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Case Report

Anatomic Variations of Coeliac Trunk and its Clinical Significance: A Case Report

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Abstract

The coeliac trunk (CT), first anterior branch of the abdominal aorta shows numerous variations in its origin and branching pattern. The adequate knowledge about variants regarding its origin and branches is very important for surgeons to perform surgical procedures without complications. The present case report is to demonstrate the rare branching pattern of coeliac trunk which divides into 4 branches; Left gastric, Splenic, Common hepatic and accessory branch. The accessory branch gave 2 short gastric and 2 left inferior phrenic arteries before continuing as left accessory hepatic artery. An accessory polar branch was observed 6 cm proximal to hilum from splenic artery which entered through superior pole of the spleen. The variant anatomy of the coeliac trunk as found in the present case may be significant in adding information regarding different branching patterns of coeliac trunk during invasive surgical procedures of the abdomen.

Keywords: *Coeliac Trunk; Accessory Hepatic Artery; Superior Polar Artery*

Introduction

Coeliac trunk (CT) variants have been noted in 25 - 75% of observed cases and are without a doubt clinically significant [1]. It is important to know the different origins of donor hepatic arteries to avoid accidental injuries during graft procurement and reconstruction. Coeliac trunk arises as first anterior branch of abdominal aorta at 12th thoracic or 1st lumbar vertebra. In 75 - 90% of individuals, CT runs horizontally forward for approximately 1.25 cm [2] and divides into three branches at the upper border of pancreas: Left gastric, Common hepatic and Splenic arteries [3]. Hiatt., *et al.* in 1994 classified origin of hepatic artery in six different types of from 1000 cases which was more precise universally accepted [4]. Sahani., *et al.* reported that pre-operative imaging of arteries is important to plan open and endovascular procedures involving upper abdominal organs [5]. Volpe., *et al.* reported that injuries to hepatic arteries are more likely to be involved in pancreaticoduodenectomy, especially in the region of portahepatis [6]. Prashant., *et al.* reported early branching pattern of splenic artery as primary branches which enter the spleen mostly towards its ends were regarded as polar arteries and superior polar artery was observed in 28.8% of cases and inferior polar artery in 42.34% of cases [7]. Study by Holibkova suggested that the segmental branches of splenic arteries are involved in three types of anastomosis; extra-parenchymatous, intra-parenchymatous and sub-capsular [8]. Detailed knowledge about these segments and segmental branches will be useful to the surgeons during segmental resection of the spleen. Variant branching pattern of splenic artery also attains clinical importance while performing total pancreatectomy for the treatment of carcinoma of pancreas [9].

Case Report

A rare variant of branching pattern of coeliac trunk was observed during routine dissection of the abdomen of a male cadaver in the Department of Anatomy, Sree Narayana Institute of Medical Sciences which was used to educate medical undergraduate students. An

unusual branching pattern of coeliac trunk and its branches were observed. Coeliac trunk originated as first anterior branch from the abdominal aorta at the level of 12th thoracic vertebra. Coeliac trunk was divided into 4 branches; An accessory branch, Left gastric, Splenic and Common hepatic arteries. The accessory branch originated as first branch from coeliac trunk passed initially posterior to the stomach and later ascends towards the cardiac end of stomach. The accessory branch gave small short gastric branches which supplied greater curvature of stomach and two left inferior phrenic arteries which supplied diaphragm. Later accessory branch winds around the cardiac end of stomach to enter the substance of liver through the groove for ligamentum venosum as accessory left hepatic artery. The left gastric and common hepatic arteries had normal course and branching pattern. An accessory polar branch (Superior polar artery) was observed from splenic artery 6 cm proximal to hilum, which measured 6.8 cm from its origin and divided into 3 branches before entering through the superior pole of spleen.

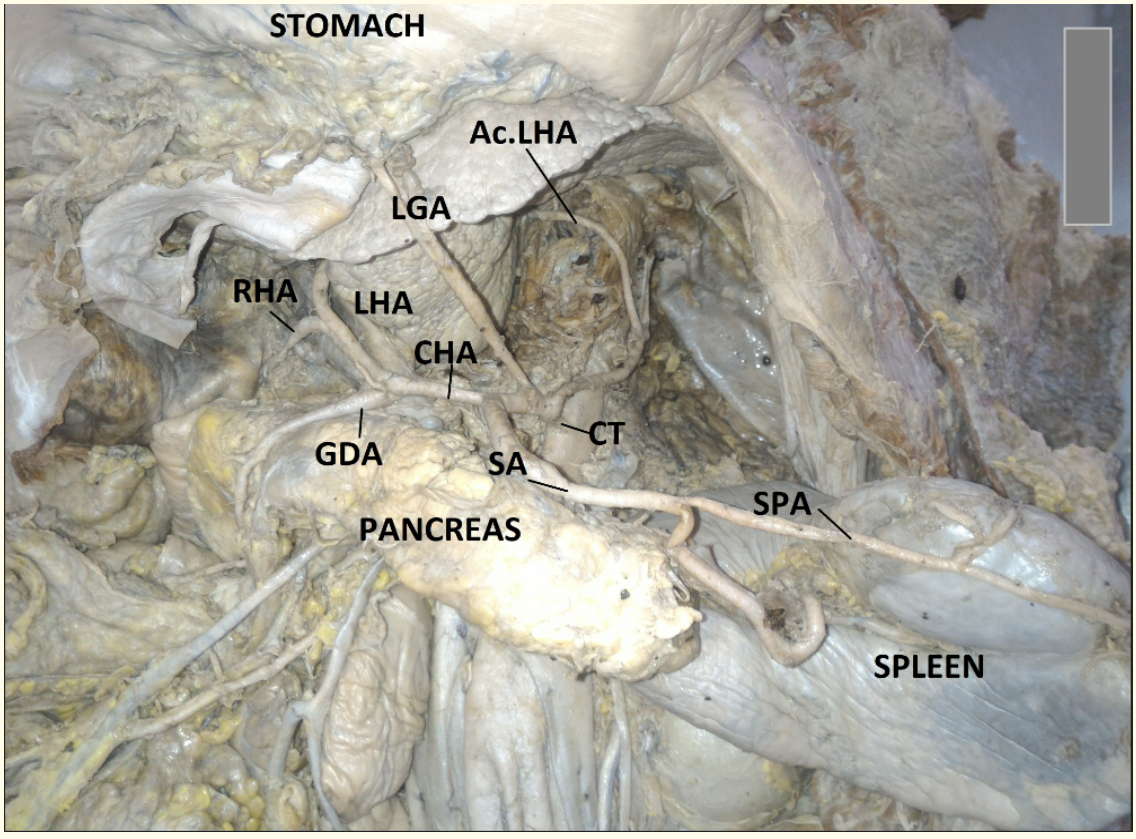

Figure 1: *Showing the unusual branching pattern of coeliac trunk.*

Abbreviations: *CT: Coeliac Trunk; CHA: Common Hepatic Artery; SA: Splenic Artery; GDA: Gastroduadenal Artery; LHA: Left Hepatic Artery; RHA: Right Hepatic Artery; LGA: Left Gastric Artery; AcLHA: Accessory Left Hepatic Artery; SGA: Short Gastric Arteries; LIPA: Left Inferior Phrenic Arteries; SPA: Superior Polar Artery.*

Discussion

Vascular anatomy of liver is important for transplant surgeries which act as guide for understanding the supply and drainage patterns. Different classifications have been reported previously for variations in the origin of CT and branching pattern of hepatic artery. Uflacker

classified division of coeliac trunk into 8 types; Type-I: Classical trifurcation of CT, Type-II: Hepato-splenic trunk, Type-III: Hepato-gastric trunk, Type-IV: Hepato-splenico-mesenteric trunk, Type-V: Gastro-splenic trunk, Type-VI: Coeliac-mesenteric trunk, Type-VII: Coeliac-colic trunk and Type-VIII: No coeliac trunk [10]. The present case doesn't belong to any variant as it has 4 branches and the accessory branch gives origin to few short gastric and left inferior phrenic arteries which are normally the branches from splenic artery and abdominal aorta respectively. At fourth week of development, both dorsal aortae give rise to multiple ventral segmental (omphalomesenteric) arteries. Fusion of the dorsal aortae occurs concurrently with regression of multiple ventral segmental arteries. The celiac axis is derived from the 10th ventral segmental artery and the superior mesenteric artery arises from the 13th segmental artery. The 11th and 12th segmental arteries normally regress. During early stages of development, there are three hepatic arteries: 1) Left hepatic arising from left gastric artery, 2) Middle hepatic arising from coeliac trunk and 3) Right hepatic arising from superior mesenteric artery. In most cases, the middle hepatic artery is the only one that persists to become the classic proper hepatic artery in the adult. This artery divides into right and left branches, which supply the respective lobes of the liver [11]. Variations in regression and persistence of these three early arteries account for the so-called accessory and replaced variants [12]. The anatomical knowledge of different variants of hepatic artery is required to reduce the number of iatrogenic complications in traditional and laparoscopic hepatobiliopancreatic surgery [13]. The surgeons can use this knowledge in surgical management of liver trauma in the region [14]. Incidence of the presence of a superior polar artery has been reported to be 51% by Sahni., *et al.* [15] and 31.3% Ignjatovic., *et al* [16]. However, a superior polar artery with no branches to the stomach, as seen in the present case, has an incidence of 3.27%. Origin of superior polar artery has been reported to be about 4 - 5 cm proximal to the splenic hilum [15]. The present case shows a more proximal origin of superior polar artery (6 cm from splenic hilum), which is of fundamental importance to surgeons. With the advanced laparoscopic techniques and the increasing use of splenic arterial interventions to treat various clinical conditions, including abdominal trauma, hypersplenism, splenic arterial aneurysm, portal hypertension and splenic neoplasms the appropriate anatomical knowledge of these variants of splenic artery is important for avoiding complications during the surgery [15].

Conclusion

Most of the vascular variations are identified during diagnostic procedures or cadaveric studies. The differential branching pattern of coeliac trunk and its branches as observed in the present case may provide additional information during the surgical procedures and avoid unnecessary complications like hemorrhage during any operative procedures on liver. The different branching patterns of splenic artery should be taken into consideration by the surgeon during segmental resection to avoid the possibility of bleeding if damaged.

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