

Case Report

Multiple Hepatolithiasis Following Hepaticojejunostomy Successfully Treated with Left Hemihepatectomy and Double Hepaticojejunostomy Reconstruction

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Surgical intervention for hepatolithiasis following hepaticojejunostomy (HJ) has rarely been reported. Herein, we present a case of post-HJ multiple hepatolithiasis treated with left hemihepatectomy with double HJ reconstruction. A 72-year-old woman who had undergone HJ for iatrogenic bile duct injury developed repeated cholangitis due to complicated hepatolithiasis accompanied by an atrophied left hepatic lobe and HJ stricture. Since endoscopic intervention was unsuccessful, the patient underwent left hemihepatectomy with HJ re-anastomoses of the common hepatic duct and left hepatic duct (double HJ technique). The double HJ technique with hepatectomy can be a useful option for treating complicated hepatolithiasis following HJ.

Key words: hepatolithiasis, hepaticojejunostomy, hepatectomy

Hepatolithiasis, which can cause cholangitis, liver atrophy, liver cirrhosis, and even cholangiocarcinoma, is a late complication of biliary reconstruction including hepaticojejunostomy (HJ) and choledochojejunostomy [1]. Although primary hepatolithiasis can be treated with nonsurgical and surgical interventions [2], the treatment strategy for hepatolithiasis in patients following HJ is more complex. In post-HJ complicated hepatolithiasis, nonsurgical intervention should be the first-line option. The feasibility of endoscopic treatment using a double-balloon enteroscope (DBE) has been reported for hepatolithiasis following HJ [3]. As a second-line treatment, surgical intervention should be considered in patients who are inadequately treated using nonsurgical interventions. However, few studies have reported on surgical techniques and outcomes for complicated hepatolithiasis following HJ. This report

demonstrates a case with complicated hepatolithiasis following HJ, which involves double HJ reconstruction with left hemihepatectomy.

Case Report

A 72-year-old woman was referred to our hospital for further examination following repeated fever and abdominal pain in the right subcostal region. Her medical history included laparoscopic cholecystectomy for gallbladder polyps 30 years earlier at another hospital; that procedure was converted to open laparotomy requiring HJ with Roux-en-Y reconstruction because of an iatrogenic bile duct injury. She was treated conservatively after that surgery. In 2020, she developed symptoms of suspected cholangitis.

Her laboratory results at our hospital showed an inflammatory reaction and obstructive jaundice: C-re-

active protein, 4.3 mg/dL; total bilirubin, 2.4 mg/dL; alanine aminotransferase, 62 IU/L; gamma-glutamyl transpeptidase, 696 U/L; albumin, 3.2 g/dL; and prothrombin time, 99%. The tumor markers of carcinoembryonic antigen and carbohydrate antigen 19-9 were within normal limits. Abdominal computed tomography revealed dilated bilateral intrahepatic bile ducts containing bilateral diffuse stones (Fig. 1A). The left hepatic lobe was atrophied, and the left intrahepatic bile duct was completely occluded with stones. There was also obstruction of the left branch of the portal vein. Anatomical assessment revealed that both the right hepatic artery and the anterior branch of the portal vein passed in front of the common hepatic duct (CHD) (Fig. 1B).

Diagnostic and therapeutic endoscopic retrograde cholangiography using a DBE was first applied to treat the complicated hepatolithiasis. However, the DBE failed twice because of flexion and stricture of the Roux-en-Y loop (Fig. 2). Interventional radiology using percutaneous transhepatic cholangiodrainage (PTCD) was then performed. Cholangiography revealed multiple intrahepatic stones with diffuse dilation of the biliary system and HJ stricture (Fig. 3). In addition, bile cytology showed no evidence of malignancy. Therefore, the patient was diagnosed with complicated bilateral hepatolithiasis following HJ accompanied by an atrophied left lobe of the liver and HJ stricture.

The best strategy for complete stone removal and bile stasis elimination was a surgical intervention consisting of left hemihepatectomy with HJ re-anastomosis using a new Roux-en-Y loop and intrahepatic bile duct exploration lithotomy. Regarding the hepatic functional reserve, the Child-Pugh score was classified as grade A (score 5), and technetium-99 m-galactosyl human serum albumin showed normal liver function with HH15 of 0.42 and LHL15 of 0.91.

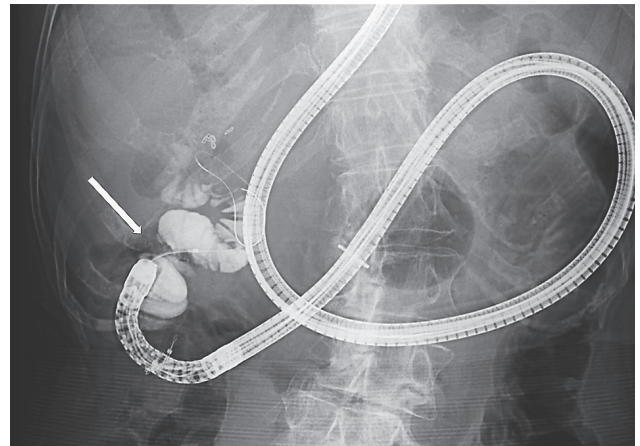


Fig. 2 Diagnostic and therapeutic endoscopic retrograde cholangiography. The hepaticojejunostomy site could not be reached using a double balloon enteroscope due to flexion and stricture of the Roux-en-Y loop (arrow).

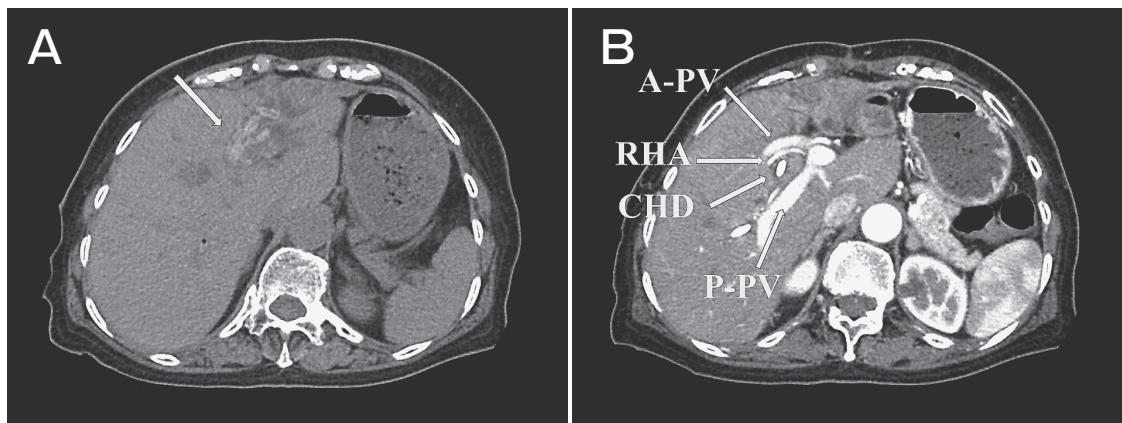


Fig. 1 Preoperative computed tomography images. **A**, The left lobe of the liver is atrophied, and the left intrahepatic duct is completely occluded by diffuse intrahepatic stones (arrow). There is bilateral dilatation in the intrahepatic bile ducts; **B**, The right hepatic artery and anterior branch of the portal vein pass in front of the common hepatic duct. The left branch of the portal vein is not enhanced due to the obstruction.

RHA, right hepatic artery; CHD, common hepatic duct; A-PV, anterior branch of the portal vein; P-PV, posterior branch of the portal vein.

During surgery, adhesions around the liver were dissected. After the Roux-en-Y loop was dissected, the HJ was detached to identify the CHD (Fig.4A). Following transection of the left hepatic artery and the left branch of the portal vein, the liver parenchyma was dissected along the demarcation line using the Cavitron Ultrasonic Surgical Aspirator and vessel sealing system (LigaSure). The left hepatic duct (LHD) was encircled and transected to remove the intrahepatic stones (Fig.4B). Intrahepatic bile duct exploration lithotomy was then performed through the CHD and LHD for

complete stone removal using an intrahepatic cholangioscope and a vascular balloon catheter. Finally, intraoperative cholangiography confirmed the absence of residual stones in the right biliary system.

For reconstruction, the Roux-en-Y loop was replaced with a new Roux-en-Y loop, and HJ re-anastomosis was performed. Since single HJ re-anastomosis of the CHD seemed to have a potential risk of biliary stricture, the HJ was revised at the CHD and LHD (the double HJ technique) into a new Roux-en-Y loop, as shown in Fig.4C. The total operative time was 435 min, and the estimated blood loss was 180 mL.

Regarding the postoperative course, the patient developed biliary leakage from the dissection line of the liver, which was managed conservatively. She was discharged on postoperative day 23. No malignancy was found on pathological examination of the liver specimen. During a short-term (7-month) follow-up, no recurrence of cholangitis or hepatolithiasis was observed.

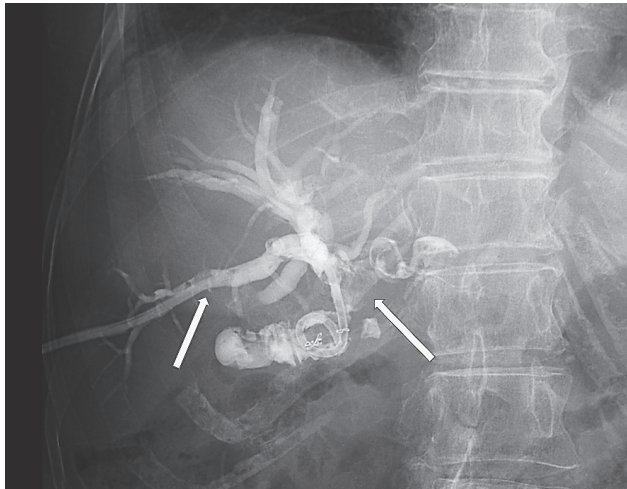


Fig. 3 Percutaneous transhepatic cholangio drainage. Cholangiography reveals multiple intrahepatic stones with proximal dilation of the biliary system (arrow) and hepaticojejunostomy stricture.

Discussion

This case report is the first to demonstrate a surgical technique for complicated hepatolithiasis following HJ, using a double HJ technique with left hemihepatectomy. In patients who were inadequately treated using nonsurgical intervention, surgical intervention was the only method of resolving complicated hepatolithiasis following HJ. Therefore, surgery should be considered, taking into account surgical indications and

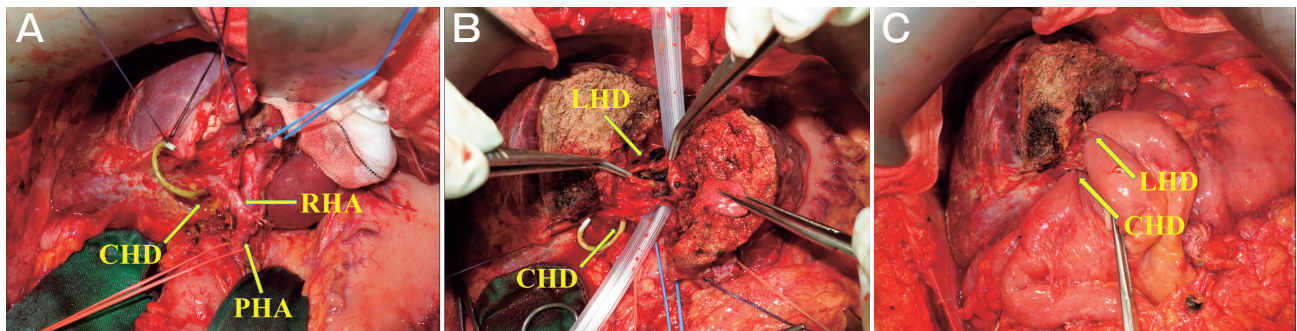


Fig. 4 Intraoperative findings. **A**, Following the detachment of hepaticojejunostomy, a percutaneous transhepatic cholangio-drainage tube is confirmed through the common hepatic duct. The proper hepatic artery and left branch of the portal vein are encircled with red and blue tape, respectively; **B**, The left hepatic duct is encircled and divided. Multiple intrahepatic stones are confirmed and removed; **C**, A double hepaticojejunostomy technique is demonstrated. Hepaticojejunostomy is revised at the common hepatic duct and left hepatic duct (arrows) into a new Roux-en-Y loop.

RHA, right hepatic artery; PHA, proper hepatic artery; CHD, common hepatic duct; LHD, left hepatic duct.

approaches.

Several clinical conditions, including cholestasis and HJ stricture of the Roux-en-Y loop, have been associated with the incidence of hepatolithiasis following HJ [4, 5]. Hepatolithiasis can be accompanied by infectious complications such as cholangitis, liver abscess, and intrahepatic cholangiocarcinoma [6]; therefore, a management strategy for hepatolithiasis should be constructed comprehensively.

According to the recent evidence-based guidelines for hepatolithiasis following biliary reconstruction, nonsurgical interventions including oral or percutaneous endoscopic treatment have been proposed as first-line treatments with very low evidence levels [7]. In contrast, hepatectomy is proposed for patients with concurrent or suspected intrahepatic cholangiocarcinoma with a low evidence level. Furthermore, resection of the atrophied lobe is recommended, as the atrophied lobe is highly likely to be the primary site of onset for cholangiocarcinoma [7]. Previous studies have supported a low recurrence rate and good prognosis after hepatectomy with complete removal of hepatolithiasis [8-10].

In our case, HJ stricture was thought to be the cause of hepatolithiasis, leading to repeated cholangitis and an atrophied left lobe. Although hepatectomy may be recommended for patients with atrophic liver [6], nonsurgical intervention was first attempted for diagnosis and biliary drainage. However, the HJ site could not be reached using a DBE due to flexion and stricture of the Roux-en-Y loop. Therefore, PTCO was performed before surgery, and surgical intervention was indicated for the treatment of complicated hepatolithiasis following HJ.

From a surgical viewpoint, several concerns should be discussed. First, resection of the atrophied left lobe was necessary to eliminate the potential risk of cholangiocarcinoma. Second, intrahepatic bile duct exploration lithotomy was performed to achieve complete stone removal. Third, HJ re-anastomosis using a new Roux-en-Y loop was needed to resolve the HJ stricture and cholestasis of the Roux-en-Y loop. Fourth, there are several options for biliary reconstruction at the CHD and LHD following left hemihepatectomy, as demonstrated in Fig. 5. In cases with normal anatomy, ductoplasty to make one large HJ reconstruction should be considered for the curative treatment of biliary stricture. In contrast, ductoplasty is not possible in cases with

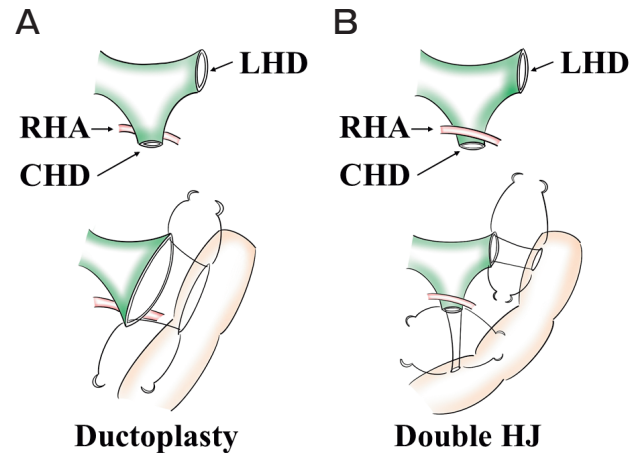


Fig. 5 Biliary reconstruction at the common hepatic duct and left hepatic duct following left hemihepatectomy. **A**, In cases with normal anatomy, ductoplasty should be considered. One large hepaticojunction reconstruction could prevent biliary stricture; **B**, In cases with abnormal anatomy, double hepaticojunction reconstructions are an alternative for bile stasis elimination. Ductoplasty is contraindicated. RHA, right hepatic artery; CHD, common hepatic duct; LHD, left hepatic duct; HJ, hepaticojunction.

abnormal anatomy, as in our case. Therefore, double HJ reconstructions were performed as an alternative treatment of the biliary stricture in the present case. In addition, we suggested that single re-anastomosis of the CHD into a new Roux-en-Y would have a high risk of HJ stricture and complications, including cholangitis and hepatolithiasis. Therefore, double HJ re-anastomoses of the CHD and LHD into a new Roux-en-Y were selected for bile stasis elimination. Actually, the postoperative cholangiography confirmed better drainage through HJ of the LHD. Moreover, this technique can allow endoscopic intervention if needed. Finally, the patient, who had post-HJ complicated hepatolithiasis, was treated with the double HJ technique as well as left hemihepatectomy and intrahepatic bile duct exploration lithotomy. We believe that this technique can be an option when selecting procedures for patients with hepatolithiasis following HJ. However, the long-term outcomes of this technique need to be investigated.

Conclusions

A novel double HJ technique with hepatectomy for complicated hepatolithiasis following HJ was demon-

strated. This technique can be a useful option for treating multiple hepatolithiasis following HJ.

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