

A rare morphological variation of the coeliac trunk in a Sri Lankan cadaver

Abstract

The classic branches of the coeliac trunk are the left gastric, common hepatic and the splenic arteries. In a routine dissection of a 72year old male cadaver at the Faculty of Medicine, University of Kelaniya, Sri Lanka a variation of five branches originating directly from the abdominal aorta at the level of the origin of coeliac trunk was observed; left gastric artery, splenic artery, main hepatic artery, first direct hepatic branch and second direct hepatic branch. This deviation from three main classic branches of coeliac trunk to five direct branches is a very rare occurrence. Records of this type of vascular patterns are really important in planning and performing abdominal surgical and radiological procedures as well as radiological interventions.

Keywords: coeliac trunk, rare, variation, cadaver, Sri Lanka

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Introduction

The coeliac trunk is the first anterior branch of the abdominal aorta which arises immediately below the aortic opening of the diaphragm at the level of the intervertebral disc between the twelfth thoracic and first lumbar vertebrae. The left gastric artery, common hepatic artery and splenic artery are the classical three branches of the coeliac trunk in almost 80% of the cases.¹ The Common hepatic artery once branched out, forms the coeliac trunk gives of the right gastric and gastroduodenal arteries, and continues as the proper hepatic artery to supply the liver. The gastroduodenal artery divides into the pancreaticoduodenal artery and right gastro-epiploic artery supplying the stomach, head of the pancreas, duodeno-jejunal flexure and the common bile duct. The splenic artery is a separate vessel from the coeliac trunk that courses along the superior border of the pancreas and supplies the spleen, fundus of the stomach, body and tail of pancreas and greater omentum. The said description of the coeliac trunk, its branches and their supplying organs reflects the embryological origin and development of the foregut. Wide variations of the origin, number of branches and their distribution occur in the coeliac trunk system indicates the importance of the field of surgery and radiology.^{1,2} The normal origin of the coeliac trunk is at the level of the twelfth thoracic vertebrae in the retro peritoneum. The length and the diameter of the coeliac trunk are also subjected to wide variations which are surgically relevant.^{3,4} Where normal anatomy was present, the mean length of the coeliac trunk was 1.9+0.08 cm and its mean arterial diameter was 0.78+0.08cm.⁴ Single coeliac trunk is the commonest type but multiple separate origins of the aforementioned main branches are seen. It is less common to find all the three branches originating separately with accessory arteries branching out from the anterior surface of the abdominal aorta.^{5,6} Therefore the variation of the coeliac trunk described here has a high value in improving the anatomical knowledge of vascular variations in this surgically important region.

Case report

The case report that is described here is of a 72year old male who died of myocardial infarction with a history of ischemic heart disease but without a known vascular anomaly by clinical details. The body was donated for routine teaching and learning activities of the

Department of Anatomy, Faculty of Medicine, University of Kelaniya, Sri Lanka. Written consent had been granted when the cadaver was donated by the relatives. The dissection carried out according to the guidelines stated in the Cunningham Manual of Practical anatomy.⁷ The abdominal cavity was opened into and the retroperitoneum was reached, preserving the vascular pedicles and the supplying organs by the coeliac trunk tracing proximally and distally in relation to the well-known anatomical landmarks of the abdominal cavity. The identified arteries in the vicinity of the coeliac trunk were labeled and photographed using a digital camera. Tracing of the vessels were done up to the supplying organ or part of the organ to confirm the distribution. In this case, instead of the coeliac trunk we observed five arterial branches originating directly from the abdominal aorta (Figure 1); left gastric artery (Branch A), splenic artery (Branch B), main hepatic artery (Branch C), first direct hepatic branch (H1) and second direct hepatic branch (H2).



Figure 1 The five arterial branches from abdominal aorta related to the coeliac trunk; A-left gastric artery, B- splenic artery, C- main hepatic artery, H1- first direct hepatic branch, H2- second direct hepatic branch, H3- hepatic branch of main hepatic artery and H4- hepatic branch of a descending branch of splenic artery, B1- descending branch of splenic artery which is divided into H4 branch and pancreaticoduodenal branch, P- pancreatic branch of main hepatic artery.

The uppermost branch or left gastric artery (Branch A) originated at the lower border of the twelfth thoracic vertebra whereas the lowest branch (Branch H2) corresponded to the upper border of the first lumbar vertebra. The other branches originated in an oblique line somewhat towards the right side. The branch A was the main supplier to the stomach lesser curvature corresponding to the left gastric artery. The branch B, being the largest, was seen bifurcating 2.3cm distal to the origin from the aorta forming a curved branch ascending towards the lesser curvature of the stomach, and a descending branch coursing towards the head of the pancreas and the duodenum. This ascending branch represents the continuation of the splenic artery. The descending branch (B1) bifurcates 4.1cm distal to its origin giving a hepatic branch (H4) and a pancreatico-duodenal branch supplying the pancreatic head mainly its inferior aspect and the anterior part of the uncinata process running in the groove formed by the 2nd and 3rd part of the duodenum. Interestingly, there were 4 identifiable arterial branches (H1, H2, H3 and H4) to the liver (Figure 1). The H1 branch was the first direct hepatic branch and it originates from aorta just below and right to the main hepatic artery. The H2 branch was the second direct hepatic branch and it arises from aorta below to H1 branch. The H3 was a hepatic branch of main hepatic artery and H4 was a branch of a descending branch of splenic artery (B1). All the hepatic branches except H2 showed similar small caliber. The H2 branch shows somewhat larger diameter which is only smaller to splenic artery. Importantly, all the branches of H1 to H4 showed an unbranching course until they reached the liver parenchyma. Moreover, the pancreas was supplied by a pancreatic branch (P) from the main hepatic artery and the pancreaticoduodenal branch of descending branch of splenic artery (B1). None of the aforementioned branches demonstrated connecting branches with each other. Both portal venous system and the hepatic veins demonstrated normal general arrangement. The extra-hepatic biliary tree showed no significant variations to the general pattern. Further, none of the visceral organs supplied by this variation showed macroscopic anomalies or deviation from the general architecture.

Discussion

The coeliac trunk arises in the anterior aspect of the aorta, just after it passes the diaphragmatic aortic hiatus, at the level of the 12th thoracic and first lumbar vertebrae and trifurcates into the common hepatic artery, left gastric artery and splenic artery. However, according to literature there are lot of variations of origin of the coeliac trunk and its main branches. Unlike the vascular abnormalities in the limbs, the variation in coeliac trunk certainly needs attention because of their surgical importance in the abdominal region.⁸ These variations are due to the developmental abnormalities in the ventral splanchnic arteries. The prevalence of classic coeliac trunk trifurcation is between 40% and 94.2% in cadaveric studies whereas radiological studies reported up to 95.9% and liver transplantation studies indicated 98.3%.⁹⁻¹² The prevalence of bifurcation of the coeliac trunk is around 7.1%.^{13,14} The most frequent type of bifurcation (3%) is the hepatosplenic trunk, with the left gastric artery originating from the abdominal aorta.¹⁵⁻¹⁷ Additional branches or collaterals of the coeliac trunk have been reported from several studies all over the world.¹⁸⁻²⁰ Interesting, the most infrequent variation of the abdominal vasculature is the absence of the coeliac trunk indicating the mean prevalence of 0.38%.^{13,14,21} Adding to this list our study reports the very first rare case of absence of coeliac trunk in Sri Lankan context. In this case, the left gastric artery, splenic artery and main hepatic artery arise independently from the aorta with another two additional direct tributaries to the liver. There have been no such cases reported previously in the country.

Importantly, Sri Lankan studies on coeliac trunk gross anatomical variations are scarce and confined to three studies. Out of that two reports claimed rare variation of coeliac trunk; coeliomesenteric trunk and hepatosplenesenteric trunk.^{22,23} The other one is a preliminary cadaveric study of branching pattern of the coeliac trunk in a selected Sri Lankan population and reported 72.7% of classic coeliac trunk division of normal 3 main branches while 27.3% had additional left and right inferior phrenic arteries as the first branches.²⁴ Therefore, awareness of anatomical variations of the coeliac trunk is important to plan abdominal surgeries or image guided interventional procedures especially in liver transplantation and laparoscopic surgery to avoid patient complications. Hence, more cadaveric studies on coeliac trunk are needed to develop the Sri Lankan data base and it should be updated from time to time.

Conclusions

We have observed five direct branches, left gastric artery, splenic artery, main hepatic artery, first direct hepatic branch and second direct hepatic branch, originating directly from the abdominal aorta at the level of the origin of coeliac trunk. The precise description of the vasculature of coeliac trunk is warranted due to uncommon variations encountered during complex abdominal surgeries.

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Conflicts of interest

Authors declare that there are no conflicts of interest.

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