Coeliac trunk and its branches: anatomical variations and clinical implications

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INTRODUCTION
Knowledge of anatomical variations of the great vessels of the abdomen, including the coeliac trunk, is important for clinicians planning surgical intervention and radiological imaging. The present study aimed to record the prevalence of variations in the vascular pattern of branches of the coeliac trunk in cadavers.

METHODS
A total of 50 properly embalmed and formalin-fixed cadavers from the Indian population were selected for the study. Dissection included surgical incision, followed by mobilisation of the anatomical viscera, to observe and record the branching pattern of the coeliac trunk.

RESULTS
The left gastric, common hepatic and splenic arteries were found to arise from the coeliac trunk in 86% of cadavers. In 76% of cadavers, the origin of the gastric artery was proximal to the bifurcation of the coeliac trunk into the common hepatic and splenic arteries. In one case, all three branches arose directly from the abdominal aorta, and the origin of the splenic artery was 1 cm distal to the origin of the left gastric and common hepatic arteries. In another case, the common hepatic and left gastric arteries arose from the coeliac trunk, and the origin of the splenic artery was 1.5 cm distal to the abdominal aorta.

CONCLUSION
Vessel ligation and anastomosis are important in surgical procedures like liver transplantation, and background knowledge of the different vascular patterns of branches of the coeliac trunk is vital. The findings of our study could help to minimise complications related to abdominal surgery, including bleeding and necrosis, and facilitate better and more accurate radiological interpretations.

Keywords: anatomy, aorta, cadaver, coeliac trunk, dissection

Anatomical variations were observed in 14% of cases, and these could be broadly classified into three categories: (1) The left gastric, common hepatic and splenic arteries were arising separately and directly from the abdominal aorta (Fig. 1) \( n = 2, 4\% \); (2) There was direct proximal origin of the left gastric artery from the aorta, along with the coeliac trunk dividing terminally into the common hepatic and splenic artery \( n = 4, 8\% \); (3) The coeliac trunk divided into the common hepatic and left gastric arteries, whereas the splenic artery was arising directly from the abdominal aorta \( n = 1, 2\% \). Fig. 1 shows the branches of the coeliac trunk, namely, the left gastric artery and the common hepatic artery arising directly from the abdominal aorta, whereas the origin of the splenic artery was arising directly from the abdominal aorta, 1 cm distal to the origin of the left gastric artery and the common hepatic artery. Fig. 2 shows the left gastric artery and the common hepatic artery as terminal branches arising from the coeliac trunk; on the other hand, the splenic artery was arising directly from the abdominal aorta 1.5 cm distal to the origin of the coeliac trunk.

**DISCUSSION**

The embryological significance of the abovementioned variations has been described. At the end of the fourth week of intrauterine life, a number of paired vessels in the form of vitelline arteries supply the yolk sac. Later, they gradually fuse and form arteries in the dorsal mesentery of the gut, which are represented in adult life as coeliac, superior mesenteric and inferior mesenteric arteries. Incomplete fusion or malfusion of the vitelline arteries during the developmental stage may be responsible for the variations observed in the present study.

During splenectomy, short gastric and splenic vessels are ligated and divided. Laparoscopic-assisted distal gastrectomy and open total or subtotal gastrectomy involve ligation and division of the gastric vessels. In laparoscopic surgery, where the operative field is relatively limited, there is a chance of ligation or division of the wrong vessel due to a lack of awareness of the anatomical variations, which may lead to bleeding and ischaemia or necrosis of the organ being irrigated.

Malnar et al reported that the coeliac trunk divides into the common hepatic artery and splenic artery, whereas the left gastric artery originates separately, proximal to the bifurcation of the coeliac trunk in 72% of cases in their study on Croatian cadavers. In our study, the aforementioned vascular pattern was prevalent in 76% of cadavers. Song et al reported the prevalence of a normal coeliac axis in 89.1% of their patients and identified anatomical variations in 9.64% of patients by studying spiral CT images and digital subtraction angiography in the Korean population. We observed the origin of the left gastric, common hepatic and splenic arteries from the coeliac trunk in 86% of the cadavers in our study.

Knowledge of the aforementioned anatomical variations is useful in laparoscopic surgeries, coeliac axis compression syndrome and aortic replacement with re-implantation of the coeliac trunk, and could help surgeons to successfully accomplish abdominal interventions and avoid catastrophic complications. Knowledge of coeliac trunk variations would enable interventional radiologists to protect important vessels prior to transcatheter therapy, and recognition of the vascular pattern would also prevent inadvertent injury. We hope that the present study would help to minimise complications related to abdominal surgeries, including bleeding and necrosis, as well as facilitate better and more accurate radiological interpretation.

**REFERENCES**