

## Morphological Study of Cadaveric Human Spleen.

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### ABSTRACT

**Background:** This study deal with the morphology of spleen regarding to shape, notches, and fissure on superior, inferior and diaphragmatic, visceral surface and compared with different study done previously. **Methods:** This study was done in the department of Anatomy, Chattishgarh Institute of Medical Science, Bilaspur, C.G. India. The study was done on 50 formalin fixed human middle age cadaveric spleen. The spleen was observed grossly and photograph was taken. The data was displayed in tabulated form. **Results:** The present study was done on 50 formalin fixed human cadaveric spleen, out of which 23(46%) spleen showed wedge shape, 19 (38%) spleen showed tetrahedral shape, 8(16%) spleen showed triangular shape. Among 50 spleen 35 (70%) exhibit notches on the superior border, 4(8%) exhibit notches on the inferior border, 6 (12%) exhibit no notches on either border of spleen, 5(10%) exhibit notches on the both border of spleen, 3 (6%) having fissures on the diaphragmatic surface of spleen. Notches on the superior border are commonly observed but it varies between 1 to 6 and in majority of spleen, it exhibits 1-3 notches respectively. **Conclusion:** This study provide knowledge about shape, notches, fissures of spleen hence this study useful for clinicians, surgeon, anatomist, radiologist for proper diagnosis and treatment of disease.

**Keywords:** Spleen, Notches, Fissures, Splenomegaly, Surface, Border, Haemo-lymphoid organ.

### INTRODUCTION

The spleen develops from mesenchymal cell called splenunculi which proliferate and fused between the two leaves in the cephalic part of dorsal mesogastrium to form lobulated spleen.<sup>[1]</sup> Due to the fusion of multilobular masses, one or more notches appear near the lateral end of superior border and fissures on the surface of spleen indicate the lobulated development of spleen.<sup>[2]</sup> Sometime encapsulated splenic masses failure to fuse, result in the formation of accessory spleen may found in gastrosplenic ligament or greater omentum and rarely in the left spermatic cord.<sup>[3]</sup>

Spleen is large, encapsulated, single secondary haemo-lymphoid organ because it perform both hematological function (manufacture of erythrocyte in fetal life) as well as immunological function (manufacture of lymphocyte after birth).<sup>[4]</sup>

Due to rotation in the orientation of the stomach, spleen shifted in the left side of abdominal cavity. The spleen is located mainly in the left hypochondrium (lateral 2/3) and partly in the epigastrium (medial 1/3).<sup>[5]</sup>

Normally spleen is not palpable but during splenomegaly occurs by number of disease like malaria, kala-azar etc. It enlarges more than 2 or 3 times and superior border of spleen clinically palpable at the left costal margin during deep inspiration. The massive spleen project downward and medially towards the umbilical and reaches right iliac fossa.<sup>[6]</sup>

The current study describe the morphology of spleen hence this study useful for clinicians, surgeon, physician, anatomist, radiologist for proper clinical diagnosis and treatment of disease.

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**MATERIALS AND METHODS**

During routine educational dissection of abdomen for undergraduate student (MBBS) in a middle aged Indian cadaver in the department of Anatomy, Chattishgarh Institute of Medical Science, Bilaspur, C.G. India. The body was embalmed and preserved as standard procedure by injecting formalin based preservative (10% formalin) and stored in 7% formalin filled plastic tank. A total 50 human middle age cadaveric spleen were studied. The organ was observed grossly and photograph was taken with 13-mega pixel camera. The splenic shapes, notches, fissure were studied with regard to different border (i.e superior and inferior border) and surface (i.e Diaphragmatic and Visceral surface). The data was analysed in tabulated form.

**RESULTS**

The present study was done on 50 formalin fixed human cadaveric spleen. Out of which 23 (46%) spleen showed wedge shape, 19 (38%) spleen showed tetrahedral shape and 8 (16%) spleen showed triangular in shape. Among 50 spleen, 35(70%) exhibit notches on the superior border [Figure 1], 4(8%) exhibit notches on the inferior border, 6 (12%) exhibit no notched on either border, 5 (10%) exhibited notches on the both border of spleen [Figure 2] and 3 (6%) having fissures on the diaphragmatic surface of spleen. Notches on the superior border varies between 1 to 6 but majority of spleen showed 1 to 3 splenic notches.

**DISCUSSION**

**Table 2:** Compare the shape of spleen with present and previous study

Study	Shape of Spleen [%]					
	Wedge	Tetrahedral	Triangular	Oval	Heart	Semilunar
Hollinshed Wh. et al. [ 1982]	44%	14%	42%	-	-	-
Chaware Pn et al. [2012]	61.26%	21.62%	12.61%	3.6%	0.9%	-
Rao S et al. [2013]	40%	20%	32%	8%	-	-
Chaudari MI et al.[ 2014]	33.87%	32.25%	19.35%	8.06%	6.45%	-
Sangeeta M et al. [2015]	33.9%	15%	33.9%	9.4%	3.7%	3.7%
Present Study 2016	46%	38%	16%	-	-	-

In this study we observed 35(70%) spleen having notches in the superior border, 4 (8%) spleen having notches in the inferior border, 6(12%) spleen having no notch on either border, 5 (10%) having notch in both border which display in [Table 1]. But previous study displayed 98%<sup>[14]</sup>, 70

Spleen is the largest lymphatic organ of our body and play very important role in manufacture of RBCs in fetal life, immunity to the body, filter blood, store RBCs and release during required.<sup>[7]</sup> Adult spleen having following external feature, 2 end (anterior and posterior end), 3 border (superior, inferior and intermediate border), 2 surface (Diaphragmatic and visceral surface). The dimension of spleen are describe as 2.5 cm thickness, 7.5 cm breath, 12.5 cm length and 150 gm weight.<sup>[8]</sup>

In the present study, we observed 50 spleen and we compared our study with previous study. We observed that in our study 23(46%) spleen showed wedge in shape [Figure 3], 19 (38%) spleen showed tetrahedral [Figure 4] and 8 (16%) spleen showed triangular in shape [Figure 5] but previous study about shape of spleen exhibit 44%<sup>[9]</sup>, 61.26 %<sup>[10]</sup>, 40%<sup>[11]</sup>, 33.87%<sup>[12]</sup>, 33.9%<sup>[13]</sup> wedge shape spleen, 14%<sup>[9]</sup>, 21.62%<sup>[10]</sup>, 20%<sup>[11]</sup>, 32.25 %<sup>[12]</sup>, 15%<sup>[13]</sup> tetrahedral shape spleen, 42%<sup>[9]</sup>, 12.6%<sup>[10]</sup>, 32%<sup>[11]</sup>, 19.35 %<sup>[12]</sup>, 33.9 %<sup>[13]</sup> triangular shape spleen, 3.6%<sup>[10]</sup>, 8%<sup>[11]</sup>, 8.06%<sup>[12]</sup>, 9.4%<sup>[13]</sup> oval shape spleen, 0.90%<sup>[10]</sup>, 6.45%<sup>[12]</sup>, 3.7%<sup>[13]</sup> heart shape spleen, and 3.7%<sup>[13]</sup> semilunar shape spleen respectively which displayed in [Table 2].

**Table 1:** Showing border and surface with or without notches and fissures

Border and surface with or without notches and fissures	N [%]
Notches in the superior border	35 (70%)
Notches in the inferior border	4(8%)
Absence of notches in either border	6(12%)
Presence of notches in both border	5(10%)
Presence of fissures in Diaphragmatic surface	3(6%)

%<sup>[15]</sup>, 95%<sup>[16]</sup>, 63.35%<sup>[17]</sup> notches in the superior border and 2%<sup>[14]</sup>, 14%<sup>[15]</sup>, 3.3%<sup>[16]</sup>, 10%<sup>[17]</sup> notches in the inferior border respectively. Which display in [Table 3]. In this study 3 (6%) spleen showed fissure in the diaphragmatic surface [Figure 6].

**Table 3:** Compare the variation of notches in superior and inferior border

Variation in notches in spleen	Study				
	Das S et al. [2008]	Sivanageswara et al. [2013].	Girish v et al. [2014]	R. Siva Chidambaram et al.[2015]	Present study 2016
Superior border	98%	70%	95%	63.35%	70%
Inferior border	2%	14%	3.3%	10%	8%

Various diseases like malaria, cirrhosis of liver, chronic myeloid leukemia, Kala-azar etc cause enlargement of spleen called splenomegaly. During splenomegaly superior, border of spleen palpable at the left costal margin, hence this study useful for clinicians, physician, surgeons, anatomist, radiologist for proper clinical diagnosis and treatment of disease.



**Figure 1:** Notches in superior border.



**Figure 2:** Notches in superior border and inferior border.



**Figure 3:** wedge shape spleen.



**Figure 4:** Tetrahedral shape spleen.



**Figure 5:** Triangular shape spleen



**Figure 6:** Fissures in diaphragmatic surface of spleen

## CONCLUSION

The spleen most frequently injured organ in the abdomen due to external trauma. Usually spleen is not palpable but during number of disease like kala-azar, malaria it became enlarges. The present study provide knowledge of shape, notches, fissure of spleen hence this study useful for clinicians, surgeon, anatomist, radiologist for proper diagnosis and treatment of disease.

## REFERENCES

1. Singh vishram, text book of anatomy, abdomen and lower limb. 2nd ed., vol. 2, Elseiver. 2014: p 106-107.
2. Sadler, T. W. Langman's Medical Embryology. Baltimore, Lippincott Williams & Wilkins, 2000: p277
3. Datta A.K. Essential of Human anatomy, thorax and abdomen . 9th ed., 2010: p 272
4. Standring, S. Gray's Anatomy. The Anatomical Basis of Clinical Practice. New York, Elsevier Churchill Livingstone. 2005: p.1239-44.
5. Datta A.K. Essential of Human anatomy, thorax and abdomen. 9th ed., 2010: p 267.
6. Kulkarni, NV. Clinical Anatomy. Jaypee Brothers Medical Publishers Private Limited; New Delhi, 2nd ed. p.700-703
7. Williams, NS. Bulstrode, CJK Ronan O'Connell, P. Bailey & Love's. Short Practice of Surgery. Hodder Arnold .London., 25th ed .2008; 1101-1110.
8. Kato T, Tzakis AG, Selvaggi G, Gaynor JJ, Takahashi H, Mathew J, et al. Transplantation of the Spleen Effect of Splenic Allograft in Human Multivisceral Transplantation. Ann Surg. 2007; p 246:436-46.
9. Hollinshed WH. Anatomy for Surgeons. 3rd ed., Vol. 2. New York: Harper and Row; 1982. p 436-45.

10. Chaware PN, Belsare SM, Kulkarni YR. Morphological variations of the human spleen. *J Clin Diagn Res* 2012;6:159-62.
11. Rao S, Katikireddi S. Morphometric study of human spleen. *Int J Biol Med Res* 2013;4:3464-8.
12. Chaudari ML, Maheria PB, Lakhani C. Morphological variations of human spleen and its clinical significance. *Int J Med Res Rev* 2014;2:16-9.
13. Sangeeta M, Varalakshmi KL, Sahana BN. Cadaveric study of morphometry of spleen. *J Med Sci Health* 2015; 1(3):14-17.
14. Das S, Abd Latiff A, Suhaimi FH, Ghazalli H, Othman F. Anomalous splenic notches: A cadaveric study with clinical importance. *Bratisl Lek Listy* 2008;p109:513-6.
15. Sivanageswara Rao Sundara Setty & Raja Sekhar Katikireddi *Int J Biol Med Res.* 2013; 4(3): 3464- 3468.
16. Girish v. Patil, Shishirkumar, Apoorva D, Thejeswari, Javed sharif, C. Sheshgiri & Sushanth, N. K. Study of splenic notches in a human cadaver, *International Journal of Recent Advances in Multidisciplinary Research.* 2014; 1(2): p.001-003.
17. R. Siva Chidambaram, Soorya Sridhar. "Morphological Variations of Spleen: A Cadaveric Study". *Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 29, July 20, 2015.* p 4248-4254.

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