TECHNICAL NOTE

Reconstruction of the middle hepatic vein in live donor liver transplantation: will it improve donor liver function?

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Key words: Live donor liver transplantation; middle hepatic vein; reconstruction.

Abstract:

Right liver graft with the middle hepatic vein sometimes induces postoperative liver failure in donors due to insufficient functional remnant liver volume. Venous drainage of the graft is important for prevention of congestion and proper function of the graft. Therefore right hepatic veins and the tributaries of the middle hepatic vein need reconstruction.

The unique technique of reconstructing the middle hepatic vein, the right hepatic vein and the short hepatic veins using allografts and artificial grafts are discussed.

Patients who had right hepatic and middle hepatic vein reconstructions had good graft functions and less hepatic congestion. This technique will be useful for preserving liver function in right liver lobe donors in Sri Lanka where more than 31% of the general population has fatty liver disease.

Introduction:

In partial liver transplantation, the middle hepatic vein (MHV) is included in either the right or left hemiliver. Especially in adult-to-adult live donor liver transplantation (LDLT), right liver graft with the MHV sometimes induces postoperative liver failure in donors due to the insufficient functional remnant liver volume . [1] When the MHV is included in the left liver (donor) the area drained by tributaries of the MHV in the right paramedian sector is impaired, as the MHV is known to be the major drainage vein for this sector. Whether MHV tributaries should be reconstructed in the hemiliver without the MHV is another crucial problem, since a congested area in the right liver graft is reported to result in poor liver function , followed by atrophy, unless venous reconstruction is performed. [2] As venous drainage of the liver graft is just as important as hepatic inflow for the integrity of graft function, drainage should be reconstructed where an area of more than 10% of congestion is anticipated. [3]

Sacrificing the donor's middle hepatic vein can cause congestion of the liver parenchyma drained by it, which can cause inadequate liver function in some donors.

In Sri Lanka where the incidence of non-alcoholic fatty liver disease (NAFLD) is as high as 31 %, it might be more advisable to preserve the MHV for the donor. [4] It has been our observation in the limited LDLT performed in Sri Lanka, sacrificing the MHV to the recipient, has resulted in prolonged derangement of liver functions in the donor. The possible reason could be fat laden large hepatocytes leading to parenchymal congestion. Though it is not meant to discourage fatty liver donations, the geographical supply of organs where many donors have various degrees of hepatic steotosis , its imperative to consider donor safety.

This brief report describes the technique of reconstruction of the drainage of the right lobe live donor liver graft. Hepatic venous congestion from deprivation of middle MHV outflow in the right lobe (RL) graft can be prevented by interposition of a vein graft between the major tributaries of MHV (segment V (V 5) and segment Viii (V 8) and recipient inferior vena cava (Figure 1 a).[5] (In addition multiple short hepatic veins including inferior right hepatic vein (IRHV), middle right hepatic vein (MRHV) and superficial RHV will require reconstruction (Figure 1 b). [6]

The technique of this procedure was perfected at Asan

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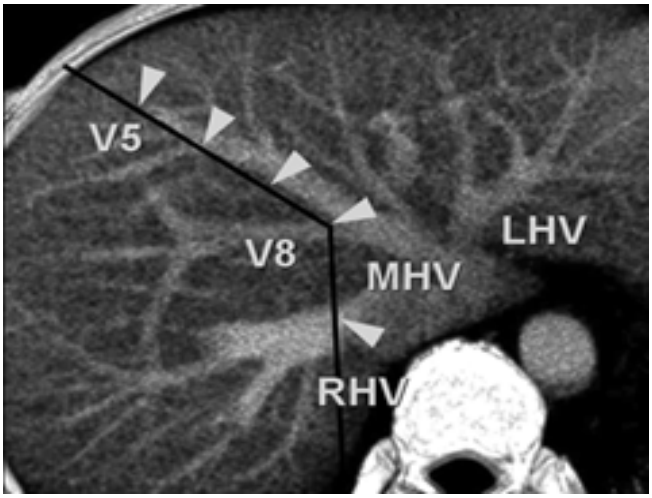

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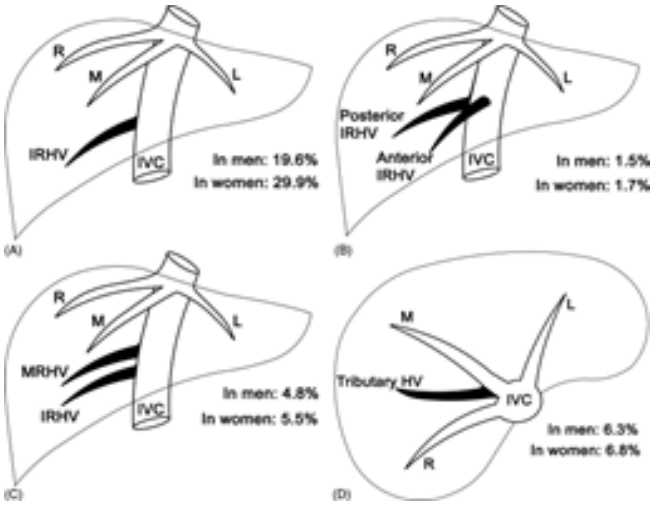

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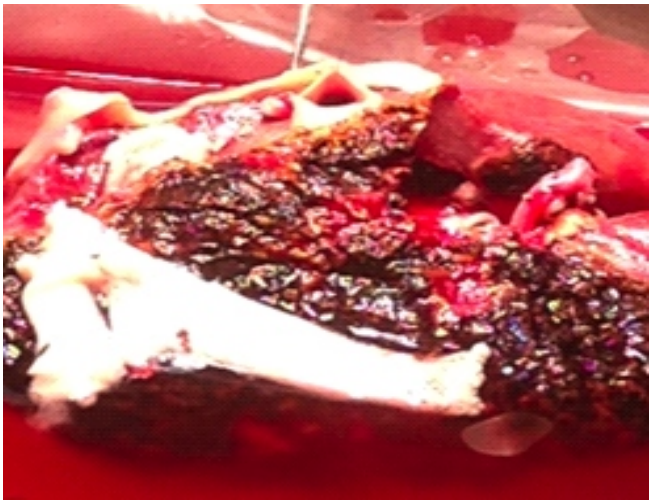

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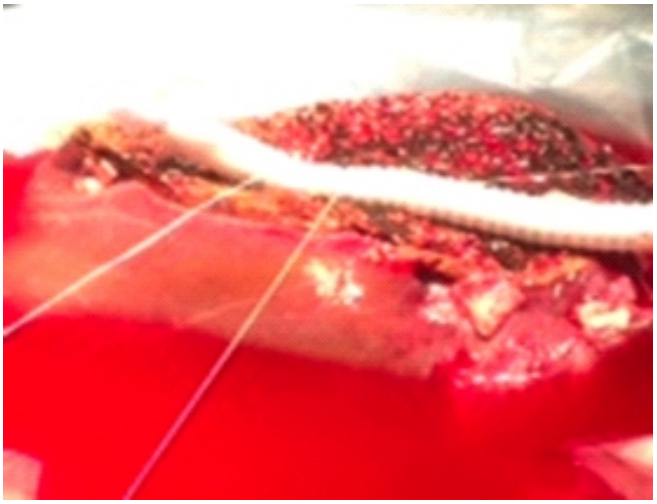

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Figure 1. Right lobe venous reconstructions.

LHV = left hepatic vein, MHV = middle hepatic vein, RHV = right hepatic vein. Arrowheads and solid lines indicate line of parenchymal transection used for right hepatectomy in donor for transplantation. V5 = middle hepatic vein tributary in segment V, V8 = middle hepatic vein tributary in segment VIII. MRHV=Middle right hepatic vein ,IRHV= Inferior right hepatic vein ,IVG= Iliac vein graft , PTFE= PTFE graft

medical centre ,Seoul , South Korea and might be useful for the Sri Lankan live donor transplantation program.

Technique:

After right lobe graft is procured (figure 1 a) and preservation solution Histidine-tryptophan-ketoglutarate-HTK) is perfused in an ice bath at the back table, the RHV, short hepatic veins and MHV are reconstructed. Long saphenous vein (LSV) is harvested from the left side of the recipient to be used as interpositional grafts and to reconstruct the RHV opening.

Reconstruction of RHV and short hepatic veins.

For a wide and long RHV anastomosis, the recipient's RHV opening of the IVC should be larger than the graft's RHV opening. A vertical slit, along the RHV opening of the IVC or a transverse slit with a patch plasty or reconstruction with a diamond shaped LSV patch could be used to enlarge the recipient's RHV opening. Reconstruction of the RHV opening of the graft with the recipient's LSV graft will aid the anastomosis and at the same time it will act as a reservoir when the graft regenerates [7].

The short heaptic veins are reconstructed if the diameter is more than 5mm. They can be directly anastomosed to the IVC if the cuff of vein was adequately procured at the harvest. If not IRHV and MRHV can be anastomosed to the side of the IVC with a quilt

venoplasty. [7]

Reconstruction of the middle hepatic vein.

The conduit for the de novo middle hepatic vein can be a cryopreserved iliac vein graft (IVG) (Figure 1.c), an iliac artery graft where a vein is not available or a ringed polytetrafluoroethylene graft (PTFE) (Figure 1 d). [8,9]

The iliac vein is positioned in such a way that a side branch of matching diameter is approximated to the V8. Anastomosis is done using 6/0 prolene sutures. If the diameters corresponds, the end of the iliac vein can be anastomosed to V5 or an end to side anastomosis is performed with 6/0 prolene suture. The reconstructed middle hepatic vein is later anastomosed to middle-left hepatic vein stump without excessive redundancy using 6/0 prolene suture. As most of the reconstruction is performed in the ice bath, the warm ischemia time could be reduced.

Ringed PTFE grafts can be used for middle hepatic vein reconstruction during living donor liver transplantation, as large vein allograft supply is often limited. Although PTFE grafts are freely available, their long-term patency is relatively poor. Usually a 10mm x 20 cm graft is used for reconstruction with one end occluded by a hem-o-loc. Use of LSV interposition grafts between V5, V8 and the PTFE graft has shown to increase patency rates comparable to those of iliac vein grafts.

In conclusion in right lobe graft transplants venous drainage needs to be reconstructed for optimal graft function. Large vein allografts or ringed PTFE grafts combined with small vessel patches showed high patency rates and can be used for MHV reconstruction.

References:

1. Yu PF, Wu J, Zheng SS; Management of the middle hepatic vein and its tributaries in right lobe living donor liver transplantation. Hepatobiliary Pancreatic Diseases International 2007;6:358-63.

2. Kim DG, Moon IS, Kim SJ, Lee YJ, Lee MD ; Effect of middle hepatic vein reconstruction in living donor liver transplantation using right lobe. Transplantation Proceedings 2006 ;38:2099-101.

3. Shin H, Lee SG, Ahn CS, Park KM , Ki-Hun K, Moon DB , Tae-Yong H. Cryopreserved iliac artery is indispensable interposition graft material for middle hepatic vein reconstruction of right liver grafts. Liver transplantation 2005;11: 644-649

4. Dassanayake AS, Kasturiratne A, Rajindrajith S, Kalubowila U, Chakrawarthi S, De Silva AP, Makaya M, Mizoue T, Kato N, Wickremasinghe AR, de Silva HJ. Prevalence and risk factors for non-alcoholic fatty liver disease among adults in an urban Sri Lankan population. Journal of gastroenertology and hepatology 2009;24:1284-8.

5. Kyoung WK, Tae K , So YK, Moon GL , Lee SG : Doppler Sonographic Abnormalities Suggestive of Venous Congestion in the Right Lobe Graft of Living Donor Liver Transplant Recipients. American Journal of Roentgenology : 2007 :188:239-245.

6. Zafer K,Levent O, NaimeT:Venous variants and anomalies on routine abdominal multi-detector row CT. European Journal of Radiology 2007;61:267-278.

7. Lee S.G : Techniques of reconstruction of hepatic veins in living-donor liver transplantation, especially for right hepatic vein and major short hepatic veins of right-lobe graft. Journal of Hepatobiliary Pancreatic Surgery 2006;13:131–138

8. Hwang S, Lee SG Yoon SY, Namgoong JM, Park CS, Park YH: Usability of ringed polytetrafluoroethylene grafts for middle hepatic vein reconstruction during living donor liver transplantation. Liver Transplantaion 2012;18:955-65.

9. Hwang S, Lee SG, Ahn CS, Park KM, Kim KH, Moon DB, Ha TY: Cryopreserved iliac artery is indispensable interposition graft material for middle hepatic vein reconstruction of right liver grafts. Liver Transplantation 2005 ;11:644-9.