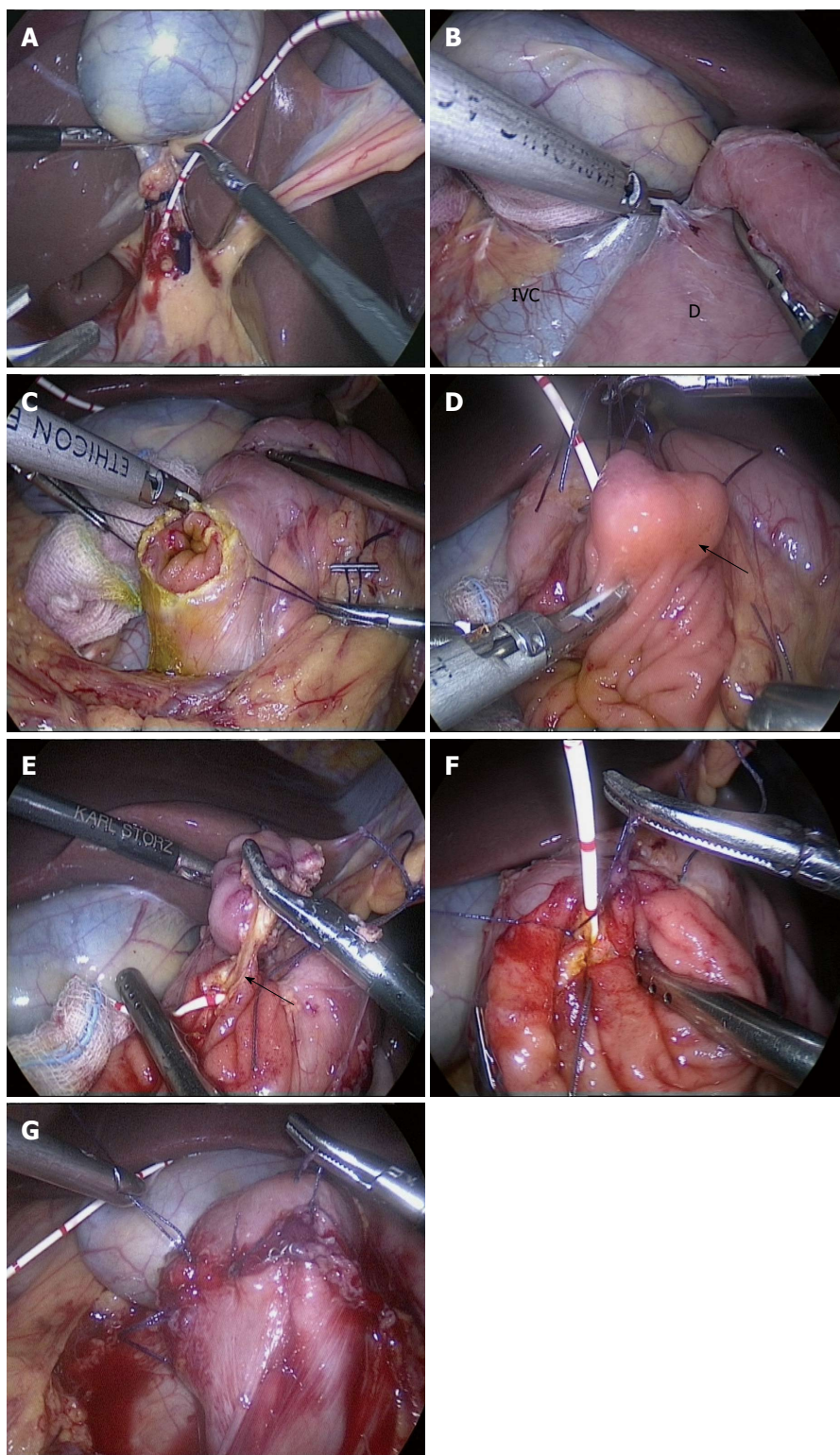


Figure 3 Steps of the surgical procedures. A: Inserting a cholangiogram catheter through the cystic duct to the duodenum; B: Mobilizing duodenum by the Kocher maneuver; C: Making a longitudinal incision of duodenal wall on the opposite site of the duodenal papilla; D: Performing the resection circumferentially at a distance of 5 mm from the tumor (arrow); E: Identifying pancreaticobiliary duct (arrow) by the cholangiogram catheter; F: Suturing the pancreaticobiliary duct to the surrounding duodenal mucosa; G: After closure of the duodenotomy. IVC: Indicates inferior vena cava; D: Duodenum.

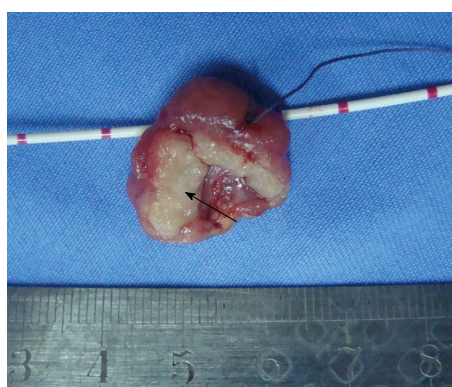
laparoscopic transduodenal local resection is a promising procedure, it needs to be validated by more clinical data.

Similar to the open surgery, laparoscopic transduodenal local resection raises two key points: (1) An adequate

margin; and (2) Reconstruction skill for restoration of ductal anatomy. To decrease the likelihood of recurrence, it is important to obtain an adequate margin^[2,12]. Adequate preoperative evaluation and careful performance

Table 2 Main Published series of open transduodenal local resection

Author	No	Operative time (min)	Blood loss (mL)	Morbidity	Mortality	Reoperation	Length of hospital stay (d)
Park <i>et al</i> ^[12]	4	258.8 ¹	NA	25%	0%	0%	16.5 ¹
Kim <i>et al</i> ^[13]	21	NA	NA	23.8%	0%	0%	9 ²
Posner <i>et al</i> ^[14]	21	NA	NA	48%	0%	0%	14 ¹
Bohra <i>et al</i> ^[15]	15	NA	NA	13.3%	0%	0%	13 ²
Sa Cunha <i>et al</i> ^[16]	10	NA	NA	10%	0%	0%	18 ¹
Ouaissi <i>et al</i> ^[17]	8	NA	NA	25%	0%	0%	15 ¹
Dixon <i>et al</i> ^[18]	19	NA	230 ¹	21.1%	0%	5.35%	NA
Feng <i>et al</i> ^[19]	25	178 ²	220 ²	8%	0%	0%	NA
Ceppa <i>et al</i> ^[20]	41	NA	NA	42%	0%	15%	10.1 ¹

¹Mean; ²Median. NA: Not available.**Figure 4** Resected specimen of periampullary neuroendocrine tumor (arrow).

of intraoperative frozen section of the margin play a decisive role in ensuring the negative margin^[12]. Schoenberg *et al*^[21] performed intraoperative frozen section of the macroscopically normal mucosal tissue 1 cm around the excised lesion in each case with no recurrence after a median 43-mo follow-up. This approach could explain the low recurrence rates in their series. If the margin is involved, conversion to PD should be considered^[12]. In our case and previous reported cases, intraoperative frozen section of the margins was all performed with negative result. Laparoscopic suturing for restoring ductal anatomy is the most difficult step of the procedure that needs highly skilled suture technique and patience. With the help of high-resolution imaging of the laparoscopy, the surgeon can suture better and ensure each stitch without omission. We inserted a cholangiogram catheter through the cystic duct exiting into the duodenum through the papilla in advance. The catheter was used not only to identify pancreaticobiliary duct during the resection, but also to guide the suturing of pancreaticobiliary duct to the duodenum.

In conclusion, our case suggests that laparoscopic transduodenal local resection is a feasible procedure in selected patients with periampullary tumor. Adequate preoperative evaluation, careful performance of intraoperative frozen section and highly skilled laparoscopic technique are the key factors of success in the laparoscopic transduodenal local resection.

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