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Research Article

Prevalence of Celiacomesenteric Trunk – A Computed Tomography Study

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ABSTRACT
Back ground: Anatomic variations are commonly seen in the origin of branches of the abdominal aorta. The celiac trunk and superior mesenteric artery arising from a single common trunk is an unusual variation. The Contrast Enhanced Computed Tomography is one of the advanced imaging techniques of radiography. It gives valuable knowledge of vessels in the body.
Methods: The present study was done to see the frequency of variations in the origin of the coeliac trunk and superior mesenteric artery from the abdominal aorta by Contrast Enhanced Computed Tomography. Contrast Enhanced Computed Tomography scan films of the abdomen of 300 patients were examined. The scans were taken with a 32-slice Siemens Somatum Go Up Computed Tomography machine with inbuilt Syngo software.
Results: During this study, three cases were observed where the coeliac trunk and superior mesenteric artery had taken origin from the abdominal aorta by a common trunk. The frequency of origin of the coeliac trunk and the superior mesenteric artery from a common trunk was 1%, and this is close to the frequency as stated in the literature.
Conclusion: This knowledge of variations can help the surgeons to plan abdominal surgery and many complications during surgery and after surgery can be avoided.

Keywords: Celiacmesenteric Trunk, Computed Tomography, Variations.

INTRODUCTION

The celiac trunk and the superior mesenteric artery are major unpaired ventral branches of the abdominal aorta, which arise at the level of the 12th thoracic vertebra and the 1st lumbar vertebra, respectively.[1] Celiac trunk supplies the organs developing from the foregut, and the superior mesenteric artery supplies the organs developing from the midgut.[2]
Anatomic variations of the abdominal aorta and its branches are common and knowledge of these variations helps in the identification and prevention of damage during laparoscopic and various surgical procedures. The arteries that show frequent variations are the celiac trunk and the renal arteries.[3,4] Variations of the celiac trunk are usually asymptomatic and their relations to the surrounding organs become important for patients undergoing angiography for gastrointestinal bleeding, celiac axis compression syndrome and before an operative procedure.[5] Variations of the superior mesenteric artery are important in laparoscopic surgery and deep injuries of the abdomen.[6] In liver transplantations, detailed knowledge of the branching pattern of the celiac trunk and hepatic arteries is important for surgical arterial anastomosis.[7] Angiographic images with abnormal patterns may be incorrectly interpreted in the absence of knowledge of the variations in the origin of these vessels. Therefore, these should be taken into consideration before planning surgical procedures.[8] Variations are identified mostly in

the routine dissections of cadavers done for teaching purposes in the educational institutes and during routine surgical procedures.[9]

The present study was done to find the frequency of variations in the origin of the celiac trunk and superior mesenteric artery from the abdominal aorta by Contrast Enhanced Computed Tomography. It can help the surgeons to plan surgery related to abdominal vessels and complications during surgery can be avoided.

MATERIALS AND METHODS

This was a prospective cross-sectional study conducted at the Department of Anatomy and Radiodiagnosis of Adesh Institute of Medical Sciences and Research, Bathinda, Punjab, India. The duration of study was 2 years and 4 months (September 2020 to January 2022). Permission to conduct the study was obtained from the Institutional Ethics Committee. Informed written consents from the patients were taken. Contrast Enhanced Computed Tomography (CECT) scan films of abdomen of the 300 patients were included in the study who underwent imaging for various clinical indications. These scans were taken with 32-slice Siemens Somatum Go Up Computed Tomography machine with inbuilt Syngo software. Patients with adequate image quality and clearly visible image quality were included in the study. Patients with disorders related to abdominal vessels and previous abdominal vascular surgery were excluded from the study.

Data Analysis: The observed anatomical variations were recorded, and their frequency was calculated as a percentage of the total number of scans examined. The findings were compared with previously reported data in the literature.

Results: It was observed that out of 300 cases, three cases of celiacomesenteric trunk were seen where the celiac trunk and superior mesenteric artery were taking origin from a common trunk arising from the abdominal aorta. The celiac trunk and superior mesenteric artery usually take origin from the abdominal aorta by separate openings, as shown in Figure 1. The celiac trunk arises at the level of T12 (12th thoracic vertebra) and the superior mesenteric artery arises at the level of L1 (1st lumbar vertebra) from the abdominal aorta. In the present study 1st case was of 33 years old male patient, 2nd case was 28 years old male patient, and 3rd case was of 38 years old male patient. These patients did not show any problem related to these variations.

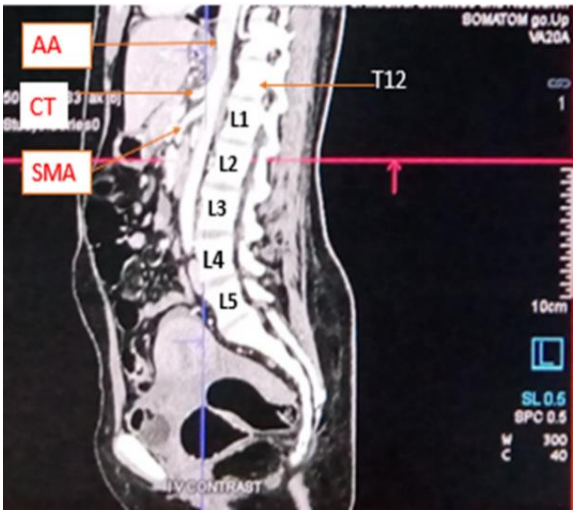

Figure1. CECT Scan Image Of Abdomen (Sagittal Section) Showing Origin Of CT At The Level Of 12th Thoracic Vertebra (T12) And SMA At The Level Of 1st Lumbar Vertebra (L1) From Abdominal Aorta (AA) By Separate Openings Which Is Common Pattern (CT- Celiac Trunk, SMA- Superior Mesenteric Artery, L5-L1 Five Lumbar Vertebrae, T12 Is 12th Thoracic Vertebra).

Figure 1 observed that Contrast Enhanced Computed Tomography (CECT) scan image of the abdomen (sagittal section) showing the origin of the Celiac Trunk (CT) at the level of the 12th thoracic vertebra (T12) and the Superior Mesenteric Artery (SMA) at the level of the 1st lumbar vertebra (L1) from the Abdominal Aorta (AA) through separate openings, which represents the usual anatomical pattern of origin.

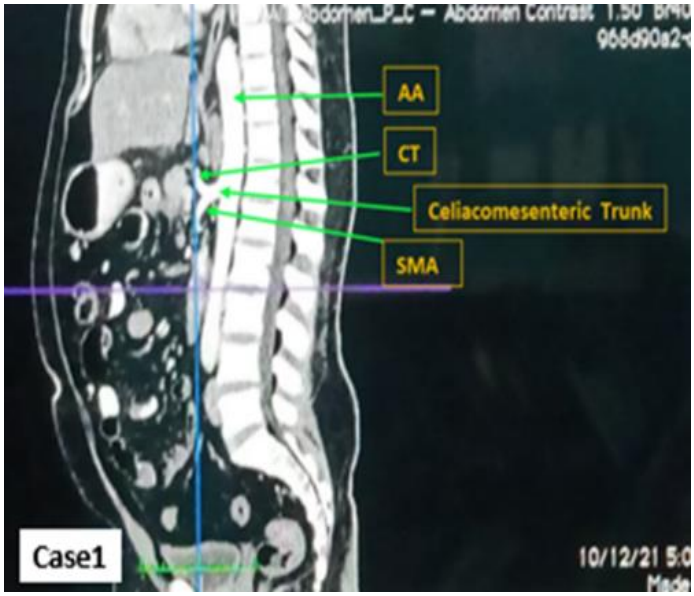

Figure 2. Case 1. CECT Scan Image of Abdomen (Sagittal Section) Showing Origin of CT and SMA Arising From the Common Trunk.

Case 1 and Figure 2 show a Contrast Enhanced Computed Tomography (CECT) scan of the abdomen of 33 years old male showing an anatomical variation in which the Celiac Trunk (CT) and Superior Mesenteric Artery (SMA) arise from a single common trunk originating from the Abdominal Aorta (AA). This variation is known as the celiacomesenteric trunk, where both major visceral arteries share a common origin before supplying the foregut and midgut derivatives.

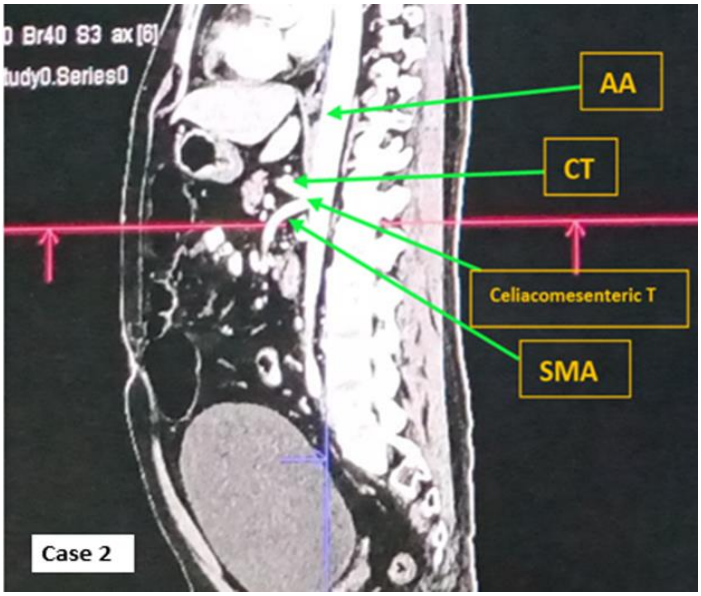

Figure 3. Case 2. CECT Scan Image of Abdomen (Sagittal Section) Showing Origin of CT and SMA from Common Trunk.

Case 2 and Figure 3 revealed that a CECT scan of the abdomen of a 28 years old male patient demonstrated a rare vascular variation where the Celiac Trunk (CT) and Superior Mesenteric Artery (SMA) arise from a common trunk from the Abdominal Aorta (AA). This common trunk subsequently divides into the celiac trunk and superior mesenteric artery, supplying the abdominal organs derived from the foregut and midgut.

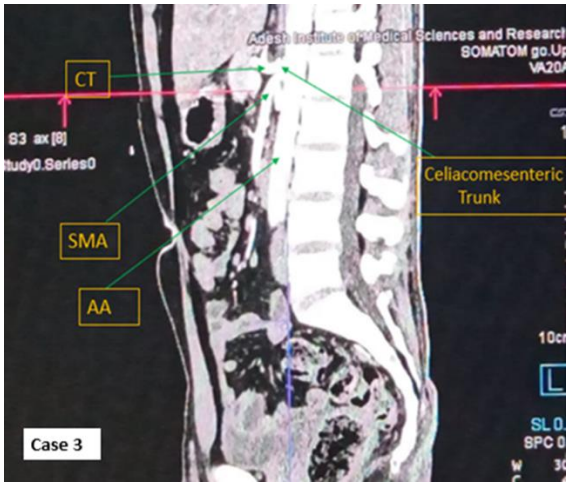

Figure 4. Case 3. CECT Scan Image of the Abdomen (Sagittal Section) Showing the Origin of the CT and SMA from the Common Trunk.

Case 3 and Figure 4 observed that the CECT scan image of the abdomen of a 38 years old male patient showed the presence of a celiacomesenteric trunk, where the Celiac Trunk (CT) and Superior Mesenteric Artery (SMA) originate together from a single trunk arising from the Abdominal Aorta (AA). This variation represents a rare anatomical pattern of abdominal arterial branching.

DISCUSSION

Anatomic variations are changes in the body form that are present in some individuals. These may be in the form of a change in shape and size, the presence or absence of any part, or changes in the right or left sides of the body.[10] Embryological basis of variations of the branches of the abdominal aorta can be explained due to defective fusion of the omphalomesenteric and vitelline arteries during development.[2] Ventral splanchnic arteries supply the allantois, yolk sac, and chorion. These vessels join to form four roots in the midline and supply gut-derived organs. The first three roots coalesce to form the celiac trunk, and the four roots form the future superior mesenteric artery.[11] Hazirolan studied the variations of the celiac trunk and explained that these are due to developmental disturbance in the anterior branches of the abdominal aorta.[12] These variations should be considered during abdominal investigation and surgical procedures to avoid postoperative complications.[13] In the present study, CECT scans of the abdomen of 300 patients were examined and abdominal scans of three patients showed the presence of a common celiacomesenteric trunk, which gave origin to CT and SMA. The prevalence of this variation was 1% and all three patients were males. It can be concluded that celiacomeasenteric trunk was common in males in North Indian population.

Arudhchelvum did a study on computed tomography on 102 cases in Shri Lanka. The celiacomesenteric trunk was observed in 0.98% of cases.[14] This frequency was close to the frequency seen in the present study (1%). Kornafel did a study on 201 patients by computed tomography angiography at Wroclaw Medical University, Poland, to observe variations in the origin of branches of the abdominal aorta. The celiacomesenteric trunk was observed in 1.5% of cases.[4]

Chen and coworkers did a study on 974 cadavers in Japan and observed the celiacomesenteric trunk in 0.7% of cases.[15] Leon examined 127 scans of the Mexican population by MDCTA (Multidetector row Computed Tomography Angiography) to find the prevalence of variations in the celiac trunk. The celiacomesenteric trunk was observed in 0.8 % of cases.[16] Dao and coworkers examined Computed Tomography scans of 160 patients in South Africa and observed 3.15% cases of celiacomesenteric trunk.[17] From these studies, it can be concluded that the presence of the celiacomesenteric trunk was population and area-specific, as shown in Table 1.

Table 1. Comparison of the Prevalence of Celiacomesenteric Trunk in Different Populations.

Study	Country	No. of cases	Method	Frequency (%)
Chen et al., 2009	Japan	974	Computed Tomography and Cadaveric	0.7

Leon et al., 2021	Mexico	127	Computed Tomography	0.8
Arudhchelvum, 2021	Sri Lanka	102	Cadaveric	0.98
Kornafel et al., 2010	Poland	201	Computed Tomography	1.5
Doa et al., 2019	South Africa	160	Computed Tomography	3.15
Present study, 2022	North India	300	Computed Tomography	1

In the literature, there are many case reports of the celiacomesenteric trunk in different areas. Taha and coworkers observed a case of celiacomesenteric trunk in a Sudanese male cadaver during routine dissection at the University of Science and Technology, Sudan, Turkey.[11] Foghi K and coworkers observed a case of celiacomesenteric trunk during routine dissection of the abdomen of a 30-year-old male cadaver at Bojnurd, Iran.[18] Yan observed a case of celiacomesenteric trunk during routine dissection in a medical school in Japan.[19] The celiacomesenteric trunk was also reported by Manyama during routine dissection at Catholic Medical University, Tanzania.[20] Another case of celaicomesenteric trunk was observed in a cadaveric dissection by Dogan at Selcuk University, Turkey.[21]

Lovisetto and coworkers reported a case of 79 years old female patient who came with a complaint of acute abdominal pain. Abdominal radiograph showed bowel distension and pneumatosis of the stomach wall. Abdominal computed tomography revealed infarction of the stomach, duodenum, and small bowel due to thrombosis of the celiacomesenteric trunk. Exploratory laparotomy revealed infarction of the spleen, necrosis of the liver, and gastrointestinal tube from the stomach to the first 1/3rd of the transverse colon. The patient did not survive after surgery.[22] Boukoucha and coworkers reported a case 27 years old male who was admitted to the emergency department for acute abdominal pain in Tunisia. The patient was immediately operated on for extensive intestinal necrosis. In postoperative Computed Tomography, the celiacomesenteric trunk was observed, which was complicated by extended thrombosis. The patient died of septic shock after two days.[23]

Huang and coworkers conducted a study on 238 gastric cancer patients to determine celiac artery variations and their impact on gastric cancer surgery. They observed 33.58% variations in celiac artery pattern and noticed the longer average operating time and bleeding time in patients with a variant celiac artery pattern.[24]

CONCLUSION

From this study, it is concluded that knowledge of the celiacomesenteric trunk, an unusual variation of the celiac trunk and the superior mesenteric artery, is very important for clinicians and surgeons for planning surgery on the abdominal region because celiac trunk and superior mesenteric arteries supply the major abdominal organs**.** This variation can affect the pattern of blood supply to the organs. Whenever there is occlusion of this trunk, it may prove fatal as collateral circulation is least possible in this part of the abdomen by the small inferior mesenteric artery.

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REFERENCES

1. David J, Susan S. Gray's anatomy: the anatomical basis of clinical practice.
2. Singh I. Human embryology. JP Medical Ltd; 2014 Sept. 30.
3. Inecikli MF, Kafa IM, Uysal M, Bakirci S, Oygucu IH. Multiple variations of the branches of abdominal aorta. Intern J Anatom Variations. 2010;3:88-90.
4. Arudchelvam J. Study on the variations of the ventral abdominal aortic branches: a computed tomography-based study. Sri Lanka Journal of Surgery. 2021 Mar 31;39(1).
5. Farghadani M, Momeni M, Hekmatnia A, Momeni F, Mahdavi MM. Anatomical variation of celiac axis, superior mesenteric artery, and hepatic artery: Evaluation with multidetector computed tomography angiography. Journal of Research in Medical Sciences. 2016 Jan 1;21(1):129.
6. Pamidi N, Varma S, Vollala VR. Anomalous branching pattern of celiac trunk. IJAV. 2008 Jan 1;1:8-9.

7. Purushothama Raju N, Yash Kumar Achantani. Variants of Coeliac Trunk, Hepatic Artery and Renal Arteries in Puducherry Population. International Journal of Anatomy, Radiology and Surgery.2018;7(1):38-43.
8. Odekunle A, Uche-Nwachi EO. Abnormal testicular vascular patterns amongst three Trinidadians: a case report. Online Journal of biological sciences. 2007;1(1):18-20.
9. Tiwari S, Kataria S, Verma R. Symmetrical variations in the branching pattern of abdominal aorta: a case report. Int J Anat Var (IJAV). 2014 Jan 1; 7:83-5.
10. Yammine K. Evidence-based anatomy. Clinical Anatomy. 2014 Sep; 27(6):847-52.
11. Taha KM, Alsharif MK, Elamin AY. Variation in morphology and branching pattern of superior mesenteric artery. Folia Morphologica. 2017;76(3):532-5.
12. Hazirolan T, Metin Y, Karaosmanoglu AD, Canyigit M, Turkbey B, Oguz BS, Ariyurek M. Mesenteric arterial variations detected at MDCT angiography of abdominal aorta. American Journal of Roentgenology. 2009 Apr;192(4):1097-102.
13. Wamanrao MU, Ramakrishna KY. Anatomical study of abdominal aorta and its branches for multiple variations. Int J Anat Res. 2016;4(2):2320-7.
14. Arudchelvam J. Study on the variations of the ventral abdominal aortic branches: a computed tomography-based study. Sri Lanka Journal of Surgery. 2021 Mar 31;39(1).
15. Chen H, Yano R, Emura S, Shoumura S. Anatomic variation of the celiac trunk with special reference to hepatic artery patterns. Annals of Anatomy-Anatomischer Anzeiger. 2009 Jan 1;191(4):399-407.
16. León RA, Aguirre GB, Coronado VT, Sánchez DA, Nava MC, Zamudio MD, Mendizabal JA, José J, De Anda M, Pineda-Martinez D. Variations of the celiac trunk in Mexican population by MDCT angiography. Eur. J. Anat. 2021;25:57-64.
17. Dao SB, Boubakar O, Moussa Z, Bénild KT, Nina NO, Annick R, Gaïba LP, Robert Z, Ousseini D, Rabiou C. Anatomical variants of celiac trunk in relation to its branching: a preliminary sub-saharan study. Open Journal of Radiology. 2019 Jun 28;9(02):151.
18. Foghi K, Ahmadpour S. Celiacomesenteric trunk: a case report. Eur J Anat. 2014;18(3):191-3.
19. Yan J, Nagasawa Y, Nakano M, Hitomi J. Origin of the celiac and superior mesenteric arteries in a common trunk-description of a rare vessel variation of the celiacomesenteric trunk with a literature review. Okajimas Folia Anatomica Japonica. 2014;91(2):45-8.
20. Manyama M, Lukanima A, Gesase A. A case of celiacomesenteric trunk in a Tanzanian man. BMC research notes. 2013 Aug 29;6(1):341.
21. Dogan NU, Fazliogullari Z, Yilmaz MT, Uysal II, Cicekcibasi AE, Ulusoy M, Gunaslan P, UNVER DOGAN N, FAZLIOGULLARI Z, YILMAZ M, UYSAL I. A complex variation of the parietal and visceral branches of the abdominal aorta. Int J Morphol. 2011;29:90-3.
22. Lovisetto F, De Lorenzi GF, Stancampiano P, Corradini C, De Cesare F, Geraci O, Manzi M, Arceci F. Thrombosis of celiacomesenteric trunk: report of a case. World journal of gastroenterology: WJG. 2012 Aug 7;18(29):3917.
23. Boukoucha M, Yahmadi A, Znaidi H, Khelifa RB, Daghfous A. Spontaneous celiacomesenteric trunk dissection: case report. International Journal of Surgery Case Reports. 2020 Jan 1;71:128-31.
24. Huang Y, Mu GC, Qin XG, Chen ZB, Lin JL, Zeng YJ. Study of celiac artery variations and related surgical techniques in gastric cancer. World Journal of Gastroenterology: WJG. 2015 Jun 14;21(22):6944.