Section: Anatomy

Original Research Article

MORPHOLOGICAL EVALUATION OF SPLENIC ARTERY AND ITS VARIATIONS- CADAVERIC STUDY IN SOUTH COASTAL ANDHRA PRADESH

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Received *: 10/01/2025*
Received in revised form *: 11/03/2025*
Accepted *: 27/03/2025*

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DOI: 10.70034/ijmedph.2025.1.353

Source of Support: Nil,
Conflict of Interest: None

Int J Med Pub Health
2025; 15 (1); 1892-1896

ABSTRACT

Background: Knowledge of course and relations of splenic artery in adults is of utmost important along with its branches so as to carry out number of interventions on the spleen as well as on its vessels.
Materials and Methods: The variations in orgin, course, and terminal branching pattern of the splenic artery were studied in 100 cadavers.
Results: The artery originated from the coeliac trunk in the majority of cadavers (90.6%), followed by abdominal aorta (8.1%), and other sights (1.3%). A suprapancreatic course of the artery was commonly observed (81.1%) followed by enteropancreatic (18.5%), intrapancreatic (2.6%), and retropancreatic (1.8%) courses. In two cases (0.63%) the proximal part of the splenic artery made a loop that was embedded in the substance of the pancreas, which is an interesting and rare finding. The splenic artery divided into terminal branches in 91 (97%) cadavers. In nine (2.8%) cadavers it passed through the hilum of spleen without dividing. Two terminal branches were the most common (63.1%) followed by four (18.8%), six (9.7%), and more than six (5.6%) branches. The present study clearly indicates that there is variation in origin, course, and terminal distribution pattern of the splenic artery.
Conclusion: The splenic artery divides either in the form pf serpentine or sinuous depending on the zone of artery which branched longer. In this study we have observed a polar artery which is inferior The knowledge of these variations are of significant importance during surgical and radiological procedure of upper abdominal region to avoid any catastrophic complications.
Keywords: Spleen, Splenic artery, pancreas, abdominal aorta accessory splenic artery.

INTRODUCTION

The spleen is present between the fundus of the stomach and the diaphragm in the left hypochondriac region, and this organ shows considerable variations in shape and size.[1] It is supplied by the splenic artery, which most commonly originates from the celiac trunk. The spleen has several important functions, which is hematological during foetal life and immune in adults. The spleen is called grave yard of red blood cells in adults Due to its structure and location (particularly at the level of ribs IX-XI), it is frequently injured during trauma.[2] The incidence of splenectomy is approximately 6.4–7.1 per 100,000 people per year, while trauma and hematological disorders are more common. The mortality in case of splenic trauma is 7–18% and injury to the vascular structures is one of the major risk factors.[4,5] Lacerations, cuts, and dissections of the splanchnic arteries lead to high mortality rates in cases when they are not detected in time.[6] The presence of developmental variations of the vessels can lead to an increase in the duration of surgery as well as increased blood loss.

Abdominal Aorta is the chief arterial supply to Abdomen and pelvis. Out of the central branches, the splenic artery is the largest branch of the Coeliac

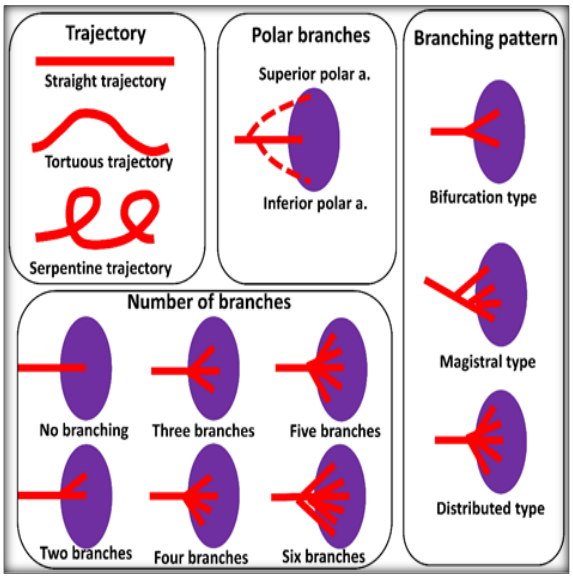
trunk in adults and is the second-largest next to the common hepatic artery in fetal life.[1] It is tortuous in its course. It gives branches that supplies to the stomach, pancreas, and greater omentum and ends by supplying the spleen via its terminal branches Incidence of splenic injury is on the rise owing to an increase in accidents.[2] Embryologically it is derived from the fusion of the vitelline arteries supplying the yolk sac and are located in the dorsal mesentery of the gut. These vessels supply the derivatives of the foregut, midgut and hindgut. Thus the splenic artery is derived from the celiac trunk. It supplies the spleen, pancreas, stomach and greater omentum. The present study was conducted to assess variation in the branching pattern and anomalies of origin in the splenic artery and as its development is from splenic nodular masses any accessory splenic vessels are present. The splenic artery and coeliac trunk are formed from fusion ventral splanchnic arteries ,The splenic artery is the largest branch of the celiac trunk. Its origin is at the level of T12/L1 vertebral bodies. Branches of the splenic artery usually arise at right angles from the stem. The splenic artery divides into constant and inconstant branches.[3] The more constant branches of splenic artery are: Short gastric arteries (vasabrevia), Left gastroepiploic artery, Pancreatic branches, Superior right terminal branch (ramuslienogastricus) or right gastroepiploic, and Inferior terminal branch (ramus lienogastroepiploicus) or left gastroepiploic and Inconstant branches are posterior gastric artery, superior polar artery, inferior polar artery, middle terminal branch.

MATERIALS AND METHODS

The present cadaveric study was conducted in the department of Anatomy. At Government Siddhartha Medical College, Vijaywada, ACSR; Nellore and SPVGMC; MTM and AMC visakhapatnam and paderu from cadavers during the routine dissection of MBBS students. It is comprised of 100 cadaveric specimens. embalmed with 10% formalin. Ethical approval for the study was obtained before starting the study. The 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 the 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. Results were statistically analysed. A P-value of less can be correlated with its embryological development. The than 0.05 was considered significant.

RESULTS

The Spleen was found behind the stomach along the ribs as per normal. The coeliac trunk found in its usual position of T12. The splenic artery was assessed based on its course and the presence of loops. Polar arteries were defined as vessels which arise from the splenic artery and enter one of the poles of the spleen. The number of branches was calculated based on the number of terminal branches (first order branches) that entered the hilum of the spleen. Branching patterns were classified based on the number and angle of terminal branches. A schematic representation of the main classifications mentioned in the article is presented in Figure 1.



The splenic artery distribution led to identification of four types: straight, sinusoidal, serpentine and combination of the abovementioned. These types of are presented in Figures 2–4. of trajectory are presented in Figures 2–3

The vessel had an intrapancreatic course (in the parenchyma of the gland) in 14.85% (49 cases) and in 10.00% of cases the artery was located retropancreatic (33 cases) (Figures 4). 4.85% (16 cases), the vessel had an intrapancreatic course (in the parenchyma of the gland) The artery was located suprapancreatic in 70.30% (232 cases), anteropancreatic in 4.85% (16 cases), the vessel had an intrapancreatic course (in the parenchyma of the gland) in 14.85% (49 cases) and in 10.00% of cases the artery was located retropancreatic (33 cases).

Figure 4: Intra pancreatic course

The course of the splenic artery can be easily assessed in case of a straight trajectory. However, in the case of a sinuous, serpentine or alternating trajectory, it is difficult to single out a specific type. In these types, the course was assessed judging by the prevailing percentage of distribution. (Figure 5)

Figure 5: (Straight course)

In the region of hilum the splenic artery branched into 2 as first order er in 82 cases (82.73%), into three arteries in 12 cases (11.11%), and in 6 cases (3.33%), the artery entered the hilum of the spleen without branching. In 2 cases, there was a separate polar artery which arised from splenic artery but didn't pass through hilum. It had individual course with thickness of 2 mm and present at the anterior pole. (Figure 6)

Figure 6: (Accesoory SA)

In this study, out of 100 specimens, Jyothi et al,[8] compared the prevalence of variations in the branching pattern of the splenic artery. The variations in the study were almost correlated with the available literature. In some instances, the left gastroepiploic artery, the posterior gastric artery and the accessory left gastric artery took origin from the interior of the spleen so care should be taken during splenectomy. Hence, the arterial blood supply of the spleen is so varied that no two vascular patterns are ever the same.

We found that origin of the splenic artery was from the celiac trunk in 94, a superior mesenteric artery in 4 and an abdominal aorta in 2 cases. Bokan et al,[9] studied the variation in the site of origin of splenic artery in 50 cadavers. It was observed that the splenic artery originated from the celiac trunk in 96 cadavers (96%), in 1 cadaver (02%) it originated from the abdominal aorta and in 1 cadaver (02%) from the superior mesenteric artery. Keeping in mind the clinical importance and to add up more knowledge to the already existing literature. Shoumara et al,[10] studied the mode of branching of the celiac trunk in 184 Japanese cadavers. They reported 4 cases of the trunk which bifurcated into the left gastric artery and splenic artery. They also observed a case which had a lienomesenteric and gastrohepatic trunk.

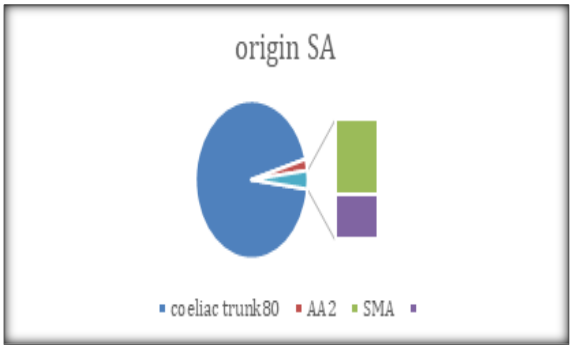


Table1: (ORIGIN of SA)

DISCUSSION

CT examinations found the incident independent origin of the hepatic and splenic arteries was observed in two of 159 The vascular architecture of the spleen was presented in detail examinations

(1.3%). This is similar to the report of the by Assolent in 1802. Variation of arterial anatomy is very angiographic and surgical literature (1%) common and occurs in nearly half of the population The morphologically terminal pattern of the splenic artery is of two types, the Magistral and Distributed. In the Magistral type, the number of surgical interventions performed on the spleen and its vessels is constantly increasing. Embolization or ligation of the vessels of the spleen is widely used in case of portal hypertension, oncological diseases, and in various hematological diseases (pancytopenia, thrombocytopenia, hemolytic anemia, Banton's syndrome, etc.).[7] All of these procedures are based on a deep understanding of both the anatomy of the organ and the region as a whole. Knowing the variants of the splenic artery is particularly important for visceral surgeons, due to its frequent involvement in gastrointestinal bleeding, organ transplantation, trans-arterial chemoembolization of neoplasms, infusion therapy and iatrogenic injuries.[10] The splenic artery is the largest artery of the celiac trunk.[9] Branching from the trunk at an acute angle, it turns to the left, participating in the blood supply of the pancreas, spleen, stomach and their ligaments.[5] Thet course of the splenic artery is variable. There are three main types: straight, sinuous and spiral.[10] One or more loops are observed in up to 83–86% of spleens.[11,12] It is assumed that tortuosity increases with age. This is confirmed by the fact that such a trajectory is not typical for the vessels in fetuses, newborns and children, but prevails in the elderly.[13,14] However, one of the studies of the tortuosity of the splenic artery did not reveal a relationship with age or body weight, but instead indicated a relationship between the female sex and a high degree of tortuosity. The authors suggested that this is due to the peculiarity of the influence of female sex hormones on the walls of blood vessels.[15] However, Brinkman and coworkers did not find any relationship between splenic artery loops and age or sex but determined that the length of the artery in contact with the pancreas decreased with age.[12] Michels suggested that the artery is straight in infants and children, minimally tortuous in middle age, and markedly tortuous in the elderly. He suggested that the tortuosity of splenic artery enables the motion of the spleen and allows expansion of the stomach without obstructing blood flow within the splenic artery when passing through the stomach bed. Other possibilities included movement of the spleen with respiration, the ability of the artery to stretch, the damping system developed to provide protection the splenic structure, growth of an artery tethered by its pancreatic branches, and developmental justification.[16,17] However, one study showed that extremely tortuous splenic artery was associated in several cases with a clinical disease pattern that resembled chronic pancreatitis.[13] According to our study, the splenic artery had a straight course in about(80%), tortuous(sinusoidal) 2 cadavers (2%),and serpentine in 16 cadavers and combined in 2%.

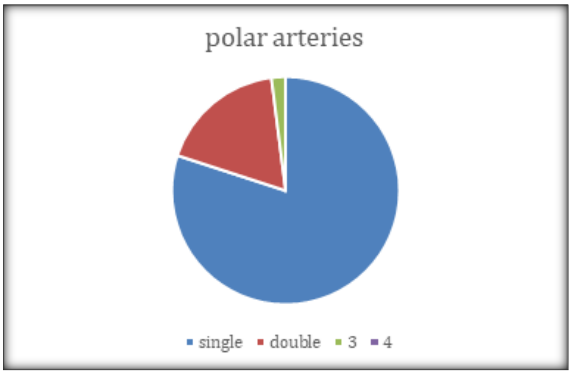


Table 2: Polar Arteries

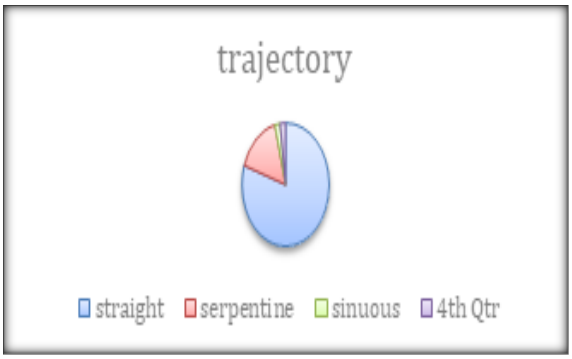


Table 3: (Comparison of type of course)

CONCLUSION

The lineal branching of the main splenic trunk takes place near the spleen (1-2cm from the hilus).[5] In the Distributed type Authors found that surgeons should have a thorough knowledge -of splenic artery branching which takes place at a distance of 2-12cm from the hilum of the spleen. There was variation in the origin of the splenic artery such as previously called a Lineal artery. The splenic artery is one of from celiac trunk, superior mesenteric artery and abdominal the branches of the coeliac trunk which in turn arises from aorta. The spleen or so called LENIES develops from mesoderm of dorsal mesentery in the form of lobules which are supplied by splachnic branches of aorta.one of the lobue with its own splanchnic branch might have merged with the other lobules as an embryological origin.

Courtesy: Government Siddartha Medical College, Vijaywada; SPVGMC Machilipatnam, Government medical college paderu, Government Siddhartha medical college vijayawada.

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