

## CT angiography based Study of Variations in Coeliac Trunk and its surgical implications.

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### **Abstract:**

**Objective:** The aim of this study was to detect and describe the existence and incidence of anatomical variations of the coeliac trunk by Using imaging technique.

**Materials and Methods:** 80 patients visited the, radiology department of S.M.S.MEDICAL college jaipur . To cover the whole abdominal aorta in each patient, spiral CT angiography scan will be made and thin slices (0.6 mm) axial images will be obtained, Both sagittal and coronal images will be reconstructed.

**Results:** We found that 77.5% of patients presented a classic anatomy of the coeliac trunk, Using this imaging technique, we found the existence of variations of these abdominal blood vessels in 22.5% of patients.

**Conclusion:** The arterial variations should not be ignored and with an accurate knowledge on the anatomical variations, many operative and post operative complications can be avoided. The knowledge on the CT variations would enable the radiologists in protecting the important vessels prior to transcatheter therapies, and also in preventing inadvertent injuries.

**Keywords:** Angiography, variations, coeliac trunk.

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### **I. Introduction**

The coeliac trunk is the first ventral branch of abdominal aorta, arises just below the aortic hiatus at the level of T12/L1 vertebral body. It is 1.5-2 cm long and passes almost horizontally forwards and divides into the left gastric, common hepatic and splenic arteries. The most common classical type of coeliac trunk is known as trifurcation and was first observed by Haller as tripus Halleri. It was, and still is, considered to be the normal appearance of coeliac trunk. According to Haller, coeliac trunk divides into common hepatic, splenic and left gastric arteries, while the other divisions of coeliac trunk rarely occur in human populations. Past research on cadavers and living persons has shown a plethora of variations. About 15% of the population displays significant variations from the typical branching pattern.

Coeliac trunk supplies the parts of the foregut. Variations in the branching pattern of the coeliac trunk are therefore having immense surgical importance. Anatomic variants of the coeliac trunk is essential to successfully accomplish surgical, oncologic, or interventional procedures including lymphadenectomy around hepato-spleno-mesenteric trunk, aortic replacement with reimplantation of the trunk, or chemoembolization of liver malignancies, all of which can potentially create significant morbidity because of the large visceral territory supplied by a single vessel(1). The coeliac trunk is a surgically significant artery of the abdomen which supplies the supracolic organs. Variations of these arteries are important from a surgical perspective.

### **II. Materials And Methods**

The study will be conducted in Department of Anatomy in collaboration with Department of Radiology, SMS Medical College & Hospital, Jaipur (Rajasthan). CT angiography will be randomly selected from the records of 80 patients visited the, radiology department of S.M.S.MEDICAL college jaipur . To cover the whole abdominal aorta in each patient, spiral CT angiography scan will be made and thin slices (0.6 mm) axial images will be obtained, Both sagittal and coronal images will be reconstructed. 3-D reconstruction will be done from the data gained by the spiral CT examination. Manipulation of the 3-D images will be done by rotation to get the correct planes and deletion of unnecessary anatomical details to clarify the arteries away from superimposed structures. Data will be saved into DVD.

All subjects undergoing the computed tomographic angiography of the abdominal aorta for any medical or surgical indications were included in study group.

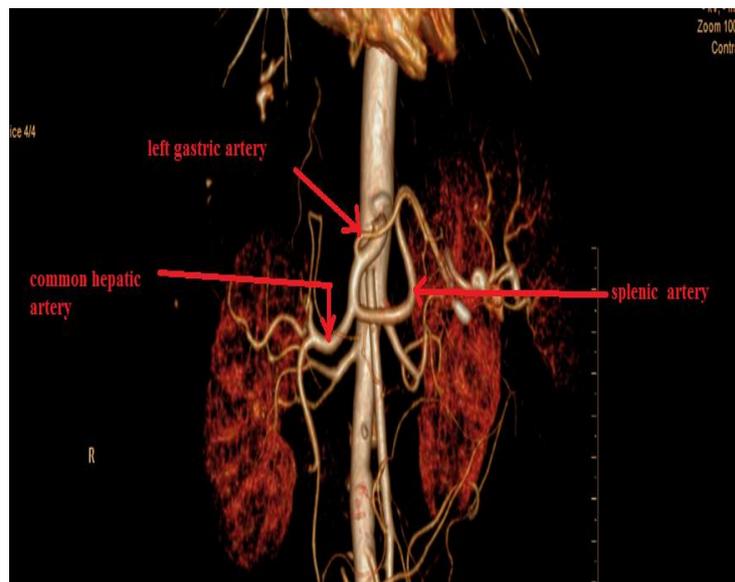
Subjects who have- Arterial pathology such as aneurysm or tumours, excluded from this study.

### III. Results

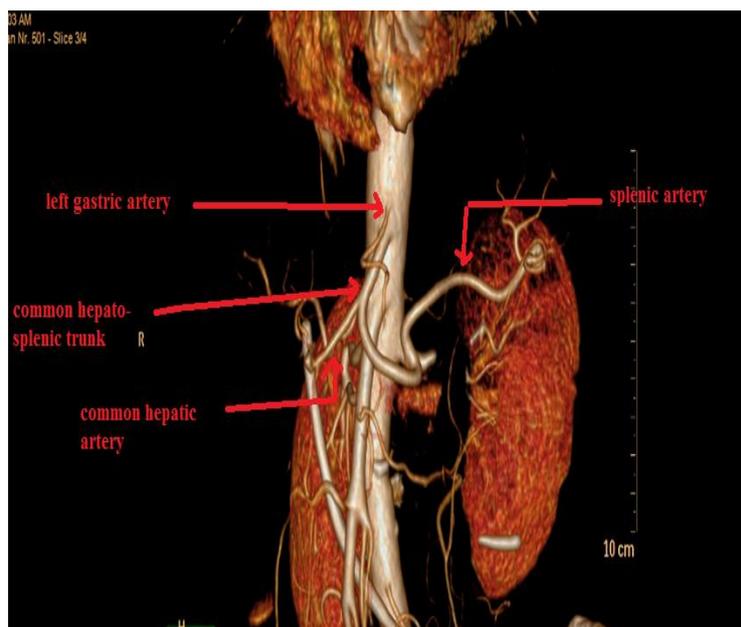
In the clinical trial conducted on total 80 patients, it is found that 8 patients i.e. 10% , were having left gastric artery originates directly from abdominal aorta and 4 patients i.e. 5% inferior phrenic artery directly from coeliac trunk , there is presence of common coeliaco-mesenteric trunk in 3 patients i.e. 3.75% and presence of arch of buhler in 3 patients i.e. 3.75% .

We found that 77.5% of patients presented a classic anatomy of the coeliac trunk, The coeliac trunk arises from the ventral side of the abdominal aorta, at the level of the 12th thoracic vertebra and then divides into three branches, the left gastric artery, the common hepatic artery and splenic artery.

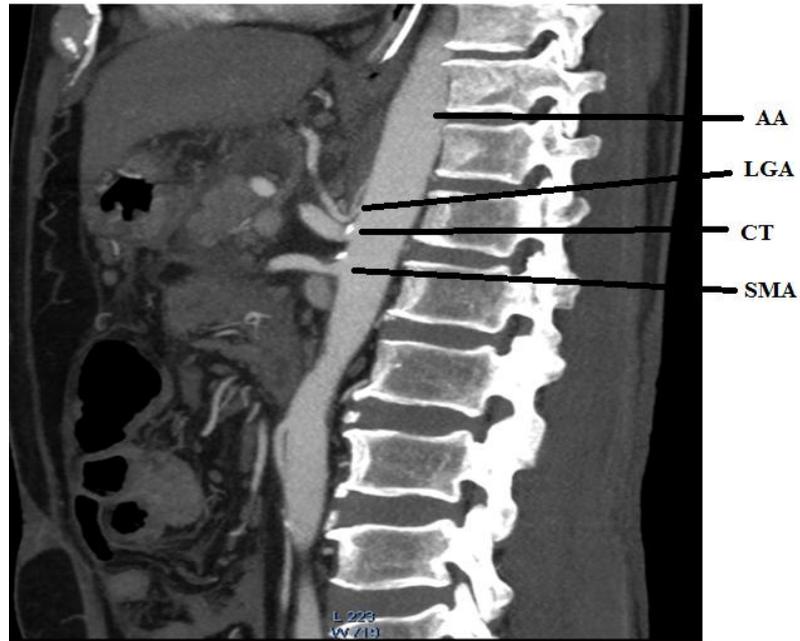
Using this imaging technique, we found the existence of variations of these abdominal blood vessels in 22.5% of patients. The most frequent variation was The origin of the left gastric artery direct from the abdominal aorta (10%), next variation according to frequency, was origin of inferior phrenic artery from directly from coeliac trunk detected in 5% of patients . presence of common coeliaco-mesenteric trunk in 3.75% patients. The arc of Buhler as anastomosis between the coeliac trunk and superior mesenteric artery was detected in 3.75% of cases.



**Fig. 1.**Normal branching pattern of coeliac trunk.

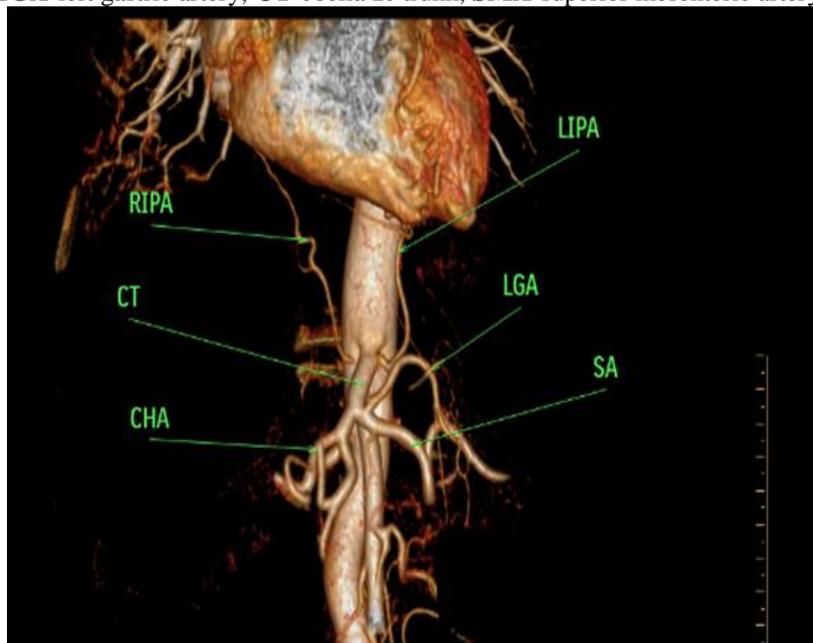


**Fig. 2.1** Origin of the left gastric artery from the abdominal aorta.

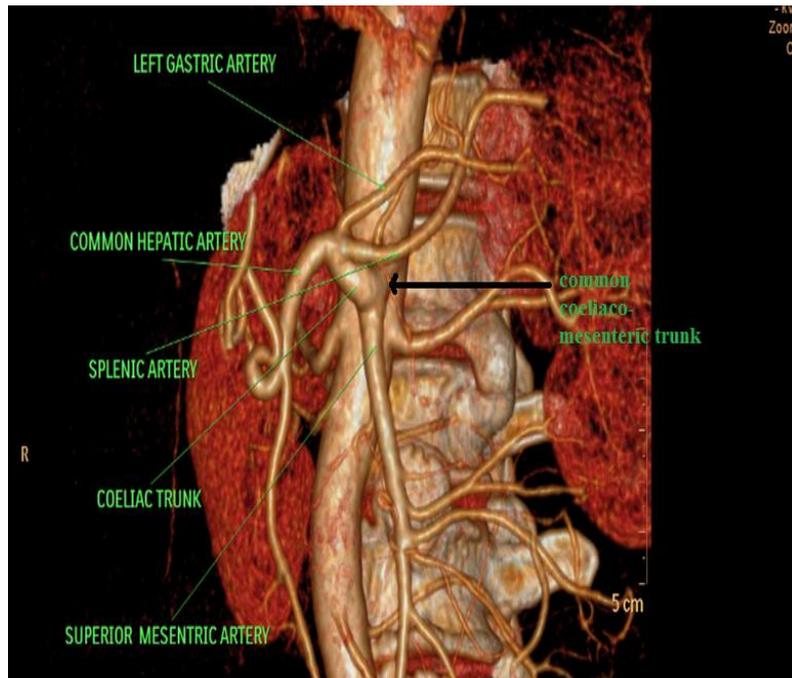


**Fig. 2.2** Contrast-enhanced computed tomography scan in sagittal section showing left gastric artery arises from abdominal aorta and artery can be delineate up to stomach.

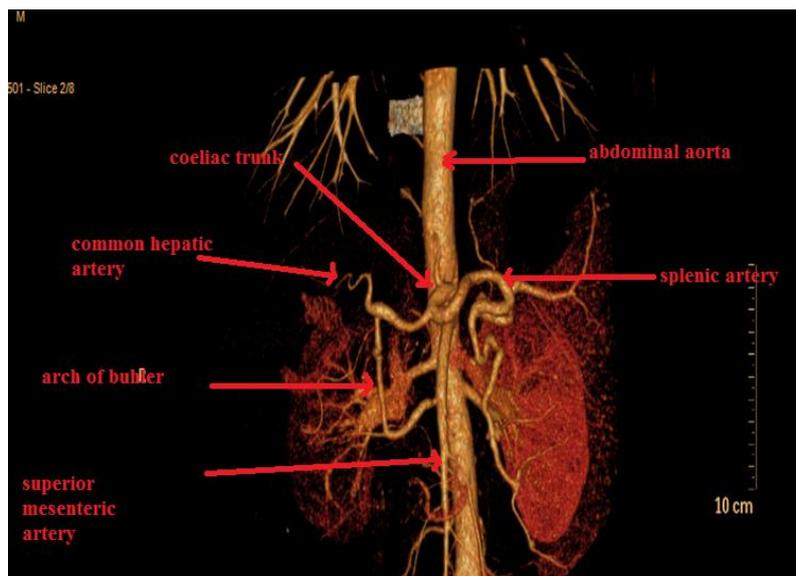
LGA-left gastric artery, CT-coelia zc trunk, SMA-superior mesenteric artery).



**Fig. 3.** Right Inferior phrenic artery arise from coeliac trunk.



**Fig. 4.** The presence of a common trunk of the coeliac trunk and the superior mesenteric artery.



**Fig. 5.** The anastomosis (arch of bulber<sup>s</sup>) between the coeliac trunk and the superior mesenteric artery.

#### IV. Discussion

Coeliac trunk is a chief artery of the fore gut. It supplies all derivatives of the foregut that lie in the abdominal cavity. It is about 1.25cm in length and 6 -8mm in diameter. It gives of three main branches as left gastric, common hepatic and splenic artery, which was found in 86%[2].Vascular anatomical variations of the coeliac trunk and the superior mesenteric artery were described by Tandler in 1904, as the result of disorders during embryogenesis. During human embryogenesis, four roots of the omphalo-mesenteric artery, as the anterior branches of the abdominal aorta, are connected by the ventral longitudinal anastomosis .The central two of these four roots disappear during embryogenesis and the ventral anastomosis connects the first and the fourth roots. The splenic, left gastric and common hepatic artery arises from this longitudinal anastomosis.

Yildirim [2] dissected the upper abdominal region of 52 cadavers and observed in one case, a hepatosplenic trunk with the left gastric artery directly originating from the abdominal aorta. In the present study, in 10% specimens, the left gastric artery arise directly from the abdominal aorta. The left gastric artery is a mobile vessel whose origin may vary between the aorta and anywhere along the coeliac trunk up to a

trifurcation. The origin of left gastric artery from the aorta has importance in operative procedures on supracolic organs, in stomach resection and during dissection of lymph nodes along this artery in gastric cancer.

Pulakunta [3] had observed the origin of inferior phrenic arteries in 4(12.5%) out of 32 cases. The present study showed the origin of inferior phrenic arteries from coeliac trunk in 4% specimens. The variations of inferior phrenic arteries are important for surgeons to avoid unintentional sectioning of small caliber arteries during coeliac artery decompression in the compression syndrome of coeliac trunk by the median arcuate ligament. [4,5]. Various anatomical variations in the coeliac trunk–hepatic arterial system and the renal arteries have also been reported in patients undergoing multidetector CT (MDCT) angiography of the abdominal aorta . The existence of a common celiac-mesenteric trunk is a rare variation and according to available literature, it has been found in less than 2% of cases (Hazirolan et al. 2009; Yi et al., 2007; Yilmaz et al., 2013). In our study, the percentage of this variation was 3%.

Buhler's arc is the anastomosis between the superior mesenteric artery and the coeliac trunk. This vascular anastomosis is present in less than 4% of individuals according to Dubel (Dubel, 2007), and 1.7% according to Ferrari et al. (2007). Apart from normal branching of the coeliac trunk, many more branching variations have been reported in the literature[6,7,8] . .

Computed tomography angiogram of one hundred and twenty five (125) patients performed by Rawat showed 2% cases of common hepatic artery arising from superior mesenteric artery (9). In a retrospective study of multidetector CT (MDCT ).

Anatomic variations of the coeliac trunk are due to developmental changes in the ventral segmental (splanchnic) arteries. Presence of additional arteries may provide collateral circulation which may be important during transplant surgeries. Anatomical variations in the branching pattern of the coeliac trunk are of considerable importance in liver transplants, laparoscopic surgery, radiological abdominal interventions and penetrating injuries to the abdomen (10).

## V. Conclusion

To conclude, the coeliac trunk which is the artery of the foregut is known for its variation. The variations were seen in the branching pattern. The branching pattern varied from bifurcation to pentafurcation with trifurcation as a common pattern. There was a significant association between short coeliac trunk and varying branching pattern. These variations should be kept in mind during surgical and radiological procedures in upper abdomen to avoid intraoperative and post –operative complications.

## Acknowledgements

Event if I had been a scholar of all the languages in the world. It would not have been possible for me to pen down my deep respect and gratitude for my esteemed teacher and learned guide DR.DHIRAJ SAXENA (Professor) Department of Anatomy SMS Medical College and Hospital Jaipur .

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