CASE REPORT

A case of absent celiac trunk: case report and review of the literature

Dalia Fahmy a,b,*, Hanaa Sadek c,d,1

a Radiology Department, Dar Al-Shifa Hospital, Kuwait
b Diagnostic Radiology Department, Faculty of Medicine, Mansoura University, Egypt
c Anatomy Department, Faculty of Medicine, Sohag University, Egypt
d Anatomy Department, Faculty of Medicine, Kuwait University, Kuwait

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Abstract We reported one case of absent celiac trunk in a 7 year old girl. She was referred to do computed tomography (CT) of the abdomen and pelvis to exclude acute appendicitis. On reviewing the images we noticed that the left gastric, splenic, common hepatic, and superior mesenteric arteries were arising independently from the abdominal aorta. Moreover there were 2 aberrant hepatic arteries, one from the left gastric and the other from the superior mesenteric. To our knowledge this pattern was never reported before. Recognition of such variation is important as it may affect several surgical procedures.

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1. Case report

A young girl aged 7 years old, suffered from right lower quadrant abdominal pain and was referred to do computed tomography (CT) of the abdomen and pelvis to exclude acute appendicitis. She took oral contrast 1000 ml of oral contrast (non-ionic solution) over a period of 90 min. Then pre and post contrast CT scan was done using a Siemens SOMATOM definition Flash dual source scanner (Siemens Medical Solutions, Forchheim, Germany): tube voltage, 120 kVp, tube current 200 mA, slice thickness, 5 mm, 40 ml Xenitex at 4 m/s. Post contrast scan was done 60 s after intravenous injection of 40 ml (Xenetix 350, Guerbet, Nederland).

On reviewing the images celiac trunk was absent, instead the left gastric, hepatic and splenic arteries took separate origin from the aorta. The left gastric artery (3 mm in diameter) was the first branch to arise at the level of the upper border of D12 and coursed anteriorly toward the stomach. It was followed by the hepatic artery which originated from the right anterolateral aspect of the aorta at level of upper border of D12, it passed to the right in pre-portal suprapancreatic course to reach the porta hepatis. It gives small branch that joined the left gastric artery shortly after its origin from the aorta. The splenic artery (4 mm in diameter) originated at the same level as the common hepatic artery but it was directed to the left toward the spleen. The left gastric
artery itself gave a small aberrant hepatic branch to the left hepatic lobe. Another aberrant right hepatic artery originated from the superior mesenteric artery.

2. Discussion

The celiac trunk is the first ventral branch of the abdominal aorta which arises at the level of T12. The classical trifurcation of the coeliac trunk into the left gastric, the common hepatic and the splenic arteries was first observed by Haller in 1756. It is thus known as Tripus Halleri, which is considered as a normal pattern (1). The superior mesenteric artery (SMA) is the second ventral branch of the abdominal aorta which arises at the level of L1. Its normal branches include the inferior pancreatico-duodenal, jejunal, ileal, ileocolic, right colic and the middle colic arteries (2).

The anatomical variations in the celiac trunk and the superior mesenteric arteries were first studied and classified by Adachi in 1928 (3). The celiac trunk presents several anatomical variations such as the absence of one of its branches (bifurcation or incomplete celiac trunk), additional branches, and common origin with the superior mesenteric artery (celiacomesenteric trunk), common origin with the superior and inferior mesenteric artery (celiac-bimesenteric trunk) and total absence (4).

Absent celiac trunk is a rare anomaly, its incidence ranged from 0.1% (1) to 2.6% (5). According to Iacob et al. (6) only 31 cases were reported all over the world and about 1/3 of cases were detected by imaging studies, while the rest were detected during anatomical dissection. To our knowledge this is the first time to report a case of absent celiac trunk in the gulf area (see Figs. 1–5).

Although absent celiac trunk was not described in Adachi classification (3), it was added later in Moritta’s classification (7). Morita proposed five types for the celiac trunk and four types (with 10 forms) for the celiac-mesenteric trunk. Morita’s classification for the celiac trunk was (i) celiac trunk; (ii) hepatosplenic trunk; (iii) gastrosplenic trunk; (iv) hepato-gastric trunk; and (v) absent celiac trunk (7).

In 1904, Tandler (8) proposed a hypothesis regarding the morphogenesis of the celiac trunk and the superior mesenteric artery. There are four primitive splanchnic arteries arising from the dorsal aorta in early human embryos and these arteries are connected to the ventral longitudinal anastomosis. During the developmental process, the primitive arteries are converged into three arteries corresponding to the celiac trunk.

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Fig. 1 Post contrast CT of the abdomen coronal reconstruction showing separate origin of the left gastric, common hepatic, splenic arteries from the anterior aspect of the aorta (arrows).

Fig. 2 Post contrast CT of the abdomen axial image showing separate origin of the left gastric artery from the aorta (white arrow), it appears joined by small branch from the hepatic artery (black arrow).

Fig. 3 Post contrast CT of the abdomen axial image showing separate origin of the common hepatic artery (white arrow) and splenic artery (black arrow) from the aorta.

Fig. 4 Post contrast CT of the abdomen coronal reconstruction and axial images (a and b) showing aberrant right hepatic artery arising from the superior mesenteric artery (black arrows).
SMA and inferior mesenteric artery (IMA). The longitudinal anastomosis then disappears. The persistence and/or abnormal regression of parts of this primitive arterial system accounts for numerous variations of the celiac trunk (8). In the case of absent celiac trunk, the longitudinal anastomoses regress completely; however, the roots of the ventral segmental arteries do not regress. The 10th primitive roots of the ventral segmental artery become the SMA; the 11th becomes the splenic artery; the 12th becomes the common hepatic artery; and the 13th and 19th become the SMA and inferior mesenteric artery (IMA) respectively with separate origins from the abdominal aorta (9).

Again this patient had complex hepatic arterial supply as she had 2 aberrant hepatic arteries originating from the left gastric and superior mesenteric arteries in addition to common hepatic artery originating from the aorta. There are 2 types of aberrant hepatic arteries, the accessory and the replacing ones. The accessory hepatic artery is defined as the vessel that supplies a lobe in addition to its normal one, while the replaced hepatic artery is a vessel that provides the sole supply to that lobe, but originates from other than its orthodox position (10). Commonly an accessory or replaced right hepatic artery arises from the superior mesenteric artery, while accessory or replaced left hepatic arteries seem to be the branches of the left gastric artery (10–14). Yang et al. (11) reported incidence of replaced or accessory right hepatic arteries originated from superior mesenteric artery (6.67%), replaced or accessory left hepatic arteries originated from the left gastric artery (6.41%).

Although aberrant arteries are common variations of the hepatic arteries (10), yet the incidence of the presence of three vessels supplying the liver is quite rare (14). Chen et al. (12) in their study described a similar pattern of 2 right and left aberrant arteries in addition to the common hepatic artery as Type Ic, with an incidence of 1.5%. But it differs from our case in the presence of normal celiac trunk which is absent in ours. On the other hand other studies reported absent celiac trunk associated with aberrant left gastric artery (6,15,16). To our knowledge this is the first case to be described as absent celiac trunk in association with 2 aberrant hepatic arteries.

Today because of the development of interventional and new surgical techniques to treat both primary and metastatic tumors and the increasing availability of living-related liver transplant donors, the accurate depiction and definition of the hepatic arterial anatomy are important (13,17,18), as it enables one to precisely plan for a resection, facilitates the operative procedure and helps to avoid inaccuracies regarding ligation of vessels, which might lead to severe postoperative morbidities bilomas, hematomas, or sepsis (19) or even mortality (20).

It is also mandatory that interventional radiologists who perform hepatic arterial embolization be familiar with both common and rare hepatic arterial variants, because failure to recognize the presence of an aberrant vessel can result in incomplete embolization. So the presence of different arterial supply may alter patient management (13,17,18).

Recent advances in imaging, made accurate evaluation of the vascular supply of the upper gastrointestinal tract easier. Dual source multi-detector CT provides isotropic coronal and sagittal images with 3D multi-planar capabilities. As compared to diagnostic digital subtraction angiography, it is non-invasive, rapid acquisition time, less preparations, less dose of radiation and contrast media, most important more available. As the case presented here, vascular anomalies could be assessed during regular examinations.

### 3. Teaching point

Celiac trunk as well as hepatic artery has different patterns and anomalies which could be assessed easily by multi-detector CT even during regular examinations. Recognition of anomalies of celiac trunk and hepatic arteries is of great important as it aids in planning for several surgical and interventional procedures help to avoid complications.

### Conflict of interest

The authors declared that there is no conflict of interest.

### References


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**Fig. 5** Post contrast CT of the abdomen coronal reconstruction image showing aberrant left hepatic artery arising from the left gastric artery (black arrows).
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