

A study of splenic notches in human cadavers and its clinical implications.

Dr.Shilpakala L .B<sup>1</sup> ,Dr.Lakshmi Prabha R<sup>2</sup>

Assistant Professor, Sri Siddhartha Medical college,Tumkur

Prof ,Sri Siddhartha Medical College,Tumkur

## Introduction

Spleen is the largest lymphatic organ which is located in left hypochondrium of abdominal cavity<sup>1</sup>.The spleen lies just beneath the left dome of diaphragm close to 9<sup>th</sup>, 10<sup>th</sup>, and 11<sup>th</sup> ribs.<sup>2</sup>The shape of the spleen vary from curved wedge shape to tetrahedral shape.The size of the adult spleen is usually 12cms long,breadth 7cms and 3-4cms width and weight from 80gms-300gms,average being 150gms .<sup>3</sup>The spleen has three borders-superior, inferior and intermediate .It has two poles-anterior and posterior and two surfaces diaphragmatic/superolateral and visceral/inferomedial.The anterior pole is broad and faces laterally.The posterior pole is narrow and faces medially towards vertebral column.<sup>4</sup>The diaphragmatic surface is convex, smooth and is related to abdominal surface of left dome of diaphragm.The visceral surface is irregular and is characterised by renal,gastric ,colic and pancreatic impression.<sup>4</sup>The upper border between gastric impression and diaphragmatic surface is sharp and well defined except where it is well interrupted by notches.The lower border separates diaphragmatic surface and renal impression.While lateral end intervenes between diaphragmatic and colic impression.<sup>5</sup>The notches donot typically appear in intermediate and inferior border.<sup>6</sup>

Spleen develops in dorsal mesogastrium as a collection of mesenchymal cells<sup>7</sup>

Spleen is lobulated in foetus but lobules normally disappear before birth.The notches in superior border are the remnants of the grooves that separated the foetal lobules<sup>8</sup>.The number of notches varies from 0-6 but commonly only one or two notches are seen.The superior border of spleen possess characteristic notch on its anterior part.<sup>9</sup>

The knowledge of anomalous size,shape,notches and other external features may be of importance for surgeons and radiologists.Splenic notches present on superior border are used as a clinical guide to palpate an enlarged spleen.<sup>8</sup>Anomalous splenic notches and fissures can be misinterpreted as splenic injury<sup>10</sup> and splenic lobules are confused as mass originating from left kidney by radiologists.<sup>11</sup>

The aim of the study was to find morphological variations of spleen with respect to its number of notches in borders and anomalous fissure on its surfaces.

## Material and Methods

The study was done on 40 formalin fixed cadaveric spleens .During routine dissection of the abdominal region, spleens were removed by cutting the splenic vessels near its hilum and carefully detaching organ from peritoneum.Following the removal, the spleens were preserved in 10% Formalin.Each spleen was carefully examined to determine the presence of splenic notches, fissures and lobation.Spleen possessing abnormal notches ,fissures and more than one lobe were photographed.The following parameters were noted:a)Shape of spleen b)Presence of splenic notches c)Presence of Anomalous fissure.

## Results

In the present study, 40 cadaveric spleens were studied and it was found that 17 (42.5%) spleens were tetrahedral shaped, 12 (30%) spleens were wedge shaped, 6 (15%) spleens were triangular, 5 (12.5%) spleens were oval shaped. Observations are tabulated in table 1.

Out of 40 spleens observed, majority of splenic notches were found to be in superior border and their notches number varied between 0-6. One notch was found in spleens, two notches were found in spleens, three notches in spleens, four notches in spleens and more than four notches were found in spleens. A spleen with an unusual presentation of an abnormal notch in the inferior border extending as a fissure into the diaphragmatic surface of spleen was noted. The fissure also extended into the visceral surface for a distance of 19mm. The superior border presented **no notches**. The fissure measured 20.5mm length and 15mm in depth.

A number of splenic notches observed in superior border and inferior border are tabulated in table 2.

Table-1

SL NO.	Shape of spleen	No. of spleen	Percentage
1.	Wedge	12	30%
2.	Tetrahedral	17	42.5%
3.	Triangular	6	15%
4.	Oval	5	12.5%

Table no.2 Variation in splenic notches and splenic fissure

Sl no.	Type of variation	No. of spleen	Percentage
1.	Notches in superior border	28	70%
2.	Notches in inferior border	3	7.5%
3.	Notches in both borders	2	5%
4.	Absence of notches in both borders	5	12.5%
5.	Anomalous fissure in diaphragmatic surface	2	5%

Table no.3-Variations in number of notches in borders

Borders	No. of notches	No. of spleen	Percentage
Superior border	0	5	12.5%
	1	4	10%

	2	9	22.5%
	3	15	37.5%
	4	5	12.5%
	>4	2	5%
Inferior border	0	33	82.5%
	1	6	15%
	2	1	2.5%
Presence of notches in both the borders		2	5%
Absence of notches in both the borders		5	12.5%



Fig-3- two notches in superior border of spleen



Fig 4-showing presence of >4 borders



Fig-5 absence of notches in superior border with fissure in inferior border

## Discussion

In the present study, out of 40 spleens observed, shape of spleen varied from tetrahedral shape to wedge shaped. 28(70%) spleens showed notches only in the superior border, 3(7.5%) spleen showed notches only in the inferior border, 5 (12.5%) spleens did not showed any notches in superior and inferior border. Majority of splenic notches were were between 1 and 3. One spleen were noted with abnormal notch in inferior border and it was extending as fissure in diaphragmatic surface. The present study is compared with other studies and tabulated in table-4

Since spleen is an important organ in human body as it has immunological and haematological function. Most commonly Splenomegaly is seen in malaria, typhoid, kala-azar, acute and chronic leukaemias. The notch on the superior border helps to identify spleen in palpation method and also to differentiate it from other organ of the abdomen in left hypochondriac region. Sometimes splenomegaly can be misdiagnosed as renal swellings on left costal margin. The spleen with many notches are categorised as a distributed type with a large hilum, in which arterial branches are small and numerous<sup>6,12</sup>. Knowledge of this is important in management of haemorrhage in case of splenic surgeries where all these branches are carefully ligated.

Table no.4

Sl no.	Study	Notches in superior border	Notches in inferior border	Splenic fissure
1.	R Sivachidambram <sup>10</sup> et al	63.33%	10%	6.6%
2.	Das <sup>12</sup> et al	98%	2%	1%
3.	Prashant Nachiket Chaware et al	74.76%	24.32%	-
4.	Srivangeswar Rao <sup>14</sup> et al	70%	14%	1%
5.	Girish v Patil <sup>15</sup> et al	95%	3.33%	-
6.	Present study	70%	7.5%	5%

### Conclusion

The knowledge of morphological variations in spleen is important for clinicians, surgeons and radiologists for the accurate diagnosis and treatment. The knowledge of notches in borders of spleen helps physician to palpate the enlarged spleen and differentiate it from adjoining organs, surgeons during spleen transplantation and radiologists to distinguish blunt injuries to spleen.

The present study shows variations in shapes, presence of notches in border and number of notches which may provide a significant information to surgeons in planning surgeries related to spleen. This knowledge is also very important for Anatomists during their routine dissection.

### References

1. Sinnatambay, Chumma's and R J Last's Anatomy-Regional and applied. Edinburgh: Churchill Livingstone, 2011; 270-272.

2. Snells R S Clinical Anatomy by regions. 8<sup>th</sup> ed. New Delhi. Wolter's Kluwer pvt. Ltd; 2008. p. 260
3. Standring S, Grays Anatomy. The Anatomical Basis of Clinical Practice. New York, Elsevier Churchill Livingstone, 2005. 1239-44.
4. A. K. Datta, Essentials of human anatomy: Thorax and abdomen. 6th edition, Current books international: 2003. p. 138-9.
5. Boyd J D, Hamilton WJ, Yoffey JM. Spleen In: Textbook of Human Anatomy. 1<sup>st</sup> ed. London, MACmillian and co Ltd; 1958. p. 683-684.
6. Skandalakis JE, Skandalakis S. Surgical Anatomy: The embryological and Anatomical basis of modern surgery. Nicosia, Cyprus. Broken hill Publishers Ltd; 2004. p. 1231-77
7. Singh IB. Development of Spleen in Human Embryology. 8<sup>th</sup> ed. New Delhi. Macmillian India Ltd; 2007. p. 169-70.
8. Last and Moore KL, Persaud TVN. The Developing human: clinically oriented embryology. 8<sup>th</sup> ed. Philadelphia. W. B Saunders; 2009. p. 224
9. Borley N. Spleen in standing. S Grays 40<sup>th</sup> ed. London: Churchill Livingstone Anatomy. Elsevier; 2008. p. 1191-4.
10. R. Siva Chidambaram, Soorya Sridhar. Morphological variation of spleen: A cadaveric study. Journal of Evidence based medicine and Healthcare; Vol. 2, Issue 29, July 20, 2015; p. 4248-4254.
11. Nayak SB, Shetty P, R Deepthineth, Sirasanagandla SR, Shetty SD. Alobulated spleen with multiple fissures and hila. JCDR. 2014 Sept. vol 8(9) ADO1-ADO2.
12. Das S, AbdLatiff A, Suhaimi FH, Ghazali H, Othman F, Anomalous splenic notches: A cadaveric study with clinical implications. Bratisl Lek Listy 2008; 109: 513-6.
13. Chaware P N, Belsare S M, Kulkarni Y R, Pandit S V, Ughade J M. The Morphological Variations of the Human Spleen, Journal of Clinical and Diagnostic Research. 2012 April, Vol-6(2): 159-16
14. Sivanageswara Raosundarasetty & Raja sekhar Katikireddi. Int J Biol Med Res. 2013; 4(3): 3464-3468.
15. Girish v. Patil, Shishirkumar, Apoorva D, Thejeswari, Javedsharif, 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.
16. 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; Page: 4248-4254