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Original Research Article

STUDY ON PRIMARY SEGMENTAL BRANCHES OF SPLENIC ARTERY IN CADAVERIC SPLEENS BY DISSECTION METHOD

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ABSTRACT

Introduction: Spleen plays an important function in immunity and haematological functions. So, nowadays total splenectomy is replaced by splenic conservative surgeries. Partial removal of spleen is possible, as the spleen is divided into various segments, supplied by its own artery. The present study was undertaken to know about the segmental branches of splenic artery.

Objectives: 1.To study the number of primary segmental branches of splenic artery. 2. to measure the distance between the termination of splenic artery and hilum.

Materials and methods: The present study was conducted on 79 adult human cadaver spleens by dissection method, irrespective of their age and sex, fixed in 10% formalin solution, collected from the Department of Anatomy and Forensic Medicine, Mysore Medical College and Research Institute, Mysore.

Results: Two primary segmental branches were seen in 56 (70.9%) specimens, three primary segmental branches were seen in 19 (24.1%) specimens and four primary segmental branches were seen in 4 (5.1%) specimens. The mean distance between termination of splenic artery and hilum of the spleen was 2.1 cm. and the range was extending from 0.3 cm to 6.1 cm.

Conclusion: The present study adds up to the existing knowledge regarding the segmental branches of splenic artery, the better anatomical knowledge about segmental distribution of splenic artery and its variations are important for the partial removal of the spleen.

KEY WORDS: Splenic artery, Segmental branches, Partial Splenectomy.

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INTRODUCTION

The spleen is a highly vascular and friable organ. It is the largest secondary of the lymphoid organ, which contains 25% of the body lymphoid tissue and has both haematological and immunological functions. It is supplied by splenic artery which is the largest branch of coeliac trunk [1].

Historically spleen was considered as a vestigial organ and was removed even for minor ailments and injuries. But because of the greater susceptibility to fulminant sepsis after removal of the spleen, now the splenectomy is not the first choice of treatment modality which is now replaced by non-operative management and spleen preservative surgeries like partial

splenectomy, splenorrhaphy, autogenous splenic implantation and splenic artery embolization [2,3].

The partial removal of the spleen is possible, as the spleen is divided into segments, separated by fibrous septa and each segment is supplied by its own main artery. The presence of splenic segmentation could be attributed to its development or to the terminal division of the artery. Better anatomical knowledge about segmental distribution of splenic artery and its variations are important for the partial removal of the organ. So, keeping the applied aspect and clinical significance of segmental branches of splenic artery and to add more knowledge to the existing one, the present study was undertaken to study the branches of splenic artery which divide the spleen into various segments.

Aims and objectives: To study the number of primary segmental branches of splenic artery and to measure the distance between the termination of splenic artery and hilum of the spleen.

MATERIALS AND METHODS

The present study is conducted on 79 Human cadaver spleens, irrespective of their age and sex, fixed in 10% formalin solution, collected from the department of Anatomy and Forensic Medicine, Mysore Medical College and Research Institute, Mysore over a period of 12 months.

The gross dissection was done by following the guide lines of Cunningham's Manual. The spleen was identified and freed from the posterior abdominal wall and stomach by cutting through the gastrosplenic and lienorenal ligaments. The splenic artery was cut about 10 cm proximal to hilum of spleen, then the spleen was removed. The fascia and fat was cleared at the hilum to expose the segmental branches of the splenic artery. Firstly, the primary segmental branches of the splenic artery were identified and noted, then measured the distance between the termination of splenic artery and the hilum of the spleen. Measurements were taken by using the Digital Vernier Caliper.

RESULTS

Two primary segmental branches were seen in 56 (70.9%) specimens, three primary segmental branches were seen in 19 (24.1%) specimens and four primary segmental branches were seen in 4 (5.1%) specimens.

Table 1: Number of primary segmental branches of splenic artery.

Sl no.	Primary segmental branches	Number of specimens	Percentage
1	One	Nil	0
2	Two	56	70.9
3	Three	19	24.1
4	Four	4	5.1
5	Total	79	100

Fig. 1: Specimen with two primary segmental branches. MT- Main Trunk, SPB- Superior Primary segmental Branch, IPB- Inferior Primary segmental Branch

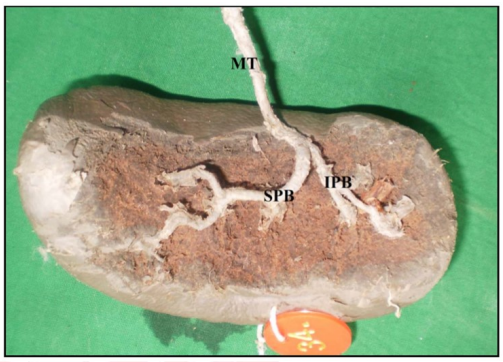


Fig. 2: Specimen showing three primary segmental branches.
MT- Main Trunk, SPB- Superior Primary segmental Branch, IPB- Inferior Primary segmental Branch, MPB- Middle Primary segmental Branch.

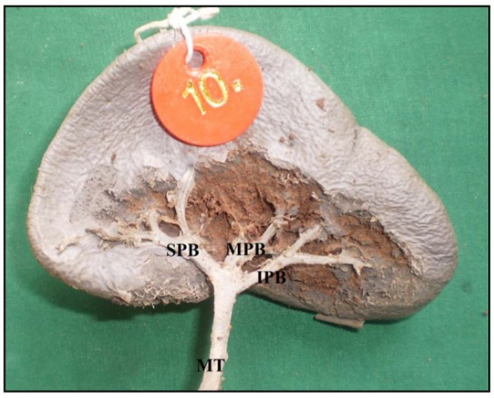
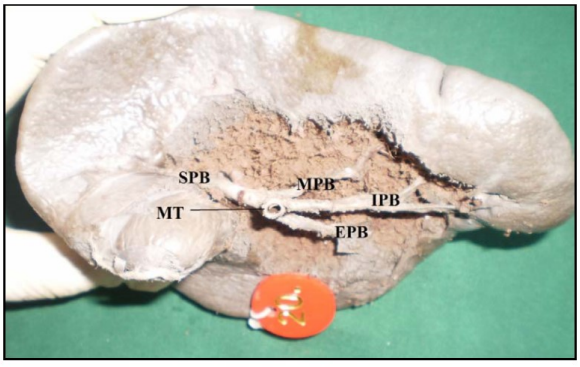


Fig. 3: Specimen showing four primary branches. MT- Main Trunk, SPB- Superior Primary segmental Branch, IPB- Inferior Primary segmental Branch, MPB- Middle Primary segmental Branch, EPB- Extra Primary segmental Branch



The mean distance between the termination of splenic artery and the hilum of the spleen was 2.1 cm. The range was extending from 0.3 cm to 6.1 cm.

Table 2: Distance between the termination of splenic artery and the hilum of the spleen in cm.

Sl no.	Mean	2.1
1	SD	1.2
2	Min	0.3
3	Max	6.1
4	Median	1.8

Fig. 4: The specimen showing the distance between termination of splenic artery and the hilum of the spleen is 0.3 cm.

MT- Main Trunk, SPB- Superior Primary segmental Branch, IPB- Inferior Primary segmental Branch, SPA- Superior Polar Artery.

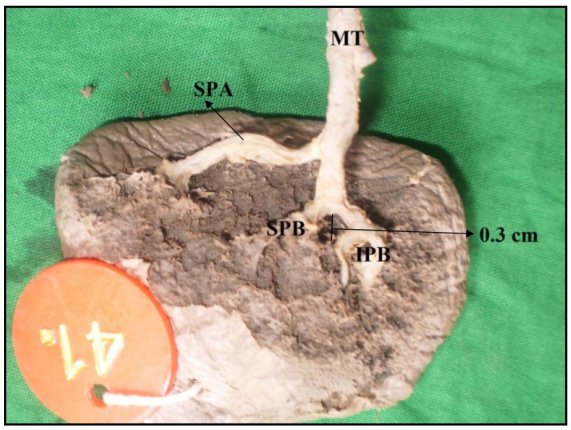
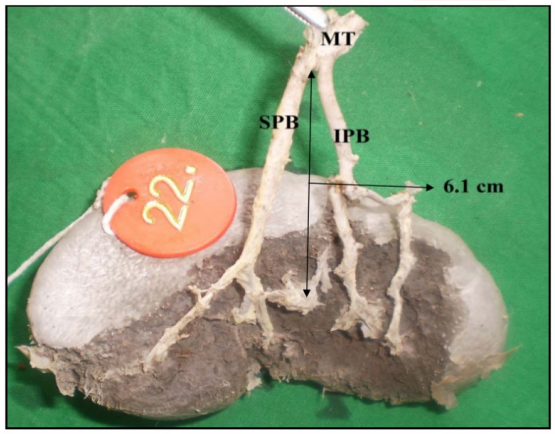


Fig. 5: The specimen showing the distance between termination of the splenic artery and the hilum of the spleen is 6.1 cm.

MT- Main Trunk, SPB- Superior Primary segmental Branch, IPB- Inferior Primary segmental Branch



DISCUSSION

Spleen is supplied by splenic artery, which terminates at the hilum by dividing into 2 or 3 terminal branches. These are named as superior, middle and inferior primary branches. These branches supply a particular part of the spleen which is separated by an avascular plane. Thus, these branches divide the spleen into definite arterial segments. So these arteries can be considered as the primary segmental branches [4]. In the present study two primary branches were seen in 56 (70.9%) specimens, three in 19 (24.1%) specimens and four in 4 (5.1%) specimens. Other studies showed only 2 to 3 primary branches. In this study we have observed 2 to 4 primary branches. The comparison of number of primary branches with the previous studies is given in Table 3.

Table 3: Comparison of number of primary segmental branches of splenic artery with the previous studies.

Author	Number of specimens studied	Number of primary segmental branches		
		2	3	4
Gupta CD et al. (1976) [5]	50	84%	16%	-
Mikhail Y et al. (1979) [6]	25	77%	23%	-
Katrisis E et al. (1982) [4]	70	88.70%	14.30%	-
Mandarin LCA (1983) [7]	25	68.20%	10.60%	4.50%
Garcia PJA (1988) [8]	181	92.82%	7.18%	-
Sow ML (1991) [9]	32	84%	16%	-
Silva LFA (2010) [10]	-	93.34%	6.66%	-
Chaware PN et al. (2012) [11]	-	85.58%	14.42%	-
Swamy VL et al. (2013) [12]	60	66%	17%	17%
Londhe SR et al. (2013) [13]	50	90%	10%	-
Present study	**79**	**70.90%**	**24.10%**	**5.10%**

The splenic artery divides into terminal branches about 1-2 cm away from hilum of the spleen. In this study the mean distance between termination of splenic artery and the hilum of the spleen was 2.1 cm. and the range was extending from 0.3 cm to 6.1 cm. Lipschultz 12 (1912) observed the distance varies from 1 to 7 cm. Piquand 11 (1910) noted that 76% of specimens divided about 2 to 3 cm away from hilum and 24% divided at the hilum. A study conducted by Pondey SK28 et al. (2004) noted Splenic artery divided into terminal branches in 97% cases and in remaining cases it passed through the hilum without dividing into branches. The comparison between other studies is given in Table 4.

Table 4: Comparison of the mean distance between the termination of splenic artery and the hilum of the spleen with the previous study and hilum.

Author	Mean distance (in cm)
Silva LFA et al [10]	2.89
Holibkova A et al. [14]	2.8
Present study	**2.1**

CONCLUSION

The spleen is a highly vascular and friable organ. It is the largest of secondary lymphoid organ, which contains 25% of the body's lymphoid tissue and has both haematological and immunological functions. Total splenectomy is commonly done after a splenic injury, which leads to decrease in the immunity and predisposes the normal host to overwhelming life threatening infections and also creates an altered haematological picture. To overcome this, partial splenectomy can be done by ligating a particular segmental branch of splenic artery.

The partial removal of the spleen is possible, as the spleen is divided into segments, separated by fibrous septa and each segment is supplied by its own main artery. The presence of splenic segmentation could be attributed to its development or to the terminal division of the artery. Better anatomical knowledge about segmental distribution of splenic artery and its variations are important for the partial removal of the organ.

Conflicts of Interests: **None**

REFERENCES

[1]. Standring S. Gray's Anatomy. The Anatomical Basis of Clinical Practice. 39th ed. Edinburg: Churchill Livingstone Elsevier; 2008. pp.1239-45.

[2]. Cooper MJ, Williamson RCN. Splenectomy; indications, hazards and alternatives. Br Jr Surg 1984;71:173-80.

[3]. El din YS, Salama MA, Rizk M. Partial splenectomy in the treatment of splenic lesions and disorders in infants and children. Alex J Pediatr 1998;12(1): 187-98.

[4]. Katritsis E, Parashos A, Papadopoulos N. Arterial segmentation of the human spleen by doing a post-mortem angiogram and making corrosion casts. Angiology. 1982;33(11):720-7.

[5]. Gupta CD, Gupta SC, Arora AK, Jeya SP. Vascular segments in human spleen. J Anat 1976;121(3): 613-6.

[6]. Mikhail Y, Kamel R. Nawar NNY, Rafla MFM. Observations on the mode of termination and parenchymal distribution of the splenic artery with evidence of splenic lobation and segmentation. J Anat (1979);128(2):253-8.

[7]. Mandarim LCA, Sampaio FJ, Passos MA. Vascular segmentation of the spleen in the new born infants. Anatomical support for partial resection. J Chir (Paris) 1983;120(8-9):471-3.

[8]. Garcia PJA, Lemes A. Arterial segmentation and subsegmentation in human spleen. Acta Anat (Basel) 1988;131(4):276-83.

[9]. Sow ML, Dia A, Ouedraogo T. Anatomic basis for conservative surgery of the spleen. Surg Radiol Anat 1991;13(2):81-7.

[10]. Silva LFA. Morfometric study of arterial branching of the spleen compared to radiological study. Rev Col Bras Cir 2011;38(3):181-5.

[11]. Chaware PN, Belsare SM, Kulkarni YR, Pandit SV, Ughade JM. Variational anatomy of the segmental branches of the splenic artery. JCDR 2012;6(3) :336-8.

[12]. Swamy VL, D Suseelamma, DJ Surekha, Chaitanya K. Study of prehilar branches of splenic artery by dissection method. IJMRHS 2013;2(3):620-3.

[13]. Londhe SR, Study of vascular pattern in human spleen by carrion cast method. Al Ameen J Med Sci 2013;6(2):167-9.

[14]. Holibkova A, Machalek L, Houserkova D, Ruzieka V. A contribution to the types of branching and anastomosis of the splenic artery in the human spleen. Biomedical Papers 1998;141(1):49-52.

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