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Original Research Article

Anatomical Variation of Coeliac Trunk and Its Branches – A Human Cadaveric Study in Telangana Region

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Conflict of interest: Nil

Abstract:

Introduction: It is the first unpaired anterior branch of the abdominal aorta. The coeliac trunk is a short, wide artery about 1.25cm long. It arises from the front of the aorta immediately below the aortic opening of the diaphragm, opposite to the lower border of T12 vertebra. The trunk of artery proceeds forward, somewhat to the right & divided into three branches-left gastric, splenic, common hepatic artery. It supplies the abdominal foregut derivatives -distal oesophagus, stomach, proximal 1/3rd of duodenum, liver, gall bladder, pancreas and spleen.

Aim and Objectives: It is of great importance for the surgical intervention & interventional radiological procedures to be aware of the variation of the coeliac trunk & its branches during surgical & radiological procedures in upper abdomen. The main objective of the present study is to know the level of origin & variation in the branches of the coeliac trunk.

Methods: The present study was undertaken on 22 formalin fixed cadavers (20male&2female) used for undergraduate dissection from department of Anatomy, Osmania medical college over a period of 2 years.

Result: The hallers tripod was found in (2=9.09%), left inferior phrenic artery arises from celiac trunk in (1=4.5%) and common inferior phrenic artery arises from the coeliac trunk in(1=4.5%), gastroduodenal artery directly arises from celiac trunk in(1=4.5%), unusually aberrant left hepatic artery arises from left gastric artery in (1=4.5%),an accessory left gastric artery arising from left hepatic artery in(1=4.5%).

Conclusion: From this study we conclude that variation in the branches of coelic trunk is very common. Knowledge about these variations is important for surgeons during liver transplantation, liver resection for liver cancer, cholecystectomy, gastrectomy for gastric cancers & pancreatic resection for pancreatic cancer, also important for radiologists during diagnostic and therapeutic conventional angiography.

Keywords: Coeliac trunk, Haller's tripod, Inferior phrenic artery, Gasrtoduodenal artery, aberrant left hepatic artery, Accessory left gastric artery.

Introduction

Coeliac trunk is the first unpaired anterior visceral branch of the abdominal aorta. It arises from the front of the aorta immediately below the aortic opening of diaphragm, opposite the lower border of T12 vertebrae and trifurcate into the left gastric artery, splenic artery and common hepatic artery [1]. From these branches, two branches go to left hand side and one branch goes to the right-hand side. Collectively they are major arterial supply to the abdominal oesophagus, stomach, spleen, liver, gall bladder, pancreas and duodenum.

This trifurcation was described by von Haller in 1756 and known as Haller's tripod [2]. The left gastric artery it ascends across the diaphragm, gives rise to oesophageal branches, before continuing anteriorly along the lessor curvature of stomach supplies lower end of oesophagus & both surfaces of stomach along lesser curvature. The splenic artery runs behind the stomach to the left side in a tortuous course along upper border of pancreas. During its course, it contain within the spleno-renal ligament [3]. It terminate into 5 branches which supply the segments of the spleen and its branches supplies body, tail of pancreas, along the greater curvature of stomach & fundus of stomach [4].

The common hepatic artery is the sole arterial supply to the liver and the only branch of the celiac artery to pass to the right hand side.as it travels pass the superior aspect of the duodenum, it divides into its two terminal branches and variations in the arrangement of these branches is common [5,6,7]. Inferior phrenic arteries usually arises from abdominal aorta, it supplies the diaphragm from its inferior aspect. In our study left inferior phrenic artery arises from coeliac trunk supplies left diaphragm and the common inferior phrenic artery arises from coeliac trunk supplies right and left diaphragm, gastroduodenal artery also arises from coeliac trunk supplies greater curvature of stomach, head of pancreas and unusually aberrant left hepatic artery arises from left gastric artery and mainly supplies to the liver.

An aberrant origin of the left hepatic artery necessarily influences the angiographic diagnosis & therapy of gastrointestinal hemorrhage. An accessory left gastric artery arising from left hepatic artery is a unusual variant of gastric artery that supplies abdominal part of oesophagus & cardiac, fundus part of stomach. In this study we aimed to determine the variations of branching pattern of coeliac trunk and its anatomical, clinical importance to surgeons & radiologists.

Materials and Methods

The present study was undertaken on 22 formalin fixed cadevers (20 male & 2 female) used for undergraduate dissection from department of Osmania medical college for a period of 2022 to 2024. After opening the abdomen Coeliac trunk lies behind the lesser sac of peritoneum, after pealing this peritoneum we can able to see the celiac trunk and its branches. Photographs & details of the anatomical variation were taken.

Results

The following variation was encountered during routine dissection of the abdomen for undergraduate students. The most common anatomical variant of celiac trunk is Haller's tripod was found in 2 cadavers accounting for 9.09% (Table. 1/Figure.1,2).

Michel et.al study showed hallers tripod where all 3 branches arises from a single point (trifurcation) was found in 12% cadavers. Prakash et al observed 10% for this pattern.

Petrella et al study on 89 cadevers showed 22.22% forming Haller's tripod. Left inferior phrenic artery arises from celiac trunk in (1=4.5%), (Table.2/ Figure.3) and gastroduodenal artery arises from celiac trunk in (1=4.5%) (Table.3/ Figure.4), common inferior phrenic artery arises from the coeliac trunk (1=4.5%) (Table.4/ Figure.5), unusually aberrant left gastric artery arises from left gastric artery in (1=4.5%) (Table.5/ Figure.6), an accessory left gastric artery arising from left hepatic artery in (1=4.5%)(Table.6/ Figure.7)

Observations: Among the 22 cadavers variations were found in the 7 cadavers.

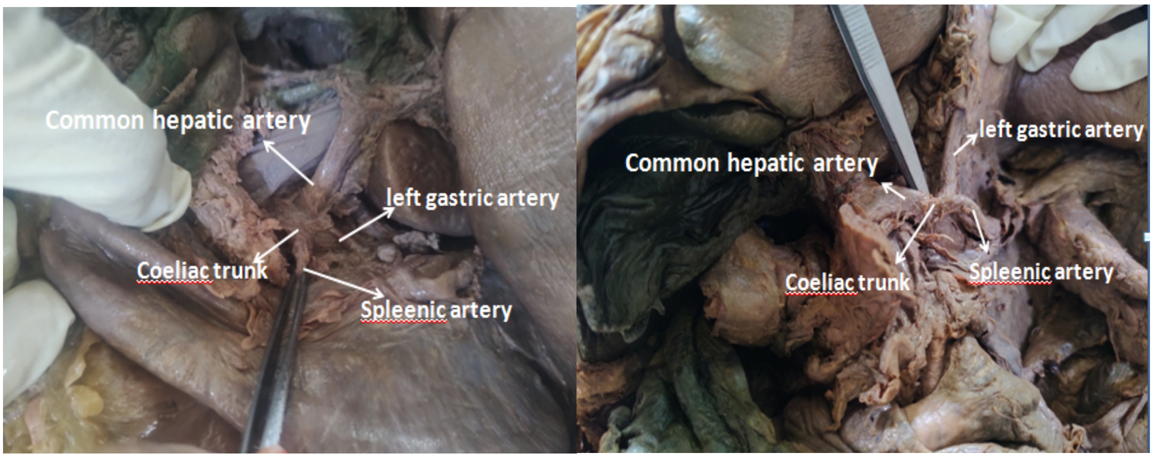

Figure 1,2: "Hallers tripod". Left gastric artery, splenic artery, common hepatic artery have common origin

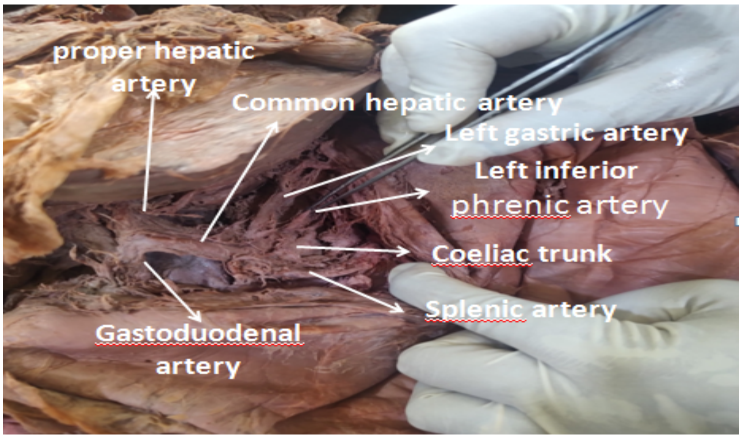

Figure 3: Left inferior phrenic artery arises from coeliac trunk.

Figure 4: gastroduodenal artery arises from celiac trunk

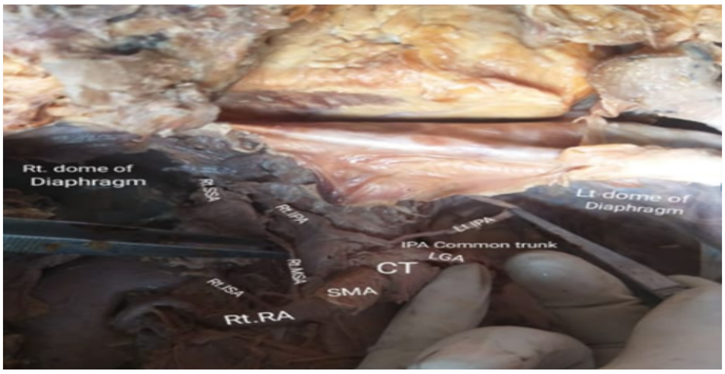

Figure 5: common Inferior phrenic artery arises from coeliac trunk.

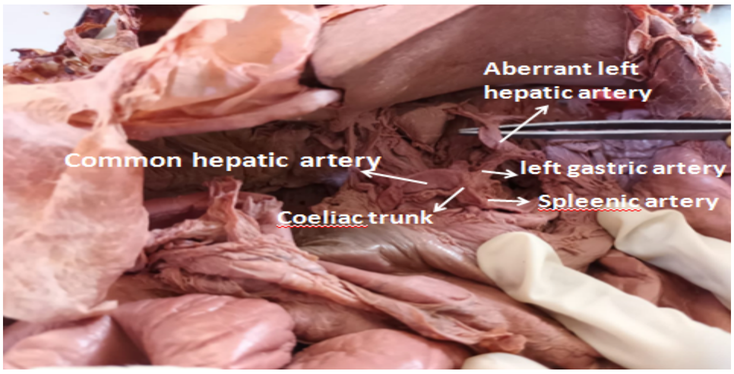

Figure 6: Aberrant left hepatic artery arises from left gastric artery.

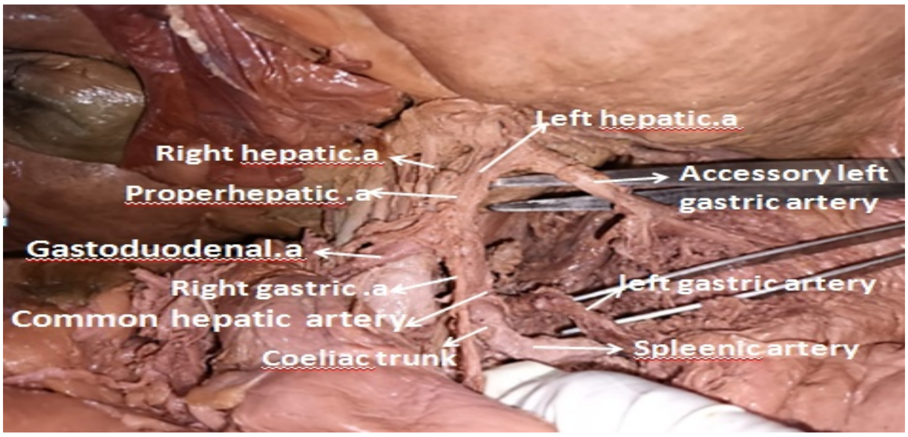

Figure 7: Accessory left gastric artery arises from left hepatic artery.

Discussion

In the present study demonstrate the Coeliac trunk variation & its branches. Variation in the coeliac trunk and its branches kept in mind while performing upper abdominal surgeries to exposure of all visceral vessel injuries is considered very difficult & coeliac trunk exposure is time consuming. It is essential that the surgeons learn critical manoeuvres associated with each vessel & understand the anatomy that allows adequate exposure. Knowledge of the coeliac trunk anatomic patterns & variation are clinically relevant for image guided surgical and radiological interventional procedures, as well as for oesophageal, gastroduodenal, hepatic, biliary, pancreatic, splenic & colonic surgical procedures. The results compared with those of earlier studies.

The results of this study discussed under the following headings

1. Hallers tripod
2. Left inferior phrenic artery arises from coeliac trunk.
3. Common inferior phrenic artery arises from coeliac trunk.
4. Gastroduodenal artery also directly arises from coeliac trunk.
5. Aberrant left hepatic artery arises from left gastric artery.
6. Accessory left gastric artery arises from left hepatic artery.

1. Hallers tripod:

- In the present study on 22 cadevers found 9.09% of hallers tripod.
- Michel et.al study showed hallers tripod where all 3 branches arises from a single point (tri-furcation) was found in 12% cadevers.
- prakash et al abserved 10% for this pattern.
- Petrella et al study on 89 cadevers showed 22.22% forming hallers tripod.

2. Left inferior phrenic artery arises from coeliac trunk:

- In the present study on 22 cadevers found 4.5%.
- Adam whitley et al study on 1752 cadevers showed 46.1%.
- B. Akhilandeswari at al observed 37.5% for this variation.
- B. Szewczynk et al study on 48 cadevers found 12.48%
- Gurses IA at al study on 26 cadevers found 23.07%

3. Common inferior phrenic artery arises from coeliac trunk.

- In the present study on 22 cadevers found 4.5%.
- Adam whitley et al study on 1752 cadevers showed 24.2%.
- B. Akhilandeswari at al observed 28.12% for this variation.
- B. Szewczynk et al study on 48 cadevers found 24.96%.
- Gurses IA at al study on 26 cadevers found 19.23%.

4. Gastroduodenal artery arises from celiac trunk.

- In the present study on 22 cadevers found 4.5%.
- David F at all study on 67 cadevers found 2.9%.

5. Aberrant left hepatic artery arises from left gastric artery.

- In the present study on 22 cadevers found 4.5%.
- Lezzi at al study on 524 cadevers found 6.10%
- Chitra at al study on 50 cadevers found 14%
- Sehgal at al study on 50 cadevers found 8.17%
- Tiwari at al study on 50 cadevers found 8%

6. Accessory left gastric artery arises from left hepatic artery.

- In the present study on 22 cadevers found 4.5%

- Michels at al observed 3%.
- Ligiakais at al observed 8.2%.
- Nakamuro at al observed 3%.

Table 1: Comparison of variations of coeliac trunk & its branches between different studies.

Serial Number	Variations of coeliac trunk & its branches	Researchers	Percentage
1	Hallers tripod	Present study	**9.09%**
		Michel et.al	**12%**
		prakash et al	**10%**
		Petrella et al	**22.22%**
2	Left inferior phrenic artery arises from coeliac trunk	Present study	**4.5%**
		Adam whitley et al	**46.1%**
		B.Akhilandeswari at al	**37.5%**
		B.Szewczynk et al	**12.48%**
		Gurses IA at al	**23.07%**
3	Common inferior phrenic artery arises from coeliac trunk	Present study	**4.5%**
		Adam whitley et al	**24.2%**
		B.Akhilandeswari at al	**24.12%**
		B.Szewczynk et al	**24.96%**
		Gurses IA at al	**19.23%**
4	Gastroduodenal artery arises from coeliac trunk	Present study	**4.5%**
		David F at all	**2.9%**
5	Aberrant left hepatic artery arises from left gastric artery	Present study	**4.5%**
		Lezzi at al	**6.10%**
		Chitra at al	**14%**
		Sehgal at al	**8.17%**
		Tiwari at al	**8%**
6	Accessory left gastric artery arises from left hepatic artery.	Present study	**4.5%**
		Michels at al	**3%**
		Ligiakais at al	**8.2%**
		Nakamuro at al	**3%**

Conclusion

From this study we conclude that variations in the branches of Coeliac trunk are very common. Knowledge about these variations is important for surgeons during liver transplantation, cholecystectomy, gastrectomy, pancreatic resection & liver resection for carcinomas and also important for radiologists during diagnostic & therapeutic angiography.

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