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Research Article: Human Anatomy Case Report

Hepato-gastric and spleno-mesenteric arterial trunks: anatomical variation report and review of literature

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Summary

The celiac trunk is one of the main arteries arising from abdominal aorta and supplies blood to several abdominal organs. The typical branching in left gastric, splenic and common hepatic arteries undergoes relatively frequent variations.
The authors report a rare variation of the celiac trunk in a Caucasian cadaver, with a hepato-gastric and a spleno-mesenteric arterial trunks which arise from the abdominal aorta in a routine dissection of a 98-year-old male cadaver. Detailed knowledge of this kind of variations is important to plan and perform surgery in this district.

Key words

Abdominal aorta; anatomical variation; celiac trunk; hepatic artery; left gastric artery; splenic artery; superior mesenteric artery.

Introduction

The knowledge of normal anatomy and anatomical variations of the vessels originated from abdominal aorta which supply organs in the sovramesocolic district represents an indispensable moment for planning and performing surgical operations in this area.

According to 1756 Haller's description, the celiac trunk – first unpaired vessel of abdominal aorta – presents usually his typical trifurcation in left gastric, splenic and common hepatic arteries (Haller, 1756). This branching still today represents the normal appearance of a celiac trunk. Second unpaired vessel originated from abdominal aorta is the superior mesenteric artery, which supplies duodenum, head of pancreas, all small bowel, caecum, ascending colon, transverse colon. Adachi (1928) first classified anatomical variations of the celiac trunk through dissection of 252 Japanese cadavers, where six types of divisions of the trunk and superior mesenteric artery were described. Adachi (1928) and Michels (1955) classified the celiac trunk into six different types. The types of celiac trunk according to Michel's classification are: Type 1: normal branching; Type 2: hepatosplenic trunk and left gastric artery from aorta;

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Table 1 – Summary of the variations reported in the literature with relative percentage of each variation.

References	No. subjects examined	CT complete (trifurcation) (%)	CT incomplete (bifurcation) (%)	CT absent (%)
Rossi and Cova, 1904	102	86 (84.3)	14 (13.7)	2 (2.0)
Leriche and Villemin, 1907	55	49 (89.1)	6 (10.9)	0
Descomps, 1910	50	44 (88.0)	6 (12.0)	0
do Rio-Branco, 1912	50	45 (90.0)	5 (10.0)	0
Picquand, 1910	50	41 (82.0)	8 (16.0)	1 (2.0)
Eaton, 1917	206	186 (90.3)	20 (9.7)	0
Lipshutz, 1917	83	62 (74.7)	21 (25.3)	0
Adachi, 1928	252	221 (87.7)	31 (12.4)	0
Tsukamoto, 1929	98	81 (81.7)	17 (17.3)	0
Imakoshi, 1949	107	97 (90.7)	10 (9.3)	0
Michels, 1955	200	178 (89.0)	22 (11.0)	0
Kozhevnikova, 1977	155	135 (87.1)	20 (12.9)	0
Katsume et al,1978	52	49 (94.2)	3 (5.8)	0
Vandamme and Bonte, 1985	156	134 (85.9)	21 (13.5)	1 (0.6)
Nelson et al, 1988	50	41 (82.0)	9 (18.0)	0
Kaneko, 1990	25	18 (72.0)	7 (28.0)	0
Shoumura et al, 1991	450	408 (90.7)	42 (9.3)	0
Chitra, 2010	50	20 (40.0)	30 (60.0)	0
Total	2191	1895 (86.5)	292 (13.3)	4 (0.2)

The table highlights the fact that the variations of the coeliac trunk are not a rare event on the whole even though some of them are quite rare.

Type 3: hepatoslenomesenteric trunk and left gastric artery from aorta; Type 4: hepatogastric trunk and splenic artery from superior mesenteric artery; Type 5: splenogastric type – splenic and left gastric from the celiac trunk and common hepatic artery from superior mesenteric artery; Type 6: celiac mesenteric trunk – splenic, left gastric, common hepatic and superior mesenteric arteries arise from a common trunk.

According to the majority of the authors who reported data about celiac trunk, it appears that only 86.5% of the celiac trunks show the classical trifurcation, while an incomplete celiac trunk can be observed in 13.3% of cases (Table 1) (Haller, 1756; Leriche and Villemin, 1907; Descomps, 1910; Picquand, 1910; do Rio-Branco, 1912; Eaton, 1917; Lipshutz, 1917; Adachi, 1928; Tsukamoto, 1929; Cauldwell and Anson, 1943; Imakoshi, 1949; Michels, 1955; Kozhevnikova, 1977; Katsume and Emura, 1978; Vandamme and Bonte, 1986; Nelson et al, 1988; Shomura et al, 1988; Kaneko, 1990; Chitra, 2010).

In this study we report the existence of hepato-gastric and spleno-mesenteric arterial trunks in spite of the classical "tripus Hallerii", name the celiac trunk is used to be called with.

Case Report

In our Department during a routine gross anatomy dissection of a 98-year-old Caucasian male cadaver for undergraduate, postgraduate students and residents (Anesthesiology, Obstetrics and Gynecology, Orthopedics, Urology, Vascular Surgery), it was noted that the celiac trunk didn't exhibit the classic trifurcation described by Haller.

In our case (Fig. 1a) from abdominal aorta at T12 level a short trunk stemmed, which then divided just into two vessels (left gastric and common hepatic arteries). The length of this trunk was 3.0 cm and it had a diameter of 0.6 cm. Below its origin, a second trunk originated from abdominal aorta and divided into two branches (superior mesenteric and splenic arteries). The distance between these two branches was only 0.7 cm.

Usually the splenic artery after its origin runs retroperitoneally along the superior margin of both pancreatic body and tail and then goes towards the splenic hilum. In our case, because of its lower origin, the splenic artery resulted very long and particularly tortuous (Fig. 2), and was located below and anteriorly to pancreatic tail.

Figure 1a – a, hepato-gastric trunk; b, left gastric artery; c, common hepatic artery; d, hepatic artery proper; e, gastroduodenal artery; f, spleno-mesenteric trunk; g, splenic artery; h, superior mesenteric artery; i, dorsal pancreatic artery; j, abdominal aorta; k, caudate lobe of the liver. Hepatic portal vein (l) and pancreas (m) have been reflected to the right side and splenic vein (n) as well as inferior mesenteric vein (o) have been cut and reflected accordingly.

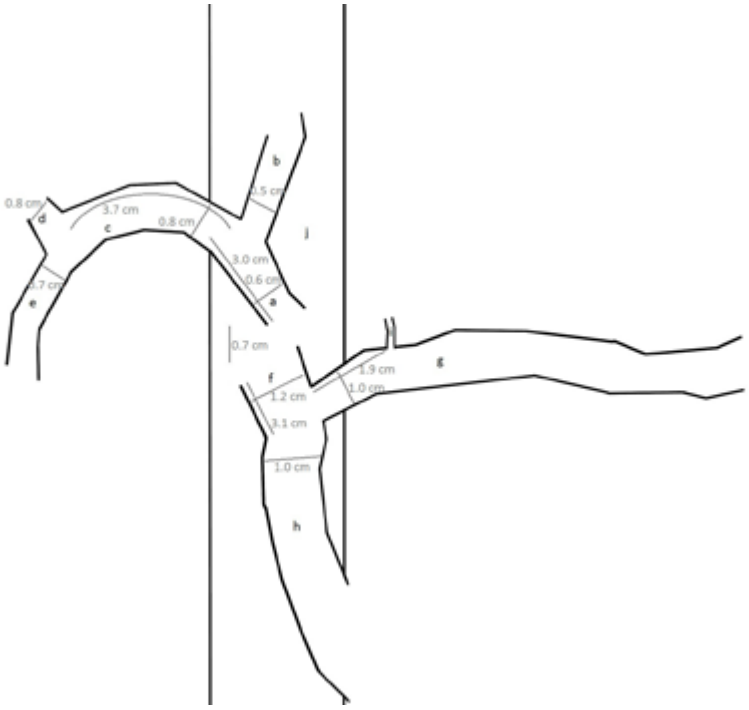

Figure 1b – schematic representation of vessels with calibers and lengths. a, hepato-gastric trunk; b, left gastric artery; c, common hepatic artery; d, hepatic artery proper; e, gastro-duodenal artery; f, spleno-mesenteric trunk; g, splenic artery; h, superior mesenteric artery; i, dorsal pancreatic artery; j, abdominal aorta.

Moreover we observed that a pancreatic vessel (dorsal pancreatic artery) originated from the splenic artery inferiorly to pancreatic body, with an ascending course. The anatomical variation we have reported could be assigned to type 4 according to Michels' classification.

Discussion

The presence of this variation affecting celiac and superior mesenteric arteries could be caused to variable ways of fusion of right and left primitive yolk arteries when they localize in the dorsal mesentery root. Probably the hepato-gastric trunk observed originated from right yolk artery and the spleno-mesenteric trunk from left one. The small distance (Fig. 1b) between the origins of these two trunks (0.7 cm versus 2.5 cm normally present between celiac and superior mesenteric artery) is an additional reason that supports this organogenetic explanation.

These data are very interesting because this variation, even though is quite rare (Chitra, 2010), could appear suddenly during surgical interventions dealing with pancreas or other organs of this region. Therefore a clear scenario of this variation could

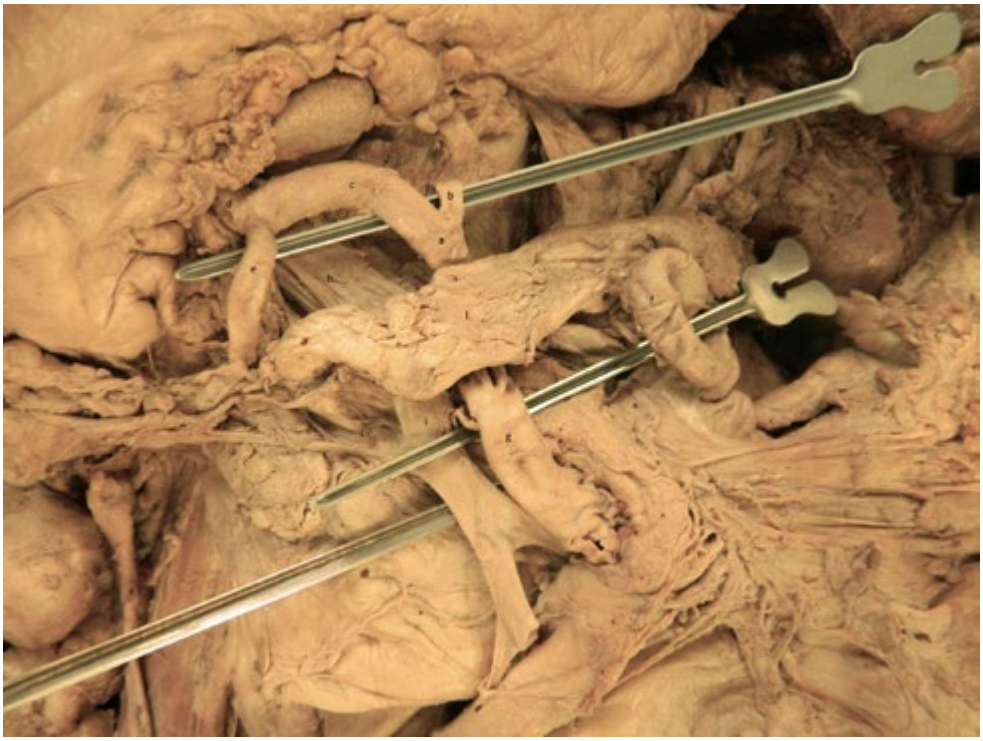

Figure 2 – a, hepato-gastric trunk; b, left gastric artery; c, common hepatic artery; d. hepatic artery proper; e, gastroduodenal artery; f, splenic artery; g, superior mesenteric artery; h, hepatic portal vein; i, superior mesenteric vein; l, pancreas. The picture was taken before transecting and reflecting structures.

be helpful and should be kept in mind by surgeons. Variations could be involved in the development of pathological conditions and namely, in the case of arteries, in changes in the normal behavior of the blood flow. In the rare variation we have described it is important to underline that the variation itself was not responsible at all of any hemodynamic problems, as reported by the clinical history of the patient, taking also into account that the patient deceased at the age of 98 years.

Conclusion

Although the occurrence of variations of the arteries stemming from abdominal aorta are quite frequent, some of them are rare and their comprehensive knowledge is not a merely anatomical issue but is important mainly from a surgical point of view. We also suggest that the knowledge of this variation, and of variations on the whole, is needed also by radiologists in order to avoid misdiagnosis during interpretation of radiological images.

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