

Variation of the Left Gastric and Right Inferior Phrenic Arteries: Its Clinical Implication

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Abstract

The celiac trunk is a short, wide ventral branch of the abdominal aorta which is only about half an inch long and trifurcates into left gastric, common hepatic and splenic arteries. The left gastric artery is the smallest and most variable branch of celiac trunk. During the routine dissection of the upper abdominal region of 64 year old male cadaver, we observed that left gastric and right phrenic arteries had a common trunk which originated directly from the right anterolateral aspect of abdominal aorta while the common hepatic artery and splenic artery arose as a common trunk (hepato-splenic trunk) from left anterolateral aspect of abdominal aorta. This variation is clinically important while performing abdominal surgery especially supracolic organs and diagnostic angiography.

Keywords: Left Gastric Artery; Celiac Trunk; Abdominal Aorta; Common Hepatic Artery; Splenic Artery; Inferior Phrenic Artery.

Introduction

The celiac trunk (CT) is a short, wide ventral branch of the abdominal aorta which is only about half an inch long and trifurcates into left gastric, common hepatic and splenic arteries. The left gastric artery (LGA) is the smallest branch of CT. It passes upwards and to the left behind the omental bursa to reach the cardiac end of stomach [1]. Inferior Phrenic arteries are the first branch of the abdominal aorta which supply the diaphragm and suprarenal glands. They arise just above the CT and pass supero-laterally over the crus of the diaphragm near the superior margin of the suprarenal gland and give superior suprarenal artery [2]. Main classical branches of the CT are usually present in 75 to 90 % and the LGA is the branch in 90% of cases [3,4]. The LGA may arise directly from the abdominal aorta in 0.5 to 15% cases [5]. Usually, the vascular variations are asymptomatic and they are identified accidentally during surgery,

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diagnostic angiography or during cadaveric dissection. The aim of this paper is to describe the rare variation that, the left gastric and right inferior phrenic arteries had a common trunk which was originating directly from the right anterolateral aspect of the abdominal aorta. This variation is clinically important while performing abdominal surgery especially supra-colic organs and diagnostic angiography.

Material and Methods

During the routine dissection of the upper abdominal region of 64 year old male cadaver at our college, we observed that left gastric and right inferior phrenic arteries had a common trunk which originated directly from the right anterolateral aspect of the abdominal aorta while the common hepatic artery and splenic artery arose as a common trunk (hepato-splenic trunk) from left anterolateral aspect of the abdominal aorta.

Case Report

We observed a variation of the left gastric and right inferior phrenic arteries. Both had a common trunk which was originating directly from the right

anterolateral aspect of the abdominal aorta 10 mm above the CT (Figure 1). Right inferior phrenic artery passes to the right over the right crus of the diaphragm and it gave right superior suprarenal artery (Figure 2). CT was arising left antero-lateral aspect of the abdominal aorta. Common trunk of CT was about 24 mm long, and then it was dividing into common hepatic and splenic arteries (Figure 1, 2). The diameters of common trunk of LGA and inferior phrenic artery and CT were 3 mm and 1.2 mm respectively.

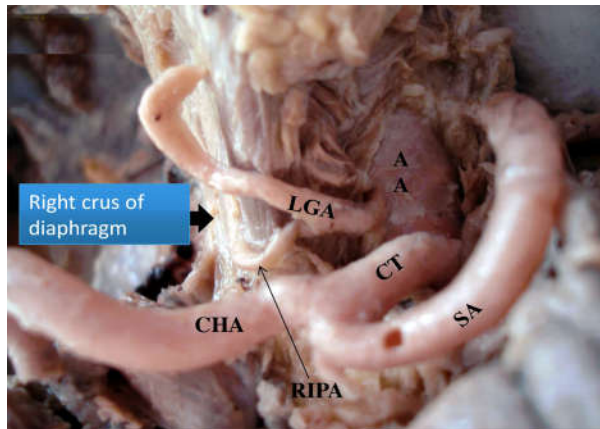


Fig. 1: showing common trunk for left gastric and right inferior phrenic arteries and bifurcation of celiac trunk. LGA: left gastric artery; AA: abdominal aorta; CT: celiac trunk; SA: splenic artery, RIPA: right inferior phrenic artery; CHA: common hepatic artery

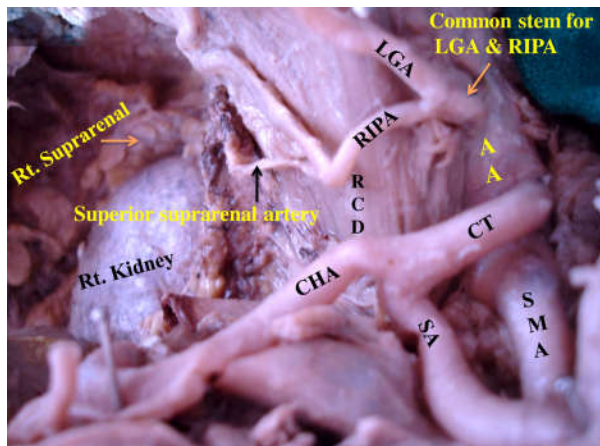


Fig. 2: showing right superior suprarenal artery arising from the right inferior phrenic artery. LGA: left gastric artery; RIPA: right inferior phrenic artery; RCD: right crus of the diaphragm; AA: abdominal aorta; CT: celiac trunk; SA: splenic artery; CHA: common hepatic artery; SMA: superior mesenteric artery.

Discussion

Tripus Halleri i.e. trifurcation is the normal appearance of CT [6]. Out of three branches of CT, the LGA is the most variable branch whose origin varies between the aorta and anywhere along CT up to a

trifurcation [7]. LGA may arise directly from abdominal aorta and may give one or both of the inferior phrenic arteries or a common trunk for both. Sometimes it gives an accessory left hepatic artery in 8-25 % or may replace the left hepatic artery in 11-12% [8]. Literature describes classification of the anatomical variations of CT. Loukas et al. (2006) reported hepatosplenic trunk with separate LGA which gave accessory left hepatic artery [4]. Variable incidence of origin of LGA was reported by researchers in cadaveric dissection studies as shown in Table 1.

Table 1: showing the incidence of left gastric artery from aorta

Author	Incidence (%)
Rossi [8]	5
Eaton [9]	6.7
Michels [10]	2.5
Kiss[11]	0.5
Lippert and Pabst [12]	3
Vandamme and Bonte [3]	6
Present study	1.6

Naidich et al. (1980) studied the origin of the LGA by evaluating 500 celiac angiograms. They reported that in 2.6% it arose as a direct branch of the aorta [13]. An accessory LGA may arise from the left hepatic artery in 14.2% cases as reported by Nakamura et al. (2011) by studying the hepatic angiograms [14]. We observed that, common trunk for left gastric and right inferior phrenic arteries which arose from right anterolateral aspect of the aorta. Also, right inferior phrenic artery gave right superior suprarenal artery (Figure 1, 2). This type of variation is very rare and it should be kept in mind while performing surgeries in upper abdominal region.

Upper gastro-intestinal hemorrhage is from LGA territory in 85% of cases. In upper gastro-intestinal bleeding when no active bleeding site identified after angiography then prophylactic embolisation of LGA may be performed and it is well tolerated because of rich collateral blood supply [15]. Also, LGA embolization is used for weight loss with safety and efficacy in man [16]. Lymph node metastasis along LGA in gastric cancer is higher. Knowledge of anatomical variations of LGA is essential while performing perivascular lymph node dissection [17].

Embryological Explanation

Ventral splanchnic arteries which arise from paired dorsal aorta supply the digestive tube. Initially vitelline arteries are number of paired vessels supplying yolk sac. These arteries gradually fuse. In adult they are represented by celiac trunk, superior mesenteric artery and inferior mesenteric artery.

During development of alimentary tract many patterns of the disappearance of ventral splanchnic arteries and of their anastomosis occur. When one of the main branches of CT shifts to aorta that time a gastrosplenic, hepatosplenic or hepatogastric trunk is formed. Sometimes, all the main branches arise separately and CT is absent or it may fuse with superior mesenteric artery to form celiacomesentric trunk [3, 9, 17].

Trandler (1904) gave the embryological explanation for variation of ventral branches. Longitudinal anastomosis between the four roots of the omphalomesentric artery is responsible for variation of ventral branches. The left gastric, common hepatic and splenic arteries originate at this longitudinal anastomosis and they are separated from fourth root i.e. the future superior mesenteric artery. If the second and third roots remain persistent then it gives rise to separate origin of celiac branches from aorta [18]. In present case the first root had not united with second root which resulted into development of LGA directly from the aorta while common hepatic and splenic arteries developed from second root as a common trunk i.e. hepato-splenic trunk.

Conclusion

LGA is the most variable branch of the CT than other branches. Present case report will be very useful for laparoscopic surgeries and diagnostic angiography. The identification of anatomic vascular abnormalities of the coeliac trunk and its branches in modern oesophago-gastric surgery is very important and angiography should be mandatory when complex surgeries are planned which will prevent the iatrogenic vascular trauma and complications during surgery.

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