Scholars Academic Journal of Biosciences (SAJB)
Abbreviated Key Title: Sch. Acad. J. Biosci.
ISSN 2347-9515 (Print)
ISSN 2321-6883 (Online)
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A Unit of Scholars Academic and Scientific Society, India
www.saspublisher.com
Anatomy

Variant Branching Pattern of Common Hepatic Artery–A Cadaveric Case Report

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Case Report

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Article History
Received: 08.03.2018
Accepted: 18.03.2018
Published:30.03.2018

DOI:
10.21276/sajb.2018.6.3.4

Abstract: Variations in the hepatic vascular anatomy are reported frequently. Usually, the celiac trunk gives off the common hepatic artery, which divides into proper hepatic and gastroduodenal arteries. The proper hepatic artery branches into the right and left hepatic arteries to supply the respective hepatic lobes. The present article reports an early bifurcation of right and left hepatic arteries before entering the porta hepatis along with a variant origin of right gastric artery from left hepatic artery. The knowledge of the variation is essential for the interventional radiologists and surgeons. The ignorance of these variations can lead to intraoperative and postoperative complications including hepatic ischemia.
Keywords: Celiac Trunk, Common Hepatic Artery, Right Gastric Artery.

INTRODUCTION

The abdominal aorta gives rise to three ventral branches, namely the coeliac trunk, superior mesenteric and inferior mesenteric arteries. These arteries provide vascularization to the gastrointestinal system and associated glands. Common hepatic artery (cHA) arising as the second largest branch of coeliac trunk usually divides into gastroduodenal and proper hepatic arteries (pHA). The most commonly described hepatic arterial supply consists of a single pHA that after giving the right gastric artery ascends through the free margin of the lesser omentum to the porta hepatis dividing into the right (rHA) and left hepatic (lHA) arteries. The rHA and lHA enter the corresponding lobe of the liver through the porta.

Variations in the branching pattern of the cHA are frequent [1]. Michels NA had classified the hepatic arterial variations that are widely followed. He had studied the variations in the hepatic arterial supply after dissection and observation in 200 specimens [2]. Variant arteries were found in 45% of cases and ten different patterns of hepatic blood supply and twenty-six collateral pathways were described. The replaced right hepatic artery is the most commonly encountered variation in the hepatic arterial structure [3]. Knowledge of the anatomy and frequency of variations in the extra-hepatic arterial pattern is essential for surgeons and radiologists in laparoscopic procedures like cholecystectomy, liver transplant surgeries, and treatment of penetrating injuries in perihepatic area[4–7]. In the present report, a case of unusual branching pattern of the cHA is reported.

CASE REPORT

During routine the cadaveric dissection for MBBS students, a variant branching of cHA was observed in a 70-year-old male (Figure 1). To expose the common hepatic artery, the anterior abdominal wall structures and greater omentum were dissected out as per Cunningham's manual [8]. Lesser omentum was cleared to visualize the branches of coeliac trunk. To

visualize the branching pattern, the cHA was traced carefully through the free border of the lesser omentum. The liver along with the gallbladder was resected out to find the branching pattern of the cHA. The length of cHA and its branches was measured using digital Vernier caliper (Table 1).

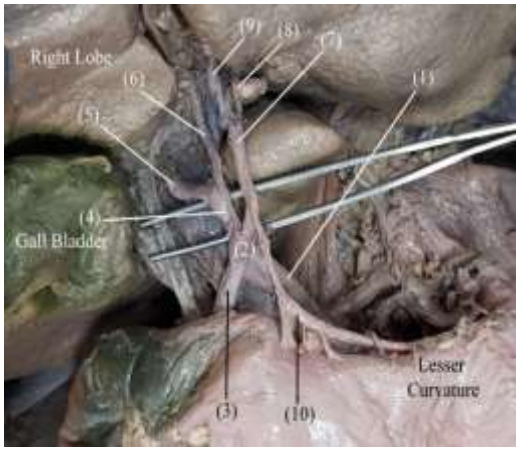

Fig-1: Branching pattern of common hepatic artery

1: common hepatic artery, 2: proper hepatic artery, 3: gastroduodenal artery, 4: right hepatic artery, 5: right branch of right hepatic artery, 6: left branch of right hepatic artery, 7: left hepatic artery, 8: right branch of left hepatic artery, 9: left branch of left hepatic artery, 10: right gastric artery.

Table-1: Morphometry of common hepatic artery and its branches

S No.	Name of artery	Length (mm)
1	Common hepatic artery	27.06
2	Proper hepatic artery	4.08
3	Right hepatic artery	13.67
4	Left hepatic artery	18.52
5	Right branch of right hepatic artery	17.91
6	Left branch of right hepatic artery	16.82
7	Right branch of left hepatic artery	14.88
8	Left branch of left hepatic artery	9.98

In the mid-epigastricregion, at the level of first lumbar intervertebral disc, the celiac trunk gave rise to cHA. The cHA, after giving the gastroduodenal artery, continued as the pHA for a very short distance (4.08mm) within the hepatoduodenal ligament. The gastroduodenal artery descended posterior to the first part of duodenum, dividing into supraduodenal, superior pancreatoduodenal and right gastroepiploic arteries. Superior pancreatoduodenal artery formed an arcade over the head of the pancreas with inferior pancreatoduodenal artery, a branch of superior mesenteric artery. The right gastroepiploic artery passed to the left side, along the greater curvature of stomach between the layers of greater momentum anastomosing with its left counterpart, a branch of splenic artery.

The pHA ascended between the duodenum and epiploic foramen and divided into rHA and lHa. The rHA was present anterior to the portal vein and posterior to the common hepatic duct. Before entering the porta hepatis, the rHA bifurcated into the left and right branches. The right branch of rHA entered the right lobe of the liver, posterior and to the left of common hepatic duct. The cystic artery and artery to cystic duct originated from the right branch of rHA. The left branch of rHA entered the porta hepatis, anterior and to the left of portal vein. Inferior to the quadrate lobe, lHA ascended to the left and a give rise to the right gastric artery, which turned towards the lesser curvature of stomach between the layers of lesser omentum, and anastomosed with the left gastric artery. The lHA bifurcated below the porta hepatis into right and left branches.

DISCUSSION

In the present report, a variant branching pattern of cHA in a human cadaver is described. Michels NA classified variants of branching pattern of cHA (Table 2). The variations of the cHA reported in the present case is different from the set of variations used to classify the variant branching patterns of cHA by Michels, making this a unique case[2].

Table-2: Michels (2) classification of hepatic arterial anomalies

Type	Description
I	Normal
II	Replaced LHA from LGA
III	Replaced RHA from SMA
IV	Replaced LHA + replaced RHA
V	Accessory LHA from LGA
VI	Accessory RHA from SMA
VII	Accessory LHA + Accessory RHA
VIII	Replaced LHA + Accessory RHA Or Accessory LHA + Replaced RHA
IX	CHA from SMA
X	CHA from LGA

LHA: left hepatic artery, LGA: left gastric artery, RHA: right hepatic artery, SMA: superior mesenteric artery, CHA: common hepatic artery

In the present case report, an unusual origin of the right gastric artery from lHA was also observed in contrast to its normal origin from the pHA. Anomalies in the branching pattern of the hepatic artery attributed to the inactivation of Hepatocyte Nuclear Factor 6 (Hnf6) at chromosome 15q21.3 in mouse [9]. The growing number of new laparoscopic techniques and hepatic transplants are the main reason for the renewed interest in extrahepatic arterial variations[10]. Although anomalies in the hepatic arterial system is not rare, the complex combinations, such as the ones observed in the present case, represent a significant deviation from the pattern of frequently observed variations. Hence, knowledge of each of the variations can be of paramount importance in individual clinical cases.

The extrahepatic arterial patterns of the donor liver and the recipient's liver must be determined with precision in a liver transplant procedure. The division , or damage to a hepatic artery owing to the ignorance of the variations may result in liver ischemia[11]. Any erroneous ligation could lead to the necrosis of a liver segment or lobe. As a result, all the variations must be defined and appropriately managed to ensure a complete vascular and biliary supply of the grafts in a liver transplantation[12]. CT based 3D visualization improves the anatomical assessment, and allows the determination of individual vascular territories and also acts as an intraoperative guide with enhanced precision for the assessment of the optimal surgical splitting lines for liver transplantation[13].

CONCLUSION

Early bifurcation of right and left hepatic artery and variant origin of right gastric artery from left hepatic artery are rare findings as per previous literature. The knowledge on the variant hepatic vascularization patterns is essential. Hence, radiologists, surgeons, and gastroenterologists should be aware of such variations.

REFERENCES

1. Tubbs RS, Shoja MM, Loukas M. Bergman's Comprehensive Encyclopedia of Human Anatomic Variation. 1st edition. Wiley-Blackwell; 2016.
2. Michels NA. Newer anatomy of the liver and its variant blood supply and collateral circulation. The American Journal of Surgery. 1966 Sep 1;112(3):337-47.
3. Standring S, editor. Gray's anatomy e-book: the anatomical basis of clinical practice. Elsevier Health Sciences; 2015 Aug 7.
4. Noussios G, Dimitriou I, Chatzis I, Katsourakis A. The main anatomic variations of the hepatic artery and their importance in surgical practice: review of the literature. Journal of clinical medicine research. 2017 Apr;9(4):248.
5. Chaib E, Ribeiro MF, Saad WA, Gama-Rodrigues J. The main hepatic anatomic variations for the purpose of split-liver transplantation. Transplant Proc 2005;37(2):1063–6.
6. Hiatt JR, Gabbay J, Busuttil RW. Surgical anatomy of the hepatic arteries in 1000 cases. Ann Surg 1994;220(1):50–2.
7. Jones RM, Hardy KJ. The hepatic artery: a reminder of surgical anatomy. J R Coll Surg Edinb 2001;46(3):168–70.
8. Romanes GJ. Cunningham's Manual of Practical Anatomy - Vol. 2. 2 edition. Impey LJ Simon Collins, Sally Hayes, Kevin Arulkumaran, Sabaratnam, editor. Oxford; 1986. 304 p.
9. Clotman F, Libbrecht L, Gresh L, Yaniv M, Roskams T, Rousseau GG, Lemaigre FP. Hepatic artery malformations associated with a primary defect in intrahepatic bile duct development. Journal of hepatology. 2003 Nov 1;39(5):686-92.
10. Abdullah SS, Mabrut JY, Garbit V, De La Roche E, Olagne E, Rode A, Morin A, Berthezene Y, Baulieux J, Ducerf C. Anatomical variations of the hepatic artery: study of 932 cases in liver transplantation. Surgical and Radiologic Anatomy. 2006 Oct 1;28(5):468-73.

11. Pulakunta T, Potu BK, Gorantla VR, Vollala VR, Thomas J. Surgical importance of variant hepatic blood vessels: a case report. J Vasc Bras 2008;7(1):84–6.
12. Streitparth F, Pech M, Figolska S, Denecke T, Grieser C, Pascher A, Jonas S, Langrehr J, Ricke J, Neuhaus P, Felix R. Living related liver transplantation: preoperative magnetic resonance imaging for assessment of hepatic vasculature of donor candidates. Acta Radiologica. 2007 Jan 1;48(1):20-6.
13. Harms J, Bartels M, Bourquain H, Peitgen HO, Schulz T, Kahn T, Hauss J, Fangmann J. Computerized CT-based 3D visualization technique in living related liver transplantation. InTransplantation proceedings 2005 Mar 1 (Vol. 37, No. 2, pp. 1059-1062). Elsevier.