

Anatomical Variation of the Celiac Trunk

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ABSTRACT

Introduction: the celiac trunk is one of the main branches originating from the abdominal aorta, supplying various organs and structures through its branches. Therefore, understanding both the normal anatomical structures and the possible anatomical variations of the celiac trunk and its branches is essential

Case report: the present study examined a formalin-fixed female cadaver in an anatomy laboratory of a medical school, in which anatomical variations of the Celiac Trunk were observed. These included a length (27.45 mm) and diameter (15.15 mm) larger than those usually reported in the literature, as well as variations in the course of the celiac trunk itself. The lengths of its branches were also measured, with the following findings: for the Left Gastric Artery, a length and diameter of 25.53 mm and 4.13 mm, respectively; for the Splenic Artery, 139.14 mm and 11.40 mm; and for the Common Hepatic Artery, 30.86 mm and 5.74 mm. Additionally, the Superior Mesenteric Artery was found to be more laterally positioned to the right, and the measurements of the Splenic Artery were greater than those typically reported in the literature.

Conclusion: given these findings, this study aims to report the observed variation, discuss potential consequences of such variation, and contribute to the existing literature to enhance the understanding of the human arterial and vascular system, thereby supporting improved approaches in medical and healthcare practice. Especially the celiac trunk, a structure of fundamental importance for the human body and various abdominal structures.

Keywords: Celiac Trunk; Splenic Artery; Superior Mesenteric Artery; Anatomical variation.

Introduction

The Celiac Trunk (CT) is a notable abdominal arterial trunk that normally arises in the epigastric region from the abdominal portion of the Aorta (AA), originating approximately at the level of the twelfth thoracic vertebra (T12) and branching into the Common Hepatic Artery (CHA), Splenic Artery (SA), and Left Gastric Artery (LGA), Pinal-Garcia *et al.* 2018¹. Anatomical knowledge of this structure is fundamental both for clinical practice, in examinations such as angiography of these vessels, and for interventions in surgical procedures, considering that the arteries originating from the celiac trunk supply crucial organs for human physiology and function, including the stomach, liver, and spleen, Neto *et al.* 2014². Additionally, the Superior Mesenteric Artery (SMA) is the primary artery supplying the intestinal region, with branches serving both the small and large intestines. It typically originates from the abdominal aorta, just below the celiac trunk, with its branches extending to the left, Chmiel *et al.* 2023³. It is imperative for medical professionals to have knowledge of possible anatomical variations in terms of length, diameter, and course, as nescience of such variations—like the one reported in this study and many others—can lead to preventable iatrogenic injuries and hemorrhages in patients with these specific variations, Kumar *et al.* 2024⁴. This study aims to report a case of anatomical variation in the

diameter and length of the CT and its branches, as well as the SMA, in a female cadaveric specimen.

Case Report

During a routine Human Anatomy practical class in a Medical course in the city of Ribeirão Preto, São Paulo, a possible variation in the celiac trunk and its splenic branch was observed in one of the female cadaveric specimens, as shown in Figure 1, with a photograph taken prior to the dissection of the region.

After meticulous dissection, a variation in the length, diameter, and course of the CT itself was observed. It originates from the abdominal part of the Aorta and presents a trajectory and diameter larger than typically reported. Measurement with a digital caliper revealed a length of 27.45 mm, measured from its origin to the branching point. Additionally, the diameter was measured at 15.15 mm, also larger than normal. Furthermore, the branching showed syntopy to the right. Measurements of the vascular diameters and lengths of the branches of the celiac trunk were performed, revealing lengths of 30.85 mm for the CHA, 25.53 mm for the LGA, and 139.14 mm for the SA. The diameters measured were 5.74 mm for the CHA, 4.13 mm for the LGA, and 11.40 mm for the SA.

In addition to the findings related to the CT, a deeper and more detailed dissection of the abdominal region revealed the lateralization of the SMA, which

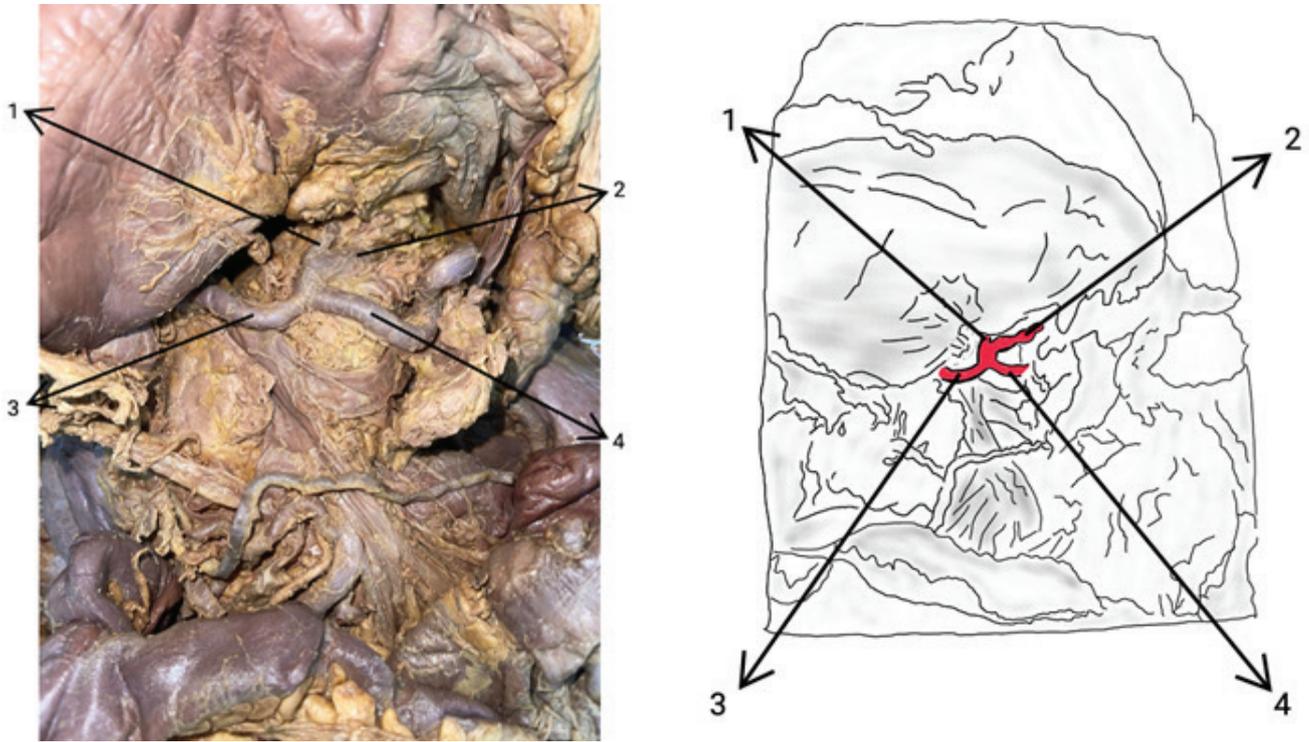


Figure 1. Arrangement before dissection. LGA: left gastric artery (1); CT: celiac trunk (2); CHA: common hepatic artery (3); SA: splenic artery (4).

follows a path to the right instead of its characteristic, more centralized course. No other studies similar to this case of the SMA were found, making this condition rare and scarcely documented. Given this, it is difficult to clearly and definitively discuss the potential implications that such rightward lateralization might or might not have on an individual (Figure 2).

Discussion

The report of such variations is essential for medical knowledge, especially when they are rarely described and documented in the scientific literature.

Therefore, the understanding of such situations is essential for excellence in medical practice, enhancing knowledge about the patient and preventing potential complications. Several variations of the CT have been reported, some of which involve its branches, as observed in Vougiadoti⁵ et al., 2023. This study presents a review of the main variations of the celiac trunk, highlighting the “hepto-splenic trunk,” where the LGA originates directly from the aorta or even from the SA, as well as the “hepto-gastric trunk,” where the SA originates from the SMA. There are also variations in the length and diameter of the CT in the present

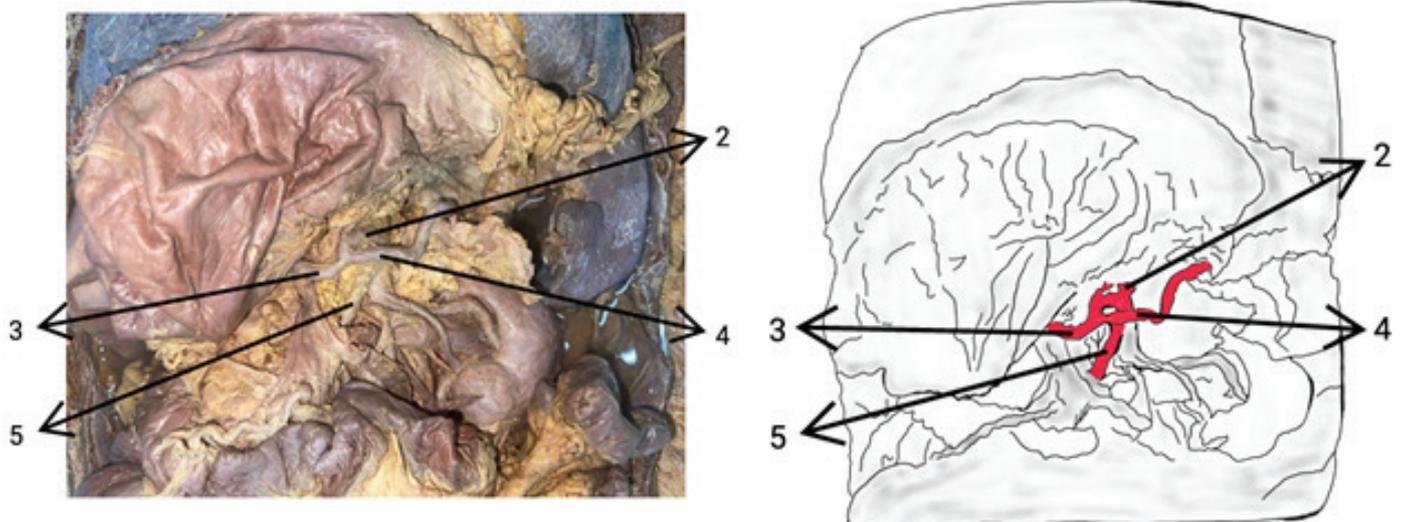


Figure 2. image depicting the celiac trunk in situ after dissection. CT: celiac trunk (2); CHA: common hepatic artery (3); SA: splenic artery (4); SMA: superior mesenteric artery (5).

study. This topic has been reported in other studies, such as the work by Petrella *et al.* 2007⁶, in which 69 formalin-fixed cadavers and 20 non-fixed cadavers were analyzed. Among the variations observed, the diameter ranged from a minimum of 4 mm to a maximum of 9 mm, while the length varied between 8,2 mm and 25.8 mm in female cadavers, corroborating the findings in the cadaver analyzed in this study. In Galastri *et al.* 2013⁷, two male patients who underwent spontaneous dissection of the CT were analyzed, with observed diameters of 13 mm and 14 mm. In the study by Pinal-Garcia *et al.* 2018¹, 140 cadavers of individuals over 18 years old were analyzed to observe anatomical variations of the CT and its branches. The study found trunk diameters ranging from 6 mm to 12 mm, without specifying the sex of the individuals or addressing the length of the CT.

In the present study, a greater length of 27.45 mm and a larger diameter of 15.15 mm were observed and documented, highlighting a notable anatomical variation of the arterial trunk in question. This variation has been rarely reported, with few documented cases in the literature. Table 1 presents a comparison between the values found in the analyzed studies and those observed in the present study, highlighting the scarcity of information and reports in the literature regarding vascular diameter, especially in female cadavers, as is the case examined here.

Table 1. Comparison between length and width observed in two other studies (Pinal-Garcia *et al.* 2018¹ and Petrella *et al.* 2007⁶) and the findings in this study. PS: the study Pinal-Garcia *et al.* 2018¹ does not describe length nor gender, and Pretella *et al.* 2007⁶ plus this studies' data refer to feminine cadavers.

Celiac Trunk	Pinal-Garcia	Petrella	Galastri	This study
Length	Not Specified	8,2-25,8 mm	Not Specified	27,45 mm
Width	6-12 mm	4-9 mm	13-14 mm	15,15 mm

In his study, Bezabih *et al.* 2024⁸ observed a 63-year-old woman who underwent abdominal surgery and presented agenesis of the CT, with all its branches originating directly from the abdominal aorta, highlighting the multiplicity and variety of existing variations in the CT and the importance of understanding them for proper surgical practice and management. Furthermore, the findings regarding the measurements of the CT branches can be discussed. In the case of the LGA and CHA, the values fall within the range reported by Saldarriaga *et al.* 2023⁹, who analyzed 26 human cadavers. The observed measurements were: for the SA, lengths ranging from 68 mm to 130.7 mm and diameters between 4.2 mm and 8.6 mm; for the CHA, lengths between 8 mm and 53.6 mm and diameters ranging from 3.1 mm to 7.6 mm; and for the LGA, lengths varying from 12.7 mm to 46.7 mm and diameters between 2.3 mm and 5.2 mm.

Our study presented different findings compared to the study by Saldarriaga *et al.* 2023⁹, with larger measurements for the length and diameter of the SA: 139.14 mm and 11.40 mm, respectively (Figures 3 and 4).



Figure 3. Image depicting the length measurement of the splenic artery.



Figure 4. Image depicting the width measurement of the splenic artery.

The greater length of the CT emerging from the aorta until reaching its branches and its more rightward positioning could indicate the larger vascular diameter of the CT found in the cadaveric specimen studied. This may be due to an increased blood supply to its branches, consequently promoting greater vascularization and perfusion of the organs related to these arteries, which naturally already have high vascularization due to the fundamental activities they perform in the functioning of various interconnected systems in human physiology and anatomy. In the case of the SMA, due to the scarcity of available data and studies, it is difficult to formulate hypotheses regarding the complications and possible consequences of its positioning being more laterally shifted to the right than usual.

Conclusion

Based on the findings presented, it is concluded that awareness of anatomical variations, such as those depicted in this study, is of utmost importance for healthcare professionals to ensure a more precise and high-quality approach when managing cases that involve such variations. As previously mentioned,

the celiac trunk plays a crucial role in the abdominal region, covering a vast irrigation area, with its branches supplying several organs and distinct regions. Therefore, every radiologist, gastroenterologist, and vascular surgeon should be aware of such anatomical variations.

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Mini Curriculum and Author's Contribution

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