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LETTER TO THE EDITORS

Adult right lobe live donor liver transplant with reconstruction of retro-portal accessory right hepatic artery

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Hepatic arterial anatomy is associated with the highest number of variations in the human body [1]. Certain variant hepatic arterial anatomy contraindicates live donor liver transplant (LDLT) owing to risks posed to the right lobe graft as well as donor remnant liver. An extrahepatic trifurcation of hepatic artery, accessory or replaced right hepatic artery (ARHA/RRHA) from superior mesenteric artery are relatively common vascular anomalies; however, ARHA arising from left hepatic artery (LHA) is a rare anatomical variant. This brief report describes the first reported case of retro-portal accessory right hepatic artery (RPARHA) originating from LHA, with successful surgical reconstruction in the LDLT setting.

A 45-year-old donor was assessed for right lobe liver donation. CT angiography along with arterial anatomy mapping of donor liver with MeVis® Medical Solutions (Bremen, Germany) suggested an abnormal artery, interpreted either as segment IV branch arising from LHA or trifurcation of hepatic artery. Furthermore, assessment of biliary anatomy by magnetic resonance cholangiography (MRCP) revealed a posterior sectoral bile duct draining segments VI/VII, passing across hilum to join the left hepatic duct. Trifurcation of hepatic artery or segment IV artery originating from LHA were not considered contraindications for right lobe donation at a multi-disciplinary meeting where surgical strategies were discussed in detail, therefore planned donor operation was carried out.

The intraoperative cholangiogram confirmed the MRCP finding of posterior sectoral duct joining the left hepatic duct. During hilar dissection, a single right hepatic artery was detected at the porta hepatis with extrahepatic division of anterior and posterior segmental branches just below hilar plate; this may have been interpreted as 'trifurcation' on preoperative imaging. Trial clamping of RHA, however, did not show complete arterial ischaemia of the posterior right lobe, hence significant arterial contribution to the right lobe by an abnormal vessel originating from LHA was suspected. Intraoperative Doppler at this stage showed an anomalous artery posterior and deep to the right portal vein, and with a significant contribution of blood flow to the right lobe; this finding was contrary to what was predicted by preoperative imaging. Doppler ultrasound suggested this artery to be in the calibre of at least 2–3 mm. Two factors were considered at this point; (i) the abnormal vessel in question is of appropriate size for reconstruction and (ii) the impact following division of this abnormal artery on the remnant liver including the segment IV is probably negligible as it exclusively supplied the posterior segment of right lobe and probably not adversely contributing towards donor morbidity. Based on this on-table analysis, we proceeded with the donor hepatectomy. This vessel was identified as RPARHA towards the completion of the parenchymal dissection. The RPARHA had a parallel course posterior to the right portal vein before entering right lobe parenchyma in a subglissonian/subcapsular plane. This was marked with a resorbable vascular clip (Absolok®; polydiaxanone/PDS, 10 mm clip; Johnson and Johnson Plz. New Brunswick, United States) at the cut surface and divided before completing the right lobe hepatectomy. Successful Bench reconstruction of graft arterial tree was performed with a iliac artery Y-graft obtained from a blood group compatible paediatric cadaveric donor (figure 1); the two limbs of the Y-graft were anastomosed to the RPARHA and RHA of graft with interrupted 7/0 Prolene sutures. Restoration of graft arterial blood flow was established with a single anastomosis between the arterial Y-graft and the recipient common hepatic artery. The recipient had an uneventful recovery following LDLT without evidence of hepatic artery thrombosis at medium term follow-up. The postoperative course of the donor was also uneventful.

Most of the aberrant anatomy in the hepatic arterial vasculature has no implications in the cadaveric liver transplant setting; however, variant anatomy described here may be considered a relative or absolute contraindication in LDLT or unfavourable for splitting livers for transplantation. The RPARHA was originally described in 1947 and known to present in up to 2.6% livers in a post-mortem study; its abnormal origin from LHA and

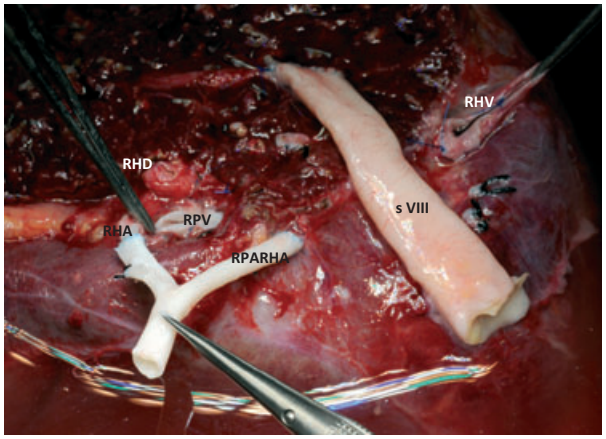

Figure 1 Bench reconstruction with bank iliac artery Y-graft. Venous drainage of the anterior segments (s VIII) has been reconstructed with a cadaveric common iliac artery graft. Note the position of the retro-portal accessory right hepatic artery (RPARHA) posterior to the portal triad (RHA, right hepatic artery; RPV, right portal vein; RHD, right hepatic duct) and the posterior glissonian subcapsular path in the right lobe graft; RHV, right hepatic vein.

retro-portal course to supply the posterior segments (VI/VII) are also likely to be associated with the biliary anomaly of a posterior sectoral bile duct draining in to the 1st order left hepatic duct [2,3]. Both these anomalies were present in this case. Rela *et al.* in early days of split liver transplantation identified this anatomical variant during ex-vivo splitting of the liver grafts; this was confirmed by bench angiography and methylene blue injection in two such cases among 37 (5.4%) consecutive split procedures. The authors discarded both right lobe split grafts and advised that such liver grafts should be used as whole grafts [4]. Meanwhile, RPARHA is not reported in the setting of LDLT which may be due to the rarity of this variant, careful donor selection avoiding complex vascular reconstruction, or even misinterpretation as segment IV artery instead of an ARHA from LHA despite evaluation by imaging as in our case. Invasive angiography was not performed in the preoperative evaluation of this case. Although invasive angiography is probably the 'gold standard' for detailed examination of hepatic vascular anatomythis procedure, it is not without its own risks hence the transplant programs nowadays rely on more sophisticated and noninvasive imaging including CT and magnetic resonance angiography techniques for the purpose [5,6]. If the interpretation was unequivocal this donor would have probably deemed unsuitable; however, the experience from this case shows that reconstruction of RPARHA is feasible if the facilities for such reconstruction, including extra vessels for reconstruction and the experience in complex vascular reconstructions are available. Stored cadaveric blood vessels provide wider choice of grafts for reconstruction. These principles may also be applied to cadaveric split liver transplant, in the modern era of segmental liver transplantation and help towards increasing the utility of both liver grafts. Option of operative reconstruction will be determined by these factors and if RPARHA is very small in calibre, the risks are more for the recipient of right lobe graft therefore even a 'no go hepatectomy' or 'hepar divisum' should be considered in view of graft and recipient safety.

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Conflicts of interest

The authors of this manuscript have no conflicts of interest to disclose with regard to this work.

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