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Is the absence of Right Hepatic Vein opening into Inferior Vena Cava a contraindication for right lobe liver donation in Living Donor Liver Transplantation? Common hepatic venous trunk—A rare hepatic vein anomaly: A case report and review

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ABSTRACT

INTRODUCTION: In majority of the living liver donors, the left and the middle hepatic veins form a common trunk and the right hepatic vein drains by a separate trunk into the IVC forming two ostial openings.
Presentation of Case: This report presents a rare challenge to the operating surgeon in which the three major hepatic veins form a common trunk and drain into the IVC through a single ostial opening. It was detected preoperatively by the routine donor imaging studies.
DISCUSSION: To our knowledge, this type of rare venous anatomy in the setting of living donor liver transplantation has not been described in the literature before. A few studies have described similar anatomy in the cadaveric liver specimen of some particular ethnicity.
CONCLUSION: This type of a rare anomaly poses challenge to the donor operation and requires a sound expertise on the knowledge of hepatic venous anatomy to perform the donor hepatectomy with the appropriate maneuvering.

1. Introduction

Liver transplantation has emerged as the standard existing therapy for end stage chronic liver diseases in the past few decades. With the paucity of cadavers available for donation and the long waiting list leading to rising mortality, the choice has been shifting to Living Donor Liver Transplantation (LDLT), especially in the Eastern hemisphere. A thorough knowledge of the variations in hepatic venous anatomy is pivotal for the segmental resection of the liver, as this can predict the risk of hepatic venous complications in the donor during LDLT [1]. There have been many studies that have reported the hepatic venous anatomy variations on the basis of diameter of the ostia, the branching/tributary distribution and the opening into the retrohepatic vena cava [2–5]. A rare variation of hepatic venous anatomy is the presence of a common ostium of the hepatic venous trunk on the Inferior vena cava (IVC), formed by the confluence of Right hepatic vein (RHV), middle hepatic vein (MHV) and the left hepatic vein (LHV). Here, we present a scenario wherein we detected this rare variation in one of our voluntary related living donors detected preoperatively by the routine imaging of an LDLT donor.

2. Case

A 23 year old female from Turkmenistan, potential liver donor for her brother with end stage liver disease was evaluated for liver donation. As per the standard institution protocol for assessment of the donor, LAI of the donor liver, ABO compatibility and triphasic CT scan of the liver was done. Assessment of the venous anatomy on triphasic CT revealed absence of a separate RHV opening in the IVC. The RHV was joining the MHV in the intrahepatic portion and later merging into the LHV, to form a common trunk (Fig. 1). This trunk was then found to open into the IVC at the site of LHV ostium (Figs. 1–3). There were two significant inferior hepatic veins on the CT scan. The portal, arterial and biliary anatomy was conventional.

The important aspects of the technique of Right hepatectomy performed in this patient can be outlined as follows:

Midline incision with Right subcostal extension was made. The cystic duct was freed, including the Hartmanns pouch of the gall bladder. A infant feeding tube size 5 french was inserted into the Hartmanns pouch and tied in place. This technique reduces the time

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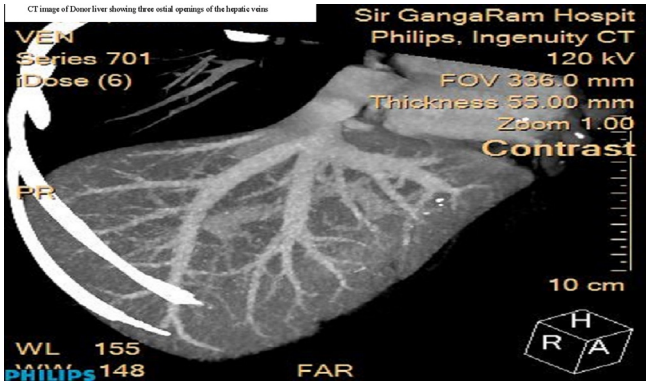

Fig. 1. CT image of Donor liver showing three ostial openings of the hepatic veins.

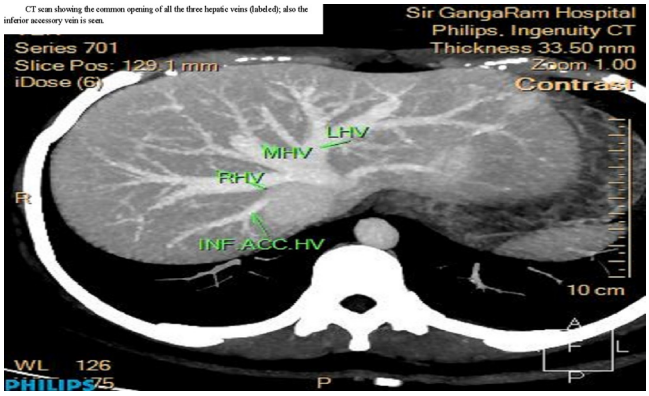

Fig. 2. CT scan showing the common opening of all the three hepatic veins (labelled); also the inferior accessory vein is seen.

Fig. 3. Reformatted (volume rendered) image showing the common opening of the three hepatic veins.

consumed in cannulating the cystic duct. The rest of the Gallbladder was removed after ligating the cystic artery.

Cholangiogram was performed and in this patient a single RHD was noted. The Right hepatic artery was freed after dissection of the cystic plate. The Right portal vein was encircled after ligation of a solitary caudate branch, to give enough length during transection of the vein.

The Right lobe of liver was mobilized by dividing the Right triangular ligament. The caudate process was divided at the bifurcation of the main portal vein. The IVC was exposed until the left side of the vein is seen. Since the RHV ostia was absent in this patient, the IVC was exposed and there was no RHV to encircle.

Liver transection was done with the help of CUSA (Cavitron Ultrasonic Surgical Aspirator, Valley Lab, Boulder, CO, USA). The distal portion of the MHV was identified initially and at the point where the Segment 4a Hepatic vein was ligated, the main MHV trunk was identified. This was used to as a guide for liver transection. In this patient, a subtotal MHV was to be taken leaving behind the proximal MHV with the drainage of the Segment 4b and RHV vein into it. Since, the patient had the RHV joining the MHV intrahepatically, the MHV was divided using the vascular stapler. The liver transection was continued using the CUSA, until the RHV was found. Using the right angled dissector, the RHV was looped with a sling. The Liver parenchyma posterior to the RHV was divided with CUSA by the hanging maneuver. The liver transection was completed with minimal blood loss.

The donor stayed in ICU for 2 days and was then transferred to the ward. She was discharged after 8 days stay in the hospital.

3. Discussion

There are several anatomic variations of hepatic venous system that the surgeon must be aware of. This becomes more important in the setting of LDLT or cadaveric split livers grafts.

The RHV is the largest of all the hepatic veins. In 85% of the cases, the MHV and LHV form a common trunk draining separately into the IVC [6]. The most common variation in hepatic venous anatomy is the presence of Right inferior accessory veins (RIHV) [7]. This can occur in up to 53% of the patients. Cecchis et al. have reported variations in the pattern of RHV branching intrahepatically in 110 macroscopically healthy cadavers [8]. Maasselot and Leborgne studied the hepatic venous variations in 80 casts [9]. Also, Nakamura and Tsuzuki studied the same in 83 cadaveric livers [6]. These studies have reported wide variability in the pattern of branching of hepatic veins, knowledge of which is crucial for the transplant surgeon in planning the planes of dissection. One of the earliest reports by Nakamura et al. in a series of 83 cadavers reported a common ostial opening of LHV and MHV with a separate opening of RHV in 84.3% of the population [6]. Joshi et al. studied the retrohepatic segment of IVC and the hepatic vein openings in it in 69 cadaveric livers [10]. They found majority of the livers having two openings on the retrohepatic cava (n = 45; 65%), followed by three separate openings for the major veins (n = 23; 33%) and four openings (n = 1; 2%). In another study, Chang et al., in their series of 60 cadavers in Chinese population reported a common opening of LHV and MHV and a separate opening of RHV in the majority (n = 52; 83.3%) [11]. Camargo et al. studied the same in a cohort of 30 cadavers in Brazil [12]. They however reported a common ostial opening of RHV, MHV and LHV in 13.3% of their population (n = 4). Sagoo et al., in a series of 100 cadaveric livers in Northwest Indian population found a common single ostial opening in 2%. (n = 2) [13]. In a study of 100 consecutive living donor candidates in Turkey, Kalayci et al. reported a common opening of the RHV, MHV and LHV in 20% of the patients [14].

The anatomy described in the patient in our present case report provided a unique challenge in deciding the candidacy of the donor for right lobe donation. Considering the lack of literature on this rare anatomical variation, planning the technique of liver resection was a challenging task. With careful discussions and planning, the procedure was successful. The right hepatic vein was approached after taking the partial MHV along with the right lobe graft and after the MHV was divided, the RHV was isolated with a rubber sling placed around RHV (Fig. 4). The parenchyma posterior to RHV was subsequently transected using CUSA by the hanging maneuver. The two inferior veins were also isolated and reconstructed. The donor surgery took 6 h and the blood loss was minimal.

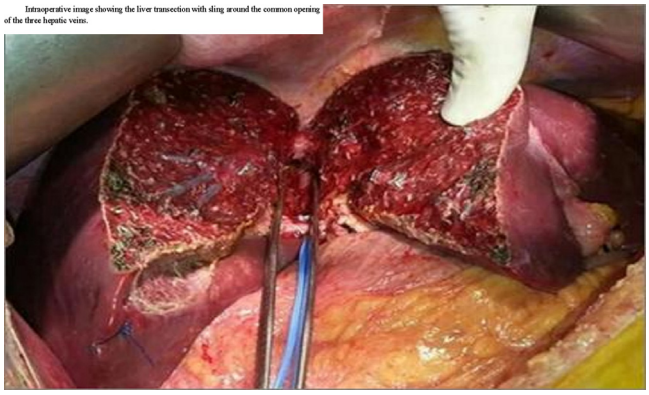

Fig. 4. Intraoperative image showing the liver transection with sling around the common opening of the three hepatic veins.

4. Conclusion

In liver transplantation, the arterial, portal and venous reconstruction has to be perfect to get good graft functions. In very rare variations of venous drainage as described above, great experience is required to make decisions to get good results without putting the donor at risk. This case is an example of good team work, surgical expertise and advancements in radiological diagnosis of rare venous anatomy.

Conflicts of interest

None.

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Ethical approval

None.

Author contribution

1 Samrat Ray: Prepared the first draft of the manuscript and collected all relevant data.
2 Anila T: Second assistant in the surgery and collected the photographs.
3 Sandeep Jha: First assistant in the surgery.
4 Kishan S Rawat: Radiologist interpreting the CT scan and providing volume rendered images.
5 Saumitra Rawat: Helped in editing the manuscript.
6 Suresh Singhvi: Primary operating surgeon and the chief supervisor of the manuscript.

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