CASE REPORT

Accessory Hepatic Artery Resulting in Difficult Identification During Endovascular Intervention. A Case Report

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Abstract

Hepatic artery (HA) variations occur in 16.8 % to 45.0% of individuals. The awareness of these variations has implications in hepatobiliary, gastric, pancreatic procedures and liver transplantation. When there is an additional HA with the normal HA, it is called an accessory hepatic artery.

Case report: This report is on a case of accessory left hepatic artery (ALHA) in a 35-year-old male. The ALHA was arising from the left gastric artery (LGA). The LGA in this case also had an abnormal origin directly from the aorta. The patient had an aneurysm arising from the ALHA. The HA variation was suspected and detected during the angiography and a successful embolization was done. The patient made an uneventful recovery. This case illustrates the importance of the awareness of such variations, for successful procedures. In addition, awareness on the HA variations is also important in preventing complications.

Keywords: Accessory left hepatic artery; left gastric artery; Aneurysm; Embryological development

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Introduction

Variation in the origin and the course of the hepatic arteries (HA) occurs in 16.8 % to 45.0% of cases (1, 2). Occurrence of these anatomical variants can be described with the embryological origin of these arteries. The awareness of these variations has implications in hepatobiliary, gastric and pancreatic procedures (both surgical and interventional radiological).

In a normal individual, the right (RHA) and the left (LHA) hepatic arteries arise from the proper hepatic artery (PHA) which is a branch of the common hepatic artery (CHA) which in turn is a branch of the coeliac axis (CA). Variations in the origin and the course of the hepatic arteries can occur. When there is additional HA in addition to the normal HA in the hilum, it is called an accessory hepatic artery. If there is only an abnormally placed HA without the normally placed hilar HA, it is called a replaced hepatic artery. This report describes a case of accessory left hepatic artery (ALHA) arising from the left gastric artery (LGA). ALHA is seen in 3.2% of cases (3). A replaced LHA is seen in 2.0% - 10.0 % of the population (4).
The LGA in this case also had an abnormal origin directly from the aorta. On the background of this variation, the patient had an aneurysm arising from the ALHA.

Case

A previously healthy 35-year-old male with no significant past medical or surgical history, presented with a vague right upper abdominal pain for 3 months duration. Ultrasound scan (USS) of the abdomen showed a large aneurysm in the left lobe of the liver. Subsequent contrast-enhanced computerized tomography of the abdomen with Angiogram (CTA) demonstrated a large aneurysm within the left lobe of the liver (Figure *1*). The hepatic parenchyma in the left lobe was normal, but stretched and thinned.

An endovascular coiling of the aneurysm was planned. During the endovascular intervention, the angiography done through the coeliac axis (CA) demonstrated a normally arising common hepatic artery CHA, the PHA and the right, left HA (Figure 2). However, there were no aneurysms demonstrated. Therefore, an anatomical variation in the hepatic blood supply was suspected. Subsequently, an angiogram was done at the aortic level. This demonstrated an ALHA arising from the LGA. The LGA was directly arising from the aorta (Figure 3). In addition, the aneurysm was found to be arising from the branches of the ALHA. A Successful coil embolization of the aneurysm was done. The patient made an uneventful recovery.

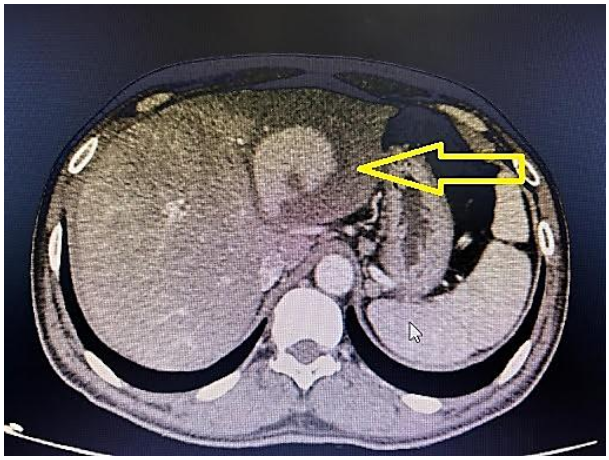

Figure 1: Computerized tomography showing the aneurysm within the left lobe of the liver (yellow arrow)

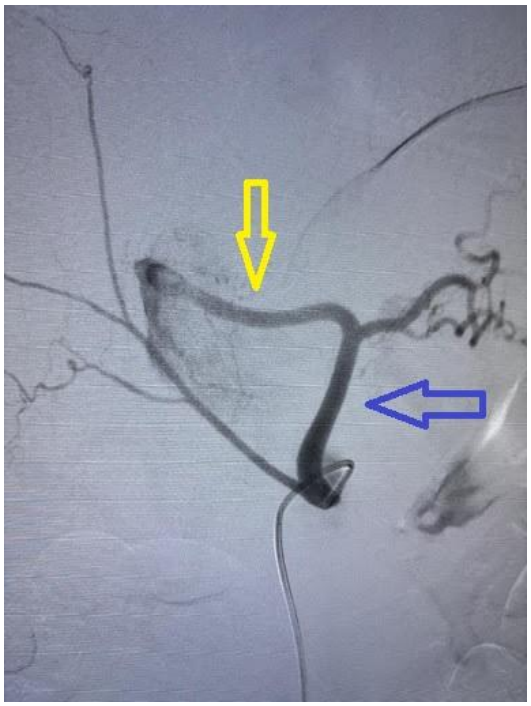

Figure 2: Angiogram showing the normally placed right (yellow arrow) and the left (blue arrow) hepatic arteries

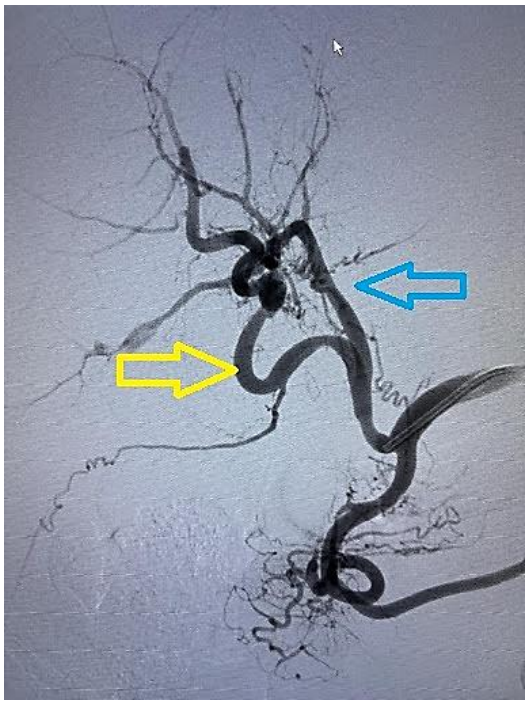

Figure 3: Angiogram showing the accessory left hepatic artery (ALHA) (yellow arrow) arising from the left gastric artery (LGA) (blue arrow)

Discussion

The standard hepatic arterial anatomy is seen only in 55.0% - 80.0 % of the population (5, 6). During embryological development, the CA and superior mesenteric artery (SMA) develop by a series of ventral branches (Omphalo Mesenteric Arteries -OMA or vitelline or ventral splanchnic arteries) that form the dorsal aorta (7) (Figure 4).

A ventral longitudinal vessel connects the OMA (ventral longitudinal anastomosis). The superior OMA develops into CA. The middle hepatic artery (MHA) (future CHA and PHA), LGA and splenic arteries, branch out from the longitudinal anastomosis. In addition, an ALHA arises from the LGA and an ARHA arises from the SMA. During further development, the ALHA and the ARHA disappear and the MHA develops into the CHA and PHA. PHA divides into the RHA and the LHA (8).

The variation in the index case has occurred due to the persistence of the embryological pattern the ALHA arising from LGA. In addition the LGA arising directly from the aorta, has occurred due to one of the following reasons i.e. either migration of the embryological LGA onto the aorta, or persistence of the connection between the LGA and the first omphalomesenteric artery (OMA) while the middle hepatic artery (MHA) and the splenic artery (SA) connect with the second OMA (9).

The HA variations can be classified according to the Michael classification system (10). According to this classification the arterial patterns are classified as follows: Type I represents the normal pattern; Type II involves a replaced left hepatic artery (LHA) arising from the left gastric artery (LGA); Type III involves a replaced right hepatic artery (RHA) arising from the superior mesenteric artery (SMA); Type IV includes replacement of both the RHA and LHA; Type

V is characterized by an accessory left hepatic artery (ALHA); Type VI involves an accessory right hepatic artery (RHA); Type VII includes accessory right and left hepatic arteries; Type VIII involves either a replaced RHA or LHA with the other hepatic artery being accessory; Type IX is defined by a hepatic trunk arising as a branch of the SMA (hepato-mesenteric trunk); and Type X involves the common hepatic artery (CHA) arising from the left gastric artery (10).

The index case had type “V” variation according to the above classification. ALHA is also reported to arise from CA and CHA (11). The LGA arises from the CA in normal individuals. However, an abnormal origin of the LGA, from other sites, is also reported. For example, a study reported the LGA arising directly from the aorta in 2.6% of the individuals (12). An additional variation of LHA arising from an abnormal LGA (i.e. LGA arising directly from the aorta as described in this case) is not specifically classified in Michael's classification. The prevalence of this variation is difficult to assess due to its complexity and rarity. For example, on a Google search using keywords “left hepatic artery" "left gastric artery" "aorta", no specific reports of such variation were found other than a report by the author describing another anatomical variation (13).

Therefore, the index case is a good example that awareness of the HA variations is important for successful interventions. If there was no awareness of the above variation, the LGA will be missed on the angiogram and the aneurysm will also be missed. Furthermore, the ALHA arising from the LGA usually enters the liver by running in the lesser omentum. This can be accidentally injured in liver surgeries. In addition, the ALHA can also be injured in liver retrieval for transplantation. An ALHA can also get accidentally damaged during other surgeries like gastrectomy and lymph node dissection. Therefore, the awareness of such variations is important for successful procedures and avoiding complications.

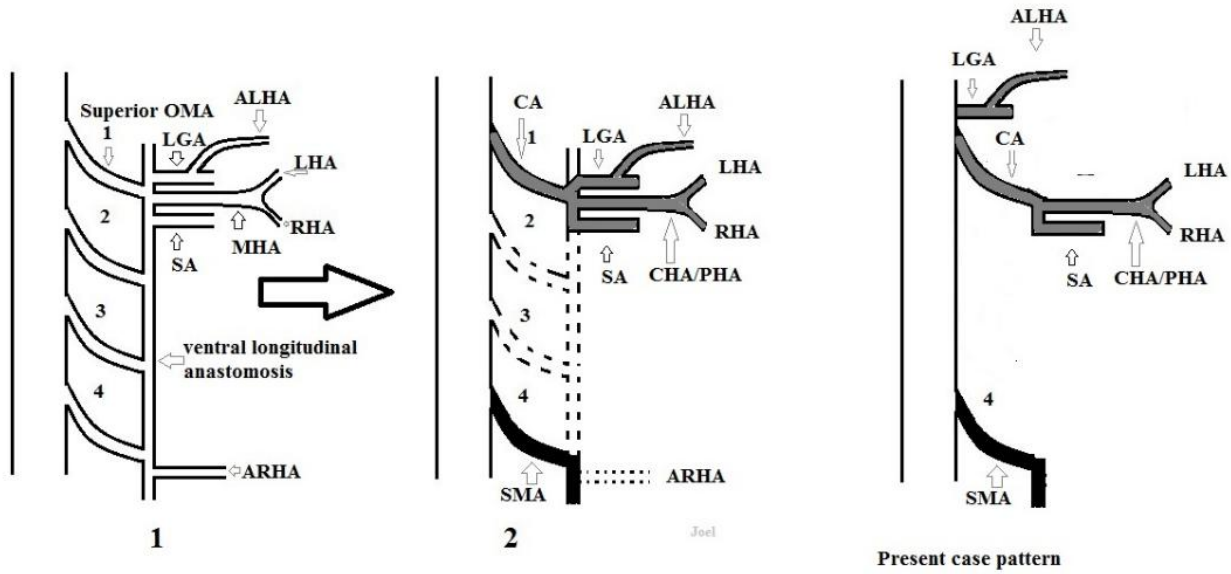

***Figure 4**: Embryological development of the accessory Left Hepatic Artery (ALHA) – 1,2,3,4 – OMA - Omphalo Mesenteric Arteries, LHA - Left Hepatic Artery, RHA-Right Hepatic Artery, ARHA - Accessory Right Hepatic Artery, CA - Coeliac Axis, SMA - Superior Mesenteric Artery, PHA - Proper Hepatic Artery, CHA - Common Hepatic Artery, SA - Splenic Artery*

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