ELSEVIER

Intrapancreatic Common Hepatic Artery Arising From the Superior Mesenteric Artery, a Challenging Anatomic Variation in a Multiorgan Harvesting

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ABSTRACT

Introduction. Understanding abdominal vascular anatomy is crucial for multiorgan recovery. In this case report, we have described a common hepatic artery that arises from the superior mesenteric artery but follows an intrapancreatic course.

Methods. The donor was ideal for multiorgan recovery and the recipient was a 29-year-old woman awaiting a second transplant owing to primary nonfunction of her first engrafted organ. The indication for transplantation was secondary biliary cirrhosis. A type I diabetic recipient on dialysis therapy was awaiting the kidney and pancreas.

Results. The urgent condition of our liver recipient combined with the anatomical finding prioritized liver procurement, therefore the pancreas was discarded.

Conclusions. The recognition of all anatomic variations will allow us to improve the use of the scarce resource of deceased donor organs.

LIVER vascular anatomy has always presented a surgical challenge. Anatomic knowledge is critical throughout the whole transplant process: namely, at the time of recipient evaluation, during the procurement, at back-table preparation and finally during the recipient operation.

In the 18th century, Heller described anatomical variations of the celiac trunk.[1] In the 20th century, Michels and Hiatt[2,3] offered the classic description of anatomic variations of the hepatic artery, including a common or right hepatic artery arising from the superior mesenteric artery (SMA). Many other works have contributed to the field by describing a retropancreatic pathway of that branch, and methods to share such an organ while avoiding jeopardizing the liver, pancreas, or intestine graft.[13] Recently, Jin et al[4] elucidated the topography of pancreaticoduodenal arteries, including the right hepatic artery by analyzing embryogenesis and its relation to other close anatomical structures. However, all of these reports have not described the variation we observed during a recent procurement. This finding led us to sacrifice the pancreas, and motivated this report. Our finding was a common hepatic artery (CHA) which arose from the SMA but followed an intrapancreatic course.

CASE REPORT

On July 26, 2010, a 20-year-old man became an ideal brain dead donor for organ recovery. We were offered the liver for an adult recipient with an urgent need for a retransplantation. The donor was 180 cm tall and weighed 75 kg. The cause of brain death was head trauma. Our recipient was a 29-year- old woman awaiting a second transplant owing to primary nonfunction of the first engrafted organ. The indication for her primary transplantation was secondary biliary cirrhosis.

Recovery Procedure

A standard procedure for organ recovery was based on the description by Starzl.[10,12] During the dissection, we identified a left accessory hepatic artery emerging from the left gastric artery. The main hepatic artery was observed in the hilum of the liver, medial to the bile duct and above the portal vein. During dissection of this artery, we discovered a low bifurcation of the right hepatic artery with an arterial branch to segment IV. The CHA origin could not be identified at the celiac trunk. Mobilization of the duodenum and

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the head of the pancreas showed the absence of a complete arterial replacement from the SMA, the most commonly described anatomic location. No gastroduodenal artery could be identified on the superior edge of the pancreas for an anatomic vascular reference.

Our finding was discussed with members of the liver and pancreas teams. Priority was given to liver recovery, considering the vascular needs for a retransplantation and the urgent condition of the recipient. Pancreatic recovery was dismissed.[12,13] Nevertheless, the pancreatic head, including the SMA branches, were included with the liver during further dissection on the back table. The organs were flushed with University of Wisconsin solution.[12,13]

Back Table Procedure

Dissection on the back table allowed us to identify a main hepatic artery emerging from the SMA, and following an intrapancreatic course, during which it gave rise to the inferior and superior pancreaticoduodenal arteries and an intrapancreatic gastroduodenal artery which was not visible in the hilum of the liver, (Figs 1, 2, and 3).

As identified during the dissection, the donor left gastric and splenic arteries were the only components of the celiac trunk (Fig 1).

Once the arterial anatomy of the liver was understood and dissected, back table reconstruction included an anastomosis between the main hepatic artery and the ostium of the splenic artery at the celiac trunk using 7/0 Prolene running suture (Fig 4). The portal vein and the bile duct showed no anatomical variations.

RESULTS

Liver engraftment was performed after removing the failed graft using the piggyback technique with, a venous iliac graft from the superior mesenteric vein, because the recipient had an hypoplastic portal vein with a very small portosplenic confluence. An arterial iliac graft was also constructed to the infrarenal aorta to obtain an adequate size match to the donor celiac trunk. The engraftment was performed uneventfully with a total ischemia time of 9:30 hours and a warm ischemia time of 35 minutes.

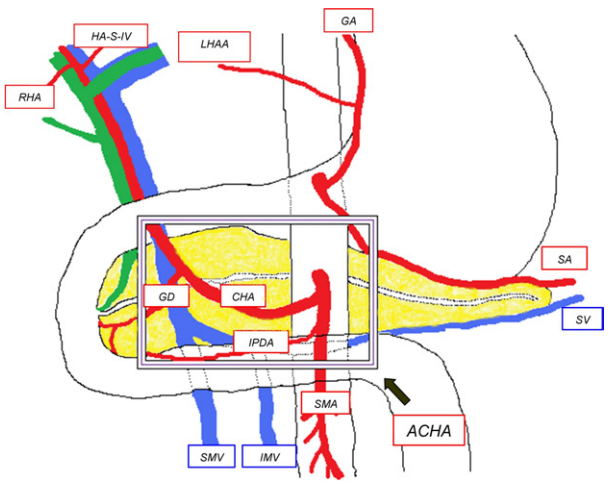

Fig 1. Anatomic diagram. LHAA, left hepatic artery accesory; HA-S-IV, hepatic artery segment IV; RHA, right hepatic artery; GA, gastric artery; ACHA, aberrant common hepatic artery; CHA, common hepatic artery; GD, gastroduodenal artery; SA, splenic artery; IPDA, inferior pancreatic duodenal artery; SMV, superior mesenteric vein; IMV, inferior mesenterio vein; SMA, superior mesenteric artery; IPDA, inferior pancreatic duodenal artery.

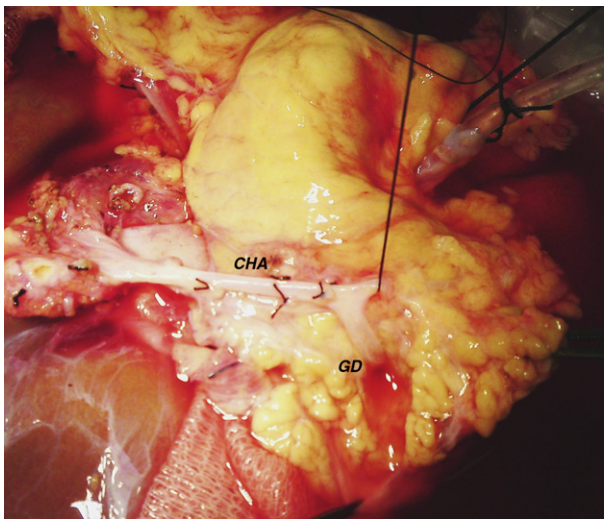

Fig 2. CHA through the pancreatic parenchyma. CHA, common hepatic artery; GD, gastroduodenal artery.

The patient evolved well after retransplantation having as a major complication severe chylous ascites, requiring total parenteral nutrition and a medium chain triglyceride oil diet. She was finally discharged on postoperative day 25.

DISCUSSION

The CHA emerging from the SMA occurs approximately 2.1%–5% of the hepatic artery anatomic variations.[5,7–9,11,14] Therefore, we performed a PubMed-based literature search using the following key words: Hepatic artery, variations; anatomy, accessory hepatic artery; intrapancreatic hepatic artery; liver transplantation; back table, arterial reconstructions; living donor, procurement and harvesting.

Our research revealed 2 reports that described an intrapancreatic course of the CHA emerging from the SMA. The first report was a milestone article written by Michels: The authors performed 200 dissections of human bodies showing the relations of the hepatic, cystic, and retroduodenal arteries with regard to the common bile duct. Only 9/200 bodies showed an aberrant CHA: 3 from the aorta; 5, the SMA and only 1 from the left gastric artery.[8] He described arterial courses that were retro- or intrapancreatic, but did not provide a further description in terms of branching and gastroduodenal origin.

The second article was a case report which analysed preoperative computed tomography and angiographic findings among candidates for pancreatic surgery. They described the presence of an aberrant CHA arising from the SMA with an intrapancreatic pathway. This finding was confirmed by intraoperative ultrasound and by surgical identification of the arterial route in a patient with a pancreatic head tumor.[6] No reports considered the possi-

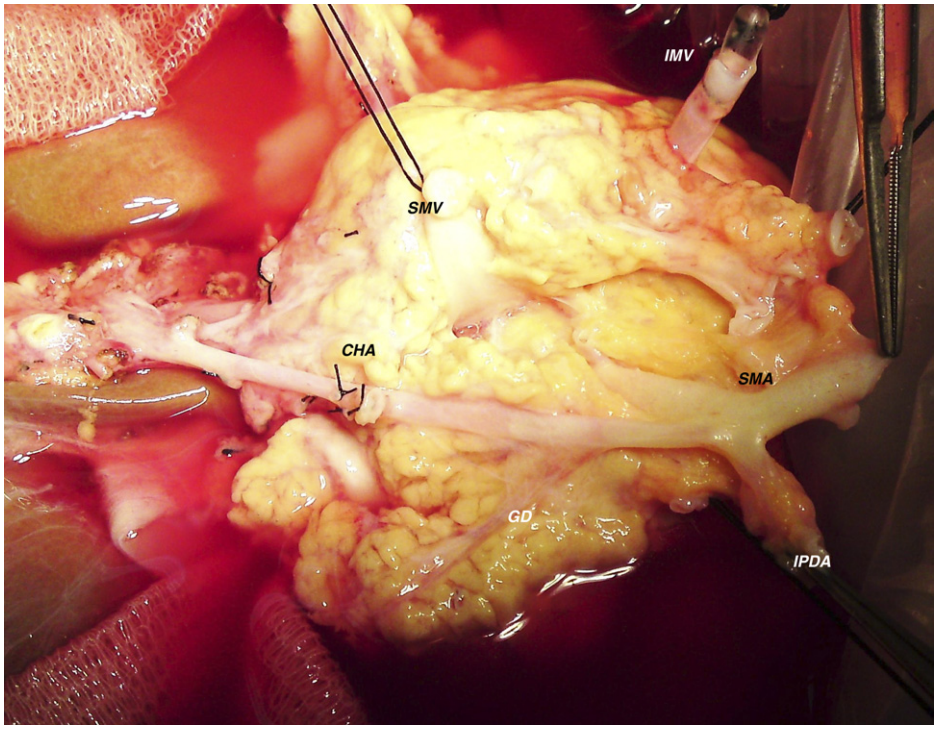

Fig 3. Pancreatic section. SMV sectioned and repaired, leaving intrapancreatic view of the CHA route. SMV, superior mesenteric vein; IMV, inferior mesenteric vein; CHA, common hepatic artery; SMA, superior mesenteric artery; IPDA, inferior pancreatic duodenal artery; GD, gastroduodenal artery.

bility of finding this anatomy at the time of procurement or during evaluation of a living donor for liver transplantation.

Although we were able to use the liver, we had to sacrifice the pancreas because of the uncertain arterial anatomy at the time of procurement. Understanding this uncommon variation led us to describe the case to warn other transplant or oncologic surgeons about this possibility. The transection of the CHA on the edge of the pancreas

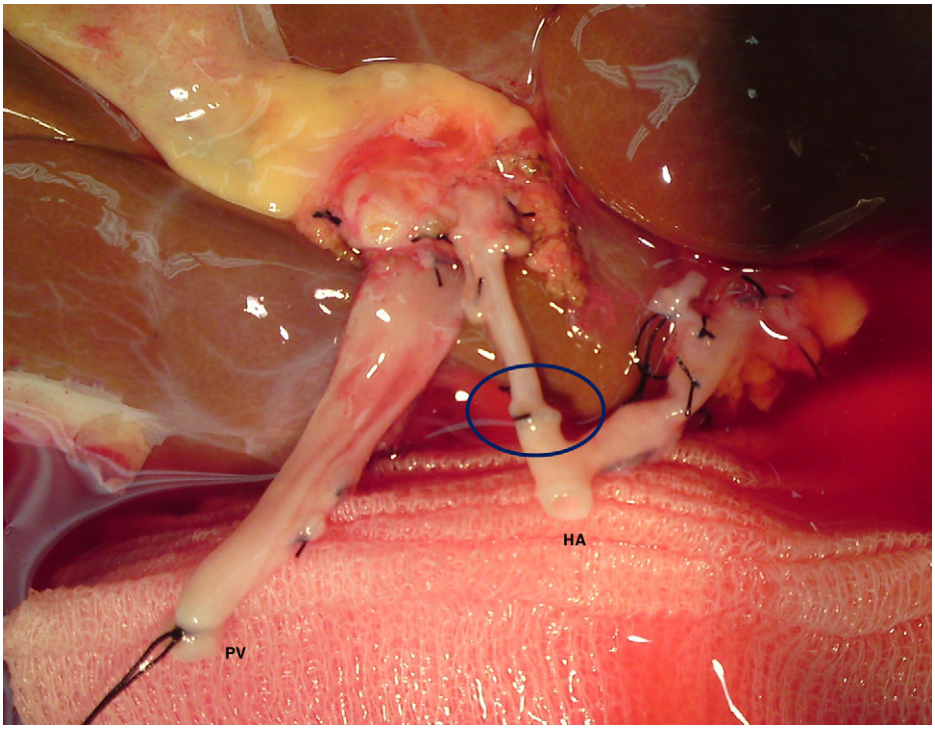

Fig 4. Reconstruction of the hepatic artery (HA) on backtable surgery. PV, portal vein.

and the subsequent reconstruction using the splenic artery on the back table might afford a chance use both organs. Due to this anatomy, the gastroduodenal artery may not be seen because of its intrapancreatic course. The recognition of this and other anatomic variations will allow us to continue improving the usage of the scarce source of cadaveric organs to benefit patients.

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