

Unusual portal reconstructions after liver transplantation – Case report and review of literature

B. NEMES* ■ D. GÖRÖG ■ I. FEHÉRVÁRI ■ T. MÁNDLI ■ E. SÁRVÁRY ■
L. KÓBORI ■ A. DOROS ■ J. FAZAKAS

Department of Transplantation and Surgery, Semmelweis University, Baross u. 23–25, H-1082 Budapest, Hungary

*Corresponding author: Balázs Nemes MD, PhD, Department of Transplantation and Surgery, Semmelweis University, Baross u. 23–25, H-1082 Budapest, Hungary; Phone: +36-1-2676-000; Fax: +36-1-3170-964; E-mail: abnemes@hotmail.com

(Received: April 29, 2010; Accepted: August 10, 2010)

Abstract: Portal vein reconstruction might be a challenge in certain cases of liver transplantation. The problem usually arises due to small vessels in pediatric transplantation and/or living related donor and split liver transplantation, or as a result of extensive PVT in adult recipients. Authors report a case of a 60-year-old alcoholic cirrhotic patient with reverse portal flow. The standard end to end portal anastomosis did not work well, so a mesoportal shunt with a donor iliac vein conduit was performed first, followed by a cavoportal hemitransposition. After unsuccessful attempts of providing good portal flow, the donor umbilical vein and the iliac conduit was used for portal flow reconstruction as meso-Rex graft. The patient has been doing fine for eight months after her liver transplantation. Unusual types of portal reconstructions consist of meso-portal, umbilico-portal, renoportal anastomoses that are primarily used as rescue techniques. However, it is rare that one has to use them sequentially in the same patient.

Keywords: liver transplantation, Rex-sinus, portal vein thrombosis, shunt, meso-Rex

Introduction

Portal vein reconstruction might be a challenge in certain cases of liver transplantation. The problem usually occurs due to small vessels in pediatric transplantation and/or living donor and split liver transplantation, or as a result of extensive grade 2–4 portal vein thrombosis in adult recipients.

Case report

A 60-year-old woman presented herself with decompensated alcoholic liver cirrhosis. She suffered from bilateral necrosis of the femoral head, for which a total endoprosthesis implantation should have been performed. However, it was cancelled due to her poor hemostatic state and poor life expectancy. She was put on OLT waiting list after all evaluations had been completed according to our protocol. CTA and US had showed reverse flow in her portal vein and she had extensive venous collaterals at the time of listing. The patient underwent surgery on January 28, 2009, with a full size adult liver graft from a deceased donor. The hepatectomy was performed by standard technique, cross clamping the caval vein. The portal vein was found to be small and tenuous, but intact, and after flushing it with heparin, a standard end to end anastomosis was per-

formed, with 6.0 running suture, knotted over a growth factor. Intraoperative US showed slow, but stable antegrade portal flow (15–20 cm/s). The arterial and choledochal anastomoses were performed with standard sutures, respectively. On the first postoperative day there was no detectable flow in the portal vein by US. At reoperation an intact and open portal vein was found, however no effective flow could be detected. After unsuccessful attempts to reconstruct normal portal flow, we decided to perform a venous conduit between the confluent site of the mesenteric superior/splenic veins and the donor portal vein, by using the proper part of the donor iliac vein (*Fig. 1*). The performed conduit resulted in an undetectable slow antegrade flow that was considered insufficient. A gastric coronary vein was isolated and ligated in hope of increasing the portal inflow. Since it was unsuccessful, we decided to perform a cavoportal hemitransposition. The donor iliac vein conduit was ligated and disconnected from the donor-portal anastomosis side and anatomised end to side to the infrahepatic/suprarenal site of caval vein by 6.0 running suture. The caval vein was narrowed by a Köper-band until an 8–9 mmHg difference was achieved between the pressures measured through the inferior and superior caval vein lines. However, intraoperative ultrasonography could not show effective flow in the portal system. As a rescue measure the umbilical vein of the

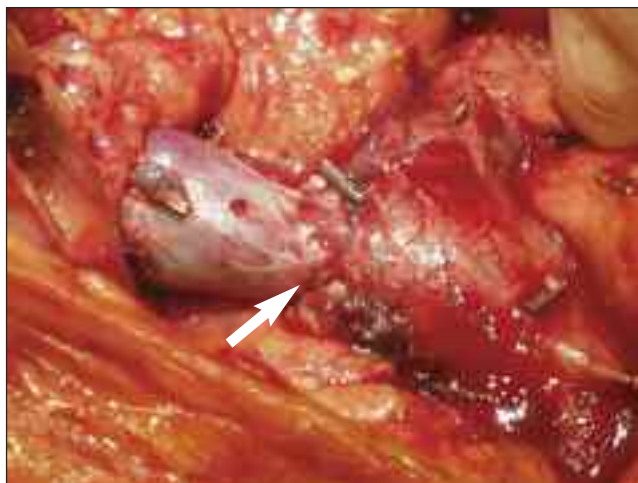


Fig. 1. The lower part of the venous conduit: Anastomosis between the confluent site of the mesenteric superior/splenic veins and the donor iliac vein. The white arrow shows the anastomosis

donor liver was prepared and recanalised. Since a good backflow was obtained from the liver graft an end to end anastomosis was performed between the graft umbilical vein and venous conduit originated from the mesenteric/splenic confluence. A very good anterograde flow has been achieved (*Fig. 2*). Biliary leakage was detected through the drains four days after the reoperation. The patient was reoperated again. The origin of the leakage was the biliary anastomosis, for which we performed a hepaticojejunostomy with Roux-en-Y limb. After an uneventful postoperative period the patient was discharged fifteen (15) days after the first operation in very good condition. Seven months later her postoperative abdominal hernia was repaired. Right now she is in excellent condition. Follow-up US showed good flow through the umbilical vein, via the left portal system and right side throughout the whole liver.

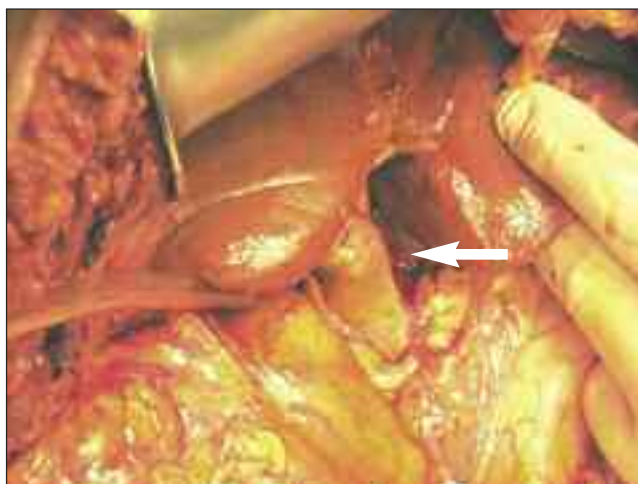


Fig. 2. The upper part of the venous conduit: Anastomosis between the donor iliac vein and the recanalized umbilical vein. The white arrow shows the umbilical vein in the Rex-sinus

Discussion

The absence of the portal vein was first described in 1957, and was also reported as the absence of portal bifurcation by Couinaud in 1993 [1]. This phenomenon occurs mainly in childhood. Emre et al. summarized their series of PSS and Rex bypasses in Mount Sinai Hospital (USA) between 1992 and 2006 among non-transplanted children. Of the 32 cases there were four portocaval, three meso-Rex, and two mesocaval shunts. They found that PSS may act as a bridge to OLT or represent an attractive alternative in selected children with compensated liver disease [2]. Fuchs et al. reported seven cases of mesenterico-left portal Rex shunts as an effective solution for children with extrahepatic portal vein thrombosis. They used internal jugular vein for grafting [3]. Regarding meso-Rex shunt and OLT, Gibelli et al. reported effective Rex shunting for late portal occlusion after liver transplantation in children [4]. Krebs-Schmidt et al. reported the effectiveness of Rex shunt in children with portal hypertension following liver transplantation. In this very recent paper meso-Rex shunt was used primarily for the resolution of PVT after OLT. Of the 25 children recanalized umbilical veins were used only in three cases [5], jugular veins were used in every other operation. A similar situation might occur in adults, in cases of extended grade 4 PVT prior to OLT. Pre-existing portal occlusion can be managed several different ways during the implantation procedure. Eversion thromboendovenectomy and bypass using a patent splanchnic vein and cavoportal hemitransposition are the most often used procedures to treat PVT [6]. Nikitin et al. collected data from 2370 adult liver transplants. Portal vein conduits were required in 1.5% at first transplants. Vein conduits were constructed from donor iliac veins. They found a higher rate (8.6% versus 1.4%) of PVT after portal vein conduit in the first 3 months after transplantation. However, there was no negative impact on long-term graft survival or patient survival [7]. Bonnet et al. reported arterialisation of the portal vein performing a calibrated end-to-side anastomosis between the donor splenic artery and the donor portal vein. They report 6-year follow-up, without symptoms related to portal hypertension and with normal liver function [8]. Wu et al. used cryopreserved vein grafts from the engorged coronary vein to the liver graft portal vein in LRLT [9]. Paskonis et al. found by reviewing the literature that 53 OLTs had been performed with extended PVT either with cavoportal hemitransposition (46 cases), and reno-portal anastomosis (10 patients) between 1996 and 2005. The survival rate was 74%. They concluded that the ideal technique to overcome PVT during OLT was still controversial [10]. Gore-Tex graft was used by Hashimoto et al. to solve the PVT after extended left lobe LRLT. The vascular jump graft was extra-anatomically interposed between the recipient superior mesenteric vein and the donor umbilical vein [11]. Moon et al. substituted an intact um-

bilical portion of recipient's left PV for the destroyed right PV in a dual donor LRLT with two left lobe donation for one recipient, who suffered from grade 4 portal thrombosis after TIPS and several inflammation [12].

Umbilical vein was also described as other substitute. Reopened umbilical vein was used to reconstruct venous outflow presented by Mergental et al. in 2007 [13]. Reconstruction of various vascular structures in liver transplantation usually does not cause a problem due to the availability of vessels of the deceased donor. Other substitutes have also been described for solving the problem, like prostheses to enlarge the caval vein [14–16]. In our report four of the reported technical approaches were applied and combined with final success. The patient had a thromboendovenectomy with moderate effect first, then a mesenterico-portal jump graft with donor iliac vein was interpositioned, followed by a cavoportal hemitransposition and finally a mesenterico-umbilical (MesoRex) shunt was performed with the composition of an interposed donor iliac vein graft. We conclude that umbilical recanalisation should be considered as a method of choice if the portal flow is inadequate following endovenectomy, due to pre-existing PVT when the mesenteric part is intact. The use of the recanalized umbilical vein is safe. In certain cases of liver transplantations, the reconstruction of portal flow could be a challenge that requires a case-tailored combination of techniques.

Abbreviations

CTA – computer tomography angiography; LRLT – living related liver transplantation; OLT – orthotopic liver transplantation; PSS – portosystemic shunt; PVT – portal vein thrombosis; TIPS – transjugular portosystemic shunt; US – ultrasonography

References

- Couinaud C: Absence of portal bifurcation. [In French] *J Chir* 130, 111–115 (1993)
- Emre S, Dugan C, Frankenberg T, Hudgins LC, Gagliardi R, Artis AT, Rodriguez-Laiz G, Gondolessi G, Shneider BL, Kerker N: Surgical portosystemic shunts and the Rex bypass in children: A single-centre experience. *HPB (Oxford)* 11, 252–257 (2009)
- Fuchs J, Warmann S, Kardorff R, Rosenthal H, Rodeck B, Ure B, Melter M: Mesenterico-left portal vein bypass in children with congenital extrahepatic portal vein thrombosis: A unique curative approach. *J Pediatr Gastroenterol Nutr.* 36, 213–216 (2003)
- Gibelli NE, Tannuri U, de Pinho-Apezato ML, Tannuri AC, Maksoud-Filho JG, Velhote MC, Santos MM, Ayoub AA, Marques da Silva M, Andrade WC: “Rex shunt” for the treatment of portal vein thrombosis after pediatric liver transplantation: A case report. *Transplant Proc* 41, 955–956 (2009)
- Krebs-Schmitt D, Briem-Richter A, Grabhorn E, Burdelski M, Helmke K, Broering DC, Ganschow R: Effectiveness of Rex shunt in children with portal hypertension following liver transplantation or with primary portal hypertension. *Pediatr Transplant* 13, 540–544 (2009)
- Ateş O, Hakgüder G, Olguner M, Seçil M, Karaca I, Akgür FM: Mesenterico left portal bypass for variceal bleeding owing to extrahepatic portal hypertension caused by portal vein thrombosis. *J Pediatr Surg* 41, 1259–1263 (2006)
- Nikitin D, Jennings LW, Khan T, Vasani S, Ruiz R, Sanchez EQ, Chinnakotla S, Levy MF, Goldstein RM, Klintmalm GB: Twenty years' follow-up of portal vein conduits in liver transplantation. *Liver Transpl* 15, 400–406 (2009)
- Bonnet S, Sauvanet A, Bruno O, Sommacale D, Francoz C, Dondero F, Durand F, Belghiti J: Long-term survival after portal vein arterialization for portal vein thrombosis in orthotopic liver transplantation. *Gastroenterol Clin Biol* 34, 23–28 (2010)
- Wu TH, Chou HS, Pan KT, Lee CS, Wu TJ, Chu SY, Chen MF, Lee WC: Application of cryopreserved vein grafts as a conduit between the coronary vein and liver graft to reconstruct portal flow in adult living liver transplantation. *Clin Transplant* 23, 751–755 (2009)
- Paskonis M, Jurgaitis J, Mehrabi A, Kashfi A, Fonouni H, Strupas K, Büchler MW, Kraus TW: Surgical strategies for liver transplantation in the case of portal vein thrombosis – Current role of cavoportal hemitransposition and renportal anastomosis. *Clin Transplant* 20, 551–562 (2006)
- Hashimoto K, Shimada M, Suehiro T, Soejima Y, Minagawa R, Hiroshige S, Shiotani S, Ninomiya M, Harada N, Komori K, Sugimachi K: Gore-Tex jump graft for portal vein thrombosis following living donor liver transplantation. *Hepatogastroenterology* 50, 1146–1148 (2003)
- Moon D, Lee S, Hwang S, Park K, Kim K, Ahn C, Lee Y, Ha T, Cho S, Oh K, Kim Y, Kim K: Umbilical portion of recipient's left portal vein: a useful vascular conduit in dual living donor liver transplantation for the thrombosed portal vein. *Liver Transpl* 10, 802–806 (2004)
- Mergental H, Gouw AS, Slooff MJ, de Jong KP: Venous outflow reconstruction with surgically reopened obliterated umbilical vein in domino liver transplantation. *Liver Transpl* 13, 769–772 (2007)
- Gloviczki P, Pairolero PC, Cherry KJ, Hallett JW Jr: Reconstruction of the vena cava and of its primary tributaries: A preliminary report. *J Vasc Surg* 11, 373–381 (1990)
- Kobori L, Doros A, Nemeth T, Fazakas J, Nemes B, Slooff MJH et al.: The use of autologous rectus facia sheath for replacement of inferior caval vein defect in orthotopic liver transplantation. *Transpl Int.* 18, 1376–1377 (2005)
- Toshimitsu Y, Miyazawa M, Torii T, Koyama I, Ikada Y: Tissue-engineered patch for the reconstruction of inferior vena cava during living-donor liver transplantation. *J Gastrointest Surg* 9, 789–793 (2005)