

Wedged-patch venoplasty of the left liver graft portal vein for size matching in pediatric living donor liver transplantation

Sang-Hyun Kang¹, Jung-Man Namgoong¹, Shin Hwang¹, Dong-Hwan Jung¹, and Kyung-Mo Kim²

Departments of ¹Surgery and ²Pediatrics, Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea

Portal vein (PV) size matching between recipient and liver graft is important in preventing anastomotic stenosis in living donor liver transplantation (LDLT). In right liver grafts, the diameter of graft PV is usually >10 mm. Thus, PV size matching does not become critical in adult recipients. If the recipient PV is very large, funneling fence can be attached to graft PV. However, if the diameter of graft PV is <8 mm, it can induce anastomotic stenosis. We experienced a few cases of PV anastomotic stenosis due to small-sized graft PV in >5000 LDLT cases, but graft PV widening was not performed because graft PV is considered as being a no-touch area. In thinking out of the box, we performed wedged-patch venoplasty to exceptionally narrow graft PV. A 4 year-old female patient underwent second LDLT due to progressive deterioration of graft function after 3 years. At first LDLT operation for biliary stesias, an iliac vein conduit was interposed for PV reconstruction. At second LDLT operation, the diameter of interposed PV was 10 mm, but the left liver graft PV was only 6 mm-sized. Uniquely, the left PV was waist only at first-order PV. To resolve this PV waist, a longitudinal incision was made to release the waist. A cold-preserved fresh iliac vein patch was inserted to widen the PV orifice. The patch size was adjusted to match the size of the recipient PV. The patient recovered uneventfully. This wedged-patch venoplasty technique can be applied to small-sized graft PV, to cope with PV size mismatching in LDLT. ([Ann Hepatobiliary Pancreat Surg 2019;23:183-186](#))

Key Words: Portal vein stenosis; Venoplasty; Pediatric transplantation

INTRODUCTION

Size matching of the portal vein (PV) between the recipient and liver graft is important in preventing anastomotic stenosis in living donor liver transplantation (LDLT). In LDLT using a right liver graft, the diameter of right liver graft PV is usually >10 mm, thus PV size matching does not become a critical problem in adult recipients. If the recipient PV is small, unification venoplasty of two PV branches can be applied.¹ If the recipient PV is very large, a funneling fence can be attached to the graft PV for easy anastomosis.² However, if the diameter of graft PV is <8 mm, it can induce anastomotic stenosis even though a growth factor is fully given at the suture material. We have experienced a few cases of PV anastomotic stenosis so far due to small-sized graft PV in >5000 LDLT cases, but graft PV widening was not performed because

graft PV is considered as being a no-touch area.

In thinking out of the box, we performed wedged-patch venoplasty to an exceptionally narrow graft PV to cope with PV size mismatching in LDLT. We herein present the case and describe the surgical technique of wedged-patch venoplasty.

CASE

A 14 kg-weighting 4 year-old female patient underwent second LDLT due to progressive deterioration of graft function for 3 years (Fig. 1). The first LDLT operation was performed due to biliary stesias at age of 11 months and the donor was her mother. At the second LDLT, the donor was the 35 year-old sister of her mother and a 350 g-weighting whole left liver with middle hepatic vein trunk was harvested. The left liver graft PV was only 6 mm, be-

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Corresponding author: Shin Hwang

Department of Surgery, Asan Medical Center, University of Ulsan College of Medicine, 88 Olympic-ro 43-gil, Songpa-gu, Seoul 05505, Korea
Tel: +82-2-3010-3930, Fax: +82-2-3010-6701, E-mail: shwang@amc.seoul.kr

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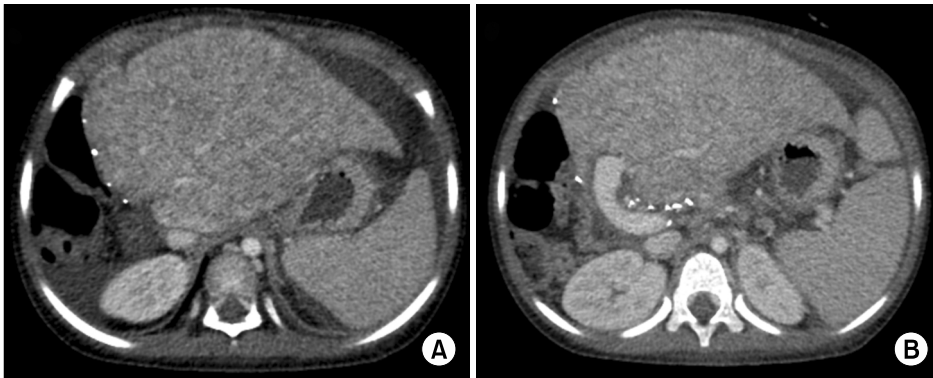


Fig. 1. Pretransplant computed tomography findings of the recipient. The first liver graft was severely damaged (A), but the interposed portal vein was well maintained (B).

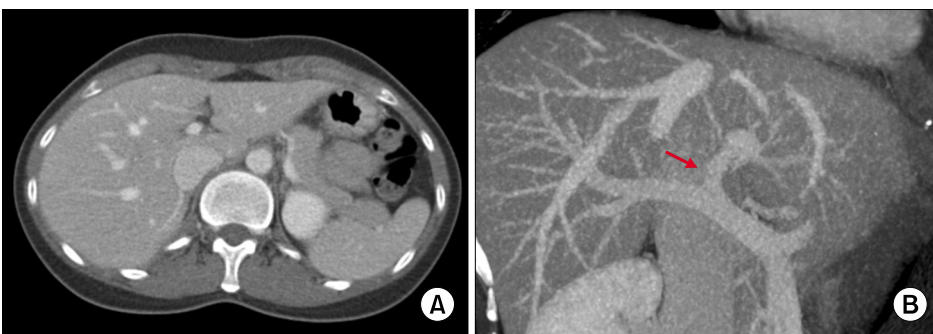


Fig. 2. Computed tomography findings of the donor. The left liver was small (A) and a waist is present at the first-order left portal vein (B, arrow).

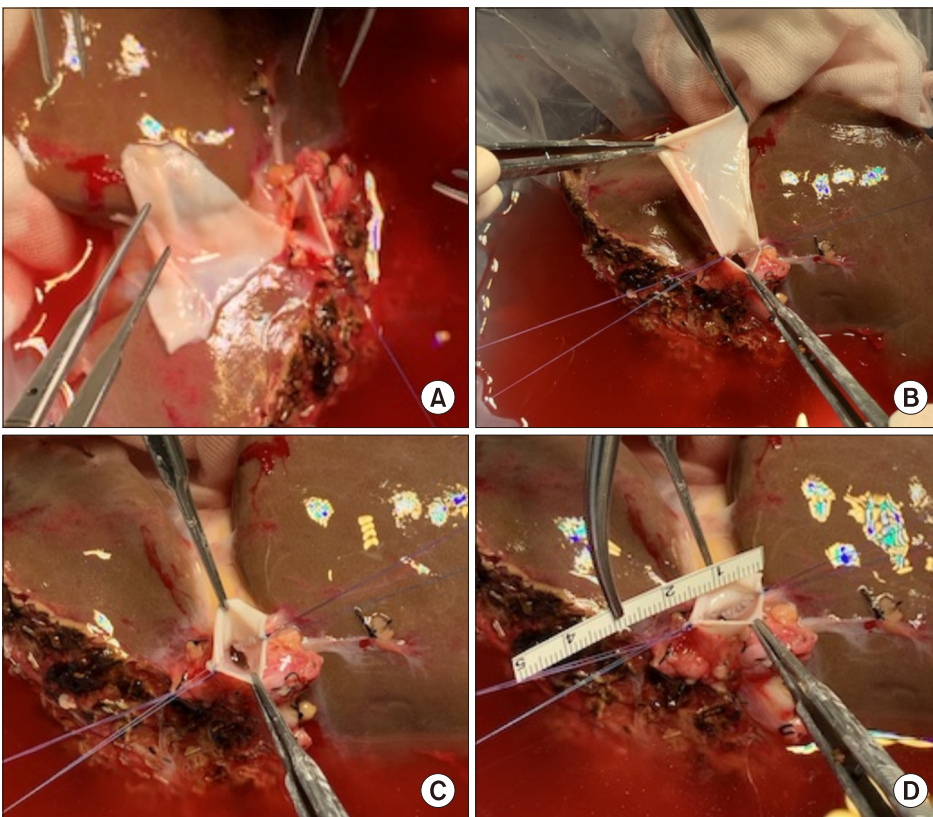


Fig. 3. Operative photographs of portal vein (PV) venoplasty. The ventral wall of the graft PV is incised and a large-sized patch is attached (A). A vein patch is anastomosed (B). The final shape of enlarged graft PV is visible (C), and its diameter is more than 15 mm (D).

cause the left PV was waisted at the first-order PV (Fig. 2).

In contrast, the diameter of the recipient PV was 12 mm because an iliac vein conduit was interposed to cope with

portal hypoplasia at the first LDLT operation (Fig. 1). To resolve this graft PV waist-associated size mismatching, a longitudinal incision was made at the graft PV stump

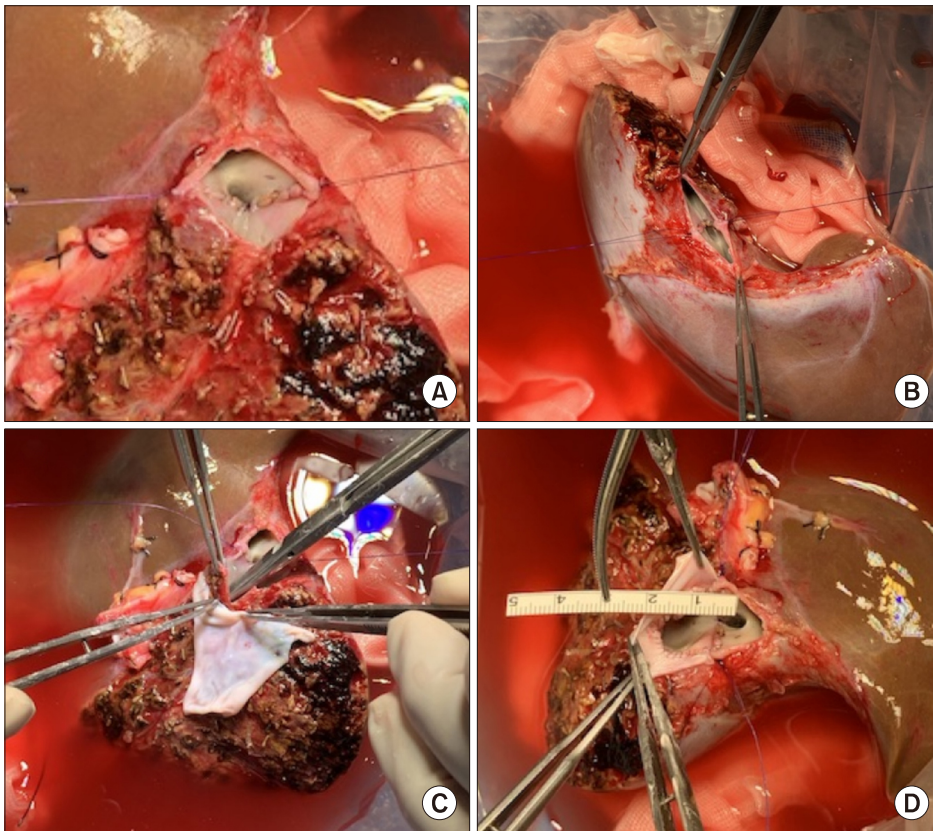


Fig. 4. Operative photographs of hepatic vein (HV) venoplasty. The middle and left HVs are unified (A and B). An incision is applied at the middle HV trunk and a vein patch is attached (C). The size of conjoined outflow orifice was measured to be approximately 30 mm (D).

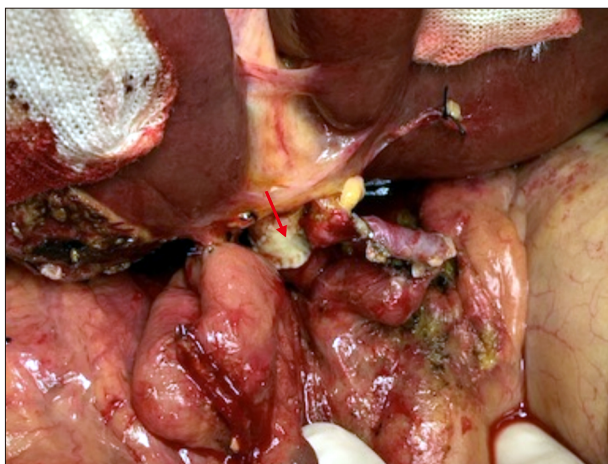


Fig. 5. Operative photograph taken after all reconstructions. An arrow indicates the vein patch at the portal vein anastomosis.

to release the waist. A small cold-preserved fresh iliac vein patch was attached to widen the graft PV orifice (Fig. 3). The size of patch was adjusted to match with the size of the recipient PV.

In addition to the PV venoplasty, the left and middle hepatic vein orifices were unified, and a vein patch was attached to the middle hepatic vein side to widen the con-



Fig. 6. Computed tomography finding of the recipient taken 2 weeks after transplantation. The reconstructed portal vein appears streamlined without noticeable stenosis.

joined outflow orifice according to our standardized LDLT procedures (Fig. 4).

Graft implantation was uneventful, along the orders of hepatic vein anastomosis under total occlusion of the inferior vena cava, end-to-end portal vein anastomosis, portal reperfusion, hepatic artery anastomosis under surgical microscopy and hepaticojejunostomy using the previously

made jejunal limb (Fig. 5). For hepatic vein and PV reconstruction, we used continuous running sutures using 5-0 and 6-0 polydioxanone (PDS) respectively. We have not applied interrupted sutures combined with continuous running sutures using polypropylene (Prolene).

The patient recovered uneventfully and is doing well to date for 6 months. The portal vein showed a streamlined configuration without anastomotic stenosis after the second LDLT operation (Fig. 6).

DISCUSSION

In pediatric LDLT, PV stenosis is one of the most common and most critical complications. Patients with biliary atresia have suffered from periportal inflammation and fibrosis due to recurrent cholangitis, by which the recipient PV becomes hypoplastic and sclerotic PV.^{3,4} To cope with such an intractable PV anatomy, we adopted an interposition graft for PV reconstruction.⁵ The favorable long-term result of PV interposition graft was shown at the time of retransplantation operation in this case.

In this case, graft PV was smaller than the recipient PV. Such size mismatching of PV is often encountered in adult LDLT because of aneurysmal dilatation of recipient PV. In most cases of adult LDLT using a right liver graft, direct anastomosis of PVs is often feasible despite presence of considerable size discrepancy. If the recipient PV is too large to perform direct anastomosis, a funneling fence can be attached to the graft PV for easy anastomosis.² However, if the diameter of right liver graft PV is <8 mm, it can induce anastomotic stenosis even though a growth factor is fully given at the suture material. We have experienced a few cases of PV anastomotic stenosis so far due to small-sized graft PV in >5000 LDLT cases, but graft PV widening was not performed because graft PV is considered as being a no-touch area.

In donor liver anatomy of this case, the native left PV has a waist at its first-order level, which is an unusual finding. Since manipulation of the single graft PV is usually unnecessary, we have considered it as a no-touch area. Meanwhile, unification of two graft PV orifices is a standard procedure.⁶⁻¹⁰ In thinking out of the box, we performed wedged-patch venoplasty to exceptionally nar-

row graft PV. The surgical technique for wedged-patch venoplasty is intuitive and simple because we accumulated similar experience on graft hepatic vein venoplasty, as shown in this case.¹¹ The lesson learned from this case can be applied to adult LDLT cases which has an unusually small graft PV.

In conclusion, we believe that this wedged-patch venoplasty technique can be applied to small-sized graft PV to cope with PV size mismatching in LDLT.

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