



Prevalence of Accessory left hepatic artery in North Indian population

Rajani Singh

Professor, Department of Anatomy UPUMS Saifai Etawah, India

***Corresponding Author:**

Rajani Singh

Professor, Department of Anatomy UPUMS Saifai Etawah, India

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ABSTRACT

Background: There are multitudes of variations of the hepatic artery in relation to origin and course. These variations were observed as accessory or replaced left/right hepatic artery. Mostly accessory left hepatic artery buds from left gastric artery. Aim of the study is to describe the prevalence of accessory hepatic artery sprouting from left gastric artery in north Indian population and associated clinical significance.

Methods: Abdomen of twelve cadavers consisting of 8 males and 4 females fixed in 10% formaline were dissected in the department of Anatomy AIIMS Rishikesh for the prevalence of accessory/replaced left hepatic artery. The mean age of these cadavers was 75 years. The Celiac trunk and its branches namely, left gastric, common hepatic and splenic arteries were exposed and identified. The complete courses of left gastric and common hepatic artery were traced.

Results: Out of 12 specimens, the accessory left hepatic artery arising from left gastric artery was observed in 1 (8.3%) specimen. The aberrant left hepatic artery was accessory in nature as this branch sprouted from the middle of left gastric artery coursing cranially in front of portal vein entered the visceral surface of the left lobe of the liver through the fissure for ligamentum venosum. Common hepatic artery dividing into right and left hepatic artery was normally present.

Conclusion: In-depth knowledge of the presence of accessory left hepatic artery is of utmost use to gastroenterologists and vascular surgeons while carrying out partial hepatectomy, gastric resection, operations performed near the gastro hepatic ligament including esophagogastricectomy.

Keywords: Hepatic artery, variation, left gastric artery, hepatectomy

INTRODUCTION

All the organs in general but liver in particular is very important in human body. The Liver dysfunction creates multitude of complication including multi-organ failure or death. Common hepatic artery normally bifurcates into left hepatic artery and right hepatic artery which irrigate left and right lobe of liver [1]. This is standard configuration. Any deviation from this configuration leads to formation of aberrant hepatic artery. Aberrant hepatic artery is categorised into two types, 1) replaced and 2) accessory. An aberrant replacing hepatic artery is a hepatic artery having different origin but irrigating same area as a normal hepatic artery. In this category

the normal hepatic artery is absent. An aberrant accessory hepatic artery is an extra hepatic artery in addition to normal hepatic artery [2]. The most common abnormal hepatic arterial variation is accessory left hepatic artery budding from left gastric artery which is reported in 25% of cases [2].

The variations in these arteries are common and observed to occur in 30% of the population [3,4,5]. The most frequent variation is occurrence of aberrant left hepatic artery (ALHA) originating from the left gastric artery (LGA). Incidence of ALHAs sprouting from the LGA ranges between 6.0% and 22% of the

population [3,4,6]. These variations are usually observed during surgery for gastric cancer. ALHAs budding from the LGA can be located by palpating lesser sac during surgery. In addition to this, ALHA is whether replaced or accessory, can be recognized by palpation of the hepatoduodenal ligament during gastric surgery. But these arteries are difficult to locate during laparoscopic gastrectomy (which is very prevalent in present time) due to small view, especially in obese individuals with bulky lesser sac [7].

A study by Michaels on 200 cadavers revealed the prevalence of accessory left hepatic artery from left gastric artery in 8% cases [4]. This extra left hepatic artery from left gastric artery is rarely detected in individuals with gastric cancer during gastrectomy. This artery may be damaged during this procedure causing liver dysfunction postoperatively since the artery irrigates large part of left lobe of liver [8]. Although a lot of work has been done in the world on the prevalence of this variation but no or very scarce data pertaining to this variation is available in north Indian population. Therefore, the aim of the present study is to bring out the prevalence and clinical significance of accessory left hepatic artery in North Indian Population.

Material and methods:

12 Abdomens from twelve cadavers consisting of 8 males and 4 females fixed in 10% formalin were

dissected following the guidelines of Cunningham's manual in the department of Anatomy. The peritoneal cavity was opened and the anterior layer of peritoneum from the lesser omentum close to the lesser curvature of stomach was removed. The Celiac trunk and its branches; left gastric, common hepatic and splenic arteries were exposed and identified. The complete course of left gastric and common hepatic artery was traced in all the twelve abdomens for the prevalence of accessory/replaced left hepatic artery. The variations encountered were recorded and photographed. The mean age of these cadavers was 75 years. Literature search was carried out and our findings were compared with those of previous investigators.

Results:

Out of the 12 specimens studied, the ALHA arising from LGA was observed in 1 of 12 specimens constituting 8.3%. The remaining 11 (91.7%) specimens did not show the presence of aberrant left hepatic artery. It was observed that, the aberrant left hepatic artery was accessory in nature as this branch sprouted from the middle of left gastric artery (Fig. 1) coursing cranially in front of portal vein entered the visceral surface of the left lobe of the liver through the fissure for ligamentum venosum whereas the normal left hepatic artery branching from common hepatic artery was present as usual.

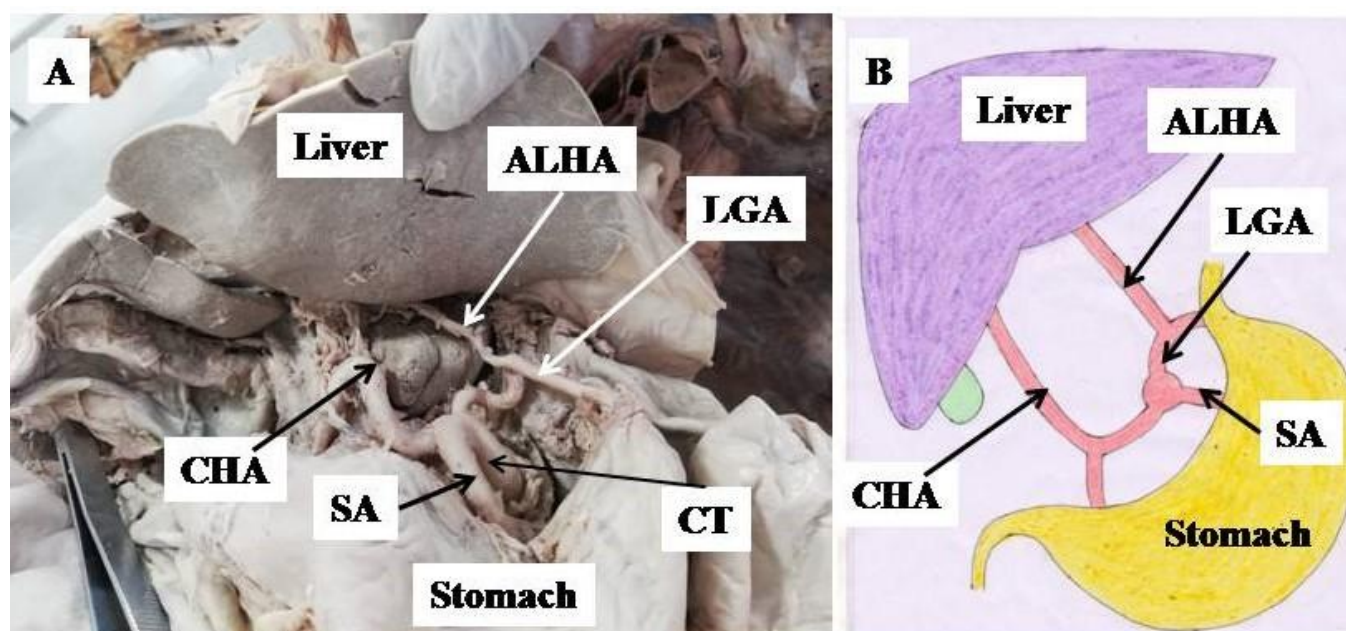


Figure-1 (A) showing accessory left hepatic artery arising from left gastric artery. (B) Schematic diagram showing accessory left hepatic artery arising from left gastric artery.

CHA- common hepatic artery, SA- splenic artery, LGA- left gastric artery, CT- celiac trunk, ALHA- accessory left hepatic artery

The common hepatic artery bifurcated into right and left branches entering into right and left lobes of liver as usual. The courses of left gastric artery and common hepatic artery were normal in all other specimens.

Discussion:

The prevalence of aberrant left hepatic artery budding from left gastric artery ranges between 6.1-21% as described in literature [9, 10, 11]. Aberrant left hepatic artery from left gastric artery was observed in 6.1% cases and 21% specimens constituting minimum and maximum frequency respectively [10, 11]. In current study the ALHA was detected in 8.3% specimens which lie within the reported range.

Developmental cause of occurrence of Aberrant left hepatic artery from left gastric artery:

Developing liver is irrigated by three hepatic arteries viz. left hepatic, right hepatic and common hepatic arteries. Normally The left and right hepatic arteries degenerates but if both or one of these two arteries fail to regress, these give rise to aberrant hepatic arteries [12].

The Accessory left hepatic artery budding from left gastric artery is likely to be damaged due to its close association with lesser omentum during mobilization of stomach in gastrectomy and fixing of hiatal hernia . Accessory left hepatic artery contribute to collateral circulation if hepatic arteries at the porta hepatis are blocked [8].

Identification of presence of accessory left hepatic artery is also essential to interventional radiologists carrying out hepatic arterial embolisation when liver tumours is present, may lead to inadequate embolisation resulting in failure of treatment [12].

The accessory hepatic artery supply extra blood to the left hepatic lobe and can be renounced without affecting irrigation to the left lobe of liver.

In case of regulating inflow of blood to left lobe of liver, left hepatic artery at porta hepatis is blocked. In such cases if an Accessory left hepatic artery is present it has to be blocked separately to achieve best result otherwise it may lead to failure and relief may be partial. Thus identification of an accessory and/or replaced left hepatic artery is very essential [9].

It is essential to identify replaced and/or an accessory hepatic artery to ligate the artery during catheter placement for adequate perfusion of the hepatic parenchyma [9, 10].

The absence of knowledge of aberrant arteries may cause liver necrosis and death when these are ligated unknowingly. Knowledge of accessory hepatic arteries and their relationship to the hepatic segments should be kept in mind before carrying out hepatic surgery as these are end arteries and damage may decrease the arterial supply of liver causing necrosis of left lobe of liver or its two and three hepatic segments [12].

An aberrant hepatic artery may be source of misinterpretation of the angiographic diagnosis of traumatic liver haematoma. Hence hepatic vascularisation should be examined before surgery by invasive and non-invasive techniques to prevent devastating complications [13].

Branches of hepatic arteries are end arteries, in case of liver transplants, variations of these arteries should be kept in mind and preserved for revascularisation to avoid ischemia and other complication [14].

Early gastric cancer now a days is commonly managed by Laparoscopic gastrectomy [7]. During this procedure LGA is to be ligated near its origin for complete removal of lymph nodes [15]. As the ligation of LGA is done at the origin in gastric cancer surgery so ALHA is automatically deleted being its branch causing transient hepatic dysfunction. But in individuals with long term hepatic disease sacrificing ALHA could end in fatal hepatic failure [16]. Life-threatening complications like left hepatic lobe necrosis has been observed after ligating ALHA [17].

Conclusion:

Aberrant left hepatic artery arising from left gastric artery is a common anomaly found in 8% of North Indian Population. The knowledge of presence of accessory is essential during hepatobiliary surgeries

as these may be injured inadvertently leading to hemorrhage. Information of variant left hepatic artery as observed in our case is of utmost use in partial hepatectomy, gastric resection, operations performed near the gastro hepatic ligament including esophagogastrectomy, gastric bypass, antireflux and in liver transplantation to vascular surgeons.

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