Reduced-right posterior sector salvage liver transplantation using a moderate steatotic graft from one obese donor after cardiac death

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To the Editor: Compared with the majority of reduced-size liver transplantations (RSLTs) performed in pediatric recipients,[1-3] the experience of RSLTs in adult recipients and surgical strategies for the reduction of grafts are relatively unfamiliar. Herein, we report a successful case of adult-to-adult RSLT, in which a unique method for removing the right posterior sector while preserving the right hepatic vein (RHV) was performed. This study was approved by the West China Hospital Ethics Committee (No. 2019-718) and was conducted in accordance with the ethical guidelines of the *Declaration of Helsinki*.

The patient was a 56-year-old man (height: 163 cm; weight: 67 kg; and body mass index [BMI]: 25.2 kg/m^2). He was diagnosed with hepatitis B virus (HBV)-related recurrent multiple hepatocellular carcinomas (HCCs) after hepatic resection for an HCC with maximum tumor diameter of 8 cm in segments 6 and 7 in another hospital 1 year ago. Unfortunately, multiple recurrent HCCs were found at postoperative 8th month, and salvage liver transplantation (LT) was recommended after multidisciplinary panel consultations. He was then on the waiting list for LT, and transcatheter arterial chemoembolization was performed as bridge treatment. He did not have ascites or episodes of encephalopathy. Laboratory tests revealed normal liver function, a good coagulation profile, and an elevated alpha-fetoprotein (AFP) serum level of 72.59 ng/mL. Computed tomography (CT) revealed three nodules, with the largest lesion of 1.7 cm in size (meeting the Milan criteria) [Figure 1A]. His Child-Pugh score was 5, and the Model for End-Stage Liver Disease (MELD) score was 6.

The allocated liver graft was from a 43-year-old donor (height: 180 cm; weight: 99 kg; and BMI: 30.6 kg/m^2) after circulatory death because of acute cerebral hernia secondary to brain stem hemorrhage. His liver function test and international normalized ratio (INR) were normal, except for marginally elevated white blood cells before donation. The weight of the whole grafts was 2060 g, and the graft-recipient weight ratio (GRWR) was 3.07%. The graft weight (GW)/right anteroposterior (RAP)[4] ratio was 108.8 [Figure 1B]. Liver biopsy revealed the presence of steatosis of 37% (macrosteatosis, 13%). Previous studies have suggested that GRWR > 2.5% and GW/RAP > 100 are associated with a higher risk of the large-for-size syndrome (LFSS),[5,6] which reminded us of the need for graft reduction for this case. Preoperative evaluations revealed that the estimated volume of the right posterior sector was 26.8% of the total liver volume.[7] Based on these results, we evaluated the weight of the right posterior sector and the remnant graft before reduction and found that the GRWR and GW/RAP could be reduced to normal values after removal of the right posterior sector. Thus, we considered it acceptable to perform a right posterior sectionectomy.

The *ex vivo* removal of the right posterior section was performed on a back table to overcome the size mismatch [Figures 1C–1E]. During the operation, the cutting plane was identified according to the right side of the RHV in the second porta hepatis, the right side of the retrohepatic inferior vena cava (IVC), and the Rouviere sulcus. Then, we mainly used the right side of the RHV as the surgical marker to navigate the intrahepatic transection, which did not influence the outflow of segments V and VIII. The cutting point for the right posterior hepatic pedicle was in the Rouviere sulcus and was distant from the porta hepatis, which may avoid damage to the right anterior hepatic pedicle. Hence, this procedure can ensure the inflow and outflow integrity of segments V and VIII. To control the duration of reduction well, the liver parenchyma was dissected using a cavitron ultrasonic surgical aspirator (CUSA), and hemostasis was achieved with dipolar coagulation, clips, or suturing. The right posterior hepatic pedicle was transected using a linear stapler (Ethicon

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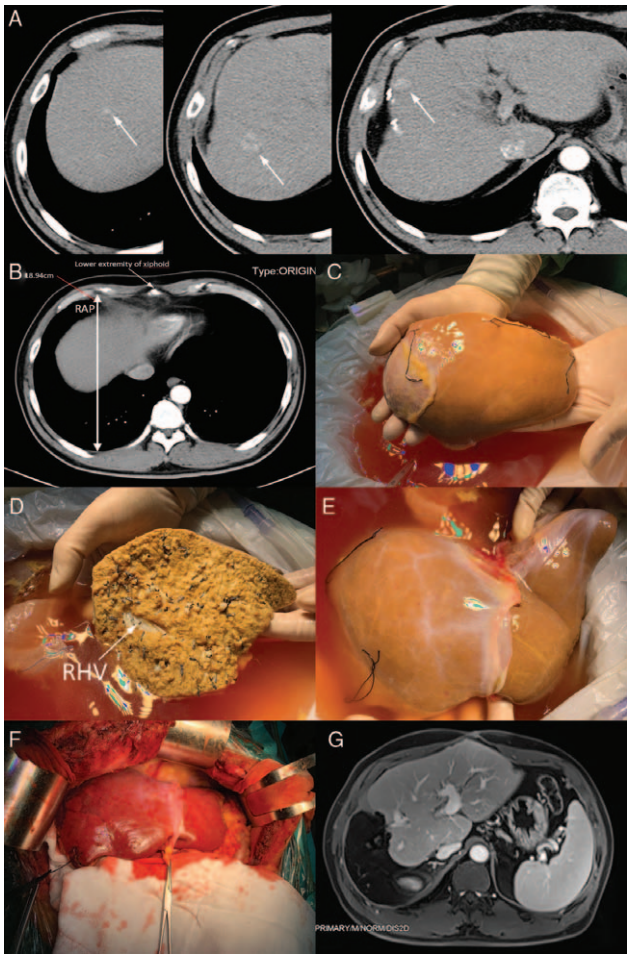

Figure 1: (A) Recipient's multiple recurrent hepatocellular carcinomas (arrow) on CT scan. (B) The right anteroposterior vertical distance between anterior and posterior parts of the ribs at the level of the xiphoid (arrow) process on CT scan. (C) Reduction of the right posterior section from the liver graft. (D) Preservation of the right hepatic vein (arrow). (E) The remaining liver graft. (F) Implantation of the reduced-size liver graft into the recipient. (G) Magnetic resonance imaging showing no recurrence at 10 months of follow-up.

Endo-Surgery, Cincinnati, OH, USA). The size reduction was performed by an experienced surgeon, who had precise anatomic knowledge of the liver and had carried out many hepatic resections. The duration of the size reduction, in this case, was approximately 40 min. Ultimately, the weight of the remaining graft was 1526 g (GRWR: 2.28% and GW/RAP: 80.6).

The recipient underwent total hepatectomy, and the reduced graft was implanted into the recipient using the piggyback method [Figure 1F] with the donor supra-hepatic cava anastomosed to the recipient common orifice of the right, middle, and left hepatic veins. The portal vein was anastomosed using a running 6-0 Prolene suture. Arterial reconstruction was performed microscopically using a running 7-0 Prolene suture. The biliary reconstruction was fashioned as a standard choledochocholedochostomy without a stent. Following transplantation, the serum total bilirubin and INR peaked at 21.9 μmol/L and 1.59, respectively, on postoperative day (POD) 1, with graft function rapidly improving thereafter. The post-operative course was uneventful, and daily routine surveillance Doppler ultrasounds were satisfactory. He was discharged on POD 9 and is currently doing well with normal liver function and serum AFP levels and no recurrence on imaging at 10 months of follow-up [Figure 1G].

In most cases, a limited resection, such as left lobectomy or left lateral lobectomy, is preferred to solve the problem of size mismatch due to the convenience and shortening time for size reduction. However, it is very unlikely to solve the mismatch issue because of compression, due to the ribs, mainly applies on the right liver. Then, a right hemihepatectomy was proposed as an alternative option for graft reduction,[8] but the remaining left liver may be insufficient for the recipient owing to reductions in both liver volume and graft outflow. Therefore, we consider the right posterior sectionectomy as one of the most practical ways to reduce the size of the graft. The removal of the right posterior sector could be a unique method with the following advantages. First, compared with the whole right lobe volume, which accounts for 60% to 75% of the total liver volume, the right posterior sector reduction can ensure adequate residual graft volume to avoid small-for-size syndrome (SFSS), especially for the steatotic graft, as we reported in this article, which is associated with a high risk of post-transplant graft failure. On the one hand, the main purpose of the right posterior sectionectomy in our case was to reduce the size of the graft to overcome size mismatch, so it is not necessary to perform a precise anatomic right posterior sectionectomy. On the other hand, preserving the RHV in this procedure ensured the outflow integrity to the greatest extent, which was another critical factor for maintaining graft function. Finally, reduction of the right posterior sector, as a main part of the right liver, can effectively avoid rib compression.

In conclusion, this is a rare description of reduction of the right posterior sector in adult-to-adult salvage LT, which may be a feasible and effective technique to prevent post-transplant LFSS or SFSS and rid compression.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

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Conflicts of interest

None.

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