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A Study on Splenic Notches in Adult Human Cadavers – its Clinical Importance

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***Abstract**: The lobulated form of the spleen in early developmental phase is represented by notches at later period which occur at the superior border. The superior border which separates the gastric impression from the diaphragmatic surface has notches near its lateral end.*
***Methods**: 40 adult spleens available in the department were studied and the splenic notches with respect to the borders were noted.*
***Results**: Two specimens showed notches only on inferior border, one specimen with notches on both superior and inferior borders and three spleens are without any notches on all borders.*
***Keywords:** spleen, notches, borders, variations.*

I. Introduction

Spleen is considered as the largest lymphoid organ in human. The coelomic epithelium of dorsal mesogastrium near its cranial end thickens at around 6th week to give rise to spleen[1, 2]. To begin with, the developing spleen is in the form of number nodules that later fuse to form a lobulated spleen. The point of fusion of nodules is seen as notches in the developed spleen. The notching of spleen, observed at superior border, signifies its multi nodular origin. Failure of fusion of these nodules results in formation of accessory spleens. The number of studies on spleen has increased due to its function along with immune system.

A normal spleen is located in left hypochondrium. Normally spleen is not palpable but may become palpable when its size enlarges two or three times the normal. Clinically, the enlarged spleen is detected by palpating the splenic notches. As per conventional textbooks of anatomy, the splenic notches are usually present on superior border with inferior border being described as blunt[2, 3].

The present study describes both cases with presence of splenic notches on superior as well as inferior border and those with absence of notches which have substantial clinical and morphological significance.

II. Materials and methods

The study was under taken by dissecting 40 adult human cadavers using conventional dissection procedure. 40 spleens were studied and the splenic notches with respect to the borders were noted and no other anomalies were considered for study. The specimens were photographed and the data obtained was tabulated, analyzed and compared with previous reported studies in literature.

III. Observations

Out of 40 specimens studied, two (5.0%) spleens presented with notches on inferior border only**(FIG 1,2)** out of which one has two notches and another one presented with three notches, one(2.5%) spleen presented with notches on both superior and inferior borders**(FIG 3**) and three (7.5%) spleens are without notches on all three borders**(FIG 4,5,6**). No spleens presented with notches on intermediate border and thirty four (85%) spleens presented notching on superior border only. The results obtained are shown in **table1**.

Table 1: Percentage incidence of spleen with notches on different borders

	BORDERS	NO.OF SPLEENS	PERCENTAGE%
1.	Superior Border Only	34	85%
2.	Inferior Border Only(FIG 1&2)	02	5%
3.	Intermediate Border Only	NIL	------
4.	Both Superior & Inferior(FIG 3)	01	2.5%
5.	Absent Notches	03	7.5%

	(FIG 4,5&6)		
6.	TOTAL	40	100%

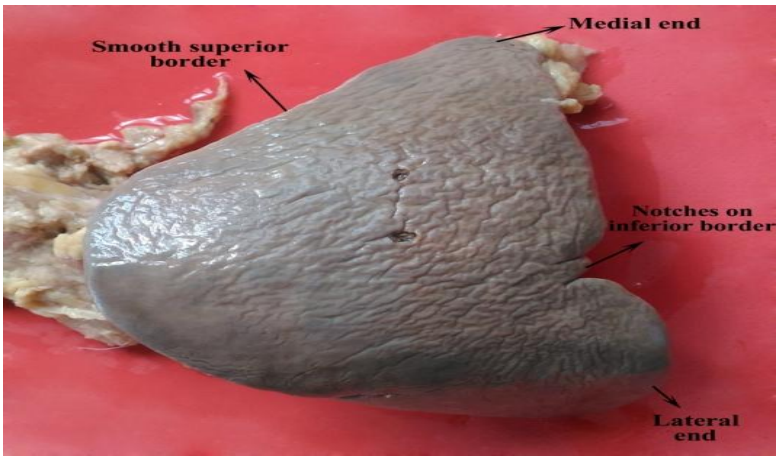

Fig 1: notches on inferior border only

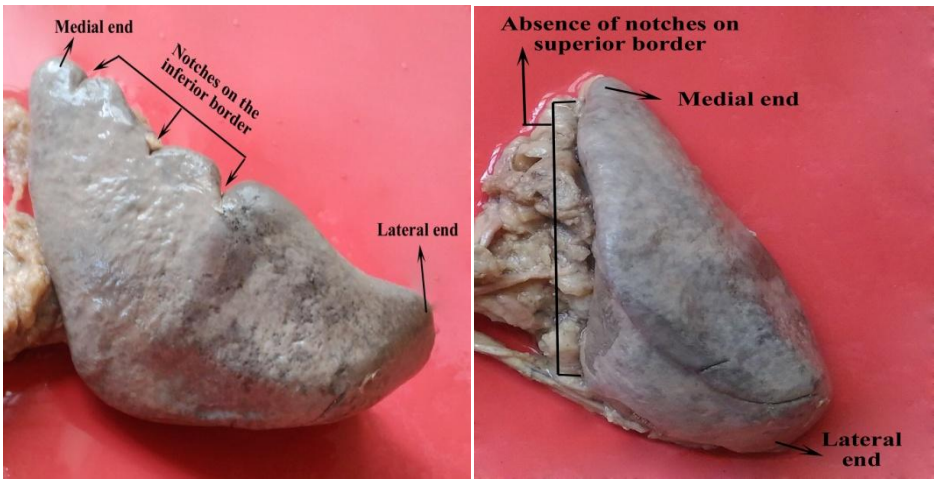

Fig 2: notches on inferior border only

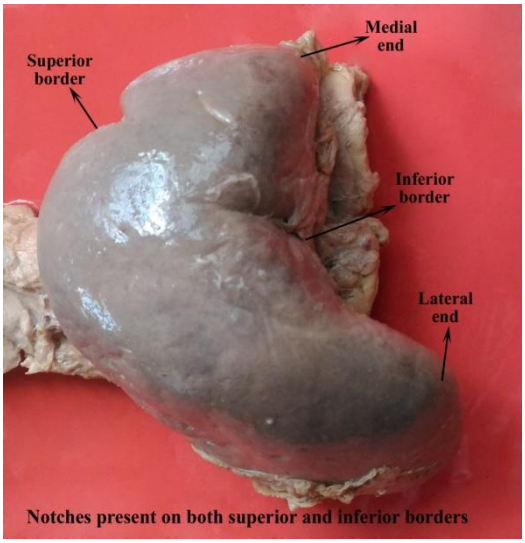

Fig 3: notches on both superior and inferior borders

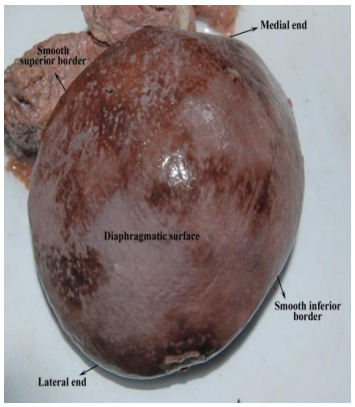

Fig 4

Fig 5

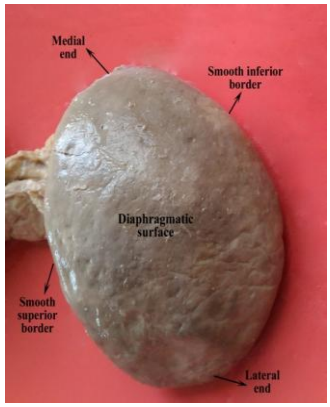

Fig 6

Fig 4, 5&6: absence of notches on both superior and inferior borders

IV. Discussion

Till the first half of twentieth century, the spleen was considered to represent an organ of no special significance[4]. Spleen is a very important organ because of its function in relation to immunological and cytological activity especially with regard to its RBC storage and blood filtration potential. The spleen has been studied in detail in various conditions ranging from its innervation to diseases like hairy cell leukemia[1,5].

All the parameters of liver and spleen are important for ultrasound examination[5]. Organ dimensions have also been linked to weight of individual[5]. Anomalies of spleen often remain undetected as they are asymptomatic. Absence of splenic notches on superior border may result in difficulty while palpating the spleen.

The spleen is less notched in anthropoids but more common in lower monkeys and lemurs[6]. Even the carnivors have been found to have notches on all its borders and some animals like ox, sheep, goat and horse have been found to display no notches[6]. The unnotched spleens are a feature of Rodentia[6].

Comparisons of results of present study with that reported in literature were presented in TABLE 2.

Table 2: Comparison of percentage incidence of spleens with notches on superior border reported in literature

S.No.	Author	Region	Incidence (%) Of Notches On Superior Border
1.	Das Etal[7]	Malaysia	98
2.	Nayak Etal[8]	Karnataka	50
3.	Skandalakis Etal[8]	America	78.65
4.	Ungor Etal[8]	Turkey	95
5.	Rayhan Etal[9]	Dhaka	88.75
6.	Kharat Vidya Etal[10]	Maharashtra	96
7.	Girish Etal[11]	Kerala	95
8.	Siva Nageswara Rao Sundara Setty Etal[12]	Telangana	70
9.	Soyluolu Etal[13]	----------	70
10.	Present Study	Andhra Pradesh	85

The percentage incidence of notches on superior border obtained in the present study was less than that reported in Kerala and Maharashtra population of India [10, 11] and more than that reported in Karnataka and Telangana population of India [8, 12]. When compared to that in Malaysian and Turkey population it was less [7, 8] and was more than that reported in American population [8].

Table 3: Comparison of percentage incidence of spleens with notches on inferior border reported in literature (FIG 1&2)

S.NO.	AUTHOR	REGION	INCIDENCE (%) OF NOTCHES ON INFERIOR BORDER
1.	Das etal[7]	Malaysia	2
2.	Muktyaz hussein etal[14]	North India	12.5
3.	Kharat vidya etal[10]	Maharashtra	10
4.	Girish etal[11]	Kerala	3.33
5.	Parsons FJ etal[6]	------	8
6.	Siva nageswara rao sundara	Telangana	14

	setty etal[12]		
7.	Present study	Andhra pradesh	5

The percentage incidence of notches on inferior border obtained in the present study was less than that reported in Maharashtra, North India and Telanagana population of India[10, 14, 12] and more than that reported in Malaysian and Kerala population [7, 11].

In the present study 2.5% incidence of cases with notches on both superior and inferior borders were observed. A study conducted by Lizamma Alex etal [15]presented 27% incidence which is very high than that observed in the present study.

Table 4: Comparison of percentage incidence of spleens with absence of notches reported in literature

S.No.	Author	Region	Absent Notches-Incidence (%)
1.	Girish Etal[11]	Kerala	1.67
2.	Kharat Vidya Etal[10]	Maharashtra	6
3.	Present Study	Andhra Pradesh	7.5

In the present study 7.5% incidence of cases with absence of notches were observed which was the highest percentage reported in literature [10, 11]in Indian population.

Spleenomegaly in unnotched spleens may be misdiagnosed as renal swelling on left costal margin by surgeons suggesting the importance of splenic notches in clinical practice. But renal swelling has resonant sound on percussion, slight movement on respiration, ballotability, bimanually palpable and insinuation of hand in between renal swelling and anterior abdominal wall.

V. Conclusion

Presence of notches is very helpful for clinician or in radiological investigation and also for anthropological studies. Splenic notches are very common on superior border than on the inferior border. It is essential for the surgeons and radiologists to become completely aware of anatomical variations that may help in accurate clinical diagnosis and treatment of cases with splenic variations.

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