

Branching Pattern of Segmental Branches of Splenic Artery: Cadaveric Study

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Abstract

Aim: Study on branching pattern of segmental branches of splenic artery in human cadaveric spleens by dissection method.

Material and methods: This prospective, randomized, study was carried out in the Department of Anatomy, Government Medical College, Bettiah (W.Champaran), Bihar, The present study is conducted on 100 Human cadaver spleens, irrespective of their age and sex, fixed in 10% formalin solution, collected from the department of Anatomy department. The gross dissection was done by following the guidelines of Cunningham's Manual.

Results: Two primary segmental branches were seen in 71 (71%) specimens, three primary segmental branches were seen in 24(24%) specimens and four primary segmental branches were seen in 5 (5%) specimens. The mean distance between the termination of splenic artery and the hilum of the spleen was 2.2 cm. The range was extending from 0.4 cm to 6.2 cm.

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.

Keywords: splenectomy, segmental branches, splenic artery

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Introduction

The spleen is a highly vascular and friable organ, which contains 25% of the body lymphoid tissue and has both

haematological and immunological functions. Spleen is supplied by splenic artery which is the largest branch of coeliac trunk [1]. It traverses through the lienorenal ligament to reach near the hilum of the spleen, where it divides into two or three primary branches, each of which is subdivided mostly into two or four secondary branches. Moreover, a superior polar arteries and inferior polar arteries are given from splenic trunk or from one of its primary branches, which goes to the poles of the spleen, without entering the hilum. It is called as superior and inferior polar branches. The human spleen is divided accordingly into two or three main segments. Each main segment is also divided usually into two to four less constant secondary segments. The segments of spleen are separated by a definite avascular plane.

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 [2,3]. 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 segmental branches of splenic artery which divide the spleen into various segments, its pattern of

distribution and also to find out any inter-segmental arterial anastomosis by dissection method.

Material and methods

This prospective, randomized, study was carried out in the Department of Anatomy, Government Medical College, Bettiah (W.Champaran), Bihar,India.

Methodology

The present study is conducted on 100 Human cadaver spleens, irrespective of their age and sex, fixed in 10% formalin solution, collected from the department of Anatomy department. The gross dissection was done by following the guidelines of Cunningham's Manual. The spleen was identified and freed from the posterior abdominal wall and stomach by cutting through the gastro splenic 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 were 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 71 (71%) specimens, three primary segmental branches were seen in 24(24%) specimens and four primary segmental branches were seen in 5 (5%) specimens.

Table 1: Number of primary segmental branches of splenic artery

Primary segmental branches	Number of specimens	Percentage
One	Nil	0
Two	71	71
Three	24	24
Four	5	5
Total	100	100

The mean distance between the termination of splenic artery and the hilum of the spleen was 2.2 cm. The range was extending from 0.4 cm to 6.2 cm.

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

Mean	2.2
SD	1.3
Min	0.4
Max	6.2
Median	1.9

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 71(71%) specimens, three in 24 (24%) specimens and four in 5(5%) 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	100	71%	24%	5%

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 2.2 cm. and the range was extending from 0.4 cm to 6.2 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 Pondy 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	2.2

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.

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