Anatomic Liver Resection of Segments 6, 7, and 8 by the Method of Selective Occlusion of Hepatic Inflow

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Abstract Anatomic liver resection not only enables enough tumor-free resection margin but also guarantees maximum preservation of remaining normal liver tissue. We report here in a hepatocellular carcinoma patient who underwent successful anatomic liver resection of segments 6, 7, and 8 by the method of selective occlusion of hepatic inflow. Multiple tumors were found in segments 6, 7, and 8 by computed tomographic (CT) scanning. CT volumetry analyzed that his left hemi-liver volume was less than the minimal limit of safe survival. Therefore, we planned to perform segment 5 remaining, anatomic liver resection of segments 6, 7, and 8 to guarantee the maximum preservation of remaining normal liver tissue. Selective occlusion of hepatic inflow was creatively used twice in this case to divide right hemi-liver Glissonean pedicle and segments 6 and 7 Glissonean pedicle, respectively. Thus, the resection line was determined, and anatomic liver resection of segments 6, 7, and 8 was completed. Selective right hemi-liver Glissonean pedicle occlusion was used, while parenchymal transection was between segments 6 and 5 and between segments 8 and 5. Therefore, liver ischemia reperfusion injury and hemodynamic instability were maximally reduced during operation.

Keywords Anatomic segmentectomy · Glissonean pedicle · Selective occlusion

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Introduction

Multivariate analysis reveals that anatomic liver resection is a significantly favorable factor for overall disease-free survivals [1, 2]. Anatomic liver resection not only enables enough tumor-free resection margin but also guarantees maximum preservation of remaining normal liver tissue. We successfully used the method of selective occlusion of hepatic inflow to complete anatomic liver resection of segments 6, 7, and 8 in a hepatocellular carcinoma patient.

Case Presentation

A 61-year-old man weighing 78 kg was admitted due to hepatic tumor detected in general checkup. He had a history of hepatitis B virus infection for 20 years. Multiple tumors were found in segments 6, 7, and 8 by contrast-enhanced computed tomographic (CT) scans (Fig. 1). The α -fetoprotein (AFP) serum level was elevated to 164.6 ng/mL. The primary diagnosis of this patient was hepatocellular carcinoma. His liver enzyme, albumin, and total bilirubin levels were in the normal ranges, and liver function was in Child-Pugh A level. The indocyanine green retention (ICG R15) value was 7.8 %. CT volumetry analyzed that his left hemi-liver volume was 459 cm³, which was under the minimal limit of safe survival. We designed to perform segment 5 remaining, anatomic liver segmentectomy of segments 6, 7, and 8 to guarantee the maximum preservation of remaining normal liver tissue.

In operation, selective occlusion of hepatic inflow was firstly used to divide the right hemi-liver Glissonean pedicle [3]. After occlusion of the right hemi-liver Glissonean pedicle, the right hemi-liver presented obvious ischemic status. Therefore, the demarcation between the right and left hemilivers, especially between segment 8 and the left liver, was determined easily (Fig. 2). After demarcation, right hemi-

Fig. 1 Multiple tumors were found in segments 6, 7, and 8 by contrast-enhanced CT scans (arrow)

liver Glissonean pedicle was left unoccluded. Then, selective occlusion of hepatic inflow was used to divide segments 6 and 7 of the Glissonean pedicle. After segments 6 and 7 of the Glissonean pedicle was ligated, segments 6 and 7 presented obvious ischemic status, and the interface between segments 6 and 5 was easily demarcated (Fig. 2). Then, we demarcated between segments 8 and 5. Finally, a “└”-shape resection line was marked onto the diaphragmatic surface of the liver, and the second hepatic portal was dissected. The right hepatic vein was divided and ligated to reduce the risk of hematogenous metastasis. After, the third hepatic portal was dissected, and hepatectomy was performed using the Cavitron ultrasonic surgical aspirator (CUSA). Selective right hemi-liver Glissonean pedicle occlusion was used while performing parenchymal transection between segments 6 and 5 and between segments 8 and 5. Total hepatic inflow occlusion was only used while performing parenchymal transection between segment 8 and the left liver. Hepatectomy was uneventfully completed with approximate blood loss of 500 mL. After hepatectomy, the inflow and outflow of segment 5 and the left liver were successful (Fig. 3).

Postoperative pathology verified hepatocellular carcinoma of the tumor. The patient recovered without any postoperative complications. The patient was discharged 16 days after the operation, and the AFP level was 12.8 ng/mL at that time. Thereafter, the patient received postoperative transcatheter arterial chemoembolization for three times. No tumor recurrence was found after a 6-month follow-up, and the parameters including AFP level (Fig. 4) and liver function were in the normal range.

Discussion

Perfect hepatectomy can only be performed in the circumstance that liver surgeons sufficiently understand the liver anatomy and scrupulously design surgical strategies. Complicated hepatectomy can be completed by the method of Glissonean pedicle transaction [3]. CT volumetry analyzed that the left hemi-liver

Fig. 2 In operation, the method of Glissonean pedicle transection was firstly used to divide the right hemi-liver Glissonean pedicle. After occlusion of the right hemi-liver Glissonean pedicle, the right hemi-liver presented obvious ischemic status. Therefore, the demarcation between the right and left hemi-livers, especially the demarcation between segment 8 and the left liver, could be easily determined (arrow). Then, the method of Glissonean pedicle transection was used to divide segments 6 and 7 Glissonean pedicle. After segments 6 and 7 Glissonean pedicle was ligated, segments 6 and 7 presented obvious ischemic status. Therefore, the interface between segments 6 and 5 could be easily demarcated (arrowhead)

Fig. 3 After hepatectomy, middle hepatic vein was not damaged (arrow in **a**). The inflow and outflow of segment 5 (dotted line in **a** and arrow in **b**) and the left liver were stable

Fig. 4 AFP level was in the normal range after operation. These results showed that hepatic tumor lesions were completely resected, and no tumor recurrence happened

Fig. 5 Specimen. This anatomic liver segmentectomy of segments 6, 7, and 8 not only enables enough tumor-free resection margin but also guarantees the maximum preservation of remaining normal liver tissue

volume of this patient was less than the minimal limit of safe survival. Therefore, we designed to perform segment 5 remaining, anatomic liver resection of segment 6, 7, and 8 to guarantee the maximum preservation of remaining normal liver tissue.

Selective occlusion of hepatic inflow was used twice in this case to divide the right hemi-liver Glissonean pedicle and segments 6 and 7 Glissonean pedicle, respectively. Thus, the resection line could be determined, and anatomic liver resection of segments 6, 7, and 8 could be completed. These procedures were pivotal for this case. Avoiding damage to the middle hepatic vein to guarantee venous outflow of segment 5 was another main focus of this operation. Finally, it was important that selective occlusion of the right hemi-liver inflow was applied while performing parenchymal transection between segments 6 and 5 and between segments 8 and 5. Total hepatic inflow occlusion was only used while performing parenchymal transection between segment 8 and the left liver. Selective right hemi-liver Glissonean pedicle occlusion not only enables blood inflow to the left liver but also avoids splanchnic stasis during hepatectomy [4]. Thus, liver ischemia reperfusion injury and hemodynamic instability were maximally reduced during operation. This anatomic liver segmentectomy of segments 6, 7, and 8 not only enables enough tumor-free resection margin (Fig. 5) but also guarantee the maximum preservation of remaining normal liver tissue.

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