



Case report

Laparoscopic liver resection with open partial resection of the thoracoabdominal wall for cancer along the transhepatic biliary drainage tract: A case report

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ARTICLE INFO

Keywords:

Case report
Laparoscopic liver resection
Cancer of the ampulla of Vater
Biliary drainage
Catheter tract recurrence

ABSTRACT

Introduction and importance: Recently, laparoscopic liver resection has been established as a standard procedure for a certain group of hepatic resections; its indications and procedures have been expanding.

Case presentation: A 67-year-old woman was referred with a chief complaint of left subcostal pain. Eight years and nine months before, she underwent pancreatoduodenectomy for cancer of the ampulla of Vater after endoscopic retrograde biliary drainage for obstructive jaundice. A trans-anastomotic internal-external retrograde transhepatic biliary drainage (RTBD) catheter was placed intraoperatively. Based on radiological findings, intrahepatic cholangiocarcinoma, or local recurrence of cancer of the ampulla of Vater, invading the anterior thoracoabdominal wall, diaphragm, and pericardium, without distant metastasis, were considered. Laparoscopic lateral segmentectomy of the liver combined with open en bloc resection of the invaded portion of the anterior thoracoabdominal wall with costal cartilage, diaphragm, and pericardium was performed. The postoperative course was uneventful, and the patient was discharged 17 days post-surgery. The patient died of cancer recurrence 46 months later.

Clinical discussion: The cancer invaded along the RTBD tract. Although the mechanisms of carcinogenesis remain unclear, transhepatic biliary drainage is a risk factor for cancer invasion along the tract. Laparoscopic liver resection before open thoracoabdominal wall resection ensured clear delineation of the cancer margins invading the thoracoabdominal wall and minimized the defect of the thoracoabdominal wall.

Conclusion: Laparoscopic liver resection for hepatic cancer invading adjacent structures or organs would be feasible and useful in selected patients, even if resection of the invaded area is performed by open surgery.

1. Introduction

Owing to the benefits of laparoscopic surgery, including reduced blood loss, less damage to the abdominal wall and peritoneum, decreased postoperative pain and morbidity, and shorter hospital stay, the laparoscopic approach has been preferred over open surgery if its feasibility and safety are assured. Recently, laparoscopic liver resection has been established as a standard procedure for a certain group of hepatic resections [1–3], and its indications and procedures have been

expanding. However, its indication for invasive hepatic cancer is controversial. Simultaneous laparoscopic resection of the liver and diaphragm could be an option for hepatic cancers invading the diaphragm [4,5].

Laparoscopic lateral segmentectomy of the liver and simultaneous open en bloc partial resection of the thoracoabdominal wall with costal cartilage, diaphragm, and pericardium was performed for a cancer around the tract of a retrograde transhepatic biliary drainage (RTBD) catheter placed during pancreatoduodenectomy for cancer of the

Abbreviations: RTBD, retrograde transhepatic biliary drainage; ERBD, endoscopic retrograde biliary drainage; PTBD, percutaneous transhepatic biliary drainage; ERCP, endoscopic retrograde cholangiography.

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<https://doi.org/10.1016/j.ijscr.2021.106497>

Received 18 September 2021; Received in revised form 5 October 2021; Accepted 7 October 2021

Available online 12 October 2021

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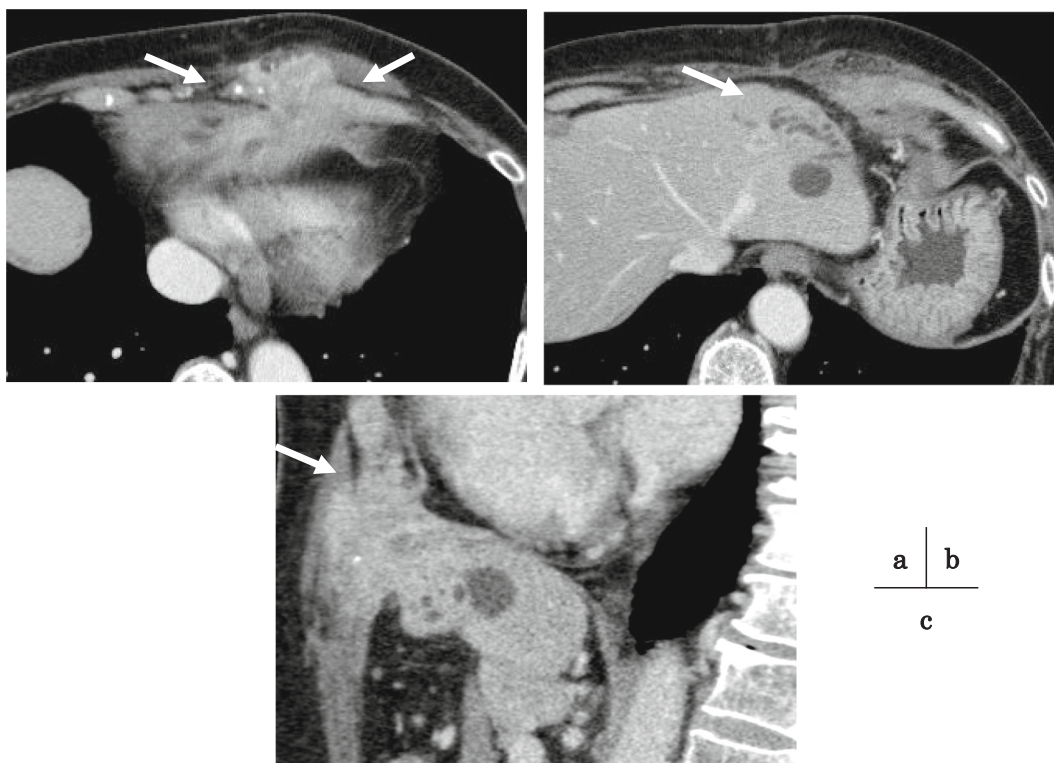


Fig. 1. Contrast-enhanced computed tomography revealed a tumor with unclear margins in the lateral lobe of the liver, causing dilatation of the intrahepatic bile ducts in the peripheral site and invasion of the left anterior thoracoabdominal wall, diaphragm, and pericardium (a, b: axial view; c: sagittal view).

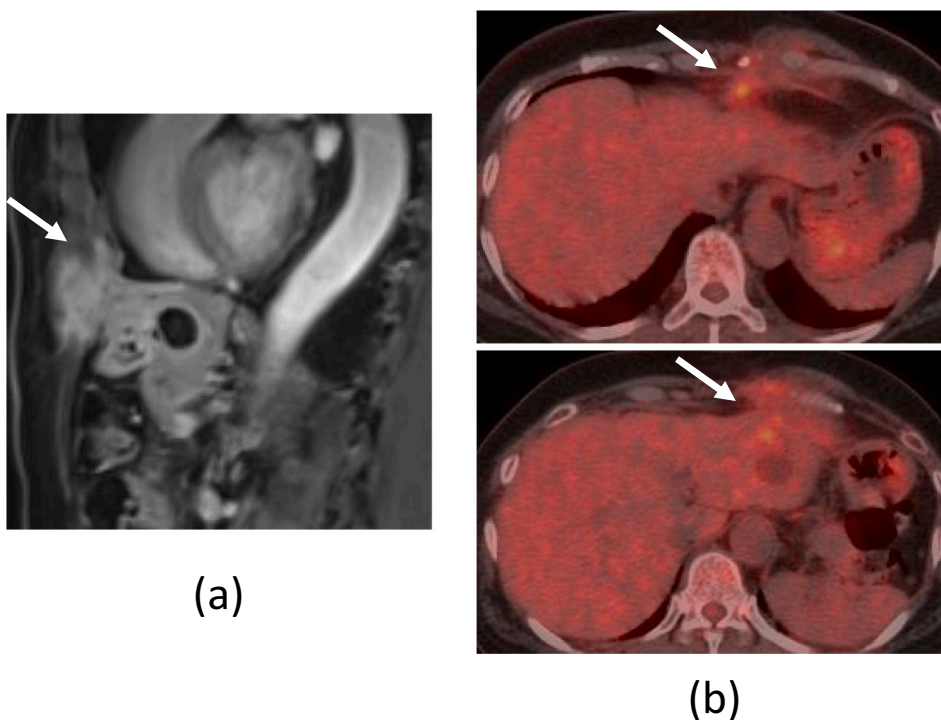


Fig. 2. (a) The tumor showed high intensity on Magnetic resonance T2-weighted imaging. (b) Positron emission tomography-computed tomography with a glucose analogue, 18F-fluorodeoxyglucose, revealed pathological uptake in the tumor.

ampulla of Vater.

This work was reported in line with the SCARE 2020 criteria [6].

2. Presentation of case

A 67-year-old woman was referred to our hospital with a chief complaint of left subcostal pain. Eight years and nine months prior, she

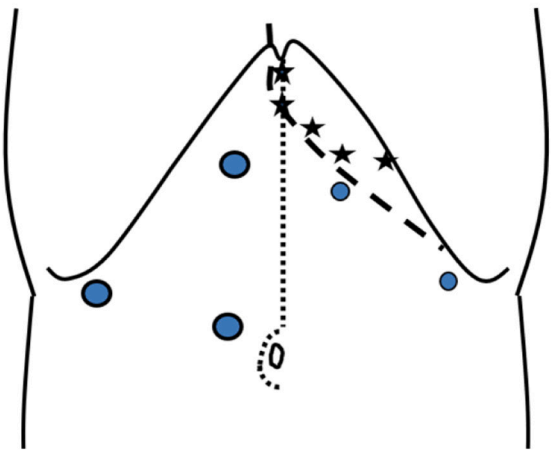
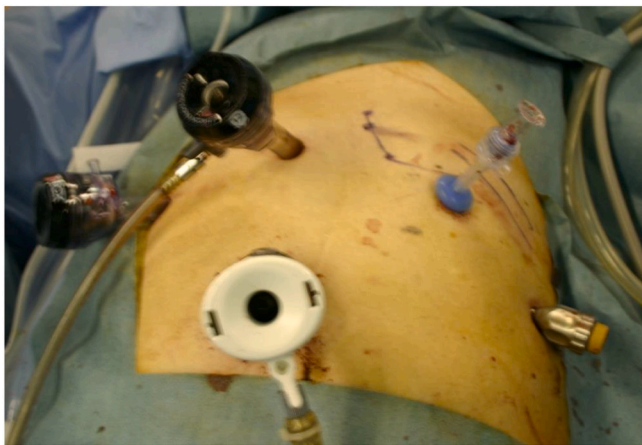


Fig. 3. Dotted line in the midline shows surgical scar for pancreateoduodenectomy. Large, closed circles show inserted position of 12-mm trocars and small, closed circles of 5-mm trocars. Stars show the marks of the caudal margin of the tumor-invaded area confirmed under laparoscopy. Dashed line in the left subcostal area shows the skin incision line for resection of the thoracoabdominal wall.

underwent pancreateoduodenectomy for cancer of the ampulla of Vater. Endoscopic retrograde biliary drainage (ERBD) was performed preoperatively for obstructive jaundice. A trans-anastomotic internal-external RTBD catheter was placed intraoperatively at the choledochojejunostomy through the left lateral lobe of the liver and the left subcostal abdominal wall. The catheter was then removed before discharge. Histopathological diagnosis showed a well-differentiated adenocarcinoma of the ampulla of Vater invading less than 5 mm into the pancreas and without lymph node metastases (T3aN0M0, stage IIA, according to the TNM classification, 8th edition). Medical follow-up on a regular basis since surgery without adjuvant treatment indicated no recurrence. When the patient was referred to our hospital, the tumor or induration could not be palpated on physical examination. Routine laboratory and hematologic investigations, including serological tumor markers (carcinoembryonic antigen, carbohydrate antigen 19-9, alpha-fetoprotein, soluble cytokeratin 19 fragment, and pancreatic cancer-associated antigen), were normal. Contrast-enhanced computed tomography revealed a tumor with unclear margins in the lateral lobe of the liver, causing dilatation of the intrahepatic bile ducts in the peripheral site and invading the left anterior thoracoabdominal wall, diaphragm, and pericardium (Fig. 1). Magnetic resonance imaging showed low intensity on T1-weighted imaging and high intensity on T2-weighted imaging (Fig. 2a). Positron emission tomography-computed tomography with a glucose analogue, ^{18}F -fluorodeoxyglucose, revealed pathological uptake in the tumor (Fig. 2b). Based on these

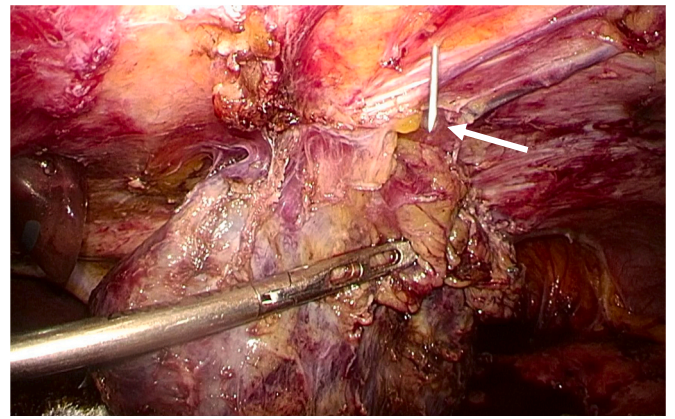


Fig. 4. Laparoscopic view of the tumor invading the anterior thoracoabdominal wall. Caudal margin of the invaded area of the tumor was marked on the overlying skin by sticking a needle and finding its tip in the abdominal cavity under laparoscopy (arrow).

radiological findings, intrahepatic cholangiocarcinoma or local recurrence of cancer of the ampulla of Vater invading the anterior thoracoabdominal wall, diaphragm, and pericardium without distant metastasis was diagnosed. Laparoscopic lateral segmentectomy of the liver combined with en bloc resection of the invaded portion of the anterior thoracoabdominal wall, diaphragm, and pericardium was performed as follows.

After checking the position of the liver tumor with extracorporeal ultrasonography, five trocars were inserted (Fig. 3): a 12-mm paraumbilical trocar for a flexible laparoscope with an open method; a 12-mm trocar at the right side of the midline in the epigastrium under laparoscopy to dissect the visceral adhesion to the abdominal wall and liver surface, transect the liver parenchyma, a 12-mm trocar at the right hypochondrium to manipulate the liver and use an automatic suturing device for the Glissonian pedicle, and two 5-mm trocars at the left hypochondrium and at the left flank for dissection around the left lateral lobe of the liver. The tumor in the lateral lobe of the liver was observed under laparoscopy, invading the anterior thoracoabdominal wall through its ventral aspect (Fig. 4). After laparoscopic transection of the lateral lobe without manipulating the tumor region under no Pringle maneuver, the caudal end of the tumor-invaded area in the anterior thoracoabdominal wall was marked on the overlying skin by sticking a needle and finding its tip in the abdominal cavity under laparoscopy (Figs. 3 and 4). An arc-shaped skin incision was made along the caudal margin of the invaded area (Fig. 3), and the skin flap was folded over to the cranial side to expose and resect the tumor-invaded area in the anterior thoracoabdominal wall, which included a partial portion of the two left costal cartilages, the diaphragm, and pericardium. Consequently, the tumor was delivered en bloc with the invaded area of the anterior thoracoabdominal wall and the left lateral lobe of the liver. The deficit portion of the pericardium was repaired with an expanded polytetrafluoroethylene (ePTFE, Gore-Tex) surgical membrane (Fig. 5a(A)). The deficit portion of the anterior chest wall and diaphragm was repaired using a Symbotex composite mesh (Fig. 5a(B)). Histopathological examination of the liver tumor revealed a well-differentiated adenocarcinoma invading the anterior thoracoabdominal wall, and pericardium (Fig. 5b). Histopathological examination could not be used to make a differential diagnosis of the intrahepatic cholangiocarcinoma (T4N0M0, stage IIIB) or local recurrence of cancer of the ampulla of Vater. The postoperative course was uneventful, and the patient was discharged 17 days after surgery. Postoperative adjuvant treatment was not administered. Local recurrence was diagnosed in the thoracic wall one year postoperatively, and then chemotherapy with gemcitabine and cisplatin were administered. The patient died of cancer recurrence 46 months postoperatively.

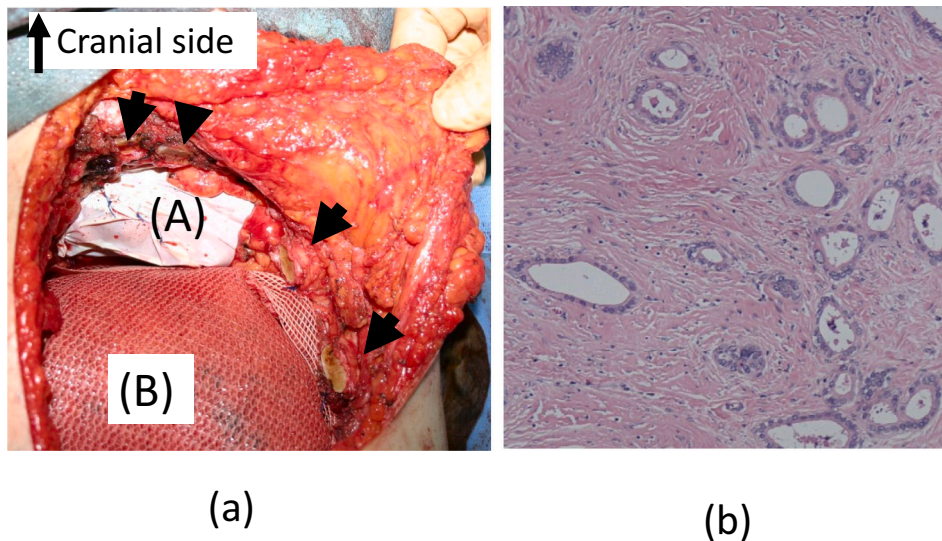


Fig. 5. (a) Intraoperative view of the abdomen. Arrow heads indicate cut ends of left costal cartilage. The deficit portion of the pericardium is repaired with an expanded polytetrafluoroethylene surgical membrane (A). The deficit portion of the anterior chest wall and the diaphragm is repaired with a Symbotex composite mesh (B).

(b) Histopathological examination of the liver tumor revealed a well-differentiated adenocarcinoma invading intrahepatic bile ducts and intrahepatic portal vein around the tumor, the anterior thoracoabdominal wall, and the pericardium. The drain sinus tract could not be assumed.

3. Discussion

In our case, laparoscopic lateral segmentectomy of the liver and en bloc open partial resection of the thoracoabdominal wall with costal cartilage, diaphragm, and pericardium were performed. Laparoscopic dissection of the postoperative intra-abdominal adhesions and laparoscopic hepatectomy ensured clear delineation of the tumor margins invading the thoracoabdominal wall before resection, and consequently minimized the defect of the thoracoabdominal wall with a cancer-free cut end. If resection of the thoracoabdominal wall was performed first, another skin incision would be needed, or lateral segmentectomy of the liver could not have been performed. The feasibility and safety of laparoscopic liver resection with simultaneous diaphragmatic resection have been reported [4,5]. In this case, it was necessary to resect the cartilage, thoracoabdominal wall, and pericardium, in addition to the diaphragm, which could not be performed laparoscopically.

It is sometimes difficult to make a differential diagnosis between intrahepatic cholangiocarcinoma and local recurrence or metastatic lesions of the ampulla of Vater in the liver, even by histopathological investigations. In this case, the cancer was located around the tract of the RTBD catheter, which was placed during pancreatoduodenectomy. Four hypotheses regarding the mechanism of cancer formation were proposed. One is the seeding of residual cancer cells in the bile duct into the tract of the RTBD catheter that was inserted intraoperatively. The other three are distant metastases or local recurrence of cancer of the ampulla of Vater or de novo carcinogenesis from the intrahepatic bile ducts, which invaded along the scar of the fistula after removal of the RTBD catheter.

Percutaneous transhepatic biliary drainage (PTBD) has been widely used for biliary obstruction [7]. However ERBD is recently preferred as the primary method because of the various disadvantages of PTBD including cancer seeding along the PTBD tract [8] or procedure-related complications [7], such as postoperative stenosis of the bile duct at the puncture point. On the other hand, most of the reported cases of cancer seeding along the PTBD tract occurred with bile duct cancer [8,9], and the impact of preoperative biliary drainage on cancer of the ampulla of Vater is unclear. Ahn et al. [10] reported that preoperative endoscopic retrograde cholangiography (ERCPC) was an independent risk factor for the postoperative recurrence of cancer of the ampulla of Vater and suggested that PTBD may be preferred over ERBD for this type of cancer. In our case, ERBD was performed preoperatively for obstructive jaundice, and the RTBD catheter was placed intraoperatively. Preoperative ERCPC before ERBD might cause distant metastasis, or intraoperative

RTBD catheter placement might seed cancer cells remaining in the bile duct. However, bile duct injury caused by RTBD may cause carcinogenesis. However, to our knowledge, there have been no reports of cancer formation along the RTBD tract. Although the mechanisms of carcinogenesis remain unclear, transhepatic biliary drainage is a risk factor for cancer invasion along the tract and had better not been performed. Currently, placement of a trans-anastomotic internal-external biliary drainage catheter, whose proximal end pierces through the anastomotic enteric wall and leads through the abdominal wall, is preferable.

For recurrent cancer of the biliary tract or the ampulla of Vater, various chemotherapies have been used as best practices for treatment, but surgery might be feasible and may offer longer survival for select patients [11–13]. As for PTBD catheter tract recurrence with no other forms of metastasis from bile duct cancer, aggressive surgical treatment could offer a better prognosis [14–16]. To the best of our knowledge, there have been no reports on resected biliary drainage tract recurrence of cancer of the ampulla of Vater with relatively long survival after resection of 46 months.

4. Conclusion

Laparoscopic liver resection for hepatic cancer invading adjacent structures or organs would be feasible and useful in select patients, even if resection of the invaded area is performed by open surgery.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Consent

Informed consent was obtained from the patient for the operation, therapeutic procedures and publication of this case report and any accompanying images before treatment.

Ethical approval

The institutional review board accepted this case report for publication.

Funding

This report has not received any funding.

Guarantor

Tadashi Tsukamoto, MD, PhD.

Research registration number

Not applicable.

CRedit authorship contribution statement

The study concept and design were conceived by T. Tsukamoto, S. Kodai, M. Tajima, A. Kanazawa, M. Takahama, and S. Mikami. T. Tsukamoto, S. Kodai, and A. Kanazawa were responsible for the interpretation of the study. Drafting of the manuscript was completed by T. Tsukamoto.

Declaration of competing interest

The authors have no conflicts of interest to declare.

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