



Case report

Right hepatic vein reconstruction in middle hepatectomy: A case report

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ABSTRACT

Background: Surgical resection is the only treatment modality that ensures complete tumor removal in patients with liver tumors involving a major hepatic vein. Central hepatectomy is a challenging procedure that often result in large defect at the right hepatic vein, which is not amenable to suturing or end-to-end anastomosis. Meanwhile, good outflow reconstruction is essential for early postoperative recovery and long-term survival.

Methods: We describe a simple technique for reconstructing the right hepatic vein. The technique is an effective method for reconstructing large venous defects after the hepatic vein resection. Reconstruction of the right hepatic vein has the advantages of prevention of congestion in segments VI and VII.

Conclusions: This technique allows surgeons to reconstruct the hepatic vein without synthetic vascular grafts and cryopreserved veins.

1. Introduction

Hepatocellular carcinoma (HCC) is one of the five most common malignancies and is the third leading cause of cancer-related death worldwide [1–10]. For centrally located HCC patients, hepatic resection remains the most commonly used technique to achieve radical tumor eradication [2]. In current surgical practice, resection of liver tumors involving major hepatic vein is increasingly performed [2–10]. Such resections with the involved hepatic vein often result in large defects at the confluence of the hepatic vein. These defects are managed by the use of interposed vascular grafts or prosthetic materials [2–10]. Reconstruction of the right hepatic vein (RHV) defect without the usage of the vascular graft in central hepatectomy in HCC has not been reported in the literature about. We describe a technique for hepatic vein reconstruction.

2. Presentation of case

Here is an interesting case of 47-year-old woman with hepatitis B in 2017. She was possibly diagnosed as HCC in a local hospital and then performed transcatheter arterial chemoembolization (TACE) twelve days before admission to Eastern Hepatobiliary Surgery Hospital. She had recurrent abdominal pain for about one month. She had not any drug history and family history [11]. At the routine preoperative test (Table 1), the evaluation test results were considered normal. Abdominal ultrasound, computed tomography (CT), and magnetic resonance

imaging (MRI) were used for the diagnosis of the patient (Fig. 1). Standard liver volume measurements and anatomy were evaluated using multilayer CT for the future remnant liver (FRL). The volume of the right posterior sector (segments VI and VII), or the left lateral sector (segments II and III) was less than 30% of the total liver volume. To avoid congestion and prevent posthepatectomy liver failure (PHLF) [12], the right posterior sector and left lateral sectors should be preserved altogether. She was planned for central hepatectomy.

Operative procedure: bilateral subcostal incisions were made, extending over the midline to the xiphoid. After exploring the abdomen, the ligaments were divided. The falciform ligament was incised from the anterior abdominal wall to the front part of the suprahepatic inferior vena cava (IVC) of the liver. Cholecystectomy was performed. The parenchymal transection was performed through inflow occlusion (Pringle's maneuver). The hepatic tissue was clamped and cut off by the clamp-crushing method. The tumor was removed en-bloc resection together with the mid hepatic vein (MHV) and a part of the RHV (about 2.0 cm) to ensure tumor-free margins. Exposure of the retrohepatic vena cava was initiated. We cut and opened longitudinally approximately 1.2 cm into the IVC wall (below level of the confluence of right hepatic vein and IVC) to match the diameters of RHV, moving the right remnant liver to touch the IVC. Then the distal end of RHV was anastomosed end-to-side with the lateral wall of the IVC without creating tension and folding in the RHV (Fig. 2). For the sake of safety, this procedure should be performed by total hepatic vascular exclusion (THVE). The hepatic wound had two stump surfaces that should be completely ligated and

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Table 1

Summary of clinical data and background characteristics of the patient with middle tumor.

Patient characteristics	
Age (yrs)	47
Gender	Female
Hepatitis B virus infection	Positive
Pre-operative laboratory data	
Total bilirubin (umol/L)	15.0
PT (s)	12.1
Albumin (g/L)	41.3
AST (IU/L)	164
ALT (IU/L)	339
Hb, g/L	92
Platelet, ×10 ⁹ /L	363
AFP (ng/mL)	366.6
CEA (μg/mL)	2.9
CA199 (U/mL)	0.6
FRLV 2 + 3 + 6 + 7 (%)	35
HBV-DNA, ×10 ⁴ /L	2.76
Child-Pugh class	A
BUN (mmol/L)	4.03
Scr (umol/L)	52
BUA (umol/L)	272
Tumor size (cm)	18
Operative time (min)	130
PTC operative time (min)	15
THVE	5
Blood loss (mL)	500
Postoperative complications	
Bile leak	N
Right sided pleural effusions	Y
Hospital stay, days	14

ALT, alanine aminotransferase (normal value, 11–50 IU/L); AST, aspartate aminotransferase (normal value, 14–50 IU/L); ALP, alkaline phosphatase total bilirubin, (normal value, 2–17 umol/L); albumin, (normal value, 35–50 g/L); PT, prothrombin time, (normal value, 10–14 s). AFP, a-fetoprotein. CEA, carcinoembryonic antigen. CA19-9, antigen19-9. PA, pre-albumin. Hb, hemoglobin. BUN, blood urea nitrogen. Scr, serum creatinine. BUA, blood uric acid. THVE, total hepatic vascular exclusion.

hemostasized. After careful examination to assure that there was no biliary fistula, the cut surface of the hepatic remnant should be kept open with hemostatic spray gel. An abdominal double cannula was routinely placed below the diaphragm and continuous drainage was applied post-operatively. The median diameter of the tumor was 18 cm. Operative times was 130 min and intraoperative blood loss was 500 mL. The patient was not treated with anticoagulant therapy postoperatively. The patient with right-side pleural effusion was subjected to drainage [13]. The patient was discharged from the hospital on the 8th postoperative day. The patient's hospital stay was fourteen days. The patency

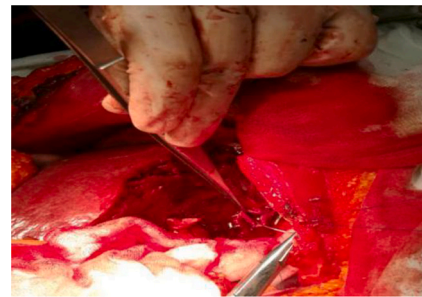


Fig. 2. The distal end of right hepatic vein was anastomosed with IVC.

of the RHV remained well by the confirmation of MIR and Ultrasound, and there was no thrombosis in the reconstructed hepatic vein during the postoperative period (Fig. 3). During the first year, the patient was followed at intervals of one month. Fourteen months later, she had tumor recurrence in the lung. She was treated with sorafenib, which has become the new standard treatment option of advanced HCC [14]. In addition, other procedures were palliative systemic chemotherapy and TACE. The patient died of lung metastasis in 16 months after surgery.

3. Discussion

Centrally located HCC is defined as a tumor situated in segments IV, V and VIII according to Couinaud's segmental anatomy of the liver. Extended hepatectomy is considered to be the first curative option for the treatment of centrally located liver tumors. However, extended hepatectomy is associated with relatively high postoperative mortality, particularly for patients with cirrhosis. Central hepatectomy avoids unnecessary sacrifice of functional parenchyma and can prevent postoperative liver failure. Nonetheless, the central hepatic tumor is always very close to major hepatic blood vessels, and the surgical manipulation involves several technical challenges. The complexity of this procedure is based on 2 hepatic dissections, doubling the area of raw liver surface, particularly for the tumor close to the main hepatic veins and IVC. To avoid hemorrhage, we used vascular clamping techniques including total hepatic vascular exclusion (THVE) and the Pringle's maneuver. In operation, we found the liver tumor infiltrating the main trunk of the RHV, performed with en bloc removal of both. The hepatic vein was reconstructed to achieve outflow of the liver. The hepatic vein replacement has been described by means of autologous, cryopreserved allogous or prosthetic vascular grafts (cryopreserved vein, recanalized umbilical vein, cryopreserved aorta, internal jugular vein) [2–10]. As the hepatic veins have no valves, are thin-walled and fixed in the hepatic parenchyma, it is therefore preferable to separate them. The hepatic veins can be performed when moving the remnant right liver to access the IVC for reconstruction. This has the advantages of prevention of possible congestion at segments VI and VII. Our surgery avoids the usage of the vascular graft. This form of reconstruction has not been reported in the literature. Therefore, liver resection combined with vascular

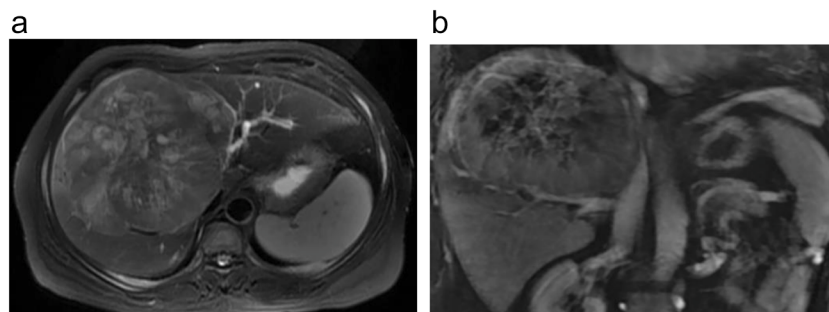


Fig. 1. (a, b). Preoperative magnetic resonance imaging revealed a huge centrally located liver tumor.

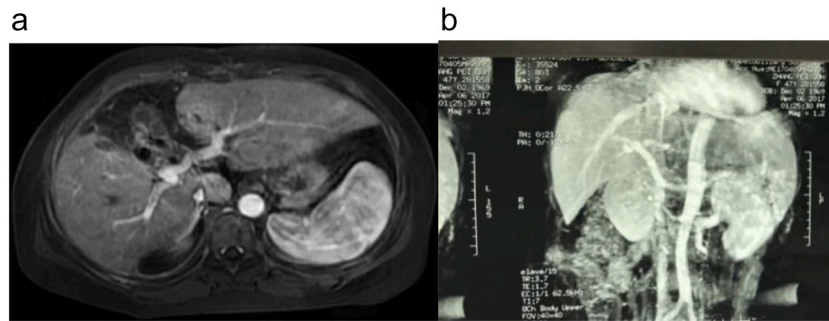


Fig. 3. (a, b). Postoperative MRI. The patency of the RHV and outflow of the liver remained were well maintained in the MIR.

resection and reconstruction can be performed in selected patients with acceptable morbidity and mortality. Central hepatectomy can increase the future remnant liver volume and reduce the risk of postoperative liver failure.

With preoperative prediction of the remnant liver functional, the liver function was within normal range using the Child-Pugh A classification. The remnant liver functional reserve was predicted from indocyanine green retention rate at 15 min [15]. Future remnant liver volume was estimated using CT or MRI [16,17]. In general, in cases when the predicted FLR is less than 30% in parenchyma or 0.8 of total body weight, portal vein embolization (PVE) or associating liver partition and portal vein ligation for staged hepatectomy (ALPPS) is used. But, PVE or ALPPS is not suitable the centrally located HCC, due to their special structure [18]. Now, the neoadjuvant chemotherapy, programmed death protein 1 (PD1), and programmed cell death ligand 1 (PDL1) have been used to advanced HCC, and favourable clinical outcomes have been reported [19].

4. Conclusion

Our technique is a simple and effective method to reconstruct large vein defects after the hepatic vein resection without synthetic vascular grafts and cryopreserved vein. Reconstruction of the RHV has the advantages of prevention of congestion at segments VI and VII. Thus, liver resection combined with vascular resection and reconstruction can be performed in selected patients. The key to the technique is moving the remnant right liver to access the IVC, and to rotate at an angle of less than 45°. If the angle is greater than 90°, the portal vein will be twisted. In the further, we will research the moving angle of RHV reconstruction.

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Ethical approval

Approval to publish this case report was waived by the institution.

Consent

Written informed consent for publication of this case report and accompanying images was obtained from the patient. A copy of the written consent is available for review by the Editor-in -Chief of this journal, on request.

Author contribution

Study conception and design: Aijun Li.
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Drafting of manuscript: Aijun Li.
Supervision: Mengchao Wu.

Operations: Aijun Li, Bin Wu, Lei Yin, Xiaoyu Yang.

Registration of research studies

This is not systematic review or meta-analysis. Also, this is not randomized clinical trial.

Guarantor

The Guarantor is Wu Mengchao MD.

Submission declaration

The authors declare that the work described has not been published previously, and is not under consideration for publication elsewhere. Its publication has been approved by all authors, with the tacit or express consent by the responsible authorities where the work was carried out. If accepted, it will not be published elsewhere-including electronically in same form in English or any other language-without the written consent of the copyright holder.

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Declaration of competing interest

No conflicts of interest.

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