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HEPATO-MESENTRIC TRUNK AND GASTRO-SPLENICO-PHRENIC TRUNK- A RARE ANATOMIC VARIATION

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ABSTRACT: During academic dissection for undergraduate students of abdominal region in 55 years old male cadaver we found that two anomalous arterial trunks arising separately from ventral aspect of abdominal aorta which are 12mm apart. The proximal one was gastro-splenico-phrenic trunk, giving right and left inferior phrenic arteries, left gastric artery and splenic artery, whereas distal one was hepato-mesentric trunk branching into common hepatic artery and superior mesenteric artery. The common hepatic artery was passing posterior to the neck of pancreas and anterior to the portal vein. Gastroduodenal artery was arising from left hepatic artery. Left inferior phrenic artery was giving a branch to supply the spleen. The splenic artery was giving a branch to supply the transverse colon. These anomalies are due to variation and ramifications in the development of ventral splanchnic arteries from dorsal aorta. Knowledge of these kinds of variations is very important for surgeons while performing surgeries on upper abdomen, laparoscopic surgeons of hepato-biliary tract, liver transplant surgeons, and interventional radiologists to avoid catastrophes. Therefore we feel presenting this rare case is very significant.

KEY WORDS: Hepato-mesentric trunk, common hepatic artery, Gastro-Splenico-Phrenic trunk, Coeliac artery, superior mesenteric artery

INTRODUCTION: Normally abdominal portion of the gastrointestinal tract is supplied by coeliac trunk (CT), superior mesenteric artery (SMA) and inferior mesenteric artery which are unpaired ventral branches of the abdominal aorta. CT arises at T12/L1 level, measures 1.5-2cms and divides into left gastric artery (LGA), common hepatic artery (CHA) and splenic arteries (SA). CT may also give off one or both inferior phrenic arteries (IFA). SMA arises 1cm below the CT, at the level of intervertebral disc between L1-L2. It gives off inferior pancreaticoduodenal, middle colic, right colic, ileocolic, jejunal and ileal branches. The SMA may be the source of CHA. The hepatic artery arises from CT and passes anteriorly and laterally below the epiploic foramen to the upper aspect of the first part of duodenum. Its branches are Gastroduodenal artery, right gastric artery, right and left hepatic arteries. Rarely the CHA arises from the SMA [1].

In our observation we found both left and right inferior phrenic arteries, left gastric artery and splenic artery arising from a single trunk and named that as gastro-splenico-phrenic trunk (GST). The common hepatic artery and superior mesenteric artery were arising from a single trunk and named it as hepato-mesentric trunk (HMT). One of the branches from left inferior phrenic artery was supplying the spleen and one of the branches from splenic artery was supplying the transverse colon. Occurrence of all these variations is rare and occurring in the same person is very rare and presenting this case is very significant surgically and radiologically.

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CASE REPORT: During routine dissection of abdominal cavity for the first year medical students in the department of anatomy, we have observed the abnormal origin of two arterial trunks arising from the anterior aspect of the abdominal aorta and their abnormal branching pattern in 55 years old male cadaver.

The first one was gastro-spleno-phrenic trunk (in the place of coeliac trunk) arising at the T12 level, measuring 7 mm in calibre and 2mm in length. The branches from this trunk were right and left inferior phrenic arteries, left gastric artery and splenic artery. Inferior phrenic arteries were arising separately. The left inferior phrenic artery was tortuous, running upwards to the left of the midline in the lesser sac and divided into three branches and one among which was most lateral and running along with the splenic artery to supply the spleen at hilum, and rest two were supplying the diaphragm and suprarenal gland. The right inferior phrenic artery was running upwards to the right of the midline and supplying the right side of the diaphragm and suprarenal gland. Left gastric artery was normal in its course and distribution. The splenic artery was largest branch and appeared as continuation of the trunk, was not much tortuous. The first branch arising from the splenic artery was running downwards and laterally behind the body of the pancreas giving a small branch to supply it and ultimately ends by supplying the transverse colon near the splenic flexure (Fig-1&2).

The second one was hepato-mesentric trunk arising 12mm below the origin of gastro-spleno-phrenic trunk at the level of L1, behind the neck of pancreas; measuring 10mm in calibre was running downwards for 15mm course and terminating by dividing into common hepatic artery and superior mesenteric artery. The common hepatic artery was 7mm in calibre and was running upwards to the right margin of lesser omentum behind the neck of the pancreas and anterior to the portal vein and terminated into right and left hepatic arteries. The Gastroduodenal artery was arising from the left hepatic artery and was normal in its course and distribution. Rest of the left hepatic artery was dividing into three segmental branches, all were supplying the liver. The right hepatic artery was running behind the bile duct and dividing into four segmental branches near the porta hepatis and all were supplying the liver. The cystic artery was arising from right hepatic artery normally. The superior mesenteric artery was normal in its course and distribution (Fig1&3).

DISCUSSION: The developing gut is supplied by paired ventral splanchnic arteries. As dorsal aortae fuse, they merge as unpaired trunks. Longitudinal anastomotic channels connect these branches along dorsal and ventral aspects of tube, forming dorsal and ventral splanchnic anastomoses. These vessels obviate the need for so many sub diaphragmatic ventral splanchnic arteries and they are reduced to three: i.e. the coeliac trunk, superior and inferior mesenteric arteries which supplies foregut, midgut and hindgut respectively. Dorsal splanchnic anastomosis persists in the gastroepiploic, pancreatico-duodenal and primary branches of coeliac arteries whereas ventral splanchnic anastomosis forms right and left gastric and hepatic arteries [1].

The arterial variations in our case are due to developmental ramifications. Tandler and Morita have given developmental basis for these variations [2, 3]. Similar vascular anomalies were reported in the previous studies. Adachi (1928) have studied and classified based on the embryological ramification of the gut arteries into six types. Our case fits into 5th type (LGA and SA as gastro-splenic trunk and CHA and SMA as hepato-mesentric trunk) of the classification where incidence was 0.4% out of 252 cases [4]. Incidence of Similar variation quoted by previous studies by Imakoshi stated 1.9 % (2 in 107), Shoumura et.al 2% (9 in 450) and Limura A et.al 0.4% (1 in 252)

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[5, 6, 7]. Similarly Huayue et.al have studied coeliac trunk variation in 974 cadavers and classified into 7 types. Our case fits into 6th variety (LGA and SA forming single trunk, CHA and SMA forming a single trunk) where incidence was 1.5% [8]. CHA arising from SMA in our case fits into 5th type of Hiatt's classification who has studied hepatic arteries in 1000 cases and reported in 15 cases (1.5%) [9]. Michel's have studied 200 autopsy series on arterial pattern of liver and classified into 10 categories, among which our case fits into 9th type (CHA arising from SMA) and incidence was 2.5% [10]. Similar case of gastro splenic trunk and hepato-mesentric trunk also reported by Poorwa baburao K, et.al, Arindom Banerjee et.al, Satheesha NAYAK B [11, 12, 13].

Inferior phrenic arteries usually arise from the aorta, occasionally from a common aortic origin with CT, from CT itself or from renal artery. They supply diaphragm, suprarenal gland, inferior venacaval, serosa of oesophagus, and rarely capsule of liver and spleen [1]. In our case left inferior phrenic artery was giving small branch to supply the spleen at hilum.

Splenic artery arises from CT and supplies pancreas, stomach and spleen. SA is one of the branches of artery of foregut i.e., CT, and in our case SA is giving one branch to supply the transverse colon near splenic flexure which is usually supplied by inferior mesenteric artery (artery of hindgut), may be due to the ramification in arterial development. Very few similar cases were reported in the past [14, 15].

Occurrence of these variations and that too in a single case is very rare hence reporting these rare variations are very significant. Knowledge of these kinds of variations is very important for surgeons while doing surgeries on upper abdomen, laparoscopic surgeons, liver transplant surgeons, radiologists and interventional radiologists. Preoperative angiogram is very important to plan the surgery or procedure and to avoid postoperative complications.

REFERENCES:

1. Gray H, Gray's Anatomy: The anatomical Basis clinical practice, 39thedtn. Elsevier Churchill Livingstone, 2005; 1118, 1218 & 1044.
2. Tandler J. Ueber die Vernetzung der Arteria coeliac und deren Entwicklung. Anathefte 1904; 25: 473-500 (in German).
3. Morita M. Reports and conception of three anomalous cases of the celiac and the superior mesenteric arteries. Igaku Kenkyu 1935; 9: 1993-2006.
4. Adachi B. A Coeliaca Arterien system Der Japaner. Band II, Kyoto: Verlag der Keiserlich-Japanischen Universitat zu Kyoto, Maruzen Publishing Co; 1928; 18-71 (in Japanese).
5. Imakoshi K. Study of the celiac artery. Studies from the anatomical department of the kanazawa medical college 1949; 37: 1-14.
6. Shoumura S, Emura S, et al. An anatomical study on the branches of the celiac trunk (IV) comparison of our findings with the Adach's classification. Acta Anat Nippon 1988; 66: 452-61.
7. Limura A, Oguchi T, Shibata M, Takahashi T. An anomalous case of the hepatic artery arising from the superior mesenteric artery. Okajimas Folia Anatomy. Japan. 2007; 84(2): 61-66.
8. Huayue Chen, Ryuichiro Yano, Shoichi Emura, Shizuko Shoumura. Anatomic variation of the celiac trunk with special reference to hepatic artery patterns. Annals of Anatomy 2009; 191: 399-407.

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9. Jonathan R. Hiatt. M.D., Joubin Gabbay, Ronald W. Busuttil. M.D., Ph.D. Surgical anatomy of the Hepatic Arteries in 1000 cases. Annals of Surgery. J.B. Lipponcott Company. 1994; 220: 50-52.
10. Michels NA. Newer anatomy of the liver and its variant blood supply and collateral circulation. American Journal of Surgery 1962; 112: 337-347.
11. Poorwa BaburaoKardile et.al, Anomalous Origin of the Hepatic Artery from the Hepato mesentric Trunk. Journal of clinical and diagnostic research, 2013; 7(2): 386-388.
12. Arindom Banerjee et.al, Anomaly of Coelico-Mesenteric Axis: A Rare Arterial Variation. Journal of clinical and diagnostic research, 2012; 6(2): 296-298.
13. Satheesha NAYAK B. Hepato mesentric trunk and gastro-splenico-phrenic trunk. International Journal of Anatomical Variations, 2008; 1: 2-3.
14. Belgin Bamac, PhD. et.al, A rare case of distal one-third of the transverse colon supplied by a branch from splenic artery. Saudi Medical Journal, 2006; 27(4):536-538.
15. Liu ST. Rare case of left colic flexure is supplied by a branch from splenic artery-a case report. Kaohsiung Journal of Medical Sciences, 2002; 18: 205-207.

Figure-1: showing Gastro-splenico-phrenic trunk (GSPT) and Hepato-mesentric trunk (HMT) and their branches i.e., Right and left inferior phrenic arteries (IPA), left gastric artery (LGA), splenic artery (SA), Common hepatic artery (CHA) and Superior mesenteric artery (SMA).

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Figure-2: showing left inferior phrenic artery (IPA) dividing into three branches and one of the branches running along with splenic artery (SA) and supplying the spleen.

Figure-3: showing the course and branching pattern of common hepatic artery (CHA) into left and right hepatic arteries which are in turn dividing into segmental branches. Gastroduodenal artery is arising from left hepatic artery

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