

Common Coeliaco-Mesenteric Trunk; a Rare Anatomic Variation.

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Abstract: Multiple variations of the branches of abdominal aorta were observed during a routine dissection of the abdominal region in a male cadaver of approximately 50-years, in the Department of Anatomy, S.M.S. Medical College, Jaipur. The coeliac trunk and superior mesenteric artery which are ventral branches of the abdominal aorta, are the major source of blood supply to the derivatives of foregut and midgut. Usually, the celiac trunk divides into the splenic, common hepatic and left gastric arteries to supply this region. The superior mesenteric artery originates from the aorta about 1 cm below the coeliac trunk at the level of the intervertebral disc between the first and second lumbar vertebrae & has been shown to display ethnic variations in its branching pattern. We report and describe, a case of variation in the branching pattern of the abdominal aorta. Common coeliaco-mesenteric trunk, with the coeliac and superior mesenteric arteries having a common origin from the aorta, is the least frequently reported anatomic variation of all abdominal vascular anomalies. Its possible embryological basis and clinical implications are discussed.

Keywords: coeliaco-mesenteric trunk, hepato-mesenteric trunk, gastro-splenic trunk, superior mesenteric artery, anastomosis.

I. Introduction

The abdominal aorta gives three sets of branches:

1. Three unpaired ventral branches to the gut.
2. Three paired lateral branches to three paired glands (suprarenal glands, kidneys, and gonads).
3. Paired posterolateral branches to the abdominal wall.

The arterial supply for the foregut derivatives in the abdomen is provided by branches of the coeliac trunk. It is a short, wide vessel (1.25 cm long), which arises from the front of the abdominal aorta immediately below the aortic opening of the diaphragm at the level of the intervertebral disc between T12 and L1 vertebrae. It runs forward and somewhat to the right and immediately divides into following three branches: (a) left gastric artery, (b) common hepatic artery and (c) splenic artery.

Superior mesenteric artery is the artery of midgut. It supplies all the derivatives of midgut, namely duodenum below the opening of bile duct, jejunum, ileum, appendix, caecum, ascending colon, right two-third of transverse colon and lower half of head of pancreas.

The coeliac artery is an essential source of blood, since the interconnections with the other major arteries of the gut are not sufficient to sustain adequate perfusion. Thus it cannot be safely ligated in a living person, and obstruction of the coeliac artery will lead to necrosis of the structures it supplies. The embryological significance of the above mentioned common pattern, and any variations in it, has been described.(1) At the end of the fourth week of intrauterine life, a number of paired vessels in the form of vitelline arteries initially supply the yolk sac.

Gradually they fuse and form the ventral spinal arteries located in the dorsal mesentery of the gut. In the adult, they are represented by the coeliac, superior mesenteric, and inferior mesenteric arteries. These vessels supply the derivatives of foregut, midgut, and hindgut, respectively (1). As anterior branches of the aorta, the coeliac trunk and superior mesenteric artery are the most important as they supply the gastrointestinal tract.

The superior mesenteric artery is the second ventral branch of the abdominal aorta. It runs anterior to the third part of the duodenum and enters the mesentery of the small intestine. Its normal branches include inferior pancreatico-duodenal, jejunal, ileal, ileo-colic, right colic and middle colic arteries. The superior mesenteric artery supplies a large part of the intestine from the descending part of the duodenum to the mid-transverse colon. Variations of these arteries and their relationship to surrounding structures are, therefore, of particular importance from a surgical perspective(2-5).

Variations in the vascular pattern of the coeliac trunk and its branches should be considered while planning surgical interventions on the abdominal part of the oesophagus, the stomach, duodenum, liver, pancreas, gallbladder and spleen.

II. Case Report

During the routine undergraduate dissection of abdomen of an adult male cadaver in the Department of Anatomy, S.M.S. Medical College, Jaipur- the coeliac trunk and superior mesenteric artery were noted to have a common anatomic origin from the aorta.



1=abdominal aorta, 2=celiac trunk, 3=superior mesenteric artery, 4=common hepatic artery, 5=left gastric artery, 6=splenic artery, 7=inferior mesenteric artery.

III. Discussion

The multiple anatomical variations in the branching pattern of the abdominal aorta (AA) has an embryological basis - developmental changes in the ventral splanchnic arteries. Mechanical effects due to unrelated anomaly are also seen- in some cases, the celiac trunk may be compressed by an overly large median arcuate ligament of the diaphragm. Coeliac and superior mesenteric arteries having a common origin from the aorta accounts for less than 1% of all abdominal vascular anomalies, and it is estimated to have an incidence of 0.25% (6-8).

The yolk sac is supplied by a number of paired vessels called omphalo-mesenteric or vitelline or ventral splanchnic arteries at the end of 4th week of intrauterine life [3]. These vessels gradually fuse in the later part of the embryonic life and in the dorsal mesentery of the gut they form the arteries which in adult life are represented as the celiac trunk (CT), superior mesenteric artery (SMA) and inferior mesenteric artery (IMA). Defective disappearance/fusion of these ventral splanchnic arteries during fetal life can be seen manifesting as the anatomical variation observed in CT & SMA [1].

Singular coeliaco-mesenteric trunk is very rare: about 1%-2.7%, of all anomalies involving the coeliac axis, which arise at the level of L1(5). The investigative scanning without knowledge of the arterial architecture of the patient in this critical area can lead to misinterpretations, risk of surgical error and lethal complications. The injury of the Coeliaco-mesenteric trunk can result in ischemia to both foregut and midgut derivatives(9).

M buru et al(10) did a study of 123 specimens at Kenyatta National hospital, Nairobi, Kenya and observed that the Coeliac trunk was trifurcated in 61.7%, bifurcated in 17.9% and gave collateral branches in 20.3%. Additional branches of Coeliac trunk other than the normal branches are referred to as collaterals. Collaterals observed include dorsal pancreatic, Gastroduodenal, inferior phrenic and ileal arteries. Dorsal pancreatic was the most common collateral occurring in 14.8% of cases, while inferior phrenic was found in 4.9%; *in our case* inferior phrenic artery was seen arising as a collateral (branch of left gastric).

Piano et al (11) reported the origins of inferior phrenic artery as follows: from Aorta (61.6%), from Coeliaco-mesenteric system of aorta including the celiac trunk (28.2%) and from left gastric artery (2.9%).

Each dorsal aorta even before the stage of its fusion gives ventral splanchnic branches, which supply the gut and its derivatives. With the fusion of the dorsal aortae, the ventral branches fuse and form a series of unpaired segmental vessels, which run in the dorsal mesentery of gut and divide into ascending and descending branches. These vessels eventually form dorsal and ventral longitudinal anastomotic channels, With the formation of longitudinal anastomotic channels, numerous ventral splanchnic branches are withdrawn and only three trunks persist as coeliac artery for foregut, superior mesenteric artery to midgut, and inferior mesenteric artery to hindgut.

Knowledge about the variations of celiac trunk and superior mesenteric artery are of extreme clinical importance in the areas of the Appleby procedure(12). Prior knowledge about the anomalous branching pattern of celiac trunk and superior mesenteric artery is essential to successfully accomplish surgical, oncologic or interventional procedures including lymphadenectomy around a hepato-spleno-mesenteric trunk, aortic replacement with re-implantation of the trunk, and chemo-embolization of liver malignancies, all of which can potentially create significant morbidity because of the large visceral territory supplied by a single vessel(13).

IV. Conclusion

Anatomical variations in the branching pattern of coeliac trunk and superior mesenteric artery are of considerable importance in liver transplants, laparoscopic surgeries, radiological abdominal interventions and penetrating injuries to the abdomen. Careful identification and dissection of coeliac trunk and its branches is therefore essential to avoid iatrogenic injury in surgical, oncologic or interventional procedures and should be kept in mind to avoid diagnostic mistakes and therapeutic complications.

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