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Coeliaco-Mesenteric Trunk– A Rare Anomaly of the Coeliac Trunk

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ABSTRACT

The Coeliaco-mesenteric trunk, characterized by the shared origin of the coeliac trunk and the superior mesenteric artery, represents a rare but clinically important anatomical variation within the abdominal vasculature. Knowledge of variations of the abdominal vascular system and their origins is of great importance to surgeons to ensure optimal patient outcomes and also to mitigate the potential complications that may arise due to this lack of knowledge.

Present case: During routine dissection for 1^{st} year MBBS (2022-23), of the abdominal region of a 60 year-old male cadaver, there was an unusual presentation of multiple blood vessels at the level of origin of the coeliac trunk.

Upon further dissection, the superior mesenteric artery was found to be originating from this group of arteries. This artery was found to be passing through mesentery upto transverse colon. No other distinct blood vessel was found at the level where the superior mesenteric artery usually originates.

Conclusion: This case underscores the importance of thorough pre-operative assessment and awareness of anatomical anomalies to facilitate safe and effective management strategies.

KEYWORDS: Abdominal Vasculature, Coeliac Trunk, Coeliaco-mesenteric trunk, Superior Mesenteric Artery

INTRODUCTION:

During the developmental phase of the primitive gut, the dorsal aorta issues ventral branches, known as vitelline arteries, which extend to the yolk sac. These vitelline arteries gradually coalesce to give rise to the principal arteries in adults – the coeliac trunk, and the superior mesenteric artery. The inferior mesenteric artery is derived from the umbilical arteries. These arteries play vital roles in supplying derivatives of the foregut, midgut, and hindgut, respectively. [1]

The coeliac trunk is the first anterior branch and arises just below the aortic hiatus at the level of T12/L1 vertebral bodies. It passes horizontally forward and slightly right above the pancreas and the splenic vein. It subsequently bifurcates into three branches – the left gastric, common hepatic, and splenic arteries. This trunk is responsible for supplying crucial structures such as the liver, stomach, pancreas, and a segment of the duodenum. [2] The superior mesenteric artery emerges anteriorly from the abdominal aorta, typically below the origin of the coeliac trunk, and courses in front of the uncinate process of the pancreas and the third part of the duodenum. It then enters the root of the mesentery. This artery plays a pivotal role in supplying a substantial portion of the gastrointestinal tract, ranging from the descending part of the duodenum to the right two-thirds of the transverse colon. [3]

CASE REPORT: While searching for the coeliac trunk during the routine dissection of the abdominal region of a 60-year-old male cadaver, multiple blood vessels were discovered originating at the same level. Upon further dissection, a blood vessel from this group of vessels was found passing through the mesentery and supplying the small intestine and the large intestine upto transverse colon. This blood vessel was identified as the superior mesenteric artery. Other blood vessels were discovered at this same level, which were then identified as the branches of the coeliac trunk. This variation discovered, wherein the coeliac trunk and the superior mesenteric artery sharing a common origin from the abdominal aorta, was referred to as the Coeliaco-mesenteric Trunk.(Figures 1 and 2) [4]

Variations in the anatomy of these arteries and their relationships with the surrounding structures hold significant surgical implications. Understanding such variations is critical for surgical planning and interventions.

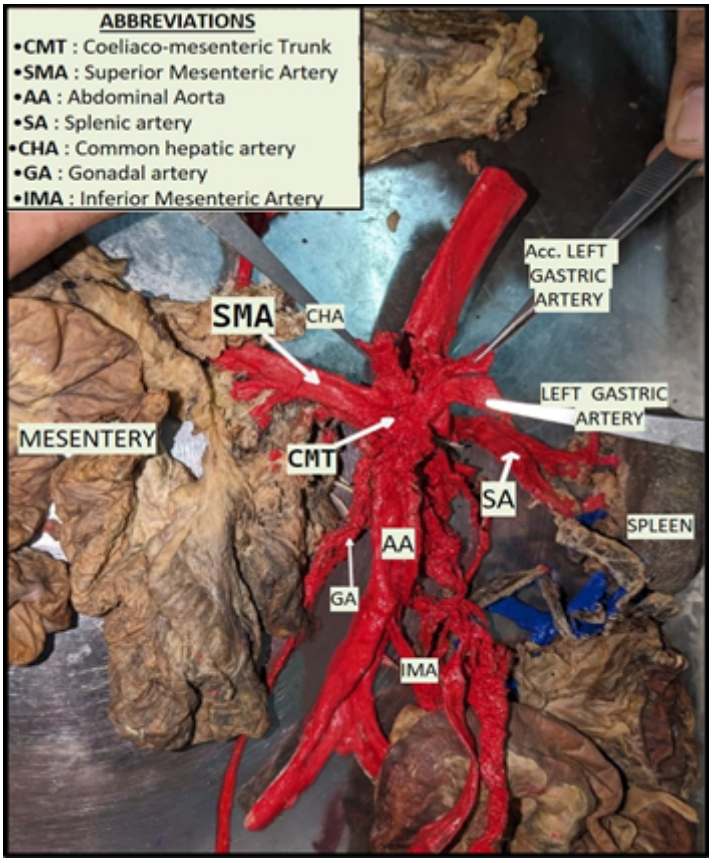

Figure 1: Picture of the Coeliaco-Mesenteric Trunk

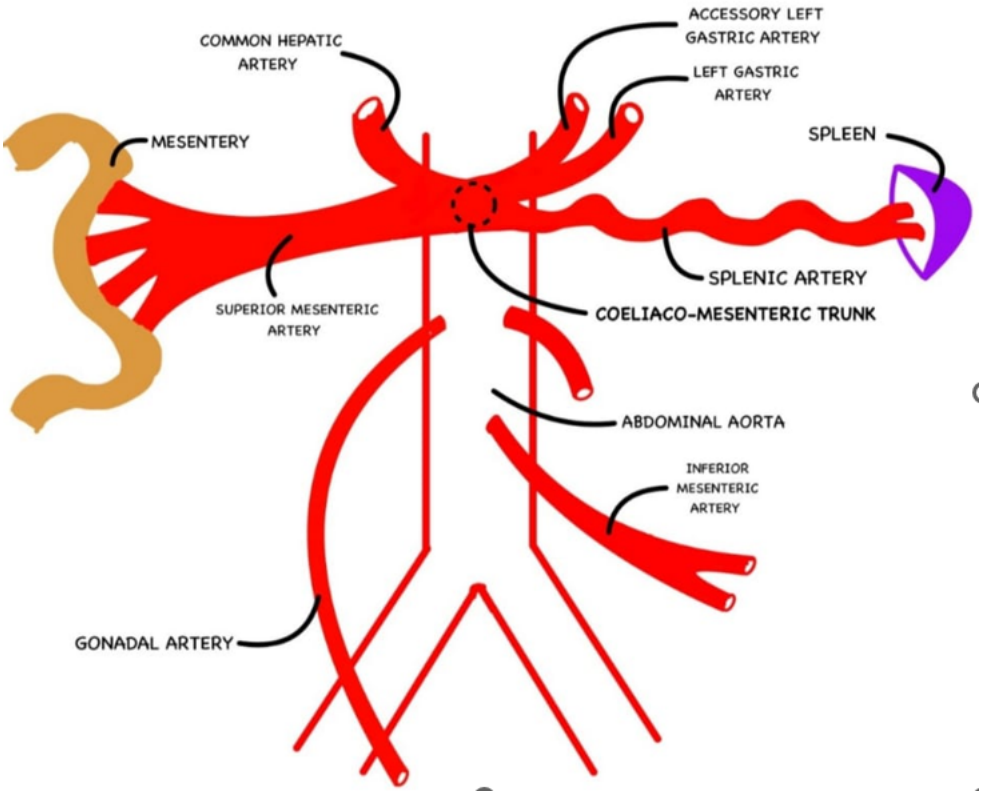

Figure 2: Schematic Diagram of Coeliaco-Mesenteric Trunk

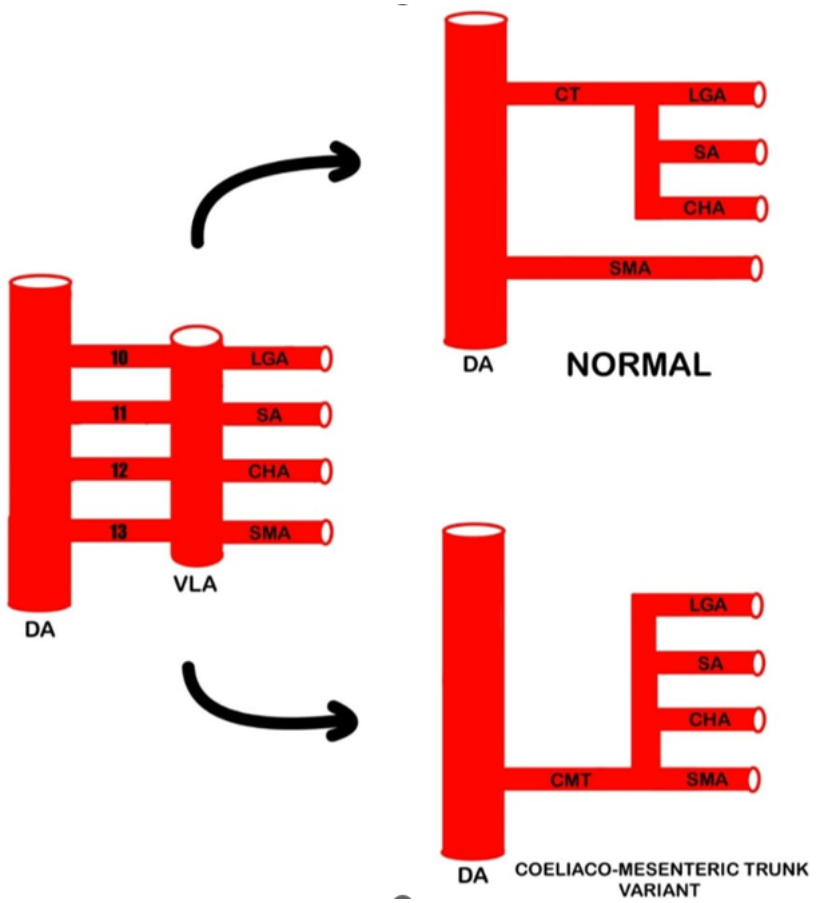

Figure 3: Schematic Representation of Normal and Variant Development of the Coeliac Trunk and Superior Mesenteric Artery (DA: Dorsal Aorta, SMA: Superior Mesenteric Artery, CHA: Common Hepatic Artery, CMT: Coeliaco-Mesenteric Trunk, LGA: Left Gastric Artery, SPA: Splenic Artery, IMA: Inferior Mesenteric Artery, VLA: Ventral Longitudinal Anastomosis)

DISCUSSION:

Encountering anomalies where both the coeliac and superior mesenteric arteries share a common origin from the aorta is rare, representing less than 1% of all abdominal vascular variations, with an estimated incidence of 0.4% to 2.7%. [5] According to Panagouli's classification, this anomaly is classified as a Coeliaco-mesenteric trunk, which is Type IV (Type IV of Adachi's classification, and Type VI of Michel's classification) with a prevalence of 0.76%. [4, 6] This variation can be traced back to embryonic development, where the superior mesenteric artery is considered an integral part of the coeliac complex.

Embryologically, these anatomical variations are rooted in differences in the coeliac trunk's diameter, length, or location. During the 4th week of intrauterine life, the fusion of dorsal aortae forms unpaired segmental vessels in the gut's dorsal mesentery. The coeliac and superior mesenteric arteries develop from the 10th and 13th metameric ventral splanchnic (vitelline) arteries. According to Tandler's observations in 1904, initially, the vitelline arteries are connected by a ventral longitudinal anastomosis. The coeliac and its three branches, and the superior mesenteric artery develop from the 10th to 13th vitelline arteries. Normally the roots of origin of 11th and 12th vitelline arteries from the dorsal aorta disappear, while the 10th root along with longitudinal anastomosis give rise to coeliac trunk and its three branches. After the disappearance of longitudinal anastomosis between 12th and 13th vitelline arteries, the superior mesenteric artery develops from the 13th vitelline artery.

Anomalies of the coeliac trunk and superior mesenteric artery can occur due to persistence of the ventral longitudinal anastomosis and regression of some of the roots of vitelline arteries. Embryologically, therefore, the occurrence of Coeliaco-mesenteric trunk can be explained by the regression of the 10th root and persistence of ventral anastomosis between 12th and 13th roots. The common hepatic, left gastric, and splenic arteries typically originate from this longitudinal anastomosis, with these branches usually separated from the 13th root (future superior mesenteric artery)Figure 3. [7]

Studying embryology helps in understanding anatomical anomalies, assisting surgeons in planning and execution during surgery like pancreaticoduodenectomy. [8] Sur-

geons aim for the best outcomes while minimizing complications related to unique vascular patterns. Integrating embryological insights into clinical practice is crucial for informed decision-making and improving patient care. The Coeliaco-mesenteric trunk's size and positioning can lead to compression from the median arcuate ligament and aortic opening, highlighting its relevance in evaluating Median Arcuate Ligament syndrome (Dunbar syndrome). [9, 10]

CONCLUSION:

Awareness of variations in the coeliac trunk and superior mesenteric artery is crucial for surgical gastroenterologists, particularly in the context of procedures like the Appleby technique, laparoscopic surgery, and upper abdominal radiological interventions. This understanding is vital to avoid complications in surgical, oncologic, or interventional procedures, including lymphadenectomy around a hepatosplenomesenteric trunk, aortic replacement with trunk reimplantation, or chemoembolization for liver malignancies.

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