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An Unusual Anatomical Variation of Accessory Left Gastric Artery Arising from Left Hepatic Artery

Una Variación Anatómica Inusual de la Arteria Gástrica Izquierda Accesoria que se Origina de la Arteria Hepática Izquierda

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SUMMARY: The stomach receives a rich blood supply from five sets of arteries, all of which originate from the celiac trunk. During the dissection of a female cadaver that had been fixed with formalin, an atypical branching pattern was observed. An accessory left gastric artery was found to originate from the left hepatic artery and send small branches to the esophagus, cardia, and fundus of the stomach. However, there was no anastomosis between the lower accessory left gastric artery and the left gastric artery. This is a rare variant of the gastric artery that has not been previously described in detail. It is important to recognize this variation for safe and effective interventional diagnosis and treatment techniques if dealing with the liver or gastric arteries.

KEY WORDS: Variations; Accessory left gastric artery; Left gastric artery; Left hepatic artery; Celiac trunk.

INTRODUCTION

The celiac trunk (CT) is the first unpaired visceral branch that arises from the anterior surface of the abdominal aorta between the T12 and L1 vertebrae. It immediately branches off into three arteries: the left gastric (LGA), splenic (SA), and common hepatic arteries (CHA). As it travels, the CHA divides into two terminal branches - the proper hepatic artery (PHA) and the gastroduodenal artery (GA) - in a Y-shaped manner. At or near the porta hepatis, the PHA further divides into two branches: the right hepatic artery (RHA) and the left hepatic artery (LHA) (Campo, Cirocchi *et al*., 2020). An accessory left gastric artery (aLGA) is a rare variant of the gastric artery that receives its blood supply from either the left hepatic artery (LHA) or the left gastric artery (LGA) Campo (Vandamme & Bonte, 1988). The liver and stomach are closely related to embryogenesis, which means that there may be multiple communicating arteries in their blood supply routes (Chang, 2019; Kishimoto *et al*., 2022). Since the liver and stomach are connected by several ligaments, they may serve as the carrier of these variant communicating arteries. Understanding the anatomical variations and hemodynamic characteristics of the arteries between the liver and stomach is crucial for the safe and effective implementation of interventional diagnosis and treatment techniques in the liver or gastric arteries (Grigori?aˇ *et al*., 2019).

CASE REPORT

During a routine dissection study for medical students at the Department of Anatomy and Embryology, an abnormality was discovered in the form of an aLGA in the formalin-fixed cadaver of a 65-year-old woman. The dissection process involved removal of the anterior abdominal wall and gaining access to the peritoneal cavity while keeping the stomach and pancreas intact, to expose the CT and its branches as much as possible. The distances between the CT branches and directors were measured using a Vernier Caliper with an accuracy of 150*0.02 mm. Photographs were taken and recorded from different angles for documentation purposes.

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The celiac trunk (CT) originated on the left side of the anterior surface of the abdominal aorta (AA) at the level of L1. After moving about 0.91 cm to the right with a diameter of 0.78 cm, the CT was divided into three branches: the left gastric artery (LGA), splenic artery (SA), and common hepatic artery (CHA). The LGA ran horizontally to the left for about 2.90 cm to reach the upper end of the lesser curvature, then followed down the lesser curvature. The splenic artery sends out small branches to the stomach wall on the lesser curvature side. The second branch of the splenic artery is the thickest with a diameter of 0.78 cm. It follows a twisted path to the left along the superior margin of the pancreas and gives off many small branches to supply the neck, body, and tail of the pancreas. The common hepatic artery is a medium-sized branch of the celiac artery with a diameter of 0.61 cm. It runs to the right for about 2.41 cm. The artery first divided into two branches called PHA and GA. The GA didn't show any unique features in its course or distribution. The PHA traveled upwards and towards the right side of the body and after traveling a distance of 0.97 cm, it divided into two smaller branches to supply the left and right hepatic arteries near the porta hepatis. After traveling a distance of 0.49 cm from the LHA, an aLGA arose and followed an ascending course towards the abdominal esophagus and gastric cardia. The aLGA traveled 2.54 cm towards the left and then divided into upper and lower branches to supply the abdomen of the esophagus, cardia and fundus of the stomach. The upper branch had a diameter of 0.31 cm and was distributed to the abdominal esophagus while the lower branch, with a diameter of 0.27 cm, was distributed to the cardia of the stomach. No anastomosis was observed between the LGA and the lower aLGA (Fig. 1).

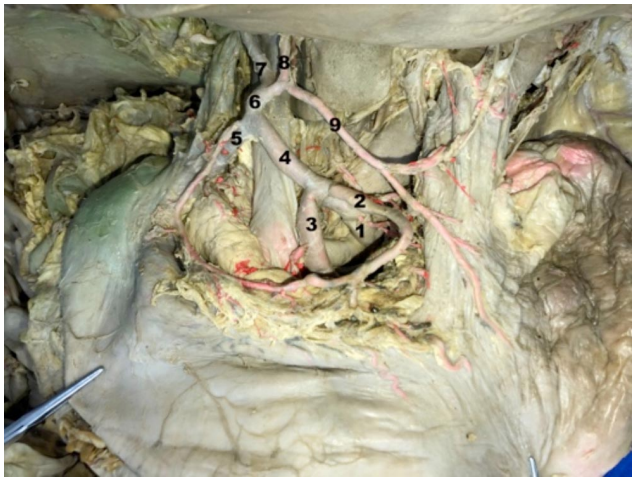

Fig. 1. Dissection that shows the branching of the celiac trunk and the origin of the accessory left gastric artery. 1. Celiac trunk; 2. Left gastric artery; 3. Splenic artery; 4. Common hepatic artery; 5. Gastroduodenal artery; 6. Proper hepatic artery; 7. Right hepatic artery; 8. Left hepatic artery; 9. Accessory left gastric artery

DISCUSSION

It's important to differentiate between the normal gastric artery and the variant gastric artery during an operation. Neglecting the variant gastric artery can cause damage to the gastric artery, leading to gastric ischemia. An anomalous branching pattern is often due to the original embryonic life, as explained by Chanasong *et al*. (2014). During embryonic development, the stomach and liver are closely related. Tomosugi *et al*. (2017) proposed the existence of an anatomical channel connecting the LGA and HA. They suggested that an aLGA and a replaced LHA are remnants of this channel. The accessory arteries provide collateral circulation to aid in digestion and protect the stomach. This circulation is important during transplant surgeries. aLGA is an important vessel of the stomach, susceptible to bleeding after pancreaticobiliary drainage (Tomosugi *et al*., 2017; Lee *et al*., 2018).

aLGA and LHA have similar embryonic development. Therefore, the accessory left hepatic artery can either originate from the LGA or the aLGA can originate from the left hepatic artery, and sometimes both can exist simultaneously. The former variation is more common and has been classified by many scholars according to various standards, whereas the latter variation is relatively rare. However, there have been few literature reports on the anatomy of the aLGA originating from the hepatic artery, and the incidence of different reports is alsoinconsistent. Michels discovered that the incidence of a rare variant gastric artery called aLGA was 3%, while Li Jiakai's research found it to be 8.2%. The aLGA arises from LHA and supplies blood to the abdomen of the esophagus, cardia, and fundus of the stomach. It is considered a rare variant with an incidence rate of 3% to 14% in angiographic studies, as documented by Campo (Nakamura *et al*., 1980). Autopsy series have shown that aLGA is more frequently found in Japanese individuals than in Europeans. According to Ishigami *et al*. (2006), aLGA that arises from LHA can be classified into two types: proximal and distal. Our study found that aLGA arose independently from the left hepatic artery, with its origin located between the origin and proximal two thirds of LHA, which is classified as a variation of the proximal type. In a study conducted by Grigorita *et al*. (2019), a different variation of aLGA was described. It originated from the origin of CT and traveled upwards towards the caidia and the vertical part of the lesser curvature of the stomach. Our research showed that there was no anastomosis between the LGA and the lower aLGA. Therefore, it is crucial to preserve the aLGA while ligating the left hepatic artery for various reasons to prevent ischemic necrosis of the esophagus and gastric cardia.

It is important to note that ALGA from LHA poses a potential risk when it comes to radioembolization complication (Lam *et al*., 2016). Furthermore, when performing transcatheter hepatic artery chemoembolization, it is crucial to distinguish the convoluted branch of ALGA and local gastric wall staining from tumor blood vessels and tumor staining of liver tumors. To ensure this, it is essential to be familiar with all gastric artery variants, including the rare ones mentioned in our report.

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RESUMEN: El estómago recibe un rico suministro de sangre de cinco conjuntos de arterias, todas las cuales se originan en el tronco celíaco. Durante la disección de un cadáver femenino que había sido fijado con formalina, se observó un patrón de ramificación atípico. Se encontró una arteria gástrica izquierda accesoria que se originaba en la arteria hepática izquierda y enviaba pequeñas ramas al esófago, el cardias y el fondo del estómago. Sin embargo, no hubo anastomosis entre la arteria gástrica izquierda accesoria inferior y la arteria gástrica izquierda. Se trata de una variante rara de la arteria gástrica que no se ha descrito previamente en detalles. Es importante reconocer esta variación para la aplicación de técnicas de diagnóstico y tratamiento intervencionistas seguras y efectivas a nivel del hígado o las arterias gástricas.

PALABRAS CLAVE: Variaciones; Arteria gástrica izquierda accesoria; Arteria gástrica izquierda; Arteria hepática izquierda; Tronco celíaco.

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