

Agensis of the coeliac trunk: a case report and review of the literature

M. Karamanidi¹ , D. Chrysikos¹, A. Samolis¹, V. Protogerou¹, N. Fourla¹, I. Michalis¹, G. Papaioannou², T. Troupis¹

¹Department of Anatomy, Medical School, National and Kapodistrian University of Athens, Greece

²Department of Surgery, "Thrasio" General Hospital, Athens, Greece

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Vascular anatomical variations of the abdomen are very common. Awareness of these variations is of paramount importance in clinical practice mainly in achieving best results in minimal invasive or surgical vascular procedures. From surgical point of view, the preoperative knowledge of vascular anatomy and the relations to the surrounding structures and tissues aims to minimise inadvertent complications. Agensis of the coeliac trunk is one of the rare anatomical variations of the abdominal aorta. Limited number of cases have been reported in the medical literature, most of which are based on angiographic and cadaveric studies of adult humans. In this paper, we report a case of absence of the coeliac trunk that has been detected as an incidental radiological finding in a female patient who was admitted with abdominal pain. (Folia Morphol 2021; 80, 3: 718–721)

Key words: coeliac trunk agensis, tripus Halleri absence, anatomical variation

INTRODUCTION

Albrecht von Haller, a Swiss anatomist and physiologist described the trifurcation of the coeliac trunk in 1756, also known as tripus Halleri and it is still considered to be the normal appearance of the coeliac trunk, although numerous variation patterns have been described [27].

Anatomical variations of the unpaired branches of the coeliac trunk may be the result of anomalous embryogenesis of primitive ventral segmental (splanchnic) arteries which supply the gut and its derivatives based on Tandler's hypothesis in 1904 [24]. The 10th primitive root of the ventral segmental artery becomes the left gastric artery, the 11th becomes the splenic artery and the 13th becomes the common hepatic artery. In case of agensis of the coeliac trunk, the roots of the ventral segmental arteries do not

regress and the longitudinal anastomoses regress completely [4, 11, 25].

The coeliac trunk, also known as the coeliac artery, is the first branch of the abdominal aorta arising anteriorly at the level of T12–L1 vertebral body. It is 1.5–2 cm in length and trifurcates into the left gastric artery, the common hepatic artery and the splenic artery which supply the liver, the stomach, the abdominal oesophagus, the spleen, the superior duodenum and the pancreas [23].

The tripus Halleri is still considered to be the normal appearance of the coeliac trunk, although numerous anatomical variations have been reported such as bifurcation or incomplete coeliac trunk, common origin with superior mesenteric artery, additional branches and common origin with superior or inferior mesenteric arteries.

Address for correspondence: Prof. T. Troupis, Department of Anatomy, School of Medicine, Faculty of Health Sciences, National and Kapodistrian University of Athens, 75 Mikras Asias str., Goudi, 11527 Athens, Greece, tel: +30-210-7462388, fax: +30-210-7462398, e-mail: ttroupis@med.uoa.gr

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CASE REPORT

A 69-year-old female with no prior history of abdominal surgery was presented in the Out-patient Department of Surgery of our Hospital complaining of a 10 hour abdominal pain of sudden onset. Her examination was unremarkable except for epigastric tenderness with no presentation of rebound sign. Ultrasonogram was undertaken without significant results. An abdominal computed tomography (CT), enhanced with oral and intra venous medium contrast was performed without remarkable findings. However, a complete agenesis of the coeliac trunk was revealed incidentally (type V according to Morita's classification). In this case the left gastric, the common hepatic and the splenic artery arose independently from the abdominal aorta (Fig. 1). In three-dimensional (3D) reconstruction we clarified that the left gastric artery arose from the anterior wall of the abdominal aorta (diameter 4 mm) while the splenic (diameter 3.5 mm) and common hepatic artery (diameter 3.3 mm) were arising lower from the abdominal aorta (Fig. 2).

Although we consider this incidental finding unrelated, the patient's symptoms were attributed to indigestion and she was treated with proton pump inhibitors. A gastroscopy was arranged on a regular basis, in order to exclude peptic ulcer disease.

DISCUSSION

Awareness of vascular anatomical variations in the abdominal cavity is important either from topographical anatomy or from a surgical perspective due to their relations with the surrounding structures.

Knowing the anatomy preoperatively assists surgeons during hepatobiliary and pancreatic surgery in order to dissect the coeliac trunk branches during liver and pancreatic resections. Any vascular variation could complicate any operation due to inadvertent vascular injury. Furthermore, oesophagogastric resection and total gastrectomy involve the ligation of left gastric vessels near their origin.

Lymph node dissection performed due to oesophageal, gastric, hepatobiliary or pancreatic cancer requires accurate knowledge of the vascular anatomy, in order to be performed meticulously avoiding any possible and preventable complications.

Transplant surgeons must be extremely cautious in order to dissect and preserve the common hepatic artery and the coeliac trunk integrity when they perform liver transplantation. The risk of damaging

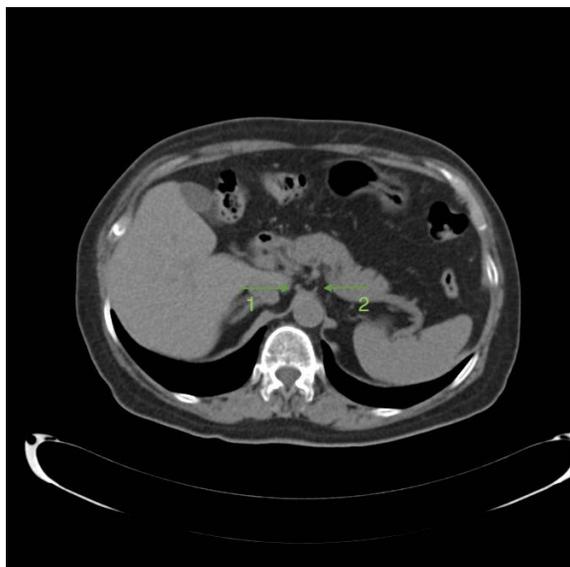


Figure 1. Abdominal computer tomography depicting separate origin of the left gastric, splenic artery (arrow 1) and common hepatic artery (arrow 2) from the abdominal aorta.

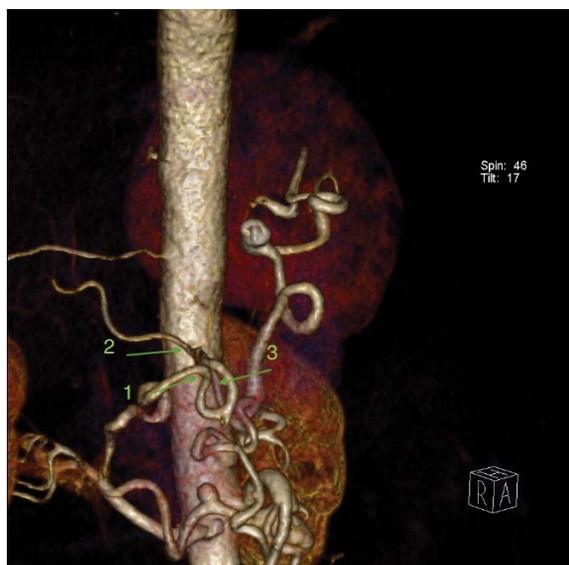


Figure 2. Abdominal computer tomography with three-dimensional reconstruction depicting absence of the coeliac trunk. Left gastric, diameter 4 mm (arrow 1), common hepatic, diameter 3.3 mm (arrow 2) and splenic artery, diameter 3.5 mm (arrow 3) arising directly from the abdominal aorta.

these arteries is higher during the cold phase of dissection and if there is a case any arterial anomaly the involved vessel may have to be reconstructed before proceeding to implantation. In the case of pancreatic transplantation the gastroduodenal, the splenic and the superior mesenteric arteries are vital as they provide its blood supply [11, 17].

Moreover, preoperative knowledge of coeliac trunk anatomy and its possible variations is extremely important during vascular operations, performed for thoracoabdominal aneurysm repair. The two therapeutic surgical options for this disease are an open and an endovascular procedure. Both, for technically different reasons demand preoperative topographic information of the involved vessels, to avoid intraoperative complications.

Interventional radiologists should be aware of the coeliac trunk variations when performing a diagnostic or a therapeutic angiography. Pseudoaneurysms can be treated by selective embolisation and possible arterial variations should always be taken into account during the procedure [17].

There are numerous classifications of the coeliac trunk morphology (Lipshutz 1917, Adachi 1928, Morita 1935, Michels 1955) [1, 9, 12, 14].

The pattern of tripus Halleri is considered to be normal and any abnormal branching is considered as an anatomical variation. Agenesis of the coeliac trunk was not described in Adachi's classification [1] though Morita in 1935 [14] proposed five types for the coeliac trunk where type I is normal coeliac trunk, type II — hepatogastric trunk, type III — gastrosplenic trunk, type IV — hepatogastric trunk, and type V — the absence of the coeliac trunk [14]. The anatomical variation reported in our case is of the fifth type (V) in Morita's classification and it is considered to be extremely rare (0–2.6%) [10, 19, 22, 25, 26, 29].

Geofry Saint-Hillaire reported the first case of this rare variation in 1832 as described by Okada in 1983 [15]. Rossi and Cova in 1904 [21] reported such a case and one was reported by Picquand in 1910 according to the statements by Eaton in 1917 [5] and Morita in 1935 [14]. In 1969, Itoh reported the first cadaveric case [7]. Petrella et al. in 2007 [18] reported 1 case of agenesis of the coeliac trunk in a study of 69 (1.12%) cadavers. Yi et al. [29] described such a case during routine gross dissection in 2008 where the coeliac trunk was absent and the arteries arose independently from the abdominal aorta. Yadav et al. [28] reported a case of a female cadaver in 2014 while another case of an adult male cadaver was reported by Badagabettu et al. in 2016 [2]. Lee et al. [8] reported a case of a male cadaver in 2016. However since the first report of Saint-Hillaire only 31 reported cases of such variation have been demonstrated by Iacob et al. 2014 [6]. Since then 4 additional cases have been reported to the best of our knowledge [2, 8, 20, 28].

The majority of these cases reported worldwide were observed during anatomical dissections in cadaveric studies, while others were detected by imaging studies. In 1965, Moretti et al. [13] reported a case based on arteriography prior to surgical exploration. Basar et al. [3] reported a case presented in angiography in 1995. In 2011, Matusz et al. [11] reported a case based on multidetector-row CT while another case was reported by Rastogi et al. in 2016 [20].

Agenesis of the coeliac trunk was observed in 0.19% of cases according to Matusz et al. [11] based on a large series of 10,750 cases from 19 studies including anatomical dissection, surgical procedures and radiological studies. The reported prevalence of the case reports noted above varies from 0.1% according to Vandamme and Bonte [25] to 2.6% according to Venieratos et al. [26] in cadaveric studies of adult humans. The latest cadaveric study by Olewnik et al. [16] in 2017 reported a prevalence of 2.5% of agenesis of the coeliac trunk. In this study the left gastric artery, the common hepatic artery and the splenic artery arose directly from the abdominal aorta, as reported in accordance with our case as well.

Finally, in comparison to most of the previous reported studies, this rare anatomical variation is mainly detected in post-mortem examinations or during cadaveric anatomical dissections. In our case, the agenesis of the coeliac trunk was an incidental finding with clinical significance, revealed during an abdominal CT with 3D reconstruction.

CONCLUSIONS

The knowledge of vascular anatomical variations of the coeliac artery and its branching pattern is of paramount importance during various operative, diagnostic and endovascular procedures. Agenesis of the coeliac trunk is a rare anatomical variation.

Preoperative awareness of coeliac trunk absence is of paramount importance assisting hepatobiliary, pancreatic, upper gastrointestinal and vascular surgeons to perform meticulously a wide range of operations in the coeliac trunk.

Conflict of interest: None declared

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