



## Variant Anatomy of the Coeliac Trunk and Its Branches

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### ABSTRACT

*The knowledge of abdominal vascular anatomy is very important for surgeons and radiologists to perform many of the clinical diagnostic evaluations. The coeliac trunks; one of the branches of the abdominal aorta shows numerous variations in its branching pattern and its branches. Total 40 cadavers were included in the present study. The aim of this study was to find out the variation in origin, course, branching pattern, length and diameter of coeliac trunk. Dissection of the trunk was performed after opening of the peritoneal cavity. Measurements were noted and statistically analyzed. The coeliac trunk originates from the abdominal aorta between T12 & L1 vertebra in maximum number of cases i.e.71.68%. The average measurement of length was 1.86 cm. The average measurement of diameter was 9.83mm. The branching pattern of the coeliac trunk was noted as classical trifurcation, abnormal trifurcation, bifurcation & tetrafurcation. The most common was the classical trifurcation seen in 47.5%, bifurcation 35.0%, abnormal trifurcation 10.0% and tetrafurcation of coeliac trunk were seen in 5.0% cases. The absence of coeliac trunk was present in 2.5% case, the branches of coeliac trunk directly originated from the aorta.*

**KEYWORDS:** Coeliac trunk, Hepatosplenic trunk, Dorsal pancreatic artery.

### Introduction

The coeliac trunk (CT) is the first anterior branch and arises just below the aortic hiatus at the level of T12/L1 vertebral bodies and 1.5–2 cm long in length.<sup>1</sup> The trunk of the artery proceeds forwards and somewhat to the right, and divides into three branches; Left gastric artery, Common hepatic artery & Splenic artery.<sup>2</sup> Variations of origin and course of coeliac trunk are not only of anatomical and embryological interest but also of practical and clinical importance; knowledge of Variations of the coeliac trunk can be valuable in abdominal surgery. With the development of techniques of arteriography, the knowledge of arteries and their variations has acquired a special importance for correct interpretation of the different, and sometimes very complicated roentgenographic studies.<sup>3</sup>

Since there is no anastomosis between the hepatic arteries, an injury to the hepatic artery during operation would result in hepatic damage with serious morbidity. Therefore, preoperative information on the anatomical features of the hepatic arteries is very important in hepatobiliary surgery.<sup>4</sup> This variable anatomy may be useful in planning and executing radiological interventions such as coeliacography and chemoembolisation of hepatic tumors.<sup>5</sup>

### Materials and Methods

In the present study 40 formalin embalmed cadavers were dissected in department of Anatomy, MGM Medical College, Navi Mumbai. Incision of anterior abdominal wall was made; the flap of the skin was reflected to expose the superficial fascia of the anterior abdominal wall. The remaining different layers were reflected in an order. Finally after cutting the falciform ligament, the anterior abdominal wall was reflected inferiorly and the abdominal cavity was exposed. The viscera of the abdominal cavity were identified individually.

Liver was identified & removed by incising the retro hepatic part of inferior vena cava from its course, and also the structures at the porta hepatis. Lesser omentum was identified. Within the free margin of the lesser omentum; portal vein, bile duct, hepatic artery were cleaned. Hepatic artery proper was traced inferiorly and confirmed, that it was the continuation of the common hepatic artery. Common hepatic artery was traced to the left and finally coeliac trunk was identified. The coeli-

ac trunk and its branches were cleaned properly. The trunk was studied with respect to the following parameters:

- Vertebral level of origin.
- Diameter of the artery.
- Length of the artery.
- Variation in origin and course.
- Branching pattern.

### Observations and results

In the present study, the coeliac trunk originates from the abdominal aorta between T12 & L1 vertebra in maximum number of cases i.e.71.68%, at the upper 1/3rd of L1 vertebra in 23.04% and lower 1/3rd of T12 vertebra in minimum number of cases i.e. 5.12%. The diameter of coeliac trunk (table-1) ranged between 9.1-11.0 mm in 22 (56.32%) cases and minimum diameter ranged between 13.1-14.0 mm in 1 (2.56%) cases. The mean diameter of coeliac trunk was 9.83mm.

The maximum length of coeliac trunk (table-2) from origin to its terminal branches ranged between 1.6-2.0 cm in 29 cases (74.24%), ranged between 2.1-2.5cm in 7 (18.0%) cases and minimum length of coeliac trunk ranged between 2.6-3.0 cm in 1 (2.56%). The mean length of coeliac trunk was 1.86cm.

The branching pattern of the coeliac trunk was noted as classical trifurcation, abnormal trifurcation, bifurcation & tetrafurcation. The most common was the classical trifurcation (fig-1) into left gastric, common hepatic & splenic artery in 19(47.5%) cases, bifurcation into left gastric artery and hepatosplenic trunk (fig-2) were seen in 14 (35.0%) cases, abnormal trifurcation of coeliac trunk (fig-3) into common hepatic artery, splenic artery, & dorsal pancreatic artery were seen in 4 (10.0%) cases. Tetrafurcation of coeliac trunk (fig-4) into left gastric artery, common hepatic artery, splenic artery, & dorsal pancreatic artery were seen in 2 (5.0%) cases. The absence of coeliac trunk was present in 1 (2.5%) case, the branches of coeliac trunk (left gastric, common hepatic and splenic artery) directly originated from the aorta.

The inferior phrenic artery which is normally a branch of the abdominal aorta was seen as a branch of the coeliac trunk. The left inferior phrenic

artery was seen in 5 cases, right inferior phrenic artery in 2 cases and both inferior phrenic artery in 3 cases.

Discussion

Anatomical variations involving the visceral arteries are common. While vascular anomalies are usually asymptomatic, they may become important in patients undergoing diagnostic angiography for gastro-intestinal bleeding or prior to an operative procedure or transcatheter therapy.<sup>6</sup>

**Origin:** In the current study of coeliac trunk, it was arising from the aorta between T12 and L1 in 28 cases (71.68%), upper 1/3rd of L1 vertebra in 9 cases (23.04%) and lower 1/3<sup>rd</sup> of T12 vertebra in 2 cases (5.12%). The findings were comparable to the study of Moncada et al<sup>7</sup> and Hofman and Watson<sup>8</sup> who concluded that the vertebral level ranged from upper third of T11 to L2 vertebra with a mean level opposite upper third of L1 vertebra. Slight variability in the vertebral level suggests that treatment planning for carcinoma of stomach, pancreas and hepatobiliary tree, should be individualised as the nodes at risk lie adjacent to this vessel.

**Diameter:** We observed the diameter of coeliac trunk ranged between 9.1-11.0mm in 22(56.32%) cases. Rio Branco<sup>9</sup> in 1912 reported that the diameter of coeliac trunk ranged from 4 to 10 mm, 3 to 12mm (Michels<sup>10</sup>, 1951); 10 to 12 mm (Pignataro<sup>11</sup>, 1969).

**Length:** Rio Branco, 1912 reported that coeliac trunk as a short and calibrous trunk, ranging from 5 to 40mm in length and a mean of 10 to 25 mm<sup>9</sup>. Length of coeliac trunk was observed 1 to 2 cm (Tandler<sup>12</sup>, 1929); 8 to 40 mm (Michels<sup>10</sup>, 1951). We observed the length of coeliac trunk ranged between 1.6-2.0cm with maximum number of cases i.e. 29 (74.24%). The mean length of coeliac trunk was 1.86cm.

**Branching patterns:** Variations in the branches of the CT are the most commonly reported ones and many authors have reported different variation patterns. Some of them were related to its diameter, length, origin, branches, such as in our case. Generally, additional branches of the CT other than its normal branches are referred to as collaterals<sup>13</sup>.

In the present study the trifurcation of coeliac trunk was reported in 47.5% cases, bifurcation 35% and complete absence of coeliac trunk was reported in 2.5% of cases. Michels in 1955 has reported 55% trifurcation of coeliac trunk<sup>14</sup>. Moncada et al.,<sup>7</sup> in 1979 has observed 89% trifurcation of coeliac trunk. Tetrafurcation of coeliac trunk was observed in 5.0% which divided into- left gastric artery, common hepatic artery, splenic artery and dorsal pancreatic artery. The abnormal trifurcation was seen in 10.0% which divided into-common hepatic artery, splenic artery and dorsal pancreatic artery whereas the left gastric artery arises from the coeliac trunk below the trifurcation. Jiji et al., observed that the dorsal pancreatic artery originated from common hepatic artery and directly anastomosed with the middle colic artery, thus forming a Buhler's arcade<sup>15</sup>. In the present study dorsal pancreatic artery was observed in 15% of cases, which is the most common collateral branch.

Conclusion

The present study will increase the knowledge on variational anatomy of the coeliac trunk which may be clinically significant during invasive procedures like angiography, chemotherapy, chemoembolization and other surgical conditions of the abdomen. Therefore, the careful identification and dissection of the CT branches are important to avoid iatrogenic injuries.

Range of diameter(mm)	Total number of case	Total percentage
7.1 - 8.0	3	7.7%
8.1 - 9.0	4	10.24%
9.1 - 10.0	11	28.16%
10.1 - 11.0	11	28.16%
11.1 - 12.0	6	15.36%
12.1 - 13.0	3	7.68%
13.1 - 14.0	1	2.56%

Table-1 Showing Diameter of coeliac trunk.

Range of length (cm)	Total number of case	Total percentage
1.0 - 1.5	2	5.12%
1.6 - 2.0	29	74.24%
2.1 - 2.5	7	18.0%
2.6 - 3.0	1	2.56%

Table-2 Showing length of coeliac trunk.

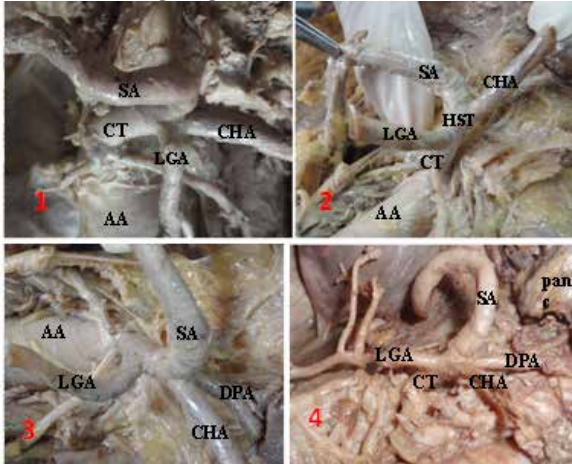


Figure showing: 1-Classical Trifurcation, 2-Bifurcation, 3-Abnormal trifurcation, 4-Tetrafurcation.

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