

Variations in the origin of the splenic artery and its clinical implications

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Abstract

Background: Splenic artery also known as lineal artery is the largest branch of celiac trunk in adults and is the second largest next to common hepatic artery in fetal life. Anatomy, Surgery and Radiology fields are intertwined. If a correct data of native population is available on the vascular anatomy it will be of excellent use for surgeons and radiologists. **Aim:** The aim of this study the variation in the site of origin of splenic artery in human cadavers. **Objective:** To study the variation in the site of origin of splenic artery. **Materials and Methods:** Fifty cadavers embalmed with 10% formalin were utilized in this study. Variations in the origin of the splenic artery were noted. **Results:** It was observed that the splenic artery originated from the celiac trunk in 48 cadavers (96%), in 1 cadaver (02%) it originated from the abdominal aorta and in 1 cadaver (02%) from superior mesenteric artery. **Conclusion:** Keeping in mind the clinical importance and to add up more knowledge to the already existing literature, the present study was conducted to know the exact variations in origin of splenic artery of native population.

Key Words: Abdominal aorta, celiac trunks, lineal artery, splenic artery.

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INTRODUCTION

Splenic artery is the largest branch of celiac trunk in adults and is the second largest next to common hepatic artery in fetal life. It is tortuous in its course. It gives branches that supplies to the stomach, pancreas, and greater omentum and ends by supplying the spleen via its terminal branches. Incidence of splenic injury is on the rise owing to increase in accidents. Now total splenectomy is not the first choice of treatment modality which is replaced by nonoperative management and spleen preserving surgeries like partial splenic artery embolization, ligation of terminal branches of the splenic

artery. Splenic artery embolization and ligation is also successively used in conditions like hypersplenism, thrombocytopenia, and aneurysms of splenic artery and tumors of spleen. There is tremendous improvement in the investigative procedures to detect the vascular disorders. X-ray angiography, an invasive procedure is replaced by noninvasive imaging modalities like Ultrasonography, Computerized tomography and Magnetic resonance imaging.

Development

The intraembryonic blood vessels in early stages consist of networks of diffuse capillary plexus which are laid down along the course of future definitive vessels. Some of the capillaries dilate and coalesce with adjacent ones to direct the blood flow, whereas others regress and disappear. Persistent vessels form arteries or veins. This arrangement alters in subsequent development due to fusion of paired vessel or hypertrophy of one and atrophy of other or formation of new vessel. Ventral splanchnic arteries are originally paired vessels. After fusion of the dorsal aortae they merge as unpaired trunks that are supplied to the visceral organs. With the advent of longitudinal anastomotic channels [dorsal channel persists as gastroepiploic, pancreaticoduodenal and marginal

arteries of large gut; ventral channels give rise right and left gastric arteries] numerous ventral splanchnic branches give rise to celiac trunk, superior mesenteric artery and inferior mesenteric artery¹. As the viscera supplied descend, their origins migrate caudally by differential growth. The celiac trunk as hypothesized by Morita is formed by the union of 1st, 2nd and 3rd root along with longitudinal anastomotic artery. 1st root corresponds with the left gastric artery, 2nd root with splenic artery and 3rd with common hepatic artery².

In adults splenic artery is the larger branch of the celiac trunk whereas in fetal and early postnatal life, the largest branch is common hepatic artery. Von Damme and Bonte⁴ studied the branches of celiac trunk in 156 abdominal preparations by arteriography, corrosion and dissection method. They describe that the celiac trunk bifurcates into the splenic artery and hepatic artery; left gastric artery is a mobile vessel whose origin may slide between the aorta, all over celiac trunk up to trifurcation. They did not observe any variations in the origin of splenic artery. Shoumura S, Emura S, Utsumi S, Chen H, Hayakawa D, Yamahira T *et al*⁵ studied the mode of branching of the celiac trunk in 184 Japanese cadavers. They reported 4 cases of trunk which bifurcated into left gastric artery and splenic artery. They also observed a case which had a lienomesenteric and gastrohepatic trunk. The splenic artery in this case originated from lienomesenteric trunk, superior mesenteric artery being its other branch. Oh E *et al*⁶ in their retrospective review of 159 contrast enhanced abdominal CT examinations found incident independent origin of the hepatic and splenic arteries was observed in two of 159 examinations (1.3%). This is similar to the report of the angiographic and surgical literature (1%). Daisy Sahni *et al*⁷ studied the branches of splenic artery and splenic artery segments in 200 adult autopsy cadavers. Study was done by both dissection and radiological method. The branching pattern of the splenic artery is very much variable and a prevailing pattern could not be identified. In all 200 cases the splenic artery originated from the celiac trunk. Pandey S K *et al*⁸ studied the variations in origin, course and terminal branching pattern of splenic artery in 320 cadavers. The splenic artery originated from celiac trunk in 90.6%, from abdominal aorta in 8.1% and either from common hepatic artery or superior mesenteric artery in 1.3%. Selma Petrella *et al*⁹ studied anatomy of the celiac trunk through

its diameter, length and variations of its branches in 89 cadavers. Classic celiac trunk with 3 branches was found in 73 cases. Variations were noted in rest 16 cadavers. In 3 cases gastrosplenic trunk was noted and common hepatic artery arose from superior mesenteric artery. In 2 cases hepatosplenic trunk was observed and the left gastric artery originated from abdominal aorta. In 2 all the 3 branches arose directly from abdominal aorta. In remaining 9 cases additional branches were observed. Bergman *et al*¹² mentioned that splenic artery may arise from the aorta in combination with the hepatic artery to form a hepatosplenic trunk (3.5%), or combination with the left gastric artery to form a splenogastric trunk (5.5%).

MATERIALS AND METHODS

Fifty cadavers embalmed with 10% formalin were utilized in this study. Cadavers were obtained from a teaching institute and tertiary care hospital. None of the cadavers showed any evidence of previous surgery. Peritoneal cavity was opened and explored. Stomach was turned superiorly. As the pancreas was uncovered the celiac trunk was identified and the dense autonomic plexus around it was cleared. Then the splenic artery was traced proximally up to its origin and also distally noting its course in relation to pancreas. The celiac trunk, splenic artery and its branches were noted and photographed. When all the branches and course of the splenic artery were visible, data were noted down.

RESULTS AND DISCUSSION

In present study, 50 embalmed cadavers were used. Out of 50 cadavers, 45 cadavers were of males and 5 cadavers were of females.

Table 1: Variation in site of origin of splenic artery (Fig.2, 3, 4)

Sr. No.	Origin	Cadavers	(%)
1	Celiac trunk	48	96
2	Superior mesenteric artery	01	02
3	Abdominal aorta	01	02
Total		50	100

It was observed that the splenic artery originated from the celiac trunk (Fig.2) in 48 cadavers (96%), in 1 cadaver (02%) it originated from the abdominal aorta (Fig.3) and in 1 cadaver (02%) from superior mesenteric artery as splenomesenteric trunk (Fig.4).

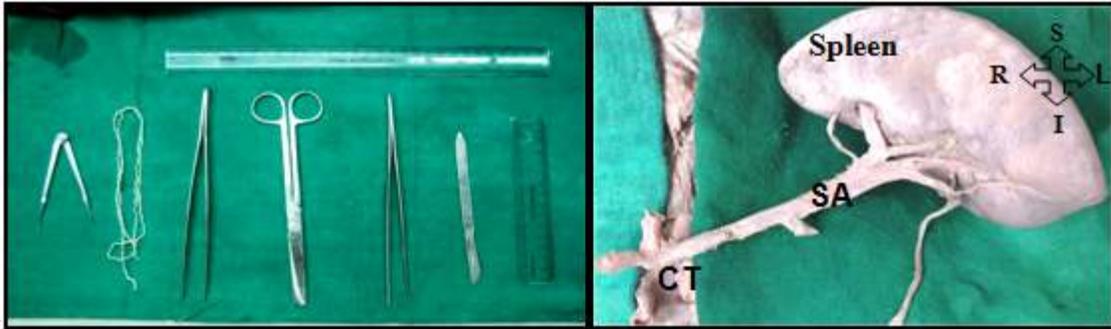


Figure 1

Figure 2



Figure 3

Figure 4

Figure 1: Instruments used for dissection; **Figure 2:** Origin of splenic artery from celiac trunk. **Figure 3:** Variation in origin of splenic artery (SA). **Figure 4:** Variation in origin of splenic artery from abdominal aorta (AA) (SA) from superior mesenteric artery (SMA) **CHA:** Common Hepatic artery. **LGA:** Left Gastric artery. **R:** Right. **L:** Left. **S:** Superior. **I:** Inferior

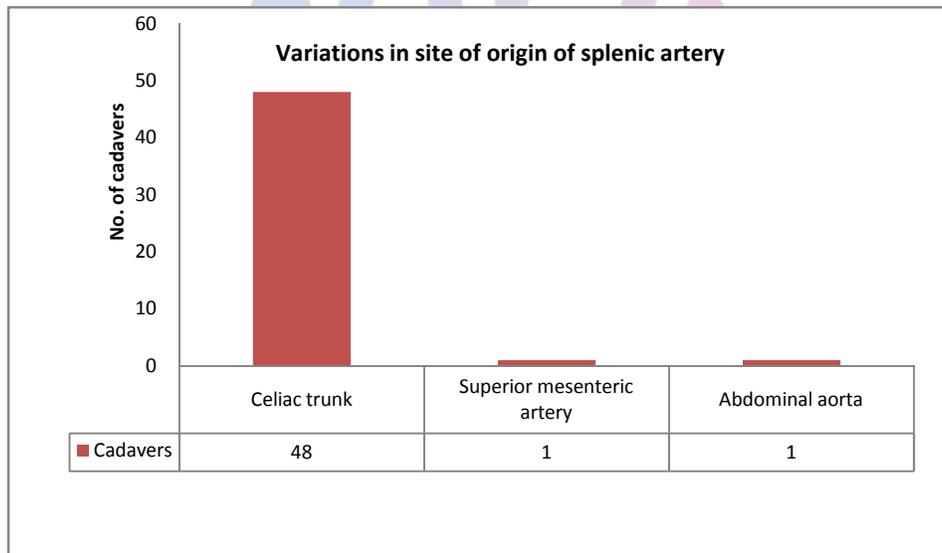


Figure 1: Showing the frequency of origin of splenic artery

Splenic artery normally arises as one of the three terminal branch of the celiac trunk. In the present study the splenic artery originated from the celiac trunk in 48 cadavers (96%), in 1 cadaver (02%) it originated from the abdominal aorta and in 1(02%) from superior mesenteric artery. Mikhail Y *et al*³, Von Damme⁴ and Daisy Sahni *et al*⁷ did not observe any variations in the origin of splenic artery. Shoumura S *et al*⁵ have found in their study that

splenic artery was arising in common with gastric artery as gastrosplenic trunk in 4 cases out of 184 cases; they also found in one case, the splenic artery was arose in common with superior mesenteric trunk as splenomesenteric trunk. Pandey S K *et al*⁸ have found that the splenic artery was arose from the celiac trunk in 90.6%, abdominal aorta in 8.1% and either from common hepatic artery or superior mesenteric artery in 1.3%.

Shoumara S *et al*⁵, Pandey S K *et al*⁸ reported origin of splenic artery from superior mesenteric artery. Oh E *et al*⁶, Pandey S K *et al*⁸, Salma Petrella *et al*⁹ reported direct origin of splenic artery from abdominal aorta. Shoumara S *et al*⁵ (2.17%), Salma Petrella *et al*⁹ (3.37%) reported origin of splenic artery from gastrolial artery. Swamy VL, Chaitanya K¹⁰ splenic artery was originated from the celiac trunk in all spleens. Gangadhara *et al*¹¹ studies show that all the cadavers the splenic artery was arising from coeliac trunk. Bergman *et al*¹² mentioned that splenic artery may originates from the aorta in combination with the hepatic artery and to form a hepatosplenic trunk (3.5%), or combination with the left gastric artery to form a gastrolial trunk (5.5%).

SUMMARY AND CONCLUSIONS

The splenic artery is clinically a very important structure. The splenic artery situated in the lesser sac has been of great interest to the anatomist; surgeons, vascular surgeons, physicians, and radiologists. Knowledge in the variation of splenic artery, coupled with preoperative study, helps to minimize the operative time and intraoperative complications. The splenic artery originated from the celiac trunk in 48 cadavers (96%), in 1 cadaver (02%) it originated from the abdominal aorta and in 1 cadaver (02%) from superior mesenteric artery as splenomesenteric trunk.

REFERENCES

1. Datta A K. Essentials of Human Embryology. 4th ed. Current Books International. 2007; 185,192-3.
2. Imura A, Oguchi T, Shibata M, Takahasi T. An Anomalous case of the hepatic artery arising from the

- superior mesenteric artery. Okajimas Folia Anat. Jpn. Aug 2007. 84(2): 64-6.
3. Mikhail Y Kamd, Nawar R, Rafla. Observation on the mode of termination and parenchymal distribution of splenic artery with evidence of splenic lobation and segmentation. J Anat. 1979; 128: 253-258.
4. Vondamme JP, Bonte J. The branches of celiac trunk. Acta Anat. 1985; 222: 110-114.
5. Shoumara S, Emura S, Utsumi S, Chen H, Hayakawa D, Yamahira T et al. Anatomical study of the branches of the celiac trunk. Comparison of the findings with Adachi's classification. Kaibogaku Zasshi. 1991; 66: 452-461.
6. Oh E, Gross BH, Williams DM. Independent origin of the hepatic and splenic arteries from abdominal aorta: CT demonstration. J Comput Assist Tomogr. 1998 Jul-Aug; 22(4): 669-670.
7. Daisy SA, Indarjit B, Gupta CN, Gupta FM, Harjeet E. Branches of the splenic artery and splenic arterial segments. Clin Anat. 2003; 16(5): 371-377.
8. Pandey SK, Bhattacharya S, Mishra RN, Shukla VK. Anatomical variations of the splenic artery and its clinical implications. Clin Anat. 2004; 17: 497-502.
9. Petrella S, de Sousa Rodriguez CF, Sgrott EA, Fernandes GJM, Marques SR, Prates JC. Anatomy and Variations of the Celiac Trunk. Int J Morphol. 2007; 25(2): 249-257.
10. Swamy VL, Chaitanya K. Study of prehilic branches of splenic artery by dissection method. International Journal of Medical Research and Health Sciences. 2013;2(3): 620-623.
11. Gangadhara et al Study on origin, course, branching pattern and morphometry of splenic artery and its branches supplying the spleen-a cadaveric study. IJCRR. 2014; 6(18): 16-23.
12. Bergman RA, Thompson SA, Afifi AK, Saadeh FA. Compendium of Human Anatomic Variation: Text, Atlas, and World Literature. Munich: Urban and Schwarzenberg, 1988.

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