

## UNUSUAL ANATOMICAL VARIATION IN THE BRANCHING PATTERN OF SPLENIC ARTERY

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### ABSTRACT

Splenic artery is the largest branch of coeliac trunk and is tortuous in its course. In routine dissection of abdomen for undergraduate students in KFMSR, among 32 cadavers, variations in the branching pattern of splenic artery were noticed in one cadaver. Splenic artery before its normal termination, it gave superior and inferior polar arteries. Apart from these arteries, an accessory splenic artery was seen arising from left gastroepiploic artery. It entered the spleen from its lateral end. The knowledge of these variations is clinically important for surgeons to prevent bleeding during any surgical or radiological interventional procedures.

**KEY WORDS:** Splenic artery, Superior polar artery, Inferior polar artery, Accessory splenic artery.

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### INTRODUCTION

Spleen is a haemolymph organ situated in the left hypochondrium and partly in the epigastrium. It is supplied only by the splenic artery. Apart from spleen, splenic artery gives branches to pancreas also. Splenic artery gives off 5 to 6 short gastric arteries and the left gastroepiploic artery which supplies the stomach. It courses superior and anterior to splenic vein, along the upper edge of the pancreas. On reaching the hilum of spleen, the artery usually divides into superior and inferior terminal branches and each branch further divides into 4 to 6 segmental intrasplenic

branches [1]. Often the third terminal branch is formed which is called as middle terminal artery. The terminal branches pass between the two layers of lieno-renal ligament and enter the hilum. These terminals which are arising from the splenic trunk divide further into ultimate and penultimate branches. After origin from the terminal arteries, ultimate arteries directly go to the spleen whereas the penultimate branches give further branches before entering the hilum of spleen [2]. The branches of splenic artery entering into the spleen through the lower ends of the spleen are called polar arteries i.e. Superior and Inferior polar arteries [2].

## MATERIALS AND METHODS

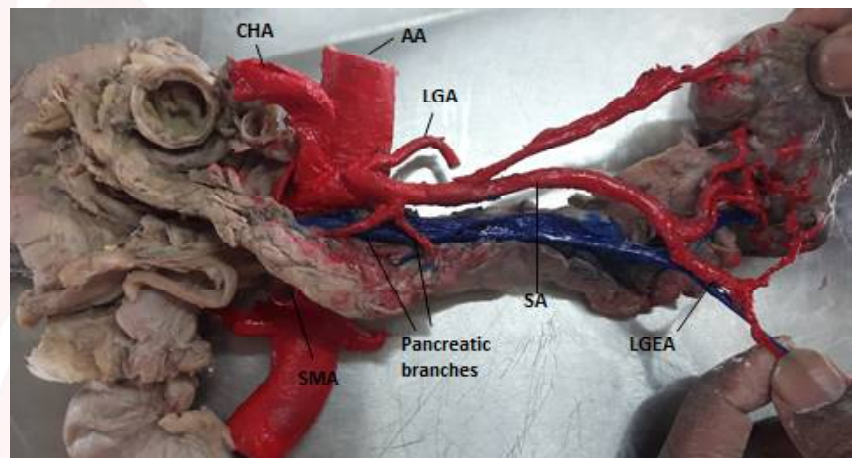
During routine dissection on 32 embalmed cadavers of both sexes, for undergraduate students in the Department of Anatomy, KFMSR during the period of 2015-2016, we observed unusual branching pattern of splenic artery in one cadaver.

## OBSERVATIONS

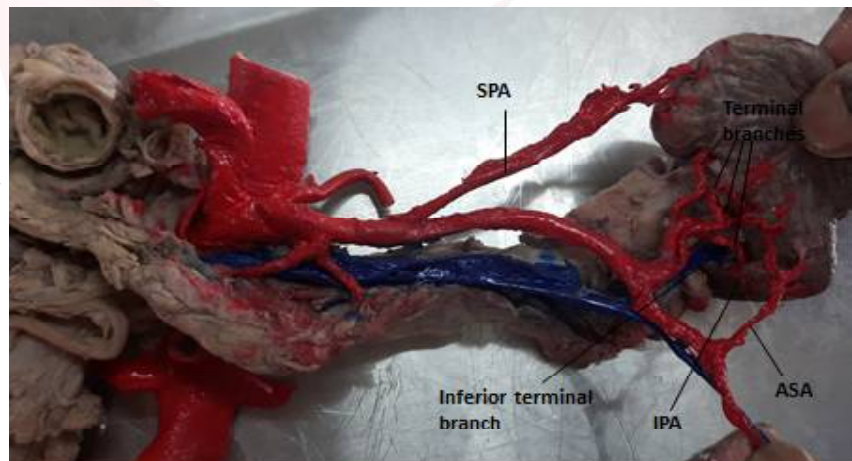
We observed normal origin of splenic artery from coeliac trunk. Splenic artery was tortuous in its course, measuring 15 cm and 0.7 cm in breadth. It showed divisions into four terminal branches. Before its termination into the hilum of the

spleen, it gave Superior polar artery. Superior polar artery was tortuous, originated from the splenic trunk. It measured 7.5 cm, entered the upper end of the spleen and divided into two smaller branches. It was 4 cm proximal to hilum of spleen. Inferior polar artery was 2cm proximal to hilum of spleen and measured 3.5 cm. It originated from inferior terminal branch, passed along the intermediate border of the spleen and entered at the lower pole of the spleen. Apart from these, splenic artery gave the left gastroepiploic artery, from which an accessory splenic artery arose and terminated into 3 smaller branches at the lateral end of the spleen

**Fig. 1:** AA –Abdominal aorta, CHA – Common hepatic artery, LGA – left gastric artery, SA – Splenic artery, LGEA- left gastroepiploic artery, SMA – superior mesenteric artery.



**Fig. 2:** SPA – Superior polar artery, IPA – Inferior polar artery, ASA – accessory splenic artery.



**Fig. 3:** Shows measurement of Superior polar artery 75mm (7.5cms).



## DISCUSSION

The unusual branching pattern of the splenic artery can be correlated with its embryologic development. Embryologically, the splenic artery is derived from the coeliac trunk [3]. It supplies the spleen, pancreas, stomach and greater omentum [4]. Any variation in the embryonic development of ventral splanchnic arteries might lead to variations of splenic artery [5]. The termination of splenic artery can be of 2 types, the Magistral / Compact (30%) and Distributing/Segmental (70%) [6]. In the magistral type, branching of main trunk takes place near the spleen (1-2 cm from the hilum) whereas in distributed type, branching takes place at a distance of 2-12 cm from the hilum. Variations in the terminal branching pattern of splenic artery were also reported. A study on this aspect reported that the splenic artery divided into terminal branches in 97% cases. In 2.8% of cases, it passed through the hilum of spleen without any division. Two terminal branches were the most common (63.1%) followed by four (18.8%), six (9.7%), and more than six (5.6%) branches [7].

In (1910) Piquand [8] reported that in 66% of cases, the splenic artery divided as distributed type and in 34% of cases, divided as Magistral type. Lipshutz [8] in (1917), observed that in 75% of cases, the splenic artery divided as distributed type, showing the three terminal branches. Lipshutz [8-15] and Seok kil Zeon et al (1998) [16] noticed the superior and inferior terminal arteries in 100% of cases. Seok kil Zeon et al (1998) [16] also, reported middle terminal arteries and accessory left gastric artery in 28% of cases. Left gastroepiploic artery took the origin from splenic trunk (72%), inferior polar artery (22%) and superior polar artery (6%) [17].

Naveen Kumar et al [9] in 2014 reported that splenic artery, before its termination in the hilum of spleen, it gave superior and inferior polar arteries. In 2010, Padmalatha et al [10] reported a case of splenic artery giving rise to two polar arteries. Apart from these, both these authors also reported about presence of an accessory splenic artery, originating from left gastroepiploic artery [9,10].

In the present study, the splenic trunk gave origin to superior polar artery reaching the

upper end of the spleen .Thereafter it entered into the hilum of the spleen as four terminal branches. The inferior terminal branch gave a polar branch to the lower end of the spleen. Left gastroepiploic artery originated from the splenic trunk and an accessory splenic artery arose from it and terminated into 3 smaller branches at the lateral end of the spleen. In 3.1% of cases, the distributed type of spleen was seen and in 96.9% of cases the Magistral type of spleen was seen. In (2012), Prashanth Nashiket Cheware et al found the superior polar artery in 28.8% of cases and inferior polar artery in 42.34% of cases [11].

D. Naga Jyothi et al [12] in 2015 reported that in 84% of cases, the distributed type of spleen was seen and in 16% of cases the magistral pattern of terminal branches of splenic artery was found. They also found that the superior polar artery arose from the superior terminal artery in 2%, the artery originated from the splenic trunk in 84% of cases and absent in 14%. The inferior polar artery was seen only in 6% of cases. The same study also reported that in 2% of cases the left gastroepiploic arteries were 2 in number. Among these two, one took origin from interior of spleen and the other from inferior terminal artery. Anterior cardio-esophageal artery or left accessory gastric artery a very rare branch originated from the splenic artery in one cadaver in the same study. The author also mentioned in the study that the ligation of splenic branches should be started from the inferior pole of the spleen as most of the splenic artery branches were very slender and can readily be missed.

Pakhiddey R et al [13] in 2013 observed a case showing two rare variations in the branching pattern of the splenic artery. They reported non-tortuous splenic artery; and was smaller (6 cm) in length a feature very rarely seen in adults. They observed a posterior gastric branch originating from splenic artery along with an accessory branch to the splenic flexure of the colon. The average length of the splenic artery is 13 cm (8–32 cm) and the average width is 7.5 mm (5–12 mm). The splenic artery in this case was considerably smaller in length (6 cm) but normal in diameter (5 mm) [13]. A rare branching pattern of SA to distal one third of



the transverse colon has been reported by Bamac et al. [14].

Holibkova in his study reported that the segmental branches of splenic artery were involved in three types of anastomosis. These are hilar extra-parenchymatous, intra-parenchymatous and subcapsular [15]. Accessory splenic artery is mostly due to intraparenchymatous anastomosis between the inferior polar artery of splenic artery and the splenic branches of left gastroepiploic artery [15].

## CONCLUSION

The observations from this study are clinically very important for surgeons because they may be neglected intraoperatively leading to excessive bleeding during procedures like Total Pancreatectomy, Splenectomy, Gastric esophagoplasty etc. The knowledge of anatomical variations of splenic artery is essential for surgeons during splenectomy.

**Conflicts of Interests: None**

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