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Malrotation of the gut with multiple anomalies in abdomen

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Abstract:

The complex arrangement of the viscera in the abdomen is readily appreciated from its development. Abnormal rotation or non-rotation of the gut leads to various anomalies of the gut and also the vessels supplying it. The aim of this paper is to present some anomalies which can be encountered during various surgeries. During cadaveric dissection we come across a case of malrotation of the gut with multiple anomalies. We found that the common hepatic artery which is normally a branch of celiac trunk is variably arising from the hepto-mesenteric trunk. The hepato-mesenteric trunk originated from ventral surface of aorta at L1 level and had length of 3cm. The trunk then divided into common hepatic artery and superior mesenteric artery. The common hepatic artery ascends laterally then it gives gastro-duodenal branch above superior part of duodenum which descends between duodenum and neck of pancreas. The common hepatic artery after giving gastro-duodenal branch continues as hepatic artery proper. It ascends to the portahepatis and divides into right and left hepatic artery accompanying portal vein and hepatic duct.The caecum was present in rightlumbar quadrant of the abdomen under visceral surface of liver instead of right iliac fossa. The caecum was mobile, dilated with a blind pouch. Its dimensions were 7 x 9.5 (6 x 7.5cm-Normal).The duodenum was mobile instead of being fixed to posterior abdominal wall.

Keyword: Rotation of Gut, Celiac Trunk, Hepato-mesenteric Trunk, Caecum, Duodenum.

Introduction:

Digestive tract is embryologically divided into three segments based on vascular supply as:[1,2]

1)Foregut (Oesophagus, stomach, II part of duodenum up to the opening of bile duct) supplied by coeliac trunk.

2)Midgut (rest of small bowel, large bowel up to right 2/3 of transverse colon) supplied by superior mesenteric artery.

3)Hindgut (rest of large bowel up to superior part of anal canal) supplied by inferior mesenteric artery.

Knowledge of variations concerning digestive tract and its vascular supply are of extreme clinical

importance.Classical trifurcation of celiac trunk into left gastric, common hepatic, splenic artery was first observed by Haller in 1756. In 1898 Mall first described the embryology of malrotation. Dott[3] in 1923 described relation between Anatomy of malrotation and its clinical outcome.Anatomical variations in celiac trunk and superior mesenteric artery were first studied by Adachi[4] in 1928.

Case Report:

During careful dissection of abdominal cavity multiple abdominal variations were observed during abdominal dissection of 75 year old embalmed male cadaver in department of Anatomy, G.M.C., Miraj.

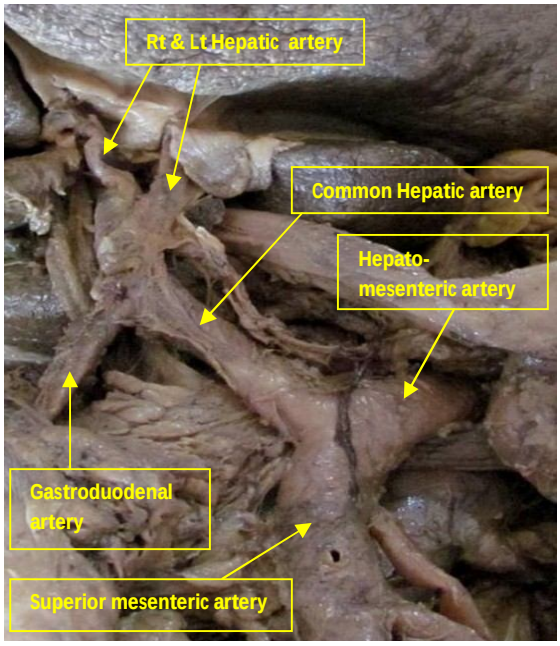


Fig. 1: Anomalies of vascular supply of gut.

In the present cadaver we found that the common hepatic artery which is normally a branch of celiac trunk is variably arising from the hepato-mesenteric trunk. The hepato-mesenteric trunk originated from ventral surface of aorta at L1 level and had length of 3cm. The trunk then divided into common hepatic artery and superior mesenteric artery. The common hepatic artery ascends laterally then it gives gastro-duodenal branch above superior part of duodenum which descends between duodenum and neck of pancreas. The common hepatic artery after giving gastro-duodenal branch continues as hepatic artery proper. It ascends to the portahepatis and divides into right and left hepatic artery accompanying portal vein and hepatic duct. The superior mesenteric artery had normal course & branches (Figure 1).

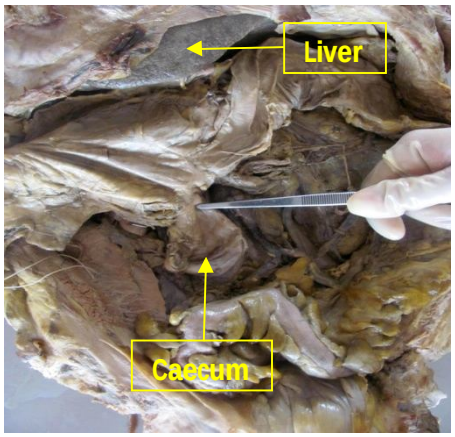


Fig. 2: Subhepatic caecum with post-ileal vermiform appendix.

The caecum was present in right upper quadrant in right lumbar region of the abdomen under visceral surface of liver instead of right iliac fossa. The caecum was mobile, dilated with a blind pouch. Its dimensions were 7 x 9.5 (6 x 7.5cm-Normal). The ascending colon was shorter in length (5cms).The vermiform appendix was post-ileal in position. Blood supply was normal (Figure 2).

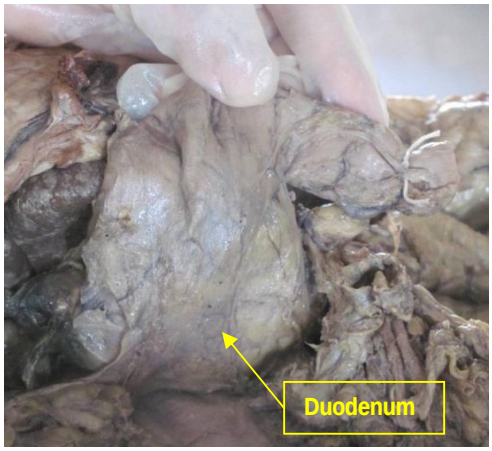


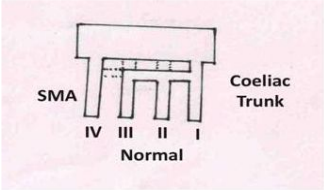
Fig. 3: Mobile duodenum

The duodenum was mobile instead of being fixed to posterior abdominal wall (Figure 3).

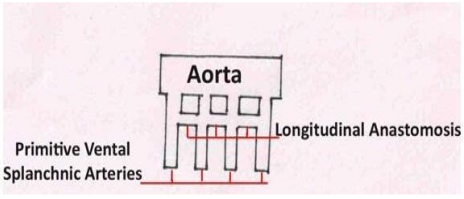
Discussion:

Anatomical variations in coeliac trunk and superior mesenteric artery were first studied by Adachi[4] in 1928.Depending on the pattern of ramification of coeliac trunk & superior mesenteric artery, he classified them into six types.According to him, when common hepatic artery and superior mesenteric artery arise from hepato-mesentric trunk as reported in the present study, it is referred to as type V anomaly.

The embryological explanation related with the anomalies of the coeliac trunk and the superior mesenteric artery were made by Tandler[6](1904) & Morita[5](1935).



According to Tandler[6], the ventral branches of the abdominal aorta develop initially as paired vessels, which then coalesce in the median line to form the four roots for the gut. Normally, the first root forms the left gastric artery, thesecond root forms the splenic artery and the third root forms the common hepatic artery. The first three roots coalesce by the longitudinal anastomotic trunk to form the coeliac trunk. The superior mesenteric trunk develops from the fourth root.



According to Morita[5], the anomalous ramification of the coeliac trunk & superior mesenteric artery are due to the disappearance of the primitive ventral splanchnic arteries & the longitudinal anastomosis between them.The embryological discussion related to the anomaly were made by Tandler[6] (human embryo, 1904), Morita[5] (1935) and Sato (1993). Ontogenesis pattern of the celiac trunk and superior mesenteric artery (alteration from Morita, 1935).The rotation of midgut has been divided into 3 stages:-

Stage 1 occurs in 5-10 weeks. There is physiological umblical herniation.

Stage 2 occurs in 11th week. There is reduction of midgut hernia.

Stage 3 occurs in 12th week. There is fixation of intestine to posterior abdominal wall & descent of caecum to right iliac fossa.

Deviation from the normal 270 degree counterclockwise rotation of midgut causes;

Stage 1: Omphaloceles caused by failure of gut to return to the abdomen.

Stage 2: Non rotation, malrotation, reverse rotation,internal hernias.

Stage 3: Subhepatic caecum, unattached duodenum, mobile caecum.

Subhepatic caecum occurs due to incomplete rotation of gut there is arrest of caecum in right upper quadrant of the abdomen under visceral surface of liver following reduction of physiological midgut hernia with no subsequent change in position. Due to nondescent of caecum in the right iliac fossa relative elongation of ascending colon does not occur, so ascending colon is not seen.[7] In early foetal life duodenum is mobile. With the rotation of gut duodenum rotates to the right side and then behind the superior mesenteric artery. The peritoneum covering posterior surface of rotated duodenum comes in contact with the parietal peritoneum of posterior abdominal wall. Subsequently both layers of peritoneum disappear. Hence, definitive duodenum becomes retro peritoneal and fixed except proximal 2.5cm of the first part. But due to incomplete rotation the mesoduodenum may persist making it mobile.

Conclusion:

In the present study, gut rotation has reached II stage but failed to complete III stage.Knowledge of variations in celiac trunk & superior mesenteric artery are important in the areas of Appleby procedure (for carcinoma pancreas), laparoscopic surgeries, radiological procedures in upper abdomen, interventional procedures like aortic replacement, chemoembolization of liver malignancy, liver transplant (anastomosis with proper vessel). Malrotation of the midgut is of surgical importance because of diagnostic problems presented by appendicitis, renal colic. Keeping these facts in view, reporting of such anomalies stand significant.

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