



ANATOMICAL ANALYSIS OF ABERRANT CELIAC TRUNK USING MULTIDETECTOR COMPUTED TOMOGRAPHY

Anatomy

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ABSTRACT

Aim: The aim of this study was to analyze the variations in Celiac trunk with Multi Detector Computed Tomography (MDCT). Materials and **Methods:** 150 patients who underwent Contrast Computed Tomography of abdomen for any medical reasons were evaluated retrospectively. **Results:** Out of 150 patients analyzed, 30.7% and 44.7% shown variations in level of Celiac trunk origin and its branching pattern respectively. **Conclusion:** Knowledge about Celiac trunk variations using MDCT provides valuable guide for surgeons and radiologist to make appropriate diagnosis and treatment.

KEYWORDS

Aberrant Celiac trunk, Arterial variations, MDCT.

INTRODUCTION

There are natural variations in abdominal vascular system. Prevalence rate of aberrant abdominal arteries has shown a recent increase possibly due to improved diagnostics and its increased awareness in medical fraternity. Splanchnic artery variations are ubiquitous and asymptomatic. Variations in typical anatomical structures are commonly congenital¹⁻³. Knowledge about aberrant abdominal arterial branching in foregut and midgut blood supply is paramount for anatomist, interventional radiologist and surgeons who compass transplants, tumor resection and gastrointestinal procedures for minimizing surgical complications in abdomen^{4,5}. The Celiac artery (CA) which is first and one of the ventral branches of Abdominal aorta commonly shows the classical trifurcation (Left gastric artery, Common hepatic artery and Splenic artery) known as Tripus halleri. It is related to T12-L1 vertebra and its length ranges from 1.5-2cm⁶. Morphological variations with respect to origin level and branching pattern was observed by previous researchers in celiac artery. Such celiac artery variations can be studied using Multidetector Computed Tomography (MDCT) non invasively⁷⁻¹². So a study is designed to analysis the anatomical variations of the celiac artery with respect to origin level and branching pattern using Multidetector Computed Tomography in a tertiary care superspeciality hospital in India.

MATERIALS AND METHODS

After getting approval from ethical committee, a cross sectional study was conducted during 2017 year in the department of Radiology, National Institute of Medical Sciences, Jaipur. 150 patients of both sex (80 Male and 70 Female) with age group range from 18 to 75 years ,who underwent contrast abdominal computed tomography (CT) of abdomen for any medical indications were enrolled in this study. Patients with history of Aortoarteritis, Collagen vascular disorder, previous abdominal surgery, Abdominal malignancy and allergy to drugs were excluded. Philips Brilliance CT scanner was used to obtain CT images. Scanning was performed using the following parameters: detector rows, 64; collimation, 0.625 mm; pitch, 0.92; gantry rotation time, 0.75 s; slice thickness 0.90 mm, slice increment, 0.45 mm; 250 mAs and 120 kV dose. A volume of 100 mL of non-ionic contrast medium was injected at 4.0 mL/s through an antecubital vein. Celiac trunk and its major branches was focused to get CT images with respect to variations in origin level and branching pattern by radiologist. Obtained CT images were reconstructed for obtaining 3D images and analyzed using Radiant software and described using Uflacker's classification⁵ (Refer Table 1).

Table 1 : Uflacker's classification

LGA- Left Gastric Artery, CHA-Common Hepatic Artery, SA- Splenic Artery and SMA- Superior Mesenteric Artery.

Type	Description
I	Classic Celiac trunk trifurcation - LGA, CHA and SA origin commonly from the Celiac trunk.
II	Hepatosplenic trunk- CHA and SA have common trunk with the LGA origin separately from aorta
III	Hepatogastric trunk- CHA and LGA have common trunk with the SA origin separately from the aorta or SMA
IV	Hepatosplenomesenteric trunk CHA, SA and SMA have common trunk with the LGA origin separately from the aorta
V	Gastrosplenic trunk- LGA and SA have a common trunk with the CHA origin separately from the aorta or SMA
VI	Celiac-Mesenteric trunk- Celiac and SMA shares the common trunk
VII	Celiac-Colic trunk- The middle colic artery and the Celiac artery have common trunk origin
VIII	No Celiac trunk- No Celiac trunk with the CHA, SA and LGA origin directly from the aorta

RESULTS

I. Level of origin variations (Refer Table 2)

In this study, Celiac trunk originated at various level from T11-L1 vertebra. Majority of patients (69.3%) shown Celiac trunk origin between T12-L1 vertebra. At T12, L1 and between T11-T12 vertebra 14%, 8.7% and 7.3% of patients respectively shown variations in Celiac trunk origin. Absence of Celiac trunk was observed in 1 male case, in which Left gastric artery, Common hepatic artery and Splenic artery arises directly from aorta.

Table 2: Celiac trunk-Level of origin variations

Vertebral Level	Males N=80	Females N=70	Total N=150	%
T11-T12	5	6	11	7.3
T12	10	11	21	14
T12-L1	58	46	104	69.3
L1	6	7	13	8.7

Note: Celiac trunk was absent in 1 male case 0.7%

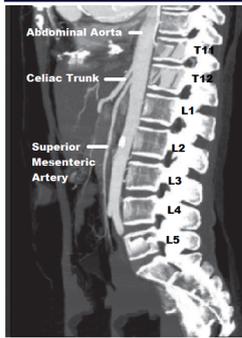


Figure 1: Celiac trunk origin between T11-T12 Vertebra



Figure 2: Celiac trunk origin opposite to T12 vertebra

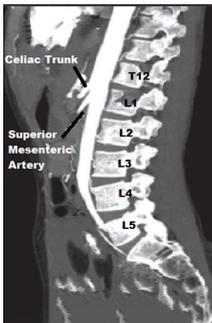


Figure 3: Celiac trunk origin between T12-L1

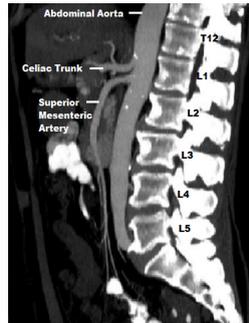


Figure 4: Celiac trunk origin at Upper border of L1



Figure 5: Celiac trunk origin at Lower border of L1

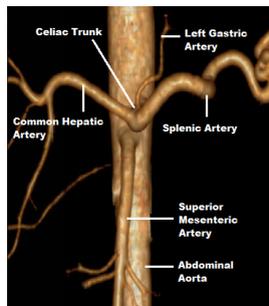


Figure 6: Type I-Classic Celiac trunk

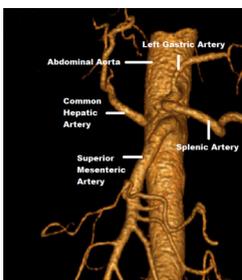


Figure 7: Type II - Hepatosplenic trunk

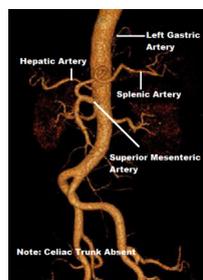


Figure 8: Type III- Hepatogastric trunk

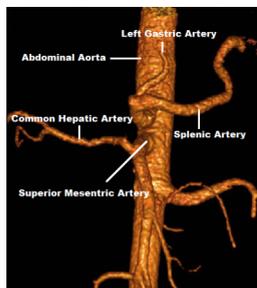


Figure 9: Type V -Gastrosplenic trunk



Figure 10: Type VIII- No Celiac trunk

II. Branching pattern variations

According to Uflacker's classification, in this study Type I- Classic Celiac trunk branching pattern [Figure 6] (Left gastric artery, Splenic artery and Common hepatic artery) shown by majority of patients (55.3%). Other branching patterns like Type II -Hepatosplenic trunk [Figure 7], Type III-Hepatogastric trunk [Figure 8], Type V - Gastrosplenic trunk [Figure 8] and Type VIII -No Celiac trunk [Figure 10] were observed in 16%, 17.3%, 10.7% and 0.7% patients. Type IV (Hepatospleno mesenteric trunk), Type VI (Celiac-Mesenteric trunk) and Type VII (Celiac-Colic trunk) were not noted in patients.

Table 3: Celiac trunk - Branching pattern variations

Type	Males N=80	Females N=70	Total N=150	%
I	47	36	83	55.3
II	10	14	24	16
III	18	8	26	17.3
IV	0	0	0	0
V	4	12	16	10.7
VI	0	0	0	0
VII	0	0	0	0
VIII	1	0	1	0.7

DISCUSSION

In this study, origin of Celiac trunk was observed at various vertebral level from T11-L1. Previous studies (Wadhwa S, Soni S and Sehgal G et al) have also shown similar results but prevalence ratio differs¹³⁻¹⁴. With respect to Uflacker's classification of branching pattern of Celiac trunk, 63.3% patients shown Classic Celiac branching pattern in this study. Whereas K.Torres and Venieratos D et al reported 92.7% and 89% of Classic Celiac trunk branching pattern in patients respectively^{5,15}. Our patients demographics were different to these previous studies which could explain the differences in branching pattern of Celiac trunk.

Other branching pattern variations (36.7%) was higher than that reported by K.Torres and Venieratos D et al (7.3% and 11% respectively). Absence of Celiac trunk was rare but noted in 1 case which was similar to Sehgal G and M.Denisow et al¹⁴⁻¹⁵ study. Awareness about variations of Celiac trunk is extremely important for clinicians as it helps them to plan management of patients keeping these variations in perspective. Due to this, these aberrations have become focus for present researchers. Authors would suggest that clinician should be aware of these variations as this will provide good guide to diagnose, plan treatment and to avoid catastrophic complications.

CONCLUSION

Variations in Celiac trunk are asymptomatic, its knowledge is important during surgery in abdomen region. So clinicians particularly radiologist and surgeons must acquire the idea of morphological variations of Celiac trunk by which correct diagnosis and treatment can be undertaken.

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