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Multiple Hepatic Vein Reconstruction Using an All-in-one Sleeve Patch Graft Technique in Living Donor Liver Transplantation: A Case Report

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ABSTRACT

Maintaining hepatic inflow and appropriate venous drainage is important for maximizing the capacity of the retrieved graft in liver transplantation. Here, we report a successful case of multiple hepatic vein (HV) reconstruction using an all-in-one sleeve patch graft of the autologous great saphenous vein to ensure adequate blood flow through the HV. A patient with hepatocellular carcinoma caused by hepatitis C virus–induced cirrhosis underwent living donor liver transplantation using a right lobe graft. A preoperative dynamic computed tomography scan and intraoperative findings revealed that the graft had three middle HV tributaries, a superficial vein, segment VIII HV (V8), and segment V HV (V5). The openings of the superficial vein and V8 were located very close to that of the right hepatic vein (RHV) in the cutting surface. Each HV had significant diameter and drainage territory requiring reconstruction. An autologous great saphenous vein was used to create a sleeve patch to incorporate the close-packed HV openings. The autologous sleeve patch graft was sutured to the openings of the RHV and the superficial vein and the hole created on the sleeve patch graft was anastomosed to the openings of V8 directly on the back table to create an all-in-one sleeve patch. For the V5 reconstruction, the recipient's intrahepatic portal vein graft was used to create an interpositional conduit from the recipient's V5 to the inferior vena cava. The postoperative course was uneventful and postoperative studies revealed good graft function with excellent blood flow in the HV.

RIGHT lobe grafts have been used in living donor liver transplantation (LDLT) in many medical centers. Preventing congestion within the anterior segment of a right lobe graft is very important because hepatic venous congestion can cause serious complications such as early graft dysfunction and sepsis, and can even affect mortality [1]. Various hepatic vein (HV) reconstruction techniques in LDLT using autologous vein grafts such as the great saphenous vein (GSV) [2], left portal vein (PV) [3], or paraumbilical vein [4] to ensure adequate blood flow have been reported to provide adequate venous drainage, although reconstruction of HV that is in close proximity to the other donor veins is technically difficult in some cases. Here, we report a successful LDLT case using a right lobe graft with multiple HV tributaries that required reconstruction using an autologous GSV graft known as the all-in-one sleeve patch graft technique to obtain adequate blood flow through the HV.

CASE REPORT

A 65-year-old man with hepatocellular carcinoma caused by hepatitis C virus–induced cirrhosis was referred to our hospital for LDLT. A preoperative dynamic computed tomography (CT) scan showed three tumors located in segments II and IV, within the Milan criteria. The hepatic artery, HV, and inferior vena cava

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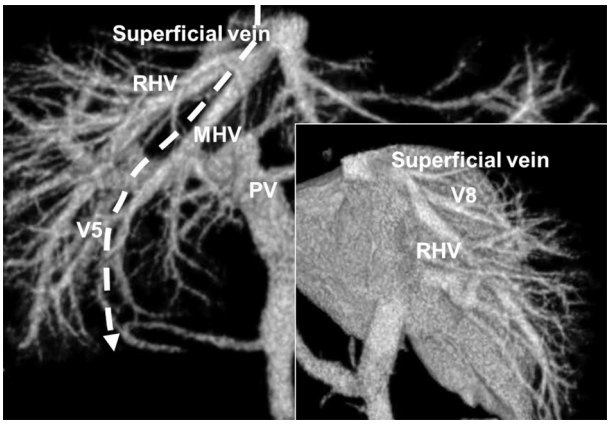

Fig 1. Preoperative computed tomography angiography showed that the middle hepatic vein (MHV) had the following three tributaries toward the anterior segment of the right lobe: superficial vein, segment VIII HV (V8), and segment V HV (V5). The dotted line is the estimated cutting line.

(IVC) appeared normal. His Child-Pugh score was 11 and model of end-stage liver disease score was 21.

The donor was the patient's 38-year-old son. CT volumetric estimation of the donor's liver was 899 mL (right lobe, 574 mL; left lobe, 325 mL). The estimated right lobe graft weight versus recipient weight ratio was 0.77%. Liver findings including the biopsy results met the donor criteria for liver transplantation. Preoperative CT angiography showed that the donor's PV and hepatic artery were normal. The middle HV (MHV) had three tributaries draining the anterior segment of the right lobe including the superficial vein, segment VIII HV (V8), and segment V HV (V5) (Fig 1). Each HV had a significant diameter (right hepatic vein [RHV], 24 mm; superficial vein, 11 mm; V8, 7 mm; V5, 5 mm), and all of those veins required reconstruction. The openings of the superficial vein and the RHV lay next each other in the cutting surface. The distance between the RHV and the V8 was 15 mm.

The recipient underwent LDLT using the right lobe graft with HV reconstruction. In the HV reconstruction, after vessel patch sheets were prepared from the autologous GSV, a hole was created in that patch graft sheet and the opening of the V8 was anastomosed to the patch graft sheet with a running suture by placing a polypropylene tube in the opening of the V8 and the sheet hole. The anastomosed patch graft sheet and another patch graft sheet were sutured to the openings of the RHV and the superficial vein side by side to make an all-in-one sleeve. Both edges of the patch graft sheets were sutured to create the sleeve. The all-in-one sleeve patch was created on the back table using a running 6-0 polypropylene suture (Fig 2). The all-in-one sleeve patch graft was anastomosed to the IVC as usual. The V5 was reconstructed using the recipient's PV graft to create an interpositional conduit from the recipient's V5 to IVC. The cold and warm ischemic time was 94 minutes and 46 minutes, respectively. The anastomotic time of the IVC to the sleeve graft was 18 minutes.

A postoperative CT scan revealed good patency of each reconstructed HV. A postoperative Doppler ultrasound showed triphasic flow patterns in all the HVs (Fig 3). The recipient's postoperative course was uneventful and the liver graft showed good function. The reconstructed HV remained patent with adequate flow velocities at the 16-month follow-up examination.

DISCUSSION

LDLT using partial liver transplantation has been established as an option to overcome the donor pool shortage,

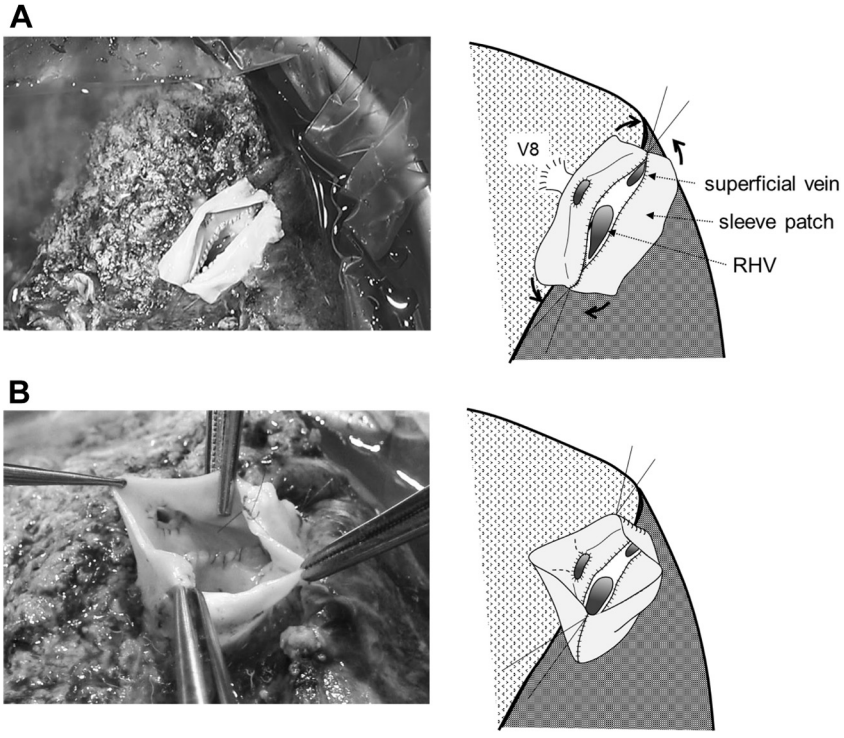

Fig 2. (**A**) Autologous vein patch graft sheets were sutured to the opening of the right hepatic vein, superficial vein, and V8 to create the all-in-one sleeve. (**B**) Complete all-in-one sleeve. The corresponding scheme is shown next to each picture.