



# Anatomical Variation of the Segmental Branches of the Splenic Artery

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## ABSTRACT

### Background

As it is very vascular and friable, the human spleen cannot be sutured always. After a splenic injury, total splenectomy is frequently performed, but it lowers immunity, altering the haematological picture. A specific segmental branch of the splenic artery can be tied up during partial splenectomy to prevent this. Therefore, this study's objective was to precisely locate the splenic artery's segmental branches.

### Methodology

This study involved 30 human spleens. The spleens were meticulously dissected. Cleaning and tracing were done on the splenic artery and its branches. Any differences and variations in the number of segmental branches and intersegmental anastomosis were observed. The splenic artery's other branches that did not supply the spleen were not taken into account.

### Results

The number of branches of the splenic artery which divided the spleen into arterial segments, varied between two to five. Two segmental branches were found in 26.67 % specimens, three were found in 53.33 % specimens, four were found in 16.67 % specimens and five segmental branches were present in 3.33 % of the total spleens. The parts of the spleen which were supplied by these segmental branches were separated by avascular zone.

### Conclusion

The study of anatomical variation of the segmental branches of the splenic artery will enlighten the surgeons knowledge in preserving the vascularity of the spleen during partial splenectomy.

**Key Word:** Spleen, Variation, Segmental branches.

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## INTRODUCTION

The spleen is the largest single mass of lymphoid tissue in the body. The spleen is a large, encapsulated, complex mass of vascular and lymphoid tissue. The splenic artery, one of the most tortuous arteries in the body, supplies the spleen.<sup>[1]</sup>

Before entering the splenic hilum, the splenic artery frequently divides into two or three branches. They separate into four or five segmental arteries when they enter the hilum, each of which serves a section of splenic tissue. Because there is limited arterial collateral circulation between segments, blockage of a segmental vascular frequently results in infarction of a portion of the spleen.<sup>[1]</sup>

The terminal branches are named as the superior, middle and inferior terminal branches which enter the spleen through its hilum.<sup>[2]</sup>

In some spleens, the splenic artery itself or its main branch gives an artery that travels to one of the spleen's poles but does not pierce the hilum. It can be referred to as either the superior or inferior polar branch. These branches supply a specific section of the spleen that is divided by an avascular region. As a result, these branches separate the spleen into distinct artery segments.<sup>[3]</sup>

The spleen's pattern of arterial segmentation and the avascular plane that lies between them vary greatly. A better understanding of the splenic artery's segmental distribution and its variations is crucial for partial removal of the organ, preventing iatrogenic damage in patients, and correctly interpreting angiograms. Additionally, differences in the vascular pattern must be taken into consideration because ligating the wrong vessel might cause ischemia or gangrene, as well as leakage and bleeding from the wound.

### 1. The number of branches of the splenic artery which divided the spleen into arterial segments, varied between two to five.

**Table 1: Showing data of segmental artery of spleen**

No. of Segmental artery	No. of specimen	%
2	8	26.67
3	16	53.33
4	5	16.67
5	1	3.33

## MATERIALS AND METHOD

The study was conducted in the Department of Anatomy, Gauhati Medical College and Hospital. After excluding spleen with obvious pathological changes, decomposition or severely damaged tissue 30 adult spleen were included in this study. The specimens were preserved in a solution containing 10% formalin. The spleens were meticulously dissected. Cleaning and tracing were done on the splenic artery and its branches. Any differences and variations in the number of segmental branches and intersegmental anastomosis were observed. The other branches from the splenic artery that did not supply the spleen were not taken into account.

## RESULTS AND OBSERVATIONS

The splenic artery terminated near the hilum by dividing into two or three primary branches. Of the 30 spleens, 23[76.67%] had two primary branches [Table 2] and 7 [23.33 %] showed three primary branches [Table 2]. Polar branches were seen in 20 specimens. The superior polar branch was present in 8[26.67%] specimens [Table-3], the inferior polar branch was present in 10[33.33 %] specimens, both the superior and inferior branches were present in 2[6.67%] specimens [Table-3] and no polar branch was observed in 10[33.33%] [Table-3] of the total spleens. Then we found out an association between the polar and the primary branches. From this, the numbers of the segmental branches of the splenic artery were counted. From [Table -1], it becomes clear that the number of segmental branches which were present in this study were two in 8 [26.67%] cases, three in 16 [53.33%], four in 5[16.67%] and five branches in 1(3.33%) of the total spleens.

**2. The splenic artery terminated near the hilum by dividing into two or three primary branches.**

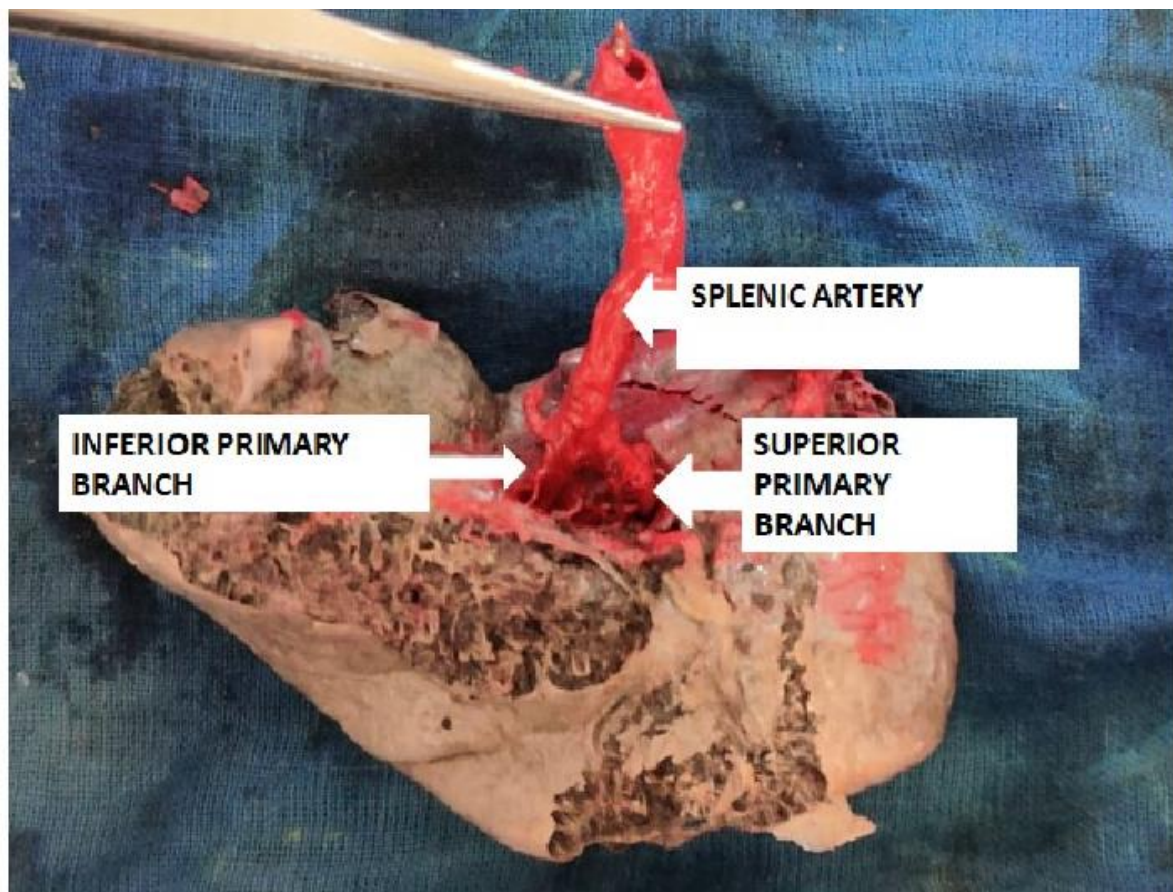
**Table 2 : Showing data of primary branches.**

No. of primary branches	No. of specimen	%
2	23	76.67
3	7	23.33

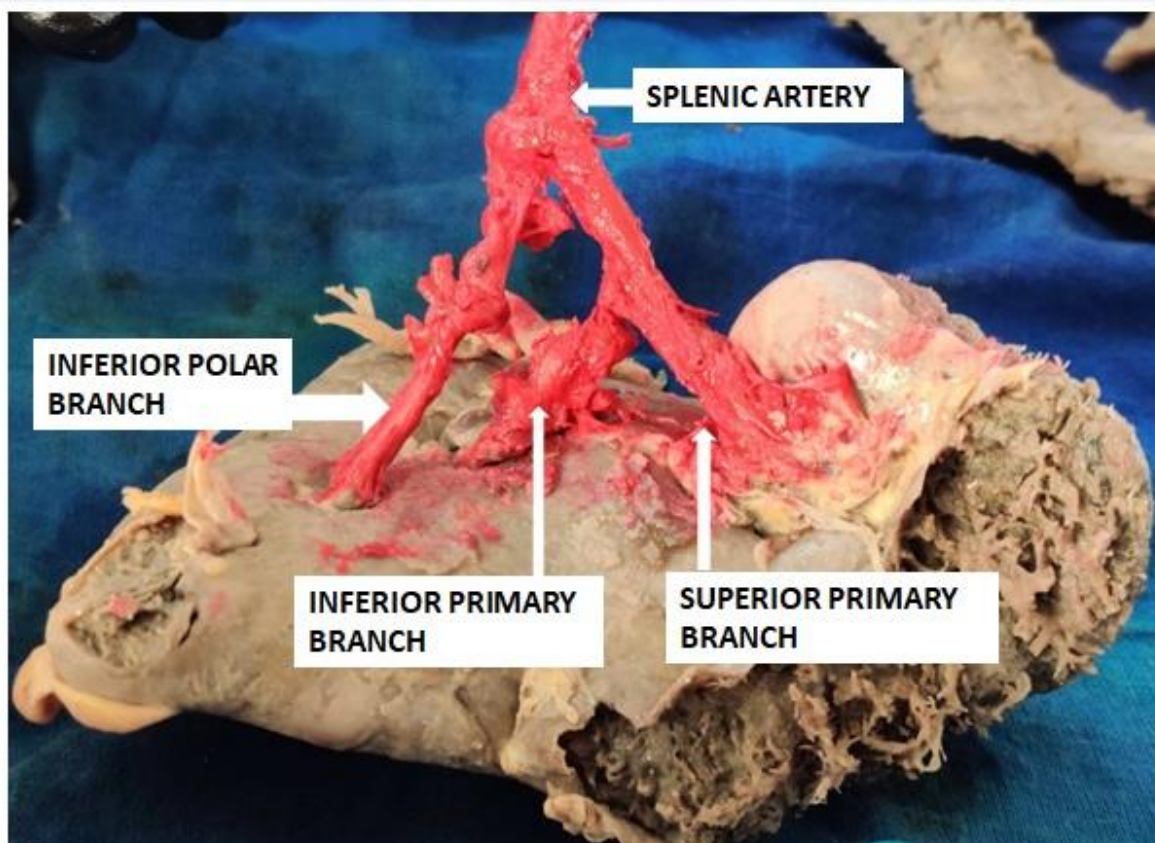
**3. Polar artery**

**Table 3: Showing data of polar artery.**

Polar artery	No. of specimen	%
Superior polar artery	8	26.67
Inferior polar artery	10	33.33
Both	2	6.67
Nil	10	33.33



**Fig. 1 showing superior and inferior primary branch coming from splenic artery.**



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Fig. 2 showing superior and inferior primary branch & inferior polar artery coming from splenic artery.

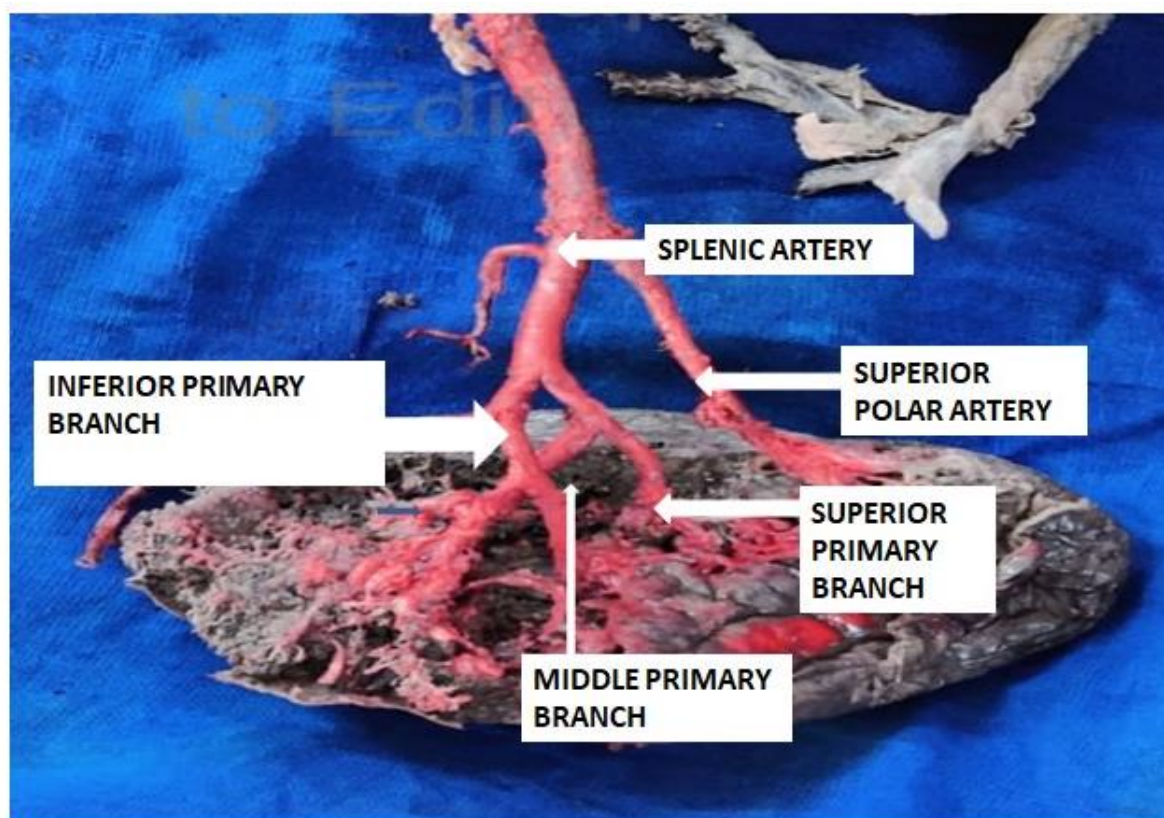


Fig. 3 showing superior, middle and inferior primary branch & superior polar artery coming from splenic artery.

### DISCUSSION

In the present study, the primary and the polar branches of the splenic artery were observed, which divided the spleen into definite segments. Two primary branches were found in 23 [76.66%] and three primary branches were found in 7 [23.33%] specimens. Earlier, Katritsis et al<sup>4</sup> had found two and three primary branches in 85.70% and 14.30% specimens respectively. Gupta et al<sup>5</sup> found them in 84% and 16% specimens, while Michels observed them in 80% and 20% specimens respectively. In other studies which were done by Mikhail et al and Garcia-Lemes, the incidence of the primary branches

was in accordance with that of the above mentioned studies.<sup>6,7</sup>

In this study, the superior polar branch was observed in 8[5+3] i.e. in 26.66% specimens, while the inferior polar branch was observed in 10 [9+1] i.e. in 33.33% specimens. These were found in 39.77% specimens and in 55.24% specimens respectively, in the studies which were done by Garcia-Lemes. The incidence of the superior and the inferior polar branches was 65% and 82% respectively in the study which was done by Michel. It was 60% and 80% respectively in the study which was done by Katritsis et al. Thus, their findings were in accordance with those of the present study.

**Table 4: Comparative studies of polar arteries with earlier studies**

Study	Superior polar artery %	Inferior polar artery %	Both %
Mikhail Y et al <sup>6</sup>	12	50	12
Garcia et al <sup>7</sup>	29.28	44.75	10.49
Jauregui E et al <sup>8</sup>	53	33	-
Shashikala R et al <sup>9</sup>	30	59	11
Karl H Truetner <sup>10</sup>	28.1	46.9	-

Ashoka et al <sup>11</sup>	14	10	12
Michels NA et al	65	82	-
Katritsis E et al <sup>4</sup>	60	80	-
Daisy Sahni et al <sup>12</sup>	52.5	66	-
Garcia – lemes et al <sup>7</sup>	39.77	55.24	-
Katritis et al <sup>4</sup>	60	80	-
SwamyVL et al <sup>13</sup>	41.60	25	16.60
ChawarePN et al <sup>3</sup>	28.82	42.34	11.70
Current study	26.66	33.33	0.6

## CONCLUSION

The spleen is an extremely vascularized and fragile organ. Complete splenectomy is usually performed following spleen injury, predisposing to immunosuppression and predisposing the normal host to life-endangering contaminations and infections, and generates a different haematologic depiction. To remedy this, a partial splenectomy can be performed by ligation of the specific splenic artery segmental branch. As various sparing spleen surgeries depend on better information of the spleen vascular anatomy, this analysis enhances the current information about the segmental branches' morphometry of the splenic artery. The study of anatomical variation of the segmental branches of the splenic artery will enlighten the surgeons knowledge in preserving the vascularity of the spleen during partial splenectomy.

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