



Original Research Article

Right Hepatic Artery From A Quadrifurcated Coeliac Trunk

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ABSTRACT

Introduction: Knowledge of variation of coeliac trunk is fundamental for a correct pre operative vascular planning in surgical and radiological abdominal procedures like liver transplantation, hepatic arterial infusion, and chemotherapy via catheters for therapy of unresectable advanced liver malignancies.

Materials and methods: Present observation about Quadrifurcated coeliac trunk and anomalous origin of right hepatic artery was noted in an adult male cadaver during routine dissection in Department of Anatomy, Government Medical College and Hospital, Chandigarh.

Observations: Besides giving origin to 3 known branches (common hepatic artery, left gastric artery, splenic artery), there was a branch (right hepatic artery) which arose from right side of coeliac trunk posterior to other 3 branches, passed posterior to bile duct, crossing it from left to right, entered through right end of porta hepatis, and was supplying right lobe of liver.

Conclusion: Persistence of the longitudinal ventral arterial segment connected to the coeliac trunk may be considered as the reason for right hepatic artery originating from coeliac trunk.

Keywords: Bile duct (BD), coeliac trunk (CT), common hepatic artery (CHA), Gastro duodenal artery (GDA), Hepatic artery proper (HAP), splenic artery (SA), Left gastric artery (LGA), right hepatic artery (RHA).

INTRODUCTION

The coeliac trunk is a wide ventral branch of abdominal aorta measuring about 1.25 cm in length. It originates just below aortic hiatus opposite to lower border of T12, passes almost horizontally forwards and divide into left gastric, splenic and common hepatic artery. ^[1] Right gastric artery is a branch from hepatic artery proper. Anomalous vessels are always interesting from a scientific point of view since they often shed lights on obscure problems of phylogeny and ontogeny. The unusual

embryological development of ventral splanchnic arteries can lead to considerable variations in branching pattern of coeliac trunk. ^[2] Knowledge of variation of coeliac trunk and their subtypes is fundamental for a correct pre operative vascular planning in surgical and radiological abdominal procedures like liver transplantation, hepatic arterial infusion, and chemotherapy via catheters for therapy of unresectable advanced liver malignancies. ^[1]

MATERIALS AND METHODS

Present observation about Quadrifurcated coeliac trunk and anomalous origin of right hepatic artery was noted in an adult male cadaver during routine dissection in Department of Anatomy, Government Medical College and Hospital, Chandigarh. Coeliac trunk was observed for its branches. Course, relation, branches of all branches was noted, colored and photographed.

OBSERVATIONS

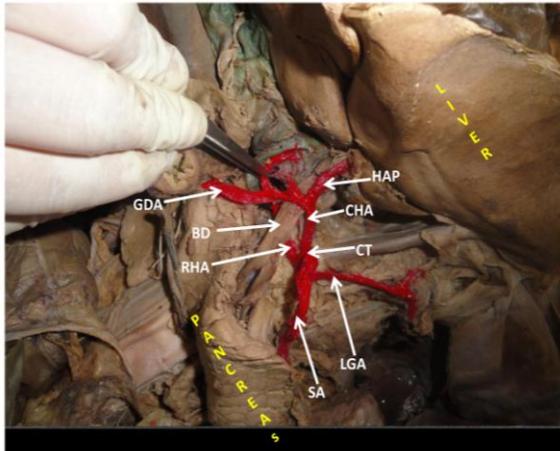


Fig 1

Fig 1: Quadrifurcation of coeliac trunk.

GDA: Gastro duodenal artery
HAP: Hepatic artery proper
CHA: Common hepatic artery
CT: Coeliac trunk
LGA: Left gastric artery
SA: Splenic artery
RHA: right hepatic artery
BD: Bile duct

In present case, coeliac trunk originated from abdominal aorta. Besides giving origin to 3 known branches (common hepatic artery, left gastric artery, splenic artery), there was a branch (right hepatic artery), which arose from right side of coeliac trunk, posterior to other branches, passed posterior to bile duct, crossing latter from left to right, entered through right end of porta hepatis, and was supplying right lobe of liver (fig 1). It also gave rise to cystic artery; whereas hepatic artery proper arose from common hepatic artery and it

was supplying left lobe of liver. Other branches from coeliac trunk had its usual course. There were no other variations in vascular structures of abdomen.

DISCUSSION

During the embryological stage, each metamere consists of 3 pairs of arteries that originate from the anterior, posterior, and lateral faces of the aorta. Posterior pairs then grow as intestinal arteries. Primitive metameric intestinal arteries (vitelline arteries) join to the longitudinal anterior anastomosis. These metameric arteries and ventral anastomosis regress during development of the embryo and when the embryo reaches nearly 9 mm, the coeliac trunk, superior mesenteric artery, and inferior mesenteric artery become visible. When the embryo is approximately 12.5 mm, the form of adult vascularization is reached. However, in some cases, one of these primitive arteries may not develop and the anterior anastomosis result in variations. [3,4]

Coeliac trunk is known to show variations in its branching pattern. [5] Previous studies have classified coeliac trunk into 6 types based on its branching pattern. The six types are as follows; Type 1: usual branching; Type 2: hepatosplenic trunk and left gastric artery coming from aorta; Type 3: hepatosplenomesenteric trunk and left gastric arising from aorta; Type 4: hepatogastric trunk and splenic artery coming from superior mesenteric artery; Type 5: splenogastric type; splenic and left gastric from the coeliac trunk and common hepatic artery from superior mesenteric artery; and Type 6: coeliacomesenteric trunk; splenic, left gastric, common hepatic and superior mesenteric arteries originate from a common trunk. [6]

The frequency of classical trifurcation of CT was found to be 86% and bifurcation pattern was 12%. [7] Studies

showed that the celiac trunk trifurcated in 61.7% and bifurcated in 17.9% though bifurcation is less. [8-13] Chitra has reported hepato-splenic trunk from coeliac trunk and left gastric artery from aorta but she has not observed hepato-gastric trunk. [14] Devi Sankar et al have reported bifurcation of coeliac trunk which divided into hepato-gastric and hepato-splenic trunks. [15]

There was a case of existence of a common coeliaco-mesenterico-phrenic trunk. [16] Deepthinath et al have reported another interesting variation where the coeliac trunk gave an accessory renal artery, two testicular arteries, middle suprarenal and left inferior phrenic arteries. [17] Even though mostly CT divides into CHA, SA, and LGA, sometimes one of its branches may arise from abdominal aorta. [7] The coeliac trunk may be absent in 1% of cases and in such cases the common hepatic, splenic and left gastric arteries arise directly from the abdominal aorta. [18,19,7]

The “classic” or “standard” hepatic arterial anatomy is present in approximately 75% of the cases with the remaining 25% having variable anatomy. [20] When the right hepatic artery does not arise from the proper hepatic artery or common hepatic artery, its origin is shifted to aorta or any of the arteries whose normal course is towards right side of the aorta like superior mesenteric, gastro duodenal, right gastric or coeliac trunk. [21] Introduction of laparoscopic cholecystectomy and emergence of liver transplants have stimulated renewed interest in hepatic artery variations. The extra-hepatic arteries must be identified with precision at the time of liver surgeries to avoid injuries that might compromise complete artery ligation of the graft. [22]

In present case cystic artery arose from right hepatic artery. The anomalous origins of cystic artery are commonly encountered during cholecystectomy. [6] The

cystic artery usually arises from the right hepatic artery in about 80% of the cases but may arise from the left hepatic, common hepatic, gastro duodenal or superior mesenteric arteries. [23]

CONCLUSION

Anatomical variations in branching pattern of coeliac trunk are of considerable importance in liver transplants, laparoscopic surgeries, radiological abdominal interventions, and penetrating injuries to abdomen. Our case report will help to augment all existing data with regards to hepatic artery variations and will re-emphasize the importance of identifying the anatomy and variations of the hepatic artery before performing liver transplants, hepatic artery infusions and trans-arterial chemo-embolization. The knowledge about right hepatic artery passing through the lesser omentum behind the bile duct may be important for radiologists and surgeons removing gall stones from the bile duct. The proper hepatic artery in this case can be called left hepatic artery since we could find the hepatic artery proper was supplying left lobe of liver. In present case, persistence of the longitudinal ventral arterial segment connected to the coeliac trunk may be considered as the reason for right hepatic artery originating from coeliac trunk.

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