

**MORPHOLOGICAL VARIATIONS OF SPLEEN: A CADAVERIC STUDY**R. Siva Chidambaram<sup>1</sup>, Soorya Sridhar<sup>2</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT:** The Spleen is a large lymphoid organ situated in the left hypochondrial region having an important role in immunological and hematological functions of the human body. The aim of this study was to find the morphological variations of the spleen with respect to it's a) Shape, b) Number of notches on its borders and c) Presence of anomalous fissure on its surface. The Study was done on 60 formalin fixed cadaveric spleen from the Department of Anatomy, Narayana Medical College, Nellore, Andhra Pradesh. Out of 60 spleens we examined, the various shapes of the spleen were noted such as wedge shape (73.33%), triangular (13.33%), tetrahedral (6.67%) and oval shape(6.67%).The number of spleen showing notches on its superior border was 38(63.33%) and in inferior border it was 6(10%). Absence of splenic notch was observed in 10(16.67%) spleens and the remaining 6 spleens (10%) shows notches on its both the borders. The anomalous splenic fissure was found in 4(6.67%) spleens on its diaphragmatic surface. The knowledge of variations in the morphology of spleen are essential for physician, surgeon, radiologist and forensic surgeon to differentiate it from the splenic pathology and splenic injury. In addition to this, it is also important for anatomist during routine classroom dissection and discussion.

**KEYWORDS:** Spleen, Lymphoid organ, Splenic notch, Anomalous splenic fissure, Splenic injury.

**INTRODUCTION:** The Spleen is a large encapsulated mass of highly vascular lymphoid organ situated in the left hypochondrial region of the abdomen. The superior border of the spleen presents one or two notches close to the lateral end, indicating the lobulated form of fetal Spleen.<sup>1</sup> Sometimes the spleen may retain its fetal lobulated form and shows deep anomalous notches and fissures on its borders and surface respectively.<sup>2</sup> Spleen is one of the organ most frequently injured in blunt abdominal trauma. Contrast enhanced CT abdomen and splenic scintigraphy study are the two important imaging modalities can accurately detect the splenic injury in a patient with blunt abdominal trauma. During such radiological examination of the abdomen, the anomalous splenic notches and fissures can be misinterpreted as a splenic injury by the radiologist.<sup>3</sup> To avoid such misdiagnosis the present study aims at providing the precise knowledge about variations in the morphology of Spleen and to explore the clinical importance of splenic notch and splenic fissure.

**MATERIALS & METHODS:** After the routine dissection at Narayana Medical College, Nellore, Andhra Pradesh for undergraduate medical students, all the organs are stored in jars containing 10% formalin. All the cadavers are donated bodies free from any kind of major illness from the Andhra Pradesh population. The present study was done on 60 formalin fixed Spleen from the Department of Anatomy and the organ was observed for the following parameters: a) Shape of

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spleen, b) Presence of notches on its superior and inferior border and c) Presence of anomalous fissure on its surfaces. The specimen was photographed (Fig. 1-5) and its clinical importance were studied in detail.

**RESULTS:** Among the 60 spleens we observed, 44(73.33%) wedge shaped, 8(13.33%) triangular, 4(6.67%) tetrahedral and 4(6.67%) oval shaped spleens were noted (Fig. 1 & 8). The number of spleen showing notches on its superior border, inferior border, both the borders and absence of notch were mentioned in Table.1 (Fig. 9). The anomalous splenic fissure was found in 4(6.67%) spleens on its diaphragmatic surface (Fig. 3 & 7). The number of notches present on the superior border varied from 0 to 4, while on inferior border it was not more than 2. The maximum number of notches noted on the superior border of spleen was 4 (Fig-2).

**DISCUSSION:** Spleen is an important lymphoid organ because of its role in immunological and cytological activity. Splenomegaly is commonly seen in case of malaria, infectious mononucleosis, typhoid and leukemias.<sup>4</sup> In such conditions, the physician can palpate the splenic notches on its superior border to differentiate the splenic enlargement from other visceral mass.

The present study has noted the variation in the morphology of spleen. Among the four different shapes, wedge shape (73.33%) was found to be the common followed by triangular (13.33%), tetrahedral (6.67%), and the oval shape (6.67%). Such proportion of various shapes of the spleen was found to be similar with Prashant Nashiket Chaware et al<sup>5</sup> (2012) and Sivanageswara Rao et al<sup>6</sup> (2013) study of Human spleen. The variation in the configuration of spleen is due to indentations of the organs including stomach, colon, pancreas and kidney which are in close relation to the spleen.

Several authors were previously reported the incidence of splenic notches in the superior border and inferior border as 98% & 2% (Das et al,<sup>7</sup> 2008), 74.76% & 24.32% (Prashant Nashiket Chaware et al,<sup>5</sup> 2012), 70% & 14% (Sivanageswara Rao et al,<sup>6</sup> 2013) and 95% & 3.33% (Girish V. Patil et al,<sup>8</sup> 2014) of spleen's studied respectively. But in the present study it was 63.34% & 10% respectively (Table.2). Absence of splenic notch was noted in 10(16.66%) spleens (Fig. 4), in such case the physician may face difficulty in differentiating the splenic mass from other visceral mass.

Srijit Das et al<sup>5</sup> (2008) and Satheesha Nayak et al<sup>9</sup> (2012) reported that the incidence of anomalous splenic fissure was 1% but in the present study we noted in 6.6% of the spleens studied. An anomalous splenic fissure may be due to the improper fusion of the splenic nodules during development or due to mechanical pressure by the adjacent viscera.

Kevin Paul Smidt et al<sup>10</sup> (1977) and Richard M. Hansen et al<sup>11</sup> (1981) suggested that the congenital splenic fissure can be masquerade as splenic laceration in the patient with suspected intra-abdominal trauma during splenic scintigraphy study. To avoid such misinterpretation a clear knowledge of splenic fissure is essential for the radiologist. Such fissures can be differentiated from the laceration by its smooth contour and sharply margined appearance in the contrast enhanced CT study.<sup>12</sup>

**CONCLUSION:**

1. The knowledge of variation in the morphology of spleen, splenic notch and splenic fissures are important to the physicians during the routine clinical examination of the abdomen, to the surgeons while performing splenic transplantation and other surgical procedures which are related to the spleen and for the radiologist to differentiate it from the splenic injury.
2. From the present study, we suggest that the additional splenic notches and anomalous splenic fissure is not an uncommon finding, but a lower in incidence in the inferior border and diaphragmatic surface respectively.
3. An extensive review of literature revealed that the congenital splenic fissure is an abnormality which can be included in the list of causes of splenic scan abnormality due its asymptomatic presentation.

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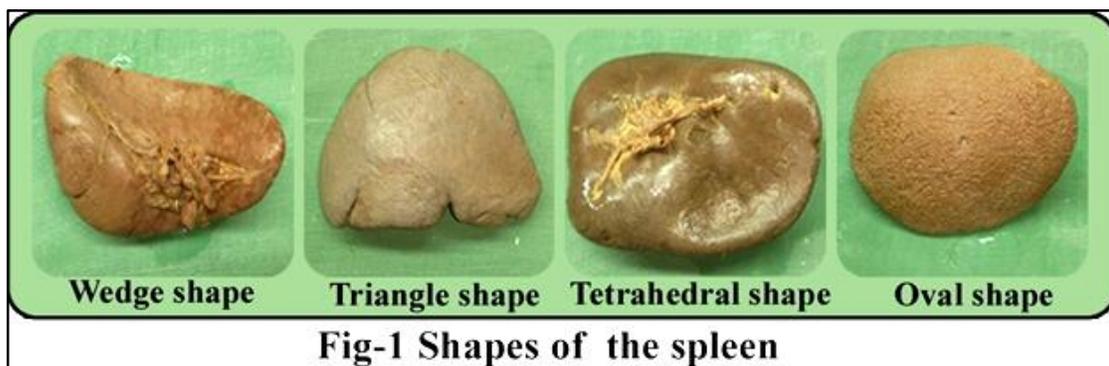
Sl. No.	Type of variation	No. of spleen	Percentage %
1	Notches in superior border	38	63.33%
2	Notches in inferior border	6	10%
3	Absence of notch	10	16.67%
4	Presence of notch in both the borders	6	10%
5	Presence of anomalous splenic fissure in diaphragmatic surface	4	6.67%

**Table 1: Incidence of variations in splenic notch and splenic fissure**

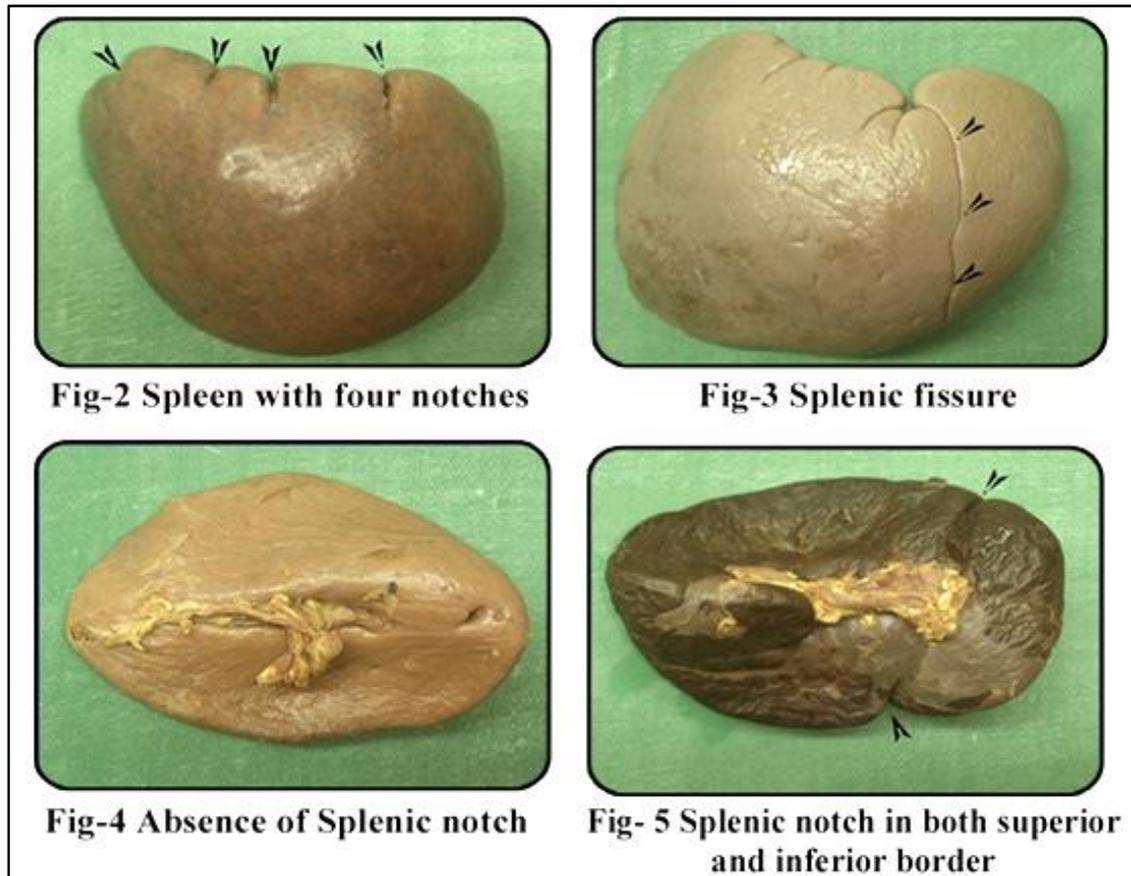
Sl. No	Study	Notches in superior border	Notches in inferior border
1	Das et al(2008)	98%	2%
2	Prashant Nashiket Chaware et al(2012)	74.76%	24.32%
3	Sivanageswara Rao et al(2013)	70%	14%
4	Girish V. Patil et al(2014)	95%	3.33%
5	Present study	63.33%	10%

**Table 2: Comparison with other studies on incidence of notches in superior and inferior border**

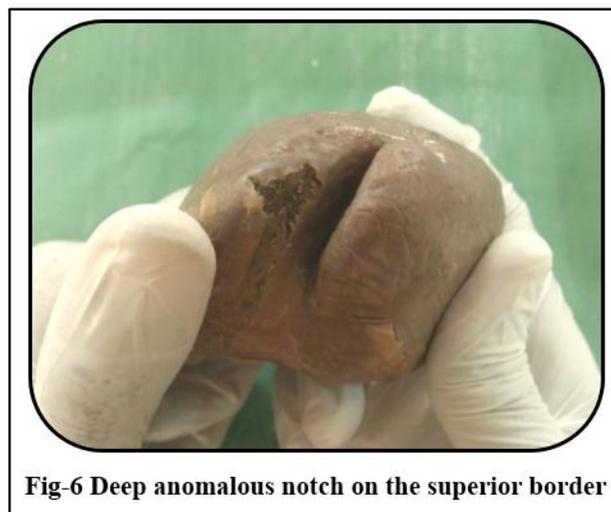
### PICTURE 1:



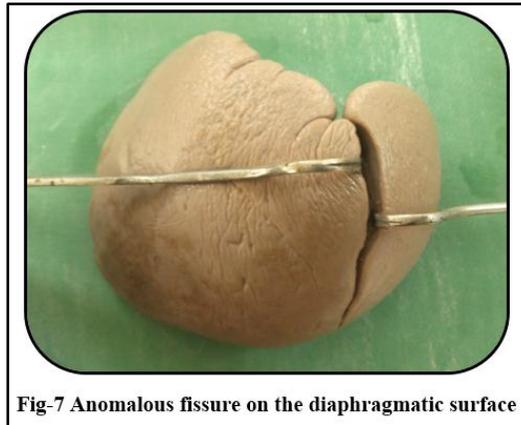
**PICTURE 2:**



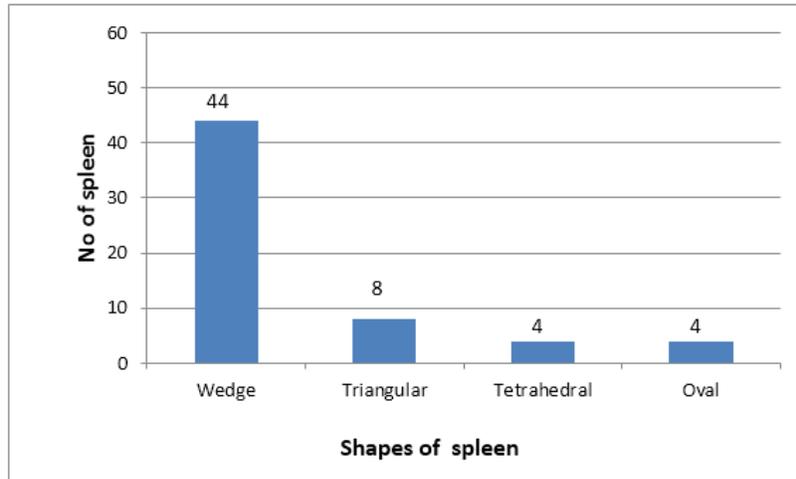
**PICTURE 3:**



**PICTURE 4:**

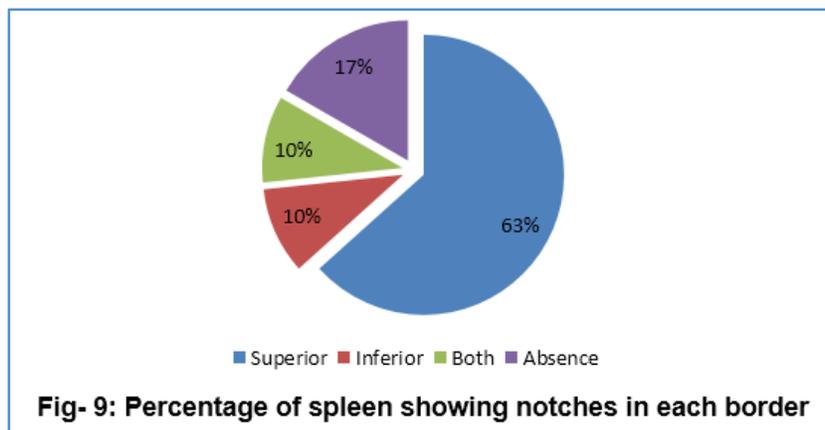


**PICTURE 5:**



**Fig- 8: Various shapes of spleen**

**PICTURE 6:**



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