Institute of Experimental Morphology, Pathology and Anthropology with Museum
Bulgarian Anatomical Society

Acta Morphologica et Anthropologica, 33 (1-2)
Sofia ● 2026

Agenesis of the Celiac Trunk with Absence of the Common Hepatic Artery. A Cadaveric Observation

K. Topalova[1], Ts. Petleshkova[1], S. Novakov[1], R. Novakov[2]*

[1]*Department of Anatomy, Histology, and Embryology, Faculty of Medicine, Medical University of Plovdiv, Plovdiv, Bulgaria*
[2]*Clinic of Plastic Reconstructive and Esthetic Surgery, University Hospital „St. George"- Plovdiv, Medical University of Plovdiv, Plovdiv, Bulgaria*

*Corresponding author e-mail: Katerina.Topalova@mu-plovdiv.bg

Existing classifications of the different variations of the celiac trunk confirm that its absence is the rarest of them, occurring in a very small percentage according to different authors. A cadaver examination of a 71-year-old male revealed the independent separation of three arteries from the abdominal aorta: the left gastric artery (LGA), which gave rise to the replaced left hepatic artery (rLHA), the splenic artery (SA), and the hepatomesenteric trunk (HMT), which split into the superior mesenteric artery (SMA) and the replaced right hepatic artery (rRHA). The dissected cadaver was donated to the Department of Anatomy, Histology and Embryology for educational purposes. Understanding variations in the celiac trunk is of significant clinical importance when performing surgical procedures in the field of abdominal vascular surgery.

Key words: absent celiac trunk, variations, cadavers

Introduction

The classical anatomy of the celiac trunk (CT) is typically described as a trifurcation into the left gastric (LGA), splenic (SA), and common hepatic (CHA) arteries [13]. However, the complete absence of a typical celiac trunk is an exceptionally rare vascular variation. Current literature reports a very low incidence of this variation, with documented values ranging from 0.24% to 0.76% [5, 8, 12]. Triantafyllou et al. [14] noted an incidence of 0.43%, observing that this condition is significantly more prevalent in radiological imaging studies compared to cadaveric dissections. According to Bergman [16], the incidence of a missing celiac trunk varies between 0.1% and 4%. In such cases, the

arterial origins shift significantly: the CHA may arise from the superior mesenteric artery (SMA), while the LGA and SA originate independently from the aorta; alternatively, the SA may arise from the SMA. To further categorize these branching patterns, Mao et al. [6] proposed a classification into five distinct types based on the origin of the three main branches and the SMA. According to this framework, a celiac trunk is considered absent when no single trunk contains at least two of its primary branches. The types are defined as follows: Type I: Independent origin of LGA, CHA, SA, and SMA from the aorta; Type II: Presence of a hepatomesenteric trunk (HMT) with independent LGA and SA; Type III: A splenomesenteric trunk (SMT) with independent LGA and CHA; Type IV: A gastromesenteric trunk (GMT) with independent CHA and SA; Type V: Any other variation meeting the criteria for CT absence.

Case Report

During routine anatomical dissection of a 71-year-old male cadaver, a rare vascular configuration was identified, characterized by the complete agenesis of the celiac trunk. The left gastric artery (LGA) and the splenic artery (SA) arose independently from the abdominal aorta. The common hepatic artery was absent. Instead, a split hepatic supply was observed: a replaced left hepatic artery (rLHA) arising from the LGA and a replaced right hepatic artery (rRHA) originating from the superior mesenteric artery at the level of the middle colic artery. The LGA, measuring 7 mm in diameter, originated directly from the abdominal aorta at the level of Th12, subsequently giving rise to the replaced left hepatic artery (rLHA), and then coursed to the lesser curvature of the stomach. The SA, with a diameter of 9 mm, arose from the abdominal aorta at 10 mm from the LGA. The HMT is 8.5 mm in diameter and originated from the abdominal aorta 5 mm

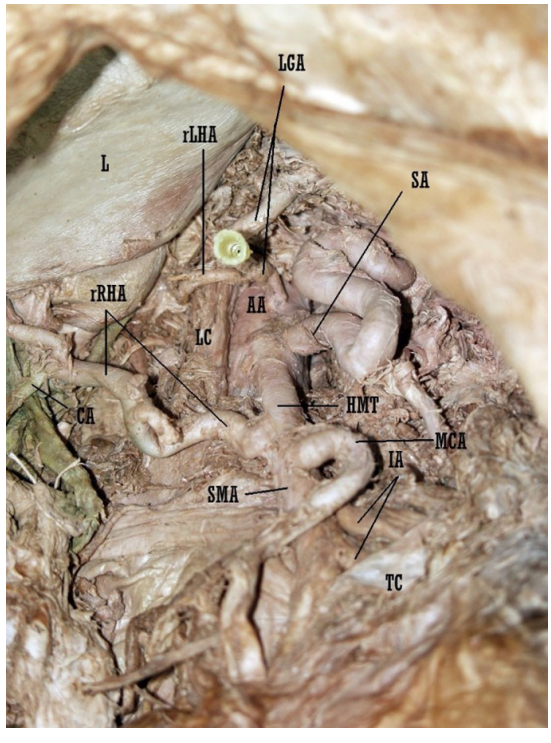

Fig. 1. Anatomical dissection of the supracolic compartment demonstrating the absence of a common celiac trunk. **AA:** abdominal aorta; **LGA:** left gastric artery; r**LHA:** replaced left hepatic artery; **SA:** splenic artery; **HMT:** hepatomesenteric trunk; r**RHA:** replaced right hepatic artery; **CA:** cystic artery; **SMA:** superior mesenteric artery; **MCA:** middle colic artery; **IA:** intestinal artery; **L:** liver; **LC:** left crus of diaphragm; **TC:** transverse colon.

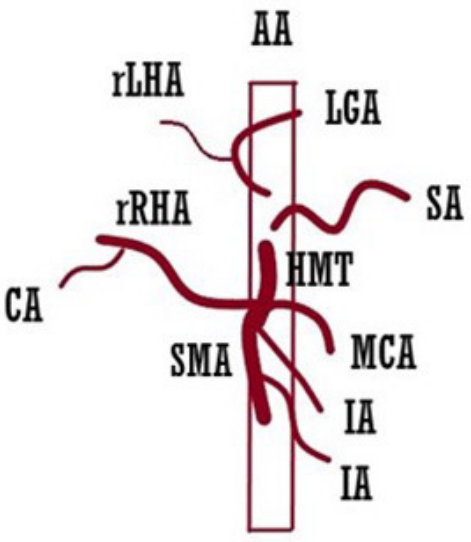

Fig. 2. Schematic representation of the dissected cadaver showing the celiac trunk variation. **AA:** abdominal aorta; **LGA:** left gastric artery; r**LHA:** replaced left hepatic artery; **SA:** splenic artery; **HMT:** hepatomesenteric trunk; r**RHA:** replaced right hepatic artery; **CA:** cystic artery; **SMA:** superior mesenteric artery; **MCA:** middle colic artery; **IA:** intestinal artery.

inferior to the origin of the SA. At 11 mm from its origin, the HMT gave off the replaced right hepatic artery (rRHA, 7.5 mm) and continued as the SMA. In summary, the absence of the celiac trunk was represented by the following vessels: rLGA+LHA; SA; HMT, which gave rise to the rRHA and SMA (**Fig. 1, Fig. 2**).

Discussion

The vitelline arteries, which are pairs of vessels responsible for supplying the yolk sac, gradually merge and form the arteries located in the dorsal mesentery of the intestine. In adults, these are the unpaired branches of the abdominal aorta - the celiac trunk, the superior mesenteric artery, and the inferior mesenteric artery. These vessels supply the anterior, middle, and posterior parts of the intestine, respectively. During embryological development, various anatomical variations of these vessels may occur [10].

This specific configuration, characterized by a hepatomesenteric trunk alongside independent aortic origins of the left gastric and splenic arteries, is exceptionally rare. Mao et al. reported a prevalence of only 0.36% (9 cases) in their extensive study [6] Although rare, this configuration of the celiac trunk was also reported by Ramanand et al. [9] and Hemalini et al. [2]. Ye et al. [18] described the same type of variation – LGA, SA, and HMT, with the difference that they identified an accessory left hepatic artery (aLHA) branching from the LGA. Unlike the authors mentioned above, in our case there was agenesis of the celiac trunk and an absent common hepatic artery (CHA). Replacement branches separating from the LGA and the SMA take over its function.

A similar variation was described by Zhang et al. [19], in which the LGA, SA, and gastroduodenal artery (GDA) originated directly from the abdominal aorta (AA) in the absence of the CHA. In their report, the replacement left hepatic artery (rLHA) branched from the LGA, and the replacement right hepatic artery (rRHA) originated from the SMA, which is completely consistent with our findings. Sheta [11] also identified cases with altered configuration of the celiac trunk and variable pattern of the hepatic arteries. In his first case, the SA arose directly from the AA, while the

RHA and SMA branched from a common trunk. In the second case, the SA originated from the AA, and the CHA and SMA emerged from a common hepatomesenteric trunk (HMT), with the CHA branching into four segments: RHA, LHA, MHA, and GDA. Although Michels and Hiatt's classifications described hepatic variations in detail, they did not include cases of complete agenesis of the celiac trunk. Our case corresponded to Type IV (double replacement hepatic supply), but with atypical direct separation of the LGA, SA, and SMA from the aorta [7, 3]. Türkyılmaz et al. [17] reported a double replacement blood supply combined with an additional left hepatic artery (a LHA) from the aorta and GDA from the splenic artery – a configuration present in only 0.21% of cases and classified by them as type IV a.

A similar rare clinical case of the celiac trunk and common hepatic artery was published by Bulgarian authors, with the difference that there was a common hepatic artery that gave rise to the left hepatic artery (LHA), middle hepatic (MHA), right hepatic (RHA), cystic (CA), right gastric (RGA), and gastroduodenal arteries (GDA). The celiac trunk is also subject to variation [15]. Notably, despite the documented cases in neighboring regions like Romania and Moldova [4, 1], to the best of our knowledge, this is the first reported case of a absent celiac trunk within the Bulgarian population.

These rare cases reveal the great variety of arterial patterns in celiac trunk absence, highlighting the need for detailed morphological analysis.

Conclusion

Understanding the variations in the celiac trunk is of great clinical importance in abdominal surgical procedures such as liver transplantation, acute mesenteric occlusion, laparoscopic surgery, and in radiological procedures (interventional angiography and computed tomography) in the upper abdomen.

References

1. **Covantsev, S., R. Uzdenov, N. Mazuruc-Gladcova, D. Turovets, O. Belik.** Absent celiac trunk and unusual arterial anatomy of the upper abdomen: into the deep. – *Folia Med. (Plovdiv)*, **65**(3), 2023, 500-507.
2. **Hemamalini.** Variations in the branching pattern of the celiac trunk and its clinical significance. – *Anat. Cell Biol.*, **51**(3), 2018, 143-149.
3. **Hiatt, J. R., J. Gabbay, R. W. Busuttil.** Surgical anatomy of the hepatic arteries in 1000 cases. – *Ann. Surg.,* **220**(1), 1994, 50–52.
4. **Iacob, N., I. Sas, S. C. Joseph, H. Pleş, G.D. Miclăuş et al.** Anomalous pattern of origin of the left gastric, splenic, and common hepatic arteries arising independently from the abdominal aorta. – *Rom. J. Morphol. Embryol*., **55**(4), 2014, 1449-1453.
5. **Iezzi, R., A. R. Cotroneo, D. Giancristofaro, M. Santoro, M.L. Storto.** Multidetector-row CT angiographic imaging of the celiac trunk: anatomy and normal variants. – *Surg. Radiol. Anat.*, **30**(4), 2008, 303-310.

6. Mao, Y., Y. Yao, X. Li, X. Chen, C. Zhang et al. Absence of the celiac trunk: Definition, classification, multidetector computed tomography angiographic findings, and their probable embryological mechanisms. – *Vascular*, **31**(6), 2023, 1214-1221.
7. Michels, N. A. *Blood supply and anatomy of the upper abdominal organs with a descriptive* Atlas. Philadelphia, JB Lippincott, 1955, 136–147.
8. Panagouli, E., D. Venieratos, E. Lolis, P. Skandalakis. Variations in the anatomy of the celiac trunk: a systematic review and clinical implications. – *Ann. Anat.*, **195**, 2013, 501-511.
9. Ramanand, G., C. A. Singh, C. K. Rana, K. Ramesh, S. I. Singh. Slice CT evaluation of anatomical variations of main arteries arising from the abdominal aorta and their branching pattern. – *J. Med. Sci. Clin. Res.*, **6**(6), 2018, 576-588.
10. Sadler, T. W. *Langman's Medical Embryology.* 12th ed., Philadelphia, Lippincott Williams & Wilkins, 2012, 188.
11. Sheta, A. A. Prevalence of anatomical variants in the branches of celiac and superior mesenteric arteries among Egyptians. – *Anat. Cell Biol.*, **57**(3), 2024, 353-362.
12. Song, S. Y., J. W. Chung, Y. H. Yin, H.J. Jae, H.C. Kim et al. Celiac axis and common hepatic artery variations in 5002 patients: systematic analysis with spiral CT and DSA. – *Radiology*, **255**(1), 2010, 278-288.
13. Standring, S. *Gray's Anatomy: The Anatomical Basis of Clinical Practice.* 41st ed., Elsevier Limited, 2016.
14. Triantafyllou, G., N. Belimezakis, O. Lyros, A. Węgiel, N. Arkadopoulos et al. Prevalence of coeliac trunk variants: A systematic review with meta-analysis. – *Ann. Anat.*, **259**, 2025, 152385.
15. Trifonov, S., M. Dobrev, P. Hristova, I. Bogeva-Tsolova. Rare variation of the branches of the coeliac trunk and the common hepatic artery in human cadaver: a case report. – *Ann. Med. Surg. (Lond)*, **87**(4), 2025, 2477-2483.
16. Tubbs, R. S., M. M. Shoja, M. Loucas. *Bergman's Comprehensive Encyclopedia of Human Anatomic Variation.* New Jersey, John Wiley & Sons, 2016.
17. Türkyılmaz, Z., O. Kula, A. O. Çelik, T. Demirel, B. Günay. Evaluation of celiac artery and common hepatic artery variations by CT-angiography and new classification model. – *Surg. Radiol. Anat.*, **45**(8), 2023, 1037-1047.
18. Ye, Z., S. Ye, D. Zhou, W. Wang. A rare variation of celiac trunk and hepatic artery complicating pancreaticoduodenectomy: A case report and literature review. – *Medicine (Baltimore)*, **96**(48), 2017, e8969.
19. Zhang, Z., S. Wang, M. Ye, F. Tao, D. Guo. Rare variation: the absence of both the celiac trunk artery and the common hepatic artery. – *World J. Surg. Oncol.*, **20**(1), 2022, 388.