Case Report

An advanced intrahepatic cholangiocarcinoma treated with minimally invasive resection: case report

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Abstract: Although reports for laparoscopic liver resection (LLR) on intrahepatic cholangiocarcinoma (ICC) are increasing, its major challenges are in lymph node (LN) dissection and bile duct reconstruction. Here we present a case report of advanced ICC, who underwent combined minimally invasive surgery. A 70-year-old man with a 9.5 cm mass and bile duct dilatation on the right liver was referred to our department. The findings of endoscopic retrograde cholangiography showed obstruction of the right branch of bile duct and stenosis on hilar portion of the main duct. Combined minimally invasive surgery of LLR and LN dissection and bile duct reconstruction through a small laparotomy was performed under the diagnosis of ICC. An 8-cm caudal-cranial incision on the right upper abdomen was placed. Through the incision, LN dissection and bile duct divisions were performed. After inserting a wound protector devise with a surgical glove to the incision, trocar ports and CO_2-pneumoperitonium were introduced. Transection of the liver was performed on the Rex-Cantlie line exposing inferior vena cava (IVC) and the resected right liver was removed, both laparoscopically. Bile duct reconstruction with Roux-en-Y hepatico-jejunostomy was performed through the small laparotomy. The patient recovered uneventfully. He survived for 6.5 years, with the recurrence at 4 years, after the surgery and died of the disease. We believe this is one of the choices for advanced ICC, which has needs for LN dissection and bile duct reconstruction.

Keywords: Laparoscopic liver resection (LLR); intrahepatic cholangiocarcinoma (ICC); minimally invasive surgery; lymph-node dissection; bile duct reconstruction

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Introduction

Since the first report of laparoscopic liver resection (LLR) in 1991 (1), accumulated experiences and technological developments have facilitated the expansion of the indication (2-4). It is becoming clear that the magnified caudal view offered by laparoscopy allows improved visualization, especially for the hilar and dorsal area of the liver, and is thus beneficial for the dissection of hilar Glissonian pedicles and the inferior vena cava (IVC) (4-6). LLRs of major hepatectomy and, even, with combined resection of major hepatic veins are now increasingly reported (7-9).

Intrahepatic cholangiocarcinoma (ICC) is the second most common primary liver malignancy with poor prognosis (10-12). The incidence of ICC has been increasing around the world (13) and surgical resection is still the only cure. Lymph node (LN) metastasis is the most important prognostic factors after surgery (14-16). Although the importance of LN dissection is under discussion, several studies suggested the necessity of LN dissection for survival benefits (17,18). Furthermore, ICC often has the need for bile duct reconstruction due to its biliary/peri-biliary invasion (10,11). Although reports for LLR on ICC are increasing (19-23), its major challenges are in the difficulties of LN dissection and bile duct reconstruction (22,24).

Here we present a case report of advanced ICC, who underwent unique combined minimally invasive surgery

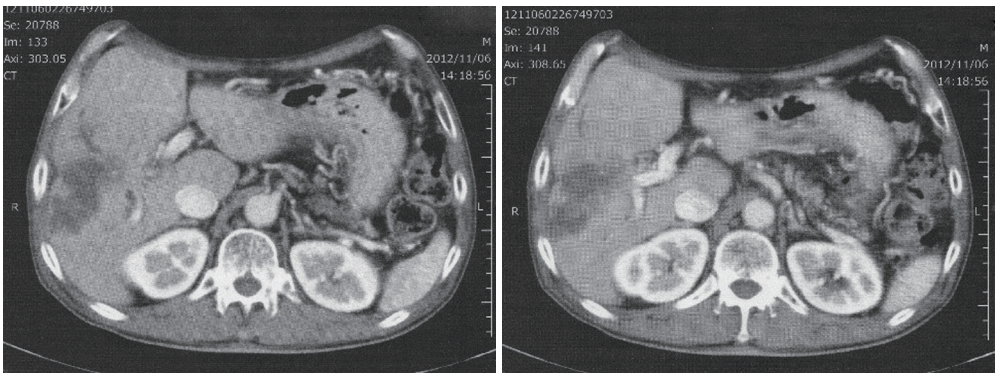

Figure 1 Contrast-enhanced computed tomography (CT) examination. CT demonstrated 9.5-cm-sized low-density lesions in the right liver segment with the right branch of intrahepatic bile duct dilatation.

of LLR and LN dissection and bile duct reconstruction through a small laparotomy and survived 6.5 years in accordance with the CARE reporting checklist (available at http://dx.doi.org/10.21037/ls-2020-mirlm-04).

Case presentation

A 70-year-old man with 9.5 cm mass and bile duct dilatation on the right liver was referred to our department for treatment of the lesion. These had been revealed by the abdominal ultrasonography undertaken for his liver dysfunction and body weight loss. The patient had only the history of medication for his diabetes mellitus, but not the other past and family histories including liver related disorders.

The laboratory data showed decreased plasma albumin level (3.3 g/dL) and elevations in plasma levels of aspartate transaminase (67 IU/L), alanine transaminase (77 IU/L), alkaline phosphatase (3,001 U/L), gamma-glutamyl transpeptidase (825 U/L), fibrinogen (582 mg/dL), C-reactive protein (0.84 mg/dL), hemoglobin A1c (10.5%) and indocyanine green retension rate at 15 minutes (11.2%), though the other data were all within normal range including plasma bilirubin level (0.5 mg/dL), prothrombin time (1.01, INR) and platelet count (218,000/microL). The tumor markers showed elevations (CEA 5.4 ng/mL, CA19-9 149.8 U/mL). Neither hepatitis B nor C virus-related markers are positive.

The contrast enhanced abdominal computed tomography (CT) demonstrated 9.5-cm-sized low-density lesions in the right liver with the dilatation of right intrahepatic bile duct (*Figure 1*). The findings of endoscopic retrograde cholangiography showed obstruction of the right branch of bile duct and stenosis on hilar portion of the main duct (common hepatic duct) (*Figure 2*).

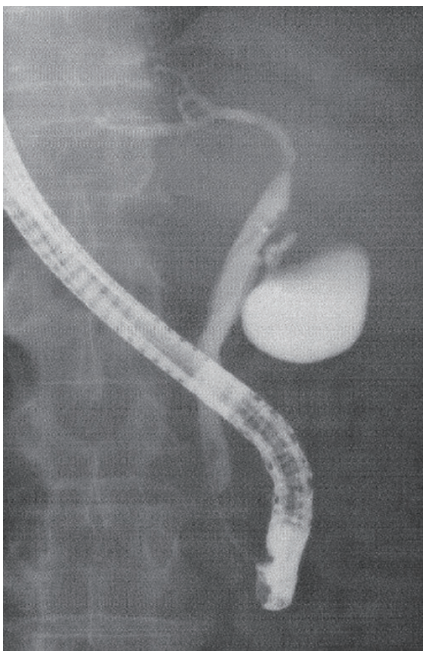

Figure 2 The findings of endoscopic retrograde cholangiography. The examination of endoscopic retrograde cholangiography showed obstruction of the right branch of bile duct and stenosis on hilar area of the main duct (common hepatic duct).

Combined minimally invasive surgery of LLR and LN dissection and bile duct reconstruction through a small laparotomy was planned under the diagnosis of advanced ICC with the invasion to common hepatic duct.

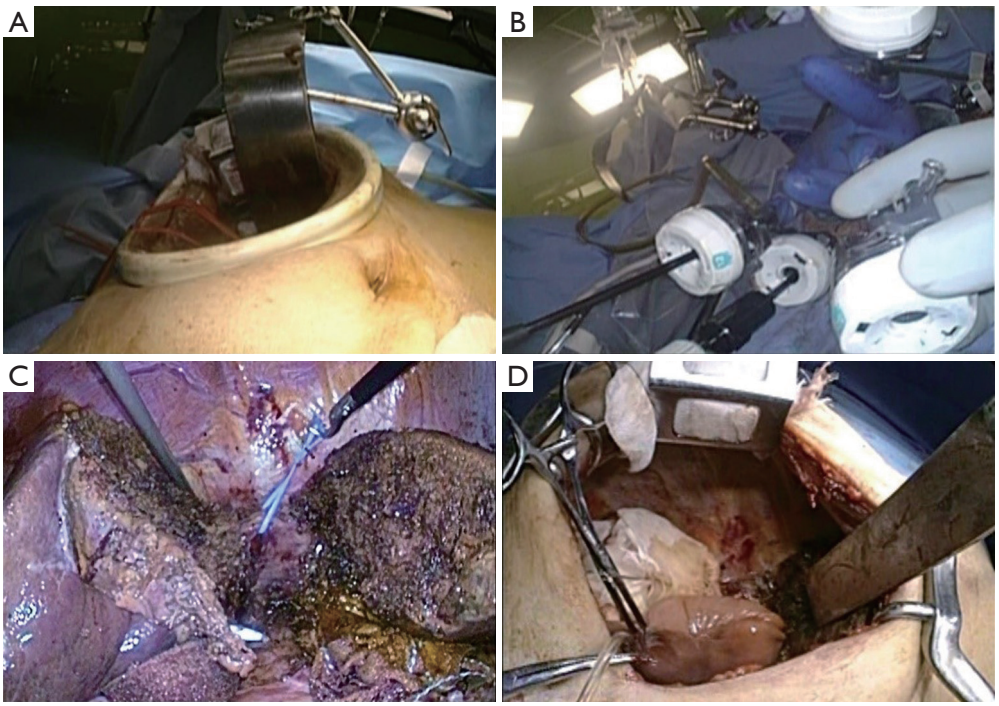

Figure 3 Intraoperative findings. (A) Through the 8-cm caudal-cranial incision on the right upper abdomen was placed just above the hepatoduodenal ligament, LN dissection of the areas of hilar place, hepatoduodenal ligament, common hepatic artery and upper dorsal area of pancreas head and, also, divisions of right hepatic artery and portal vein were performed. Subsequently, bile duct divisions at the line of right-side edge of umbilical portal vein in proximal and the upper margin of pancreas head in distal were also performed through the incision. (B) After inserting a wound protector devise with a surgical glove to the incision, the 5 trocar ports of 12-mm-size were introduced, 2 from glove fingers and 3 from new incisions surrounding the first incision. CO_2-pneumoperitonium (8–12 mmHg) was established through the ports. (C) Transection of the liver parenchyma was performed on the Rex-Cantlie line, which was confirmed as the ischemic demarcation line, exposing inferior vena cava. (D) After the completion of liver resection, bile duct reconstruction with Roux-en-Y hepatico-jejunostomy was performed through the incision of small laparotomy. The operation took 545 min and the estimated intraoperative blood loss was 847 mL. LN, lymph node.

Surgical procedures

During the surgery, the patient was placed in a supine position.

The 8-cm caudal-cranial incision on the right upper abdomen was placed just above the hepatoduodenal ligament under the guide of extracorporeal ultrasonography. Through this incision (*Figure 3A*), LN dissection of the areas of hilar plate, hepatoduodenal ligament, common hepatic artery and upper dorsal area of pancreas head and, also, divisions of right hepatic artery and portal vein were performed. Subsequently, bile duct divisions, at the line of right-side edge of umbilical portal vein in proximal (with negative findings of carcinoma invasion on frozen section pathological examination) and the upper margin of pancreas head in distal, were also performed through the laparotomy.

After inserting a wound protector devise with a surgical glove to the incision of laparotomy, the 5 trocar ports of 12-mm-size were introduced, 2 from glove fingers and 3 from new incisions surrounding the first incision (*Figure 3B*). CO_2-pneumoperitonium (8–12 mmHg) was established through the ports. The Pringle maneuver was not applied to this patient, since the liver parenchymal transection was following after hilar lymph nodal dissection and divisions of right hepatic artery and portal vein. Transection of the liver parenchyma was performed on the Rex-Cantlie line, which was confirmed as the ischemic demarcation line, exposing IVC in the laparoscopic specific caudal approach without prior mobilization of the liver (*Figure 3C*). After the completion of the transection, the root of right hepatic vein

was divided with laparoscopic stapler and the resected liver was dissected and removed laparoscopically.

After the completion of liver resection, bile duct reconstruction with Roux-en-Y hepatico-jejunostomy was performed using single-layer interrupted suture with 5-0 absorbable monofilament materials through the small laparotomy (*Figure 3D*). A surgical drain was placed in right subphrenic space. The operation took 545 min and the estimated intraoperative blood loss was 847 mL with 4 units of red blood cell transfusion.

Pathological examination of the tumor identified it to be well-differentiated tubular adenocarcinoma (ICC) with invasions to the confluence of the right hepatic duct to the common hepatic duct and right portal vein, there was no evidence of metastasis in 11 LNs dissected as surgical specimen.

The patient recovered uneventfully and discharged at 14 days after the surgery. He survived for 6.5 years with the recurrence at 4 years after the surgery and died of the disease.

Written informed consent was obtained from the patient for the treatment process and publication of this study and any accompanying images.

Discussion

The first report of LLR for ICC (left lateral sectionectomy with LN dissection) was in 2002 (25). Thereafter, more challenging laparoscopic left hepatectomy, caudate hepatectomy, and right hepatectomy have been reported (26,27). A case series report of 11 LLRs for ICC was in 2015 (19). Recently, Wei *et al.* demonstrated that LLR for ICC has similar feasibility and safety in the comparison to open procedure by analyzing 384 and 2,147 patients who had undergone LLR and open procedure in their meta-analysis (23). They described that the rate of R0 resection in LLR patients was higher than open (81.6% versus 73.8%) and mentioned that laparoscopic magnified vision allowed the resection of lesions and hepatectomies safe and efficient.

Although reports of LLR for ICC are increasing as above, there are still challenges in the procedure, the difficulties of LN dissection and bile duct reconstruction (22,24). The incidence of LN metastases from ICC is high and ICC often has the need for bile duct resection/reconstruction like present case due to its biliary/peri-biliary invasion. The techniques for LN dissection have been applied in other established procedures (28,29). Although dissection of the posterosuperior area of pancreas head is difficult, it is reported that this dissection can be easier with the Kocher maneuver (30,31). However, laparoscopic bile duct reconstruction are still demanding techniques with small number of reports (31-34).

In present case, we choose the minimally invasive combination of laparoscopic liver transection and mobilization plus LN dissection and bile duct reconstruction through small laparotomy. There are several reports of hybrid procedures, such as laparoscopic pancreaticoduodenectomy with reconstruction through mini-laparotomy for pancreatic tumors (35) and laparoscopic plus robotic (for reconstruction) hepatopancreaticoduodenectomy for cholangiocarcinoma (24). These hybrid procedures can make the complicated LN dissection and bile duct reconstruction easier. Furthermore, small laparotomy may facilitate the decision making for the dividing point of bile duct with its good overview for whole hepato-biliary system, contrary to the laparoscopic magnified but locally limited view.

Present case, who underwent minimally invasive combination surgery for advanced ICC, recovered uneventfully and survived for 6.5 years, although he developed recurrence at 4 years after the surgery and died of the disease. We believe this is one of the choices for advanced ICC, which has needs for LN dissection and bile duct reconstruction, especially in the early stage of the learning curve for the laparoscopic procedures.

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Footnote

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Ethical Statement: The author is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this study and any accompanying images.

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