Original Research Paper

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Study of Anatomical Variation of Celiac Trunk and its Branches in North Indian Population

Anatomy

KEYWORDS : Abdominal aorta, celiac trunk, hepatopancreatic, hepatomesenteric, gastrosplenic

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ABSTRACT

Celiac trunk is originated from the abdominal aorta and supplied to the derivatives of foregut and spleen. Knowledge of variation in its origin and branching pattern are necessary for surgeons, performing abdominal surgeries. The abdomen of total 32 human cadavers were dissected, to observe the origin and branching pattern of the celiac trunk. In 6 (18.75%) cases (Ist group) the celiac trunk bifurcated into hepatomesenteric and gastrosplenic divisions. In 3 (9.4 %) cases (IInd group) the celiac trunk bifurcated into hepatopancreatic and gastrosplenic divisions. In 3 (9.4%) cases (IIInd group) the abnormal origin (intrathoracic) and branching pattern of the celiac trunk was observed. The left gastric artery in this group originated from the trunk and finally the trunk divided into hepatic and splenic branches. The present study documents the variations in origin and branching pattern of the celiac trunk in North Indian population.

Introduction

Celiac artery is the first branch of the abdominal aorta that supplies to spleen and the structures derived from the foregut, arises at the level of T12 vertebra (Standring et al.,2008 and Venieratos et al.,2012). Normally the celiac trunk trifurcate into left gastric, splenic and common hepatic arteries. Variation in origin and branching pattern of the trunk has been described earlier by many authors (Vandamme and Bonte,1985; Uflacker 1997; Cavdar et al.,1997,1998; Nakamura et al.,2003; Aynur et al.,2005; Nayak et al.,2008). Celiac trunk is intimately related to celiac plexus, celiac ganglion, lesser sac and right crush of diaphragm. Knowledge of the celiac trunk variation is of important during liver transplantation, resection, gastrectomy, duodenal and pancreatic surgeries. As celiac trunk branches show considerable amount of regional variations, thus study of the celiac trunk ramification is counter plated on cadavers to delaminate the various types of ramification pattern in north Indian subjects and the importance of its knowledge to the operating surgeons.

Material and methods

Variations in origin and branching pattern of the celiac trunk were studied during routine dissection of 32 cadavers (22 males, 10 females) in the Department of Anatomy, Institute of Medical Sciences, Banaras Hindu University, Varanasi, 221005-India duly permitted by the Head of Anatomy Department. The Institutional ethical clearance was also taken.The study was conducted during the academic period of 3 years from July 2013 to May 2016. Dissection was performed by opening the abdomen through the midline incision on the anterior abdominal wall. Transverse colon and greater omentum were mobilized superiorly over the costal margin, while the coils of jejunum and ileum were moved to the left of the abdomen to expose the celiac trunk and its branches. The variations in origin of the celiac trunk and its branches has been observed, recorded followed by gross photography.

Results

Total 32 cadavers had been used for the present study, out of which 22 (68.75%) male and 10 (31.25%) female cases. In 13 (59.09%) cadavers of male and 7 (70%) of female showed normal branching pattern of the celiac trunk i.e., left gastric, splenic and superior mesenteric arteries (Figure 1here)

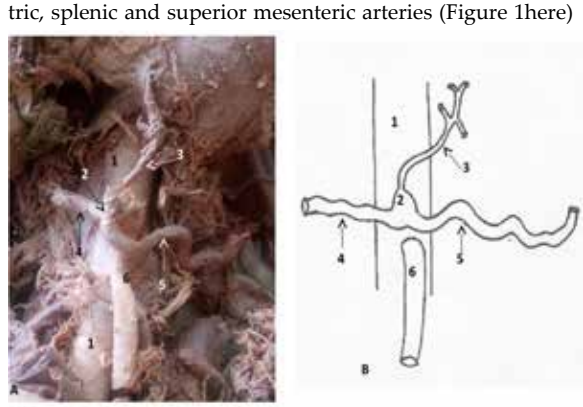

Figure 1. Showing the normal branching pattern of the celiac trunk.

(A) Photograph showing the normal origin and branching pattern of the celiac trunk.

(B) Line diagram showing the normal origin of the celiac trunk as seen in Fig 1 A.

1- Abdominal aorta

2- Celiac trunk

3- Left gastric artery

4-Common hepatic artery

5- Splenic artery

6- Superior mesenteric artery

There were three variation groups has been observed in 9 (40.9%) cases of male and 3 (30%) of female.

(Table-1here).

Table 1- Showing the variations in origin and branching pattern of the celiac trunk in both sexes

Celiac trunk branching pattern		No (%) of cases from present study					
Groups	Branching pattern	Male Total = 22		Female Total =10		Total 32	
		No	%	No	%	No	%
Normal	Left gastric artery Splenic artery Common hepatic artery	13	59.09	7	70	20	62.5
Ist variation	Hepatomesenteric and gastrosplenic division	4	18.18	2	20	6	18.75
II nd variation	Hepatopancreatic and gastrosplenic division	3	13.63	0	0	3	9.38
IIIrd variation	Left gastric artery and hepatosplenic trunk	2	9.09	1	10	2	9.38

The first variation group was found in 4 (18.18%) cases of male and 2 (20%) of female. In this group the celiac trunk bifurcated into hepatomesenteric and gastrosplenic divisions. The hepatomesenteric division of the trunk branched into common hepatic and superior mesenteric arteries. The gastrosplenic division ran to the left and divided into left gastric and splenic arteries.

(Figure 2 here).

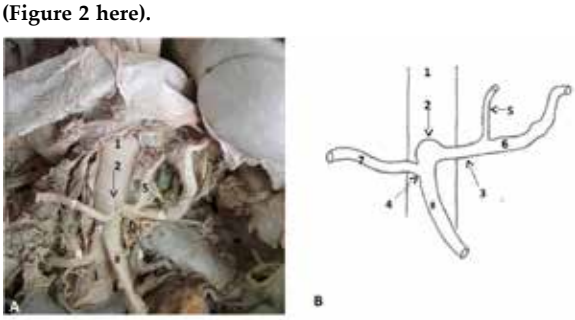

Figure-2. Showing abnormal bifurcation of the celiac trunk.

(A) Photograph showing bifurcation of the celiac trunk into hepatomesentric and gastrosplenic divisions.

(B) Line diagram showing the structures as seen in Fig 2 A.

1-Abdominal aorta
2- Celiac trunk
3-Gastrosplenic trunk
4-Hepatomesentric trunk
5-Left gastric artery
6-Splenic artery
7-Common hepatic artery
8-Superior mesenteric artery

The second variation group was found in 3 (13.63%) cases of male, but no any case was found in female. In this group the celiac trunk bifurcated into the hepatopancreatic and gastrosplenic divisions .The hepatopancreatic division bifurcated into two branches i.e. common hepatic and pancreatic arteries, whereas the gastrosplenic division bifurcated into left gastric and splenic arteries

(Figure 3 here).

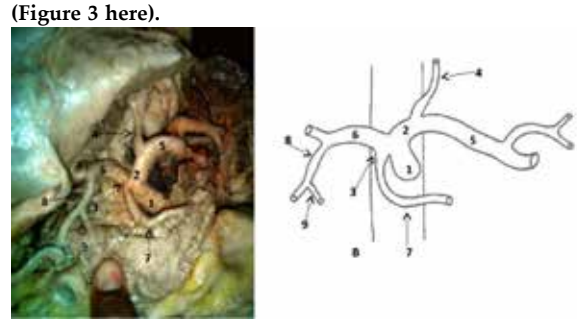

Figure-3. Showing the abnormal bifurcation of the celiac trunk.

(A) Photograph showing division of celiac trunk into hepatopancreatic and gastrosplenic divisions.

(B) Line diagram showing the structures as seen in Fig 3 A.

1- Celiac trunk
2- Gastrosplenic trunk
3-Hepatopancreatic trunk
4- Left gastric artery
5- Splenic artery
6- Common hepatic artery
7- Pancreatic artery
8- Gastroduodenal artery
9- Right gastric artery

The third variation group was found in 2 (9.09%) cases of male and 1 (10%) of female. In this group the celiac trunk was originated from the left side of the thoracic aorta, (above to the aortic opening), at the level of 11th thoracic vertebra. In this variation left gastric artery originated from the celiac trunk just below the aortic opening and then continued as common hepatosplenic trunk, which was bifurcated into common hepatic and splenic arteries, just above the origin of the superior mesenteric artery.

(Figure 4 here).

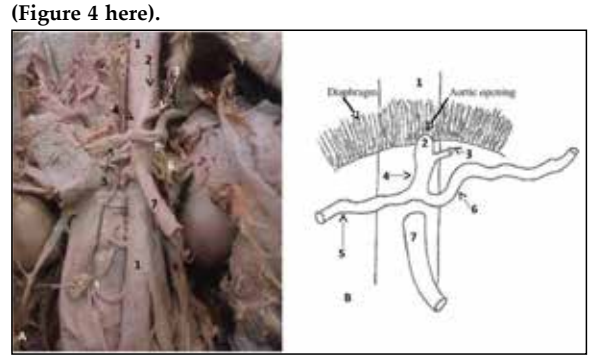

Figure-4. Showing the variation in origin and branching pattern of the celiac trunk.

A. Photograph showing the left sided higher origin (Intrathoracic) of the celiac trunk and its abnormal branching pattern

B. Line diagram diagram showing the structures as seen in Fig 4, above aortic opening

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1- Abdominal aorta
2- Celiac trunk
3- Left gastric artery
4-Hepatosplenic trunk
5- Common hepatic artery
6 -Splenic artery
7- Superior mesenteric artery

Discussion:

The incidence of the normal celiac trunk has been reported earlier in 92.7% cases (Gümüs et al.,2013;Torres et al.,2015), whereas it has been observed in 62.5% cases of the present study. The celiac trunk and its branches showed several variation (Anson & McVay 1984; Uflacker 1997; Chen et al.,2009). The gastrosplenic division is the most common variation seen in 4.1 % cases (Ugurel et al.,2010), whereas same variation is observed in 28.13% cases in the present study. There was not any earlier documented evidence regarding the hepatomesenteric and hepatopancreatic divisions of the trunk, but we have observed the incidence of hepatomesenteric division in 18.75% and hepatopancreatic division in 9.38% cases. The hepatosplenic trunk has been described earlier as the most common celiac trunk variation in 4.4% cases (Song et al.,2010), we are also reporting such type of variation in 9.38% cases. It is also observed that the celiac trunk originated from the thoracic aorta in the intrathoracic region, that type of the variation has been not reported in literature till date. Anatomical variation of the celiac trunk has been appeared from the fetal developmental changes in the ventral segmental arteries supplying to the gut (Matusz et al.,2012). The 10^{th} and 13^{th} segmental arteries are responsible for development of left gastric, common hepatic, splenic and superior mesenteric arteries respectively (Tandlor,1904; Walker,2009). These 10^{th} to 13^{th} segmental arteries communicate between primitive aorta and ventral anastomosis arteries. Normally the ventral anastomosis and 11^{th}- 12^{th} segmental arteries disappear and 10^{th} segmental artery persist as the celiac trunk, whereas 13^{th} segmental artery develops as superior mesenteric artery (Walker,2009). In our view the variation in origin and branching pattern of the celiac trunk might be due to incomplete regression/ disappearance of these segmental arteries. In view of the relatively high prevalence of the variation in origin and branching pattern of the celiac trunk, it is advisable for the surgeons operating in the area of the supracolic region to keep in mind the possibility of the occurrence and the complication that may occur during the surgical procedure.

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