

Case Report

Limited Hepatic Resections in Carcinomas with Hilar Invasion Due to Impaired Liver Function: Report of Two Cases

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Extent of hepatectomy for liver tumor is often limited in case the patient has an impaired liver function. We report here our experience in 2 patients with carcinoma involving hilar bile duct who have undergone limited liver resection. *Case 1.* 76-year-old male, who have had hepatitis C cirrhosis, showed in segment 4 a hepatocellular carcinoma of 4 cm in diameter. The tumor involved the right and left main hepatic ducts and obstructive jaundice was progressed. The patient had liver and respiratory dysfunctions and, therefore, limited resection of lower segments 4 and 5 and resection of hilar hepatic duct and the common bile duct were performed to avoid postoperative morbidity including liver failure. Histopathological diagnosis showed the tumor invasion and thrombus in major hepatic ducts and severe fibrosis in non-cancerous liver. In spite of long-term ascites, gastrointestinal bleeding or sepsis, liver functions were relatively maintained and the patient was discharged 3 months after surgery. *Case 2.* 64-year-old male, who had obstructive jaundice, showed a carcinoma in the common hepatic duct. After biliary drainage, however, liver dysfunction was not improved for a long period. The common hepatic duct including gall bladder was resected, and superficial spreading of the tumor to the right and left main bile duct was confirmed by the pathologic examination. Therefore, limited hepatic resection of lower segments 4 and 5 and resection of main hepatic ducts were additionally undergone. Although bile leakage of left hepatic duct occurred for 1 month, hepatic function was reserved and the patient was discharged 2 months after surgery. In conclusion, hepatic resection may be limited even in patient with carcinoma invading hilar bile duct in case the hepatic functional reserve is poor for major hepatectomy.

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Introduction

Primary liver carcinomas or upper bile duct carcinomas often invade to the main hepatic ducts,^{1,2} and therefore major hepatic resections, i.e. resection of a large volume of the liver including hilar bile ducts, are usually chosen to cure the diseases.³ On the other hand, the liver functions in most of these patients are transiently impaired compared to liver function before the occurrence of tumor because of obstructive jaundice by the hilar invasion. Hepatectomy was usually postponed until the impaired liver functions were improved by biliary drainage⁴ or use of drugs supporting hepatic cell functions. However, in some patients, the impaired liver function was not read-

ily improved after these treatments. In case tumors rapidly progress, there was not enough time to wait until the liver function recovers. Balance between curative resection and limited hepatic functions should be fully considered before operation.

We report here our surgical experiences in 2 patients, with carcinoma invading hilar bile duct and impaired liver functions, who underwent limited hepatic resection and resection of extrahepatic bile duct.

Case report

Case 1. A 76-year-old asymptomatic male was found to have a

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tumor during an annual medical checkup for chronic hepatitis C at the other hospital. This tumor was found by non-enhanced computed tomography (CT) scan 12 months ago, but the lesion was not treated because of smallness in size. When the patient was referred to our institute, CT scan demonstrated an obstruction of the right and left main bile ducts with dilatation of the peripheral intrahepatic bile duct. After admission to our hospital, obstructive jaundice was remarkable and the patient underwent percutaneous biliary drainage (PTBD) on December 12, 2004. The patient had undergone distal gastrectomy for duodenal ulcer and had suffered from viral hepatitis caused by blood transfusion. The blood test of the patient showed elevation of total bilirubin (3.9 mg/dL) and alkaline phosphatase level (1722 IU/L), which recovered after PTBD. The test included the analysis of the following tumor markers: alpha-feto protein (AFP, 12520 ng/mL), protein induced by vitamin K absence or antagonist (PIVKA-II, 220 ng/mL), carcinoembryonic antigen (CEA, 5.5 ng/mL) and carbohydrate antigen (CA) 19-9 (1128 U/mL). Although Child-Pugh score was grade A, liver uptake rate (LHL15) in galactosyl serum albumin (GSA)-liver scintigraphy was well (97.0%), while indocyanine green retention rate (ICGR15, 15.6%) and serum hyaluronic acid level (590 ng/mL) were increased. Enhanced CT (Figure 1) demonstrated a tumor of 4 cm in diameter in which the margin was enhanced at arterial phase. The tumor was diagnosed as hepatocellular carcinoma (HCC). The right and left main hepatic ducts were involved and stenotic, and the peripheral intrahepatic bile ducts were dilated. PTBD showed a filling defect of 3 cm in the hilar bile ducts representing tumor thrombus (Figure 2). Hepatic angiography showed the tumor stain and feeding artery (A4) at arterial phase.

The above-mentioned laboratory and image findings suggested HCC or combined type of HCC with biliary tumor thrombus. Although right or left trisegmentectomy was necessary, major hepatectomy was inadequate because of high ICGR15 and serum hyaluronic acid level. Furthermore, the patient had respiratory dysfunction (59.8% of FEV 1.0%). We therefore scheduled the limited hepatic resection of lower segment 4 and segment 5 (Figure 3) to avoid postoperative complications including hepatic failure in the present case. The patient underwent a J-shaped incision laparotomy (upper median plus right-sided transverse incision to the 10th intercostal space) in the supine position. The hepatectomy and resection of extrahepatic bile duct were performed. However, resection of caudate lobe was avoided because the intraoperative bleeding was remarkable and lymphatic ascites was massive due to liver cirrhosis during hepatic transection. The negative margin of tumor infiltration at the bile duct stump was obtained. The anterior and posterior branches and left bile duct were anastomosed to the jejunum (3 holes) by an end-to-side anastomosis (Roux-en-Y method). The operation took 11 hours and 20 minutes, and the amount of bleeding was 2240 mL.

Macroscopic findings showed a multiple nodular type HCC of 4 cm in diameter, which directly obstructed the left main hepatic duct. Tumor thrombus from the tumor in the left hepatic duct grew into the right main hepatic duct (Figure 4). Histologic findings showed moderately differentiated HCC with capsular infiltration, portal tumor

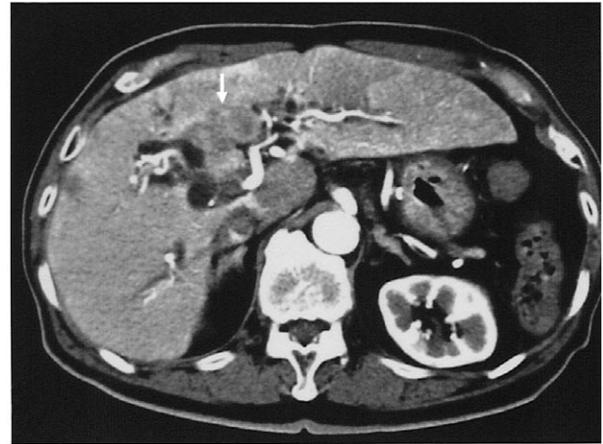


Figure 1. A hepatocellular carcinoma of 4 cm in diameter enhanced at arterial phase. The right and left main hepatic ducts were involved and the peripheral intrahepatic bile ducts were dilated.



Figure 2. Percutaneous biliary drainage showing a filling defect of 3 cm in the hilar bile ducts.

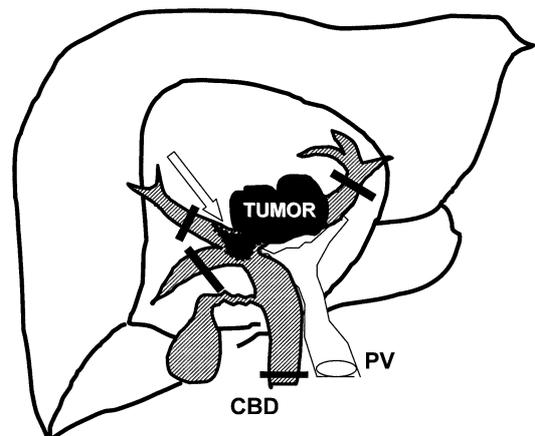


Figure 3. Scheme of surgical resection. The lower part of segment 4 and segment 5 was transected. The 4 thick bars indicate the cut line of respective bile ducts: left hepatic duct, anterior and posterior branches of right hepatic duct, and the common bile duct (CBD) at the upper margin of pancreas. PV=Portal vein.

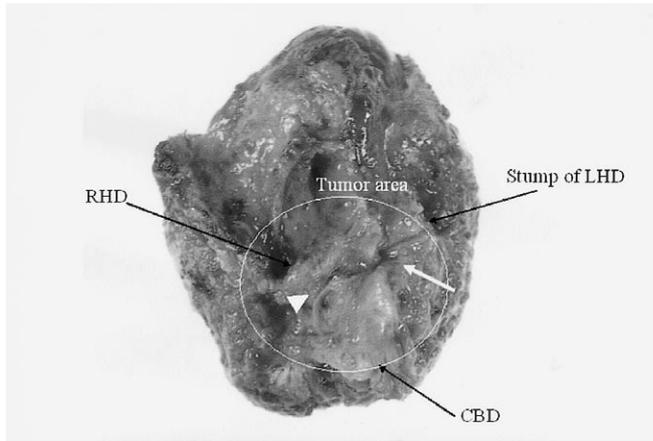


Figure 4. Resected specimen. The arrow indicates the stenosis of left hepatic duct by the tumor invasion. The arrowhead indicates the tumor thrombosis in the right hepatic duct. RHD=Right hepatic duct; LHD=Left hepatic duct; CBD=Common hepatic duct.

thrombus (vp1), biliary tumor thrombus (the right and left main hepatic ducts) and liver cirrhosis. Tumor Node Metastasis classification was T3N0M0 (stage III) and curability was C according to the published rule.⁵

Although the liver functions such as bilirubin level, prothrombin activity or platelet counts were maintained (Figure 5), the long-term uncontrolled ascites, biliary leakage, sepsis and malnutrition were observed and the multiple recurrences in the remnant liver were observed for 2 months. The patient condition was gradually improved, and he was discharged and transferred to an associated hospital 3 months after surgery. The patient, however, died of hepatic failure 12 months after surgery.

Case 2. A 64-year-old male was found to have symptoms such as upper abdominal pain, appetite loss and icteric skin. Obstructive jaundice was found and CT scan demonstrated irregular obstruction of the common hepatic duct and dilatation of the peripheral intrahepatic bile duct. The patient underwent PTBD at the beginning of May, 2004. The blood test of the patient showed remarkable elevation of total bilirubin (19.3 mg/dL) and alkaline phosphatase level (1017 IU/L), and the total bilirubin level did not fall below 5 mg/dL after PTBD. The test included the analysis of the following tumor markers: CEA (4.9 ng/mL) and CA 19-9 (53 U/mL). Child-Pugh score was grade B and LHL15 by GSA liver scintigraphy was 0.86. Enhanced CT demonstrated cancer stenosis of 3 cm in length in the common bile duct whose wall was slightly enhanced. Tumor was diagnosed as bile duct carcinoma of the common hepatic duct and the peripheral intrahepatic bile ducts were dilated. Because of

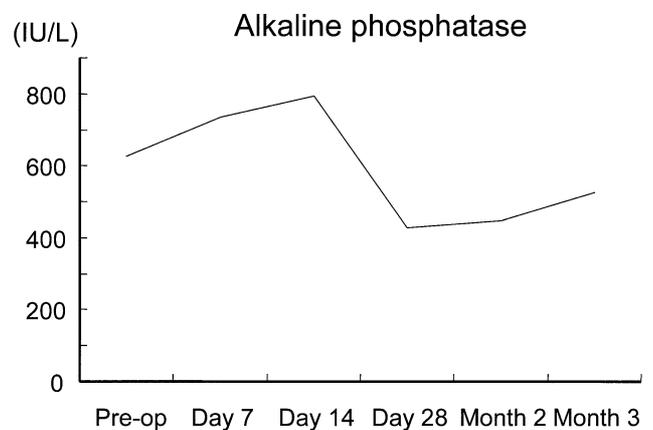
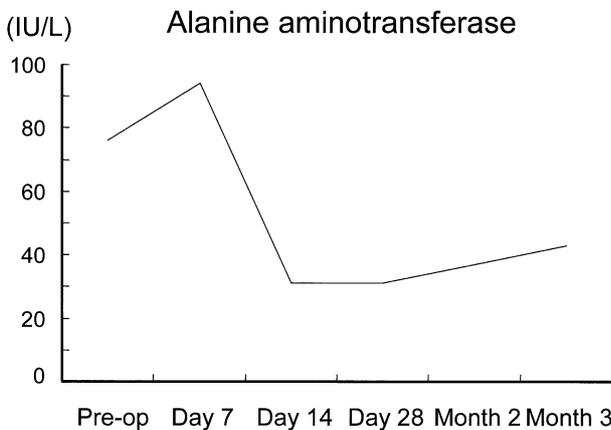
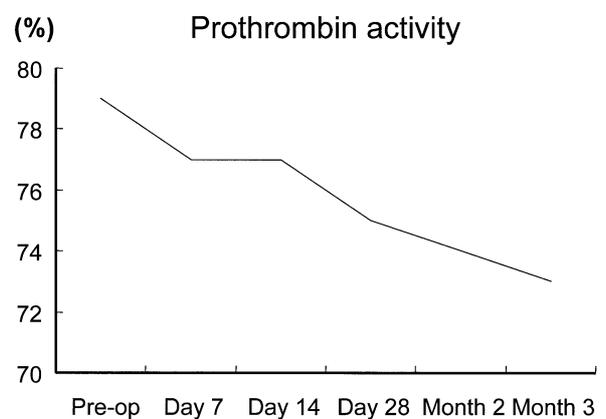
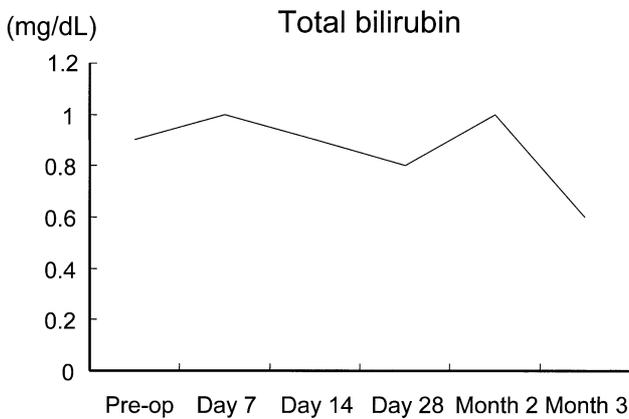


Figure 5. Change of liver functional parameters before and after hepatectomy in Case 1.

the impaired liver function, major hepatectomy was difficult when the cancer invaded to the hepatic hilum.

We first scheduled the resection of extrahepatic bile ducts, and the patient underwent an upper median incision in the supine position. The tumor infiltration was observed in the common bile duct. The hepatic bile duct stump showed positive for cancer infiltration and the pathologic examination during operation showed that the cancer superficially spread to the right and left main hepatic ducts. Additional hepatectomy was therefore performed in the lower segments 4 and 5 including the right and left hepatic ducts. Resection of caudate lobe was avoided because the cancer invasion did not reach the caudate branches. The negative margins of tumor infiltration at the bile duct stump were obtained. The right and left bile ducts were anastomosed to the jejunum (2 holes) by the Roux-en-Y method. The operation took 12 hours and 34 minutes, and the amount of bleeding was 1560 mL.

Macroscopic findings showed a flat invasive type bile duct carcinoma of 4 cm in length infiltrating from the common bile duct to the hepatic hilum (Figure 6). Histologic findings showed well differentiated tubular adenocarcinoma with $INF\gamma$, lymphatic invasion of $ly2$, venous invasion of $v0$ and nervous invasion of $pn1$. Tumor Node Metastasis classification was T2N0M0 (stage II) and curability was B according to the published rule.⁶



Figure 6. Macroscopic finding of the main carcinoma showing flat invasive type in the common hepatic duct spreading to the hepatic duct (arrows).

Although the liver functions were maintained (Figure 7), biliary leakage and sepsis were observed for 1 month. The patient condition was improved and he was discharged 2 months after surgery. The patient has been free from cancer relapse after surgery.

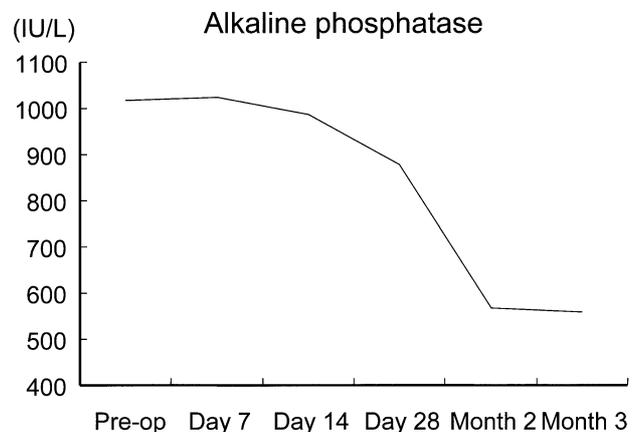
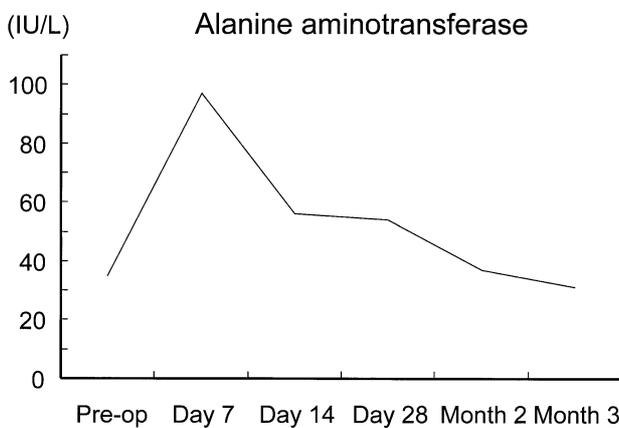
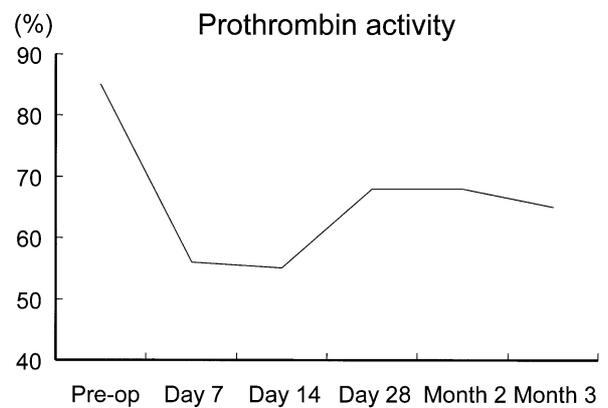
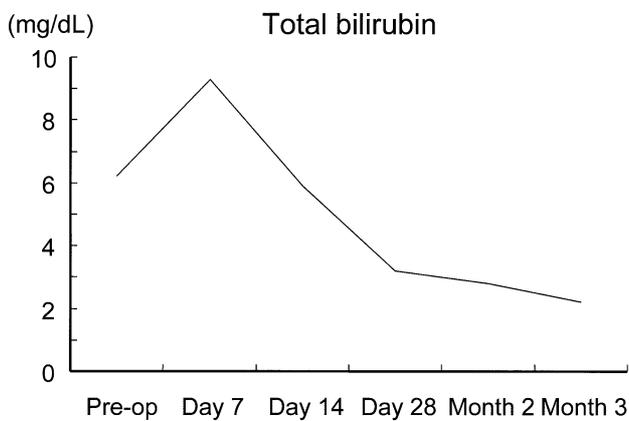


Figure 7. Change of liver functional parameters before and after hepatectomy in Case 2.

Discussion

Bile duct thrombus (BDT) or occlusion in HCC is rarely observed^{1,7-11} and more than half of patients show obstructive jaundice^{1,7,9} as Case 1 of the present report. This type of HCC was called "icteric type" by Lin et al.,⁷ and was observed in from 0.7 to 9% of patients.^{7,12,13} Recently, the incidence of BDT in the main bile duct (B3 or B4) in Japan was reported approximately 0.9% by 16th follow-up survey of primary liver cancer.¹⁴ PTBD was often necessary to improve hepatic function before hepatectomy.⁴ The icteric type with BDT in the main hepatic duct is advanced stage and therefore postoperative recurrence is frequent.^{1,12,15} On the other hand, significance of surgical resection has been reported recently¹⁶⁻¹⁹ and postoperative prognosis might be improved. Peng et al.¹⁶ and Qin et al.¹⁷ described that early diagnosis of BDT is necessary for improving patient prognosis after hepatectomy because jaundice might be a poor prognostic factor. In Case 1 of the present report, HCC observed at other hospital one year ago was followed by changes in CT findings. Impairment of liver function by cholangitis or jaundice due to BDT may gradually progress and therefore early treatment at the detection of tumor is necessary.

Anatomical resection of the liver has been recommended for HCC treatment to achieve better prognosis.¹⁸ Usually, HCC with BDC in the main hepatic duct is treated by hemi-hepatectomy or more extended hepatectomy if the hepatic functional reserve is maintained.^{1,2,19,20} However, as in Case 1 of the present report, limited hepatectomy should be chosen according to the degree of liver dysfunction. Kanematsu et al.²¹ proposed the limited hepatectomy in HCC patients with impaired liver function. We reported the correlation between ICGR15 and LHL15 in GSA-liver scintigraphy.²² About 5% of patients showed a discrepancy in the results of the two tests and the results of LHL15 were more reliable for clinical evaluation than those of ICGR15. However, in Case 1 of the present report, serum hyaluronic acid level was very high; the results indicate, according to our preliminary report,²³ a high probability of postoperative liver failure in major hepatectomy. We chose limited hepatectomy because of these findings in addition to general status of the patient. In HCC patients with poor liver function, partial resection with surgical margin exceeding 1 cm has often been undergone.²⁴ In Case 1 of the present report, we considered the balance between poor liver function and curability of HCC, and to avoid liver failure we chose the anatomical resection in lower S4 and S5 with exploration of the extrahepatic bile duct. Unfortunately, long-term hospital stay was required because of severe complications. Patients with hilar bile duct carcinomas usually undergo major hepatectomy such as extended hemihepatectomy or tri-segmentectomy.^{2,25,26} At present, the role of PTBD is important to improve the liver function.⁴ However, in some patients, liver dysfunction is not readily recovered as was Case 2 of the present report, in whom carcinoma did not extend to the secondary branches of the main hepatic ducts. In such a case, Kawarada et al.²⁷ and Miyazaki et al.²⁸ recommended the limited hepatectomy preserving hepatic function such as resection of S1 or S1+S4 (or S5). In Case 2, postoperative liver function was well maintained by

S4+S5 hepatectomy with resection of extrahepatic bile duct although the major bile leakage was observed for 1 month; the hepatectomy made curable resection of bile duct carcinoma possible. In malignant carcinomas invading hilar bile ducts, caudate lobectomy was necessary because caudate branches are diverged from the hilar bile duct and carcinoma readily infiltrates these branches.²⁶⁻³⁰ In either case of the present report, caudate lobe was not resected because of intraoperative massive bleeding or ascites, longer operation time and fragility of the liver. The opened branches of S1 were closed by suture and clinical problems were not observed. However, we regret these procedures and we would like to attempt the S1 resection as much as possible in the next similar case of carcinoma infiltration to hepatic hilum.

In conclusion, we experienced 2 patients with HCC and bile duct carcinoma invading to hilar bile duct. To avoid postoperative hepatic failure, we selected limited hepatectomy within the area of lower S4 and S5 taking the complete explorations of carcinomas into consideration. One patient had severe complications after surgery. To improve the prognoses of patients similar to those we reported here, early and careful detection of biliary involvement before the occurrence of jaundice is quite important.

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