CASE REPORT

# Additional branches of celiac trunk and its clinical significance

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**Abstract**

The anatomical variations of the abdominal arteries are important due to its clinical significance. Various types of vascular anomalies are frequently found in human abdominal viscera, during cadaveric dissection and diagnostic radiological imaging. The present report describes a variation in the celiac trunk as found during routine dissection in a 59-year-old male cadaver. The celiac trunk (CT) was unusually lengthy and took origin from the left antero-lateral surface of the abdominal aorta. Altogether, there were five branches, including three classic branches of CT. The left phrenic artery (LPA) was the first branch of the CT. The remaining four branches were left gastric artery (LGA), splenic artery (SA), common hepatic artery (CHA) and gastroduodenal artery (GDA). There was an arterial loop between the posterior branches of the superior pancreatico-duodenal artery (SPDA), arising from the GDA, and the posterior branch of the inferior pancreatico-duodenal artery (IPDA), arising from the superior mesenteric artery (SMA). The arterial loop formed by the above arteries, supplied the head of the pancreas and duodeno-jejunal flexure. The embryological and clinical significance of above variations has been described.

***Keywords*:** abdominal vessels, celiac trunk, inferior phrenic artery, superior mesenteric artery, pancreatico-duodenal artery, arterial variation.

## Introduction

The CT arises just below the aortic hiatus at the level of thoracic 12–lumbar 1 (T12–L1), and is the first anterior branch of abdominal aorta. It divides into the left gastric, common hepatic and splenic arteries [1]. The abdominal vessels, especially CT and SMA, frequently show diverse anomalies in their origin and course [2–5]. The CT is a wide ventral visceral branch of the aorta arising just below the aortic hiatus superior to the pancreas. In 75–90% of individuals, it runs horizontally forward for approximately 1.25 cm. The trunk may be shorter or longer than usual and the length of this trunk varies between 8 and 40 mm [6–8]. The trifurcation of the CT was first described by Haller (1756). This "tripus Halleri" was and is still considered to be the normal appearance of the CT [9].

Although the CT, in general, divides into three arteries, namely LGA, SA and CHA, one of the components of the CT sometimes arises directly from the abdominal aorta [9, 10]. In rare cases, all three components are branched independently from the aorta [11–13]. In addition, it has been reported that the CT unites with the SMA at their origins to form a common trunk, the celiacomesenteric trunk (CMT) [8, 14]. Nayak S (2006) reported a common celiaco-mesenterico-phrenic trunk (CMPT) [15]. Moreover, Nonent M *et al.* (2001) reported a case in which all three arteries were converged into one trunk, namely the celiac-bimesenteric trunk (CBMT) [16]. Koizumi M *et al.* (1990) described a case in which dorsal pancreatic artery (DPA) took origin from CA [17]. Dupuis and Barnay, 1874 (quoted by Bergman RA *et al.*, 2007) reported a celiac trunk with five branches [6]. Similarly, six branches from a celiac trunk have been reported in the literature [18]. In the present case, there were five branches from the celiac trunk.

## Material and methods

During routine dissection of the upper abdominal cavity of a 59-year-old male cadaver, we observed a CT with five branches.

## Results

The celiac trunk exhibited a length of 2.6 cm (usual length of the celiac trunk is approximately 1.25 cm as available in medical literature) and originated from left antero-lateral surface of the abdominal aorta at the level of L1.

The celiac trunk gave rise to LPA first and after that it gave the, three usual branches (i) CHA (ii) SA (iii) LGA and GDA. There was an arterial loop between the posterior branches of the SPDA, arising from the GDA, and the posterior branch of the IPDA, arising from SMA. The arterial arcade was formed below the head of the pancreas and supplied the head of the pancreas, considerable part of duodenum and jejunal flexure (Figures 1 and 2). The LPA also supplied few branches to the stomach and gave rise to the superior supra renal artery.

## Discussions

The vitelline arteries, initially a number of paired vessels supplying the yolk sac, gradually fuse and form the arteries located in the dorsal mesentery of the gut. In the adult, they are represented by the CT, SMA and inferior mesenteric arteries (IMA). These vessels supply the derivatives of the foregut, midgut, and hindgut, respectively [19]. The anatomical variations of the celiac trunk are due to the ventral splanchnic branches of dorsal aorta [7, 8]. Karakose M *et al.* (2006) reported a case in which, the CT divided into four branches the LGA, CHA, SA and DPA [20]. Dupuis and Barnay, 1874 (quoted by Bergman RA *et al.*, 2007) described a coeliac trunk-giving rise to five arteries as the left gastro-epiploic, the splenic, the right gastro-epiploic, the hepatic, and the inferior phrenic [6].

Çiçekcibaşi AE *et al.* (2005) reported a CT, which gave rise to the LGA, CHA and the additional branches (i) left gastro-epiploic and (ii) the right and left inferior phrenic arteries [18]. In the present case, the LPA took origin from the CT. 8.1% cases the inferior phrenic artery originated from the CT [2].

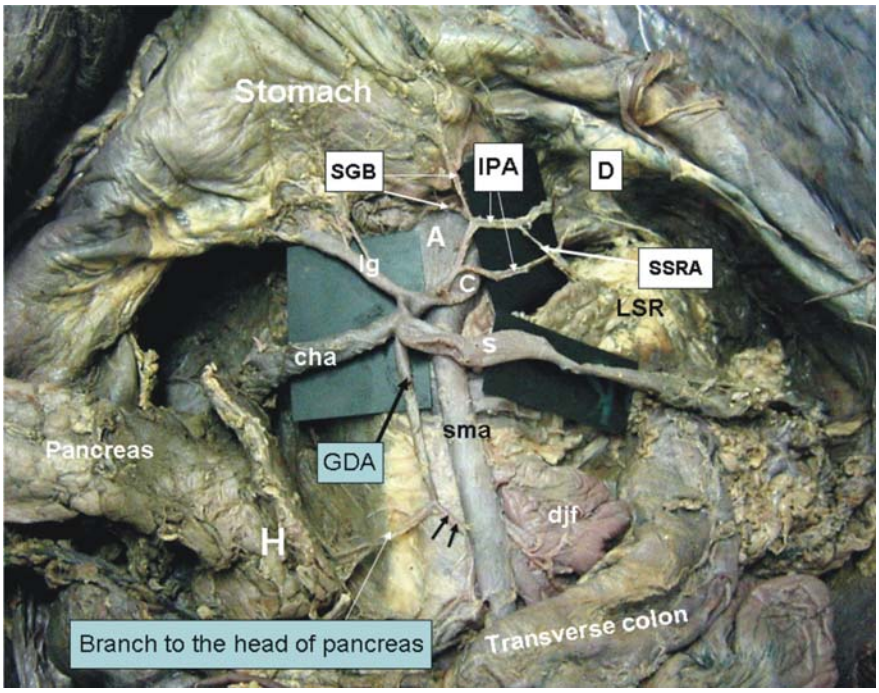


**Figure 1 –** ***Photograph of posterior abdominal wall showing the branches of celiac trunk. A – abdominal aorta, C – celiac trunk, sma – superior mesenteric artery, cha – common hepatic artery, s – splenic artery, lg – left gastric artery, IPA – left inferior phrenic artery, SGB – short gastric branches, SSRA – superior supra renal artery, GDA – gastroduodenal artery, D – diaphragm, LSR – left suprarenal gland, H – head of the pancreas, djf – duodeno-jejunal flexure. Black arrows (→→) indicating the posterior branches of the superior pancreatico duodenal artery (SPDA), arising from the GDA. Note the celiac trunk was unusually lengthy and took origin from the left lateral side of the abdominal aorta***

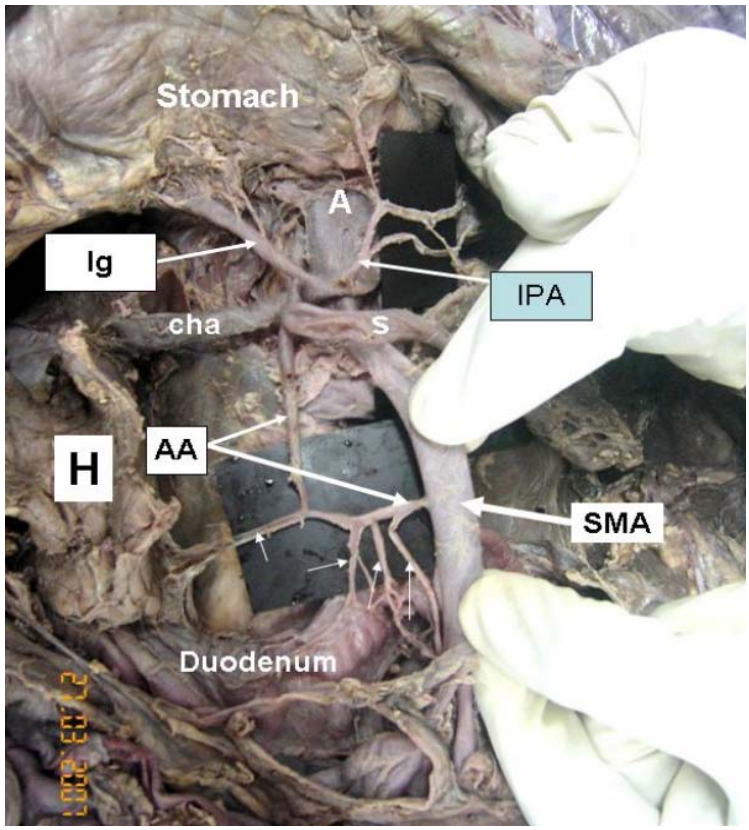


**Figure 2 –** ***Photograph of posterior abdominal wall showing the celiac trunk and the arterial arcade formed by the branches of celiac trunk and superior mesenteric artery. A – abdominal aorta, SMA – superior mesenteric artery, cha – common hepatic artery, s – splenic artery, lg – left gastric artery, IPA – left inferior phrenic artery, H- head of the pancreas, AA – arterial arcade formed between the posterior branches of the SPDA, arising from the GDA, and the posterior branch of the inferior pancreatico-duodenal artery (IPDA), arising from SMA. White arrows (→→→→) indicate the branches from the arterial arcade to the head of the pancreas and duodeno-jejunal flexure***

The arterial loop in the present case involves the posterior branches of the SPDA and the posterior branch of the IPDA. The IPDA is the first branch of the superior mesenteric artery. It supplies the distal part of the duodenum, the head and uncinate process of the pancreas. In a case where there is absence of IPDA, the surgeon must expect an abnormal arterial loop to avoid considerable bleeding [21].

In the present case, there is a similar arterial loop, which should be kept it, mind while dealing with abdominal viscera and vessels. Murakami G *et al.* (1999) suggested that special attention should be paid to the IPDA, because of the high incidence of the common trunk formation between the upper jejunal and IPDA [22]. The variation of CT should be kept in mind during surgery and also in non-surgical evaluation of the patient. In the post-operative closing, the variations in the anatomy of the CT must be carefully studied in order to make proper adjustments in anastomosing the proper arteries. Moreover, the arterial variations are significant while matching organ procurements for transplantations [23].

## Conclusions

The present variation of CT and absence of IPDA will be very useful for the surgeons dealing with gastric and duodenal ulcers and mobilization of the head of pancreas. Awareness of variations in arteries supplying the duodenum and pancreas can also help in minimizing the blood loss during various surgical procedures in this area.

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