CASE REPORT

RJME
Romanian Journal of Morphology & Embryology
http://www.rjme.ro/

Right accessory hepatic artery arising from the left gastric artery: a case report

ELENI PANAGOULI, D. VENIERATOS

Department of Anatomy,
Medical School, University of Athens, Greece

Abstract

During educational dissection of the abdomen in a female Caucasian cadaver, an unusual origin of an accessory right hepatic artery from the left gastric artery was observed. The left gastric artery was the first branch of the celiac trunk, but ended trifurcating into two abnormal large gastric branches and an accessory hepatic artery (d=1.27 cm) which entered the right hepatic lobe at the margin between the two lobes and close to the quadrate lobe. An aberrant hepatic artery branching from the left gastric supplies the left lobe of the liver in most of the cases. The irrigation of the right lobe described by us seems to be extremely rare. Nevertheless, this arterial anomaly can be enlightened by embryonic development. The knowledge of existence of aberrant hepatic arteries, either accessory or replacing, is important because they may influence surgical and interventional radiological procedures.

Keywords: lobe, liver, aberrant, variation.

Introduction

According to classical anatomic textbooks (Gray's Anatomy), the common hepatic artery constitutes one of the three branches of the celiac trunk. It gives rise to the right gastric, and gastroduodenal arteries continuing as proper hepatic artery. At the level of the *porta hepatis* this artery divides into left and right branches, the latter providing a cystic branch as well. They enter the parenchyma of the liver and supply the left and right hepatic lobe respectively.

Deviations of the above-described normal arterial pattern are not rare. In a sample of 426 operated individuals, Randjelovic DT *et al.* (2007) [1] report a total percentage of variations reaching 13% (55/426).

One of the most common and well-described variations of the hepatic artery is the so-called aberrant hepatic arteries which occur in approximately 42% of the individuals [2]. There are two types of aberrant hepatic arteries, the accessory and the replacing ones. The accessory hepatic artery is defined as a vessel that supplies a lobe in addition to its normal one, while the replaced hepatic artery is a vessel that provides the sole supply to that lobe, but originates from other than the orthodox position [3]. More commonly, an accessory or replaced right hepatic artery is reported to emerge from the superior mesenteric artery, while accessory or replaced left hepatic arteries seem to be branches of the left gastric artery [2–6]. Other, rarer locations of origin might be the gastroduodenal artery, the celiac artery or the abdominal aorta [2, 3, 7].

In the present study, we describe an accessory hepatic artery, which rose from the left gastric artery and entered the right hepatic lobe. As far as we know, there is only one report of this variation in the available literature.

Knowledge of anatomical variations of the arterial pattern of the common hepatic artery and its branches is important because they may influence surgical and interventional radiological procedures.

Materials, Methods and Results

The reported anatomical variations were discovered in a female Caucasian cadaver, deceased at the age of 92 years. The dissection was performed for educational purposes at the Anatomy Department of the Medical School of the University of Athens. The cadaver derived from body donation with informed consent, written and signed (with signature authentication) by the donator himself.

The anatomy of the branches of the abdominal aorta was carefully examined. The stomach and the pancreas were dissected and mobilized to expose the celiac trunk and its typical branches (common hepatic artery, splenic artery and left gastric artery). During the above procedure, we discovered that abnormal branches emerged from the left gastric artery.

The celiac trunk rose from the abdominal aorta at the level of the middle third of the body of the 12th thoracic vertebra (T12) and after 0.5 cm it gave rise to the left gastric artery, which we also dissected and followed its course. Surprisingly, the left gastric artery ended in a trifurcation (Figure 1). The two of its branches were going both to the lesser curvature of the stomach, so they were gastric branches, as expected, but unusually large (Figure 2). The third branch, which was as wide with a diameter of 0.27 cm, presented a different course,

as it ended to the liver and actually to its right lobe. This extra branch ran backwards, towards the liver in the upper portion of the lesser omentum and away from the portal vein and the bile duct (Figures 2 and 3). Finally, it entered the right hepatic lobe at the posterior surface of the liver, close to the quadrate lobe and at the margin between the right and left lobe (Figures 2 and 3). Its total length was measured to be 3 cm.

The celiac trunk had a total length of 1.8 cm finally bifurcating into common hepatic and splenic artery, which followed the usual described course and branching. The common hepatic artery (d=0.38 cm) after giving origin to the gastroduodenal artery continued as the proper hepatic artery (d=0.31 cm). We thus considered the extra branch arising from the left gastric artery as an accessory right hepatic artery.

All the distances were measured using calipers. The vertebral bodies were divided into upper, middle and lower thirds. In order to obtain the distances between the vessels, the center of the origin of each vessel was taken as the recordable point of origin.

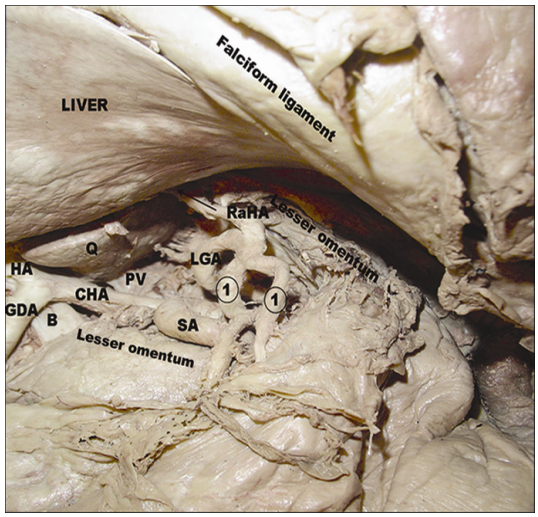
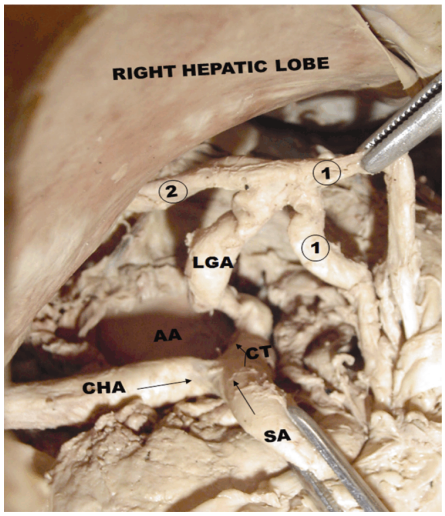


Figure 1 – *Accessory right hepatic artery originating from the left gastric artery. Q: Quadrate lobe, HA: Hepatic artery (proper), SA: Splenic artery, CHA: Common hepatic artery, LGA: Left gastric artery, CT: Celiac trunk, RaHA: Accessory right hepatic artery, PV: Portal vein, GDA: Gastroduodenal artery, B: Bile duct, 1: Large gastric branches.*



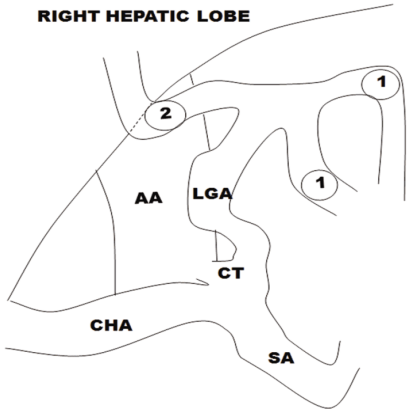


Figure 2 – *Accessory right hepatic artery and large gastric branches originating from the left gastric artery. AA: Abdominal aorta, SA: Splenic artery, CHA: Common hepatic artery, LGA: Left gastric artery, CT: Celiac trunk, 1: Large gastric branches, 2: Accessory right hepatic artery.*

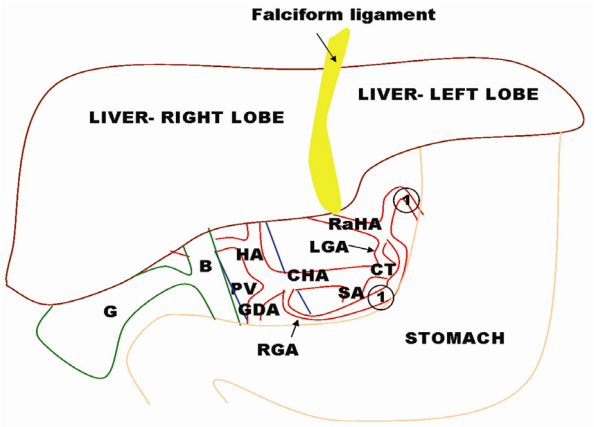


Figure 3 – *Schematic diagram showing an accessory right hepatic artery originating from the left gastric artery. AA: Abdominal aorta, SA: Splenic artery, CHA: Common hepatic artery, LGA: Left gastric artery, CT: Celiac trunk, 1: Large gastric branches, 2: Accessory right hepatic artery, B: Bile duct, G: Gallbladder, HA: Hepatic artery (proper), RGA: Right gastric artery, RaHA: Accessory right hepatic artery, PV: Portal vein, GDA: Gastroduodenal artery.*

Discussion

The existence of aberrant-accessory or replaced-hepatic arteries has already been well described [2–5, 7–10]. Specifically, accessory left hepatic arteries are reported to occur in the 23% of the cases [2], while the incidence of the right ones ranges between 10% and 19% [2].

Variable origins of those arteries have been recorded and they seem to differ according to the hepatic lobe they supply. Accordingly, possible locations of origin of accessory hepatic arteries, which supply the left lobe, might be the left gastric artery, the right hepatic artery, the common hepatic artery, the celiac trunk and the gastroduodenal artery [7, 11]. On the other hand, accessory hepatic arteries, which go to the right lobe,

might emerge from the superior mesenteric artery, the celiac trunk, the gastroduodenal artery, the common hepatic artery, the left hepatic artery, the right phrenic artery, the abdominal aorta and the left gastric artery [7, 9–11].

The origin of a right accessory hepatic artery from the left gastric artery seems to be extremely rare (1/600, [11]) and not well described. There is only one report of such a variation in the study of Covey AM *et al.* (2002) [9] where the left gastric artery gave rise to an accessory right hepatic artery. The artery seemed to follow the course of the common hepatic artery, while it gave rise to an accessory left hepatic artery as well, which did not exist in our case.

An accessory right hepatic artery more commonly arises from the superior mesenteric artery and run behind the portal vein and bile duct in the lesser omentum [3]. Due to that, it can be identified behind the portal vein by pulsation. The close position of the accessory right hepatic arteries to the portal vein increases the risk of injury during resections of the pancreatic head. In our case, the accessory right hepatic artery did not follow that course, as it passed fairly distant from the portal vein and the bile duct (Figure 3). Actually, its course resembled more the one of an accessory left hepatic artery, arising from the left gastric artery. Such an accessory right hepatic artery presents the additional risk of injury during mobilization of the stomach.

During embryonic life, a common hepatic artery gives its expected branches but also an additional right hepatic artery exists, originating from the superior mesenteric artery, and an additional left hepatic artery is given from the left gastric artery. Thus, the partial or complete persistence of the above-mentioned pattern could lead in anatomical variations such as the aberrant hepatic arteries [10]. In our case, we may speculate the following scenario: The additional fetal left hepatic artery was close enough to the middle of the liver in a way that its subsequent development finally drove the artery to its right lobe, as this lobe is known to become significantly bigger than the left one. Furthermore, the fairly important distance of this branch from the normally existent common hepatic artery became a crucial factor for its subsistence. Noticeably, the diameter of the proper hepatic artery is nearly the same (0.31 cm) with that of the additional one (0.27 cm), which turned out to be the main artery of the right lobe.

Complete dissection of common and aberrant hepatic arteries takes place during liver transplantation. In organ retrievals, the retrieving surgeon should be skilled enough and extremely careful in order to dissect, preserve and not to damage proper, common hepatic artery, aberrant hepatic arteries if present and the celiac trunk. Especially during the cold phase of dissection, the danger of damaging these vessels is higher. If there are arterial anomalies, the surgeon may have to reconstruct the arteries supplying the donor liver before the implantation.

Moreover, as transarterial hepatic artery chemo-embolization is a treatment choice for hepatocellular cancer, the origin and course of the hepatic artery and the presence or not of aberrant hepatic arteries should be known.

Conclusions

In a cadaveric specimen, we found an accessory right hepatic artery rising from the left gastric artery. This constitutes a very rare variation, reported only once in the literature. Much more often, a left accessory hepatic artery arising from the left gastric artery is described. Surgeons and interventional radiologists must be familiar with the existence of arterial anomalies, which may complicate their task.

References

[1] Randjelovic DT, Filipovic RB, Bilanovic LD, Stanisavljevic SN, *Perigastric vascular abnormalities and the impact on esophagogastrectomy*, Dis Esophagus, 2007, 20(5):390–398.

[2] Bergman RA, Afifi AK, Miyauchi R, *Illustrated encyclopedia of human anatomic variation*, http://www.anatomyatlases.org/AnatomicVariants/AnatomyHP.shtml, Accessed May 1st, 2006.

[3] Standring S, Borley NR, Collins P, Crossman AR, Gatzoulis MA, Healy JC, Johnson D, Mahadevan V, Newell RLM, Wigley CB, *Gray's Anatomy. The anatomical basis of clinical practice*, Elsevier, Edinburgh, 2008, 1072–1074, 1379–1380.

[4] Michels NA, *Blood supply and anatomy of the upper abdominal organs, with a descriptive atlas*, Lippincott, Philadelphia, 1955, 139–143.

[5] Chen H, Yano R, Emura S, Shoumura S, *Anatomic variation of the celiac trunk with special reference to hepatic artery patterns*, Ann Anat, 2009, 191(4):399–407.

[6] Iezzi R, Cotroneo AR, Giancristofaro D, Santoro M, Storto ML, *Multidetector-row CT angiographic imaging of the celiac trunk: anatomy and normal variants*, Surg Radiol Anat, 2008, 30(4):303–310.

[7] Yang Y, Jiang N, Lu MQ, Xu C, Cai CJ, Li H, Yi SH, Wang GS, Zhang J, Zhang JF, Chen GH, *Anatomical variation of the donor hepatic arteries: analysis of 843 cases*, Nan Fang Yi Ke Da Xue Xue Bao, 2007, 27(8):1164–1166.

[8] Adachi B, *Anatomie der Japaner I. Das Arterien system der Japaner*, Band II, Kaiserliche-Japanischen Universität zu Kyoto, Maruzen Publishing Co., Kyoto, 1928, 20–71; as cited by Chen H *et al.*, 2009.

[9] Covey AM, Brody LA, Maluccio MA, Getrajdman GI, Brown KT, *Variant hepatic arterial anatomy revisited: digital subtraction angiography performed in 600 patients*, Radiology, 2002, 224(2):542–547.

[10] Polguj M, Gabryniak T, Topol M, *The right accessory hepatic artery; a case report and review of the literature*, Surg Radiol Anat, 2010, 32(2):175–179.

[11] Daseler EH, Anson BJ, Hambley WC, Reimann AF, *The cystic artery and constituents of the hepatic pedicle; a study of 500 specimens*, Surg Gynecol Obstet, 1947, 85(1):47–63.

Corresponding author

Eleni Panagouli, Research and Teaching Associate, MD, Department of Anatomy, Medical School, University of Athens, 75 Mikras Asias Street, 11527 Athens, Greece; Phone +30 2107462394, Fax +30 2107462398, e-mail: eleni72000@yahoo.gr

Received: May 2nd, 2011 *Accepted: October 17th, 2011*