Resection of metastatic liver cancer in a patient with a left-sided gallbladder and intrahepatic portal vein and bile duct anomalies: A case report

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ABSTRACT

INTRODUCTION: The presence of left-sided gallbladder is closely associated with multiple combined anomalies of the portal vein, hepatic vein, hepatic artery, and bile duct. This requires special attention for preoperative evaluation for the purpose of preventing postoperative complications.

PRESENTATION OF CASE: A 70-year-old woman with metastatic liver cancer and intrahepatic portal vein, biliary system and hepatic artery anomalies with left-sided gallbladder is reported. On computed tomography (CT), a solitary low density mass occupied from the right anterior to the posterior segment of the liver. The gallbladder bed was on the left of the hepatic fissure. On drip-infusion-cholangiography (DIC) CT three-dimensional (3D) reconstruction, the left medial bile duct arose from the right umbilical portion after arising from the left lateral bile duct. Following a right hepatectomy and lymph node dissection of the hepatoduodenal ligament, hepaticojejunostomy was conducted separately to the left medial and left lateral bile duct.

DISCUSSION: The left-sided gallbladder accompanies with several anomalies of hepatic vascular and bile duct anomalies in a frequent manner. A safe hepatectomy needs accurate operative plans to ascertain the range of hepatectomy, because it often has the diversity of a combined anomaly.

CONCLUSION: Preoperative DIC-CT 3D reconstruction was extremely useful because it provided an important information that could not be obtained with 2D-DIC-CT. 3D imaging has the ability to demonstrate complex anatomical relationships, this devise is a effective new tool for making appropriate preoperative strategy.

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Fig. 1. CT reveals a low density mass in the right lobe (white circle). The gallbladder is located on the left side of the round ligament (arrow).

Fig. 2. DIC-CT 3D reconstruction demonstrates that the left medial bile duct arises from the right umbilical portion (arrow). The gallbladder is located to the left side of the hepatoduodenal ligament.

Fig. 3. Intrahepatic arterial branch of left lateral hepatic artery (A2) arises from the celiac artery separately. Left medial hepatic artery (A4) branches from the right hepatic artery.

Fig. 4. Portograms showing long straight left lateral portal vein (P2), which does not have the umbilical portion; the right umbilical portion forms after the branching left portal vein.

Fig. 5. On intraoperative findings, the gallbladder can be seen located to the left of the right-sided round ligament.

was found to be located to the left of the round ligament (Fig. 5). Intraoperative ultrasonography showed a long, straight, left lateral portal vein without the characteristic umbilical portion.

A right hepatectomy and lymph node dissection of the hepatoduodenal ligament were performed. Partial resection of the portal vein was conducted because the lymph node of the hepatoduodenal ligament partially invaded to the portal vein. The defect of the portal vein was simply sutured with non-absorbable suture. Lymph node invasion in the common bile duct was suspected, so hepaticojejunostomy was created separately to the left medial duct and the left lateral bile duct (Fig. 6). The tumor was extirpated by right hepatectomy with en bloc resection of the extrahepatic bile duct and lymph node around the hepatoduodenal ligament. The operation time was 8 h and 46 min, and the blood loss was 750 ml. The patient was discharged without any complication 23 days after the operation. Due to previous her mental illness, it took long time to discharge.

3. Discussion

With improvements in diagnostic imaging methods, such as DIC-CT 3D reconstruction and magnetic resonance imaging, left-sided gallbladder has been reported to be associated with a right-sided round ligament accompanied by abnormal intrahepatic portal venous branching.
Gross\textsuperscript{1} proposed two explanations for left-sided gallbladder development: (1) the gallbladder migrates to a position under the left liver, that is, to the left of the round ligament, and the location of the cystic duct is normal; (2) a second gallbladder develops directly from the left hepatic duct, accompanied by failure of development of the normal structure on the right side.

Several cases of this anomaly have been reported since Hochstetter et al. first reported this in 1886\textsuperscript{2} in three anatomical specimens. In principle, the arterial and bile duct branches appeared to follow the portal venous branches, but in some patients, their ramifications differed from those of the portal veins. Our case is the same as the few reports of left-sided gallbladder associated with anomalous branching of the intrahepatic portal vein and biliary systems.\textsuperscript{3} Hepatectomy\textsuperscript{3–9} was undertaken only in eight cases, including our case. All cases were safely performed, including our case, without major complications such as liver failure and bile leakage.

Nagai et al.\textsuperscript{3} reported that a right-sided round ligament caused a gallbladder at the normal site to be located on the left side, and this anomaly was always associated with abnormal intrahepatic portal venous branching. The intrahepatic portal venous branching was classified into two types: (1) trifurcation type, in which the portal venous branches were trifurcated; and (2) bifurcation type, in which the portal venous branches were bifurcated. In the case reported by Nagai et al., the trifurcation type was more common than the bifurcation type. Our case was the bifurcation type with biliary system anomalies.

From the surgical point of view, identification of a right-sided round ligament is important when performing hepatotomy, because it is associated with abnormal intrahepatic vessel and biliary ramification. Intraoperative ultrasound (US) has been shown to be useful when performing hepatotomy.\textsuperscript{10} Ligation of the portal trunk results in lack of portal flow in three-fourths of the liver when performing left hepatotomy in such a situation. This may result in liver failure. Ikoma et al.\textsuperscript{11} reported that, when the left portal vein was ligated in a patient with cholangiocellular carcinoma and a left-sided gallbladder during left hepatotomy, three-fourths of the liver became darkened, and only lateral segmentectomy was carried out. Although right-sided round ligaments are rare, more clinical attention should be paid to them because recognition of this anomaly is essential when surgeons perform hepatotomy. The same is true of the anomalous bile duct that may accompany the corresponding portal vein branch. Ligation of inappropriate bile duct may cause biliary congestion or bile leakage. In our case DIC-CT 3D reconstruction provided accurate informations of biliary anomalies, which made prevent post operative complications. Acquiring the correct anatomical relationships between the tumor and the hepatic vein, the hepatic artery, the portal vein, and the bile duct, is significant, which make us to plan optimum surgical strategy. Kamiyama et al.\textsuperscript{9} reported that preoperative evaluation of hepatic vasculature by 3D-CT contributed important information that could not be obtained with 2D-CT, while it facilitated preoperative simulation, which helped to improve the safety of hepatotomy. Furthermore, 3D-DIC-CT was extremely useful for preoperative simulation for evaluating the biliary system as in our case. Right-sided round ligaments have been reported to be associated with other intra-abdominal vascular anomalies, such as a preduodenal portal vein or azygos continuation of the inferior vena cava.\textsuperscript{1,2}

In conclusion, this portal vein and biliary anomaly has important clinical implications because of the greater ramification of the major branches. The anomaly is not as rare as the paucity of the literature indicates. This anomaly should be kept in mind when preoperative examination of the gallbladder is abnormal relative to that of the ligamentum teres.

Conflict of interest

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Ethical approval

None.
Author contribution

T.A., K.S., K.K. and G.T. evaluated the patient and wrote the manuscript. T.A., K.K., K.S and N.H. performed surgery. T.N. was the leader of the treatment.

References