

Morphometric Evaluation of the Variation of Spleen Morphology in Human Cadavers

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Abstract

Aim: Morphometric study of adult human spleen in a cadaver

Methods: This prospective observational study was carried out in the Department of Anatomy, Anugrah Narayan Magadh Medical College, Gaya, Bihar, India for 15 months. The present study was conducted on 60 adult human cadaveric spleens collected from department of Anatomy. All the spleens were observed for their morphometric features like shape, number of notches on borders and measurements were taken for length, breadth and thickness using vernier calliper.

Results: Out of 50 spleens studied, five different shapes of the spleen were observed. 20 spleens were wedge shaped (40%), 13 spleens were triangular shaped (26%), 10 spleens were tetrahedral (20%), 6 spleens were oval shaped (12%), 6 spleens were irregular shaped (12%). All the spleens were observed for the presence of notches. 30 spleens (60%) had notches on its superior border, 2 spleens (4%) had notches on its inferior border, and 13 spleens (26%) had notches both in their superior and inferior borders, 5 spleens (10%) were found with absence of notch on either of its borders. The number of notches varied from zero to six, but in most of the spleens there were one or two notches. The presence of splenic fissure on diaphragmatic surface was noted in 3 spleens.

Conclusion: The knowledge of morphometric variations is helpful for clinicians, surgeons and radiologists during routine clinical examinations. These variations are to be considered during splenic transplantations, surgical procedures and differentiate it from splenic injuries.

Keywords: Spleen, Number of Notches, Cadaver.

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Introduction

Spleen is the largest lymphoid organ in the human body and is located in the left hypochondrium resting on the left colic

flexure opposite to the 9th - 11th ribs [1]. It is one of the frequently damaged organs in blunt abdominal trauma and also in

penetrating injury to the left upper abdominal quadrant [2]. Spleen has superior and inferior poles, superolateral diaphragmatic and inferomedial visceral surfaces, anterosuperior and posteroinferior borders. The superior pole corresponds to the posterior extremity and usually faces the vertebral column. The inferior pole which is less angulated than the superior pole connects the anterosuperior and posteroinferior borders anteriorly. The diaphragmatic surface is smooth and convex, faces mostly superiorly and laterally, although the posterior part may face posteriorly. The visceral surface is irregular, faces inferomedially towards the abdominal cavity. The anterosuperior border is usually convex and inferiorly, it may bear one or two notches. The size and weight of the spleen vary with age, sex, and can also vary slightly in the same individual under different conditions. The adult spleen is usually 9-14 cm long, 6-8 cm wide and 3-5 cm thick. It reaches its largest dimension in puberty and diminishes thereafter. The average adult weight depends on the amount of blood in it. The weight ranges from 150 to 350 g in vivo and when emptied of blood, it weighs between 70 and 120 g [3]. Congenital anomalies of the spleen are believed to be rare and include spleen lobulation, wandering spleen, accessory spleen, polysplenia and absence of the spleen [4]. Prenatally, the spleen is a hematopoietic organ, but after birth it is involved primarily in identifying, removing, and destroying worn out red blood cells (RBCs) and platelets. Moreover, this organ also acts as a reservoir of blood, stores RBCs and platelets [1]. The spleen participates in many different pathological processes e.g., generalised haematopoietic and lymphopietic disorders, systemic infection, sepsis and immunologic-inflammatory processes. Despite its clinical significance, spleen seems to be "the forgotten organ" unless enlarged, traumatized, or infarcted [5]. Many researchers feel that radiologists and

clinicians should be well aware of the normal spleen variants, as well as relevant congenital and acquired abnormalities so that they interpret correctly the variable spectrum of findings that may involve the organ [6,9].

Material and Methods:

This prospective observational study was carried out in the Department Of Anatomy, Anugrah Narayan Magadh Medical College, Gaya, Bihar, India for 15 months

Methodology

The present study was conducted on 60 adult human cadaveric spleens collected from department of Anatomy. All the spleens were observed for their morphometric features like shape, number of notches on borders and measurements were taken for length, breadth and thickness using vernier calliper. All these observations and measurements were tabulated, statistically analysed and compared with previous studies.

1. Length - maximum distance between the two ends of the spleen.
2. Breadth - maximum distance between two points at the same level on the superior and inferior borders.
3. Thickness - Midpoint of both the visceral and diaphragmatic surfaces.

Results:

Out of 50 spleens studied, five different shapes of the spleen were observed. 20 spleens were wedge shaped (40%), 13 spleens were triangular shaped (26%), 10 spleens were tetrahedral (20%), 6 spleens were oval shaped (12%), 6 spleens were irregular shaped (12%).

All the spleens were observed for the presence of notches. 30 spleens (60%) had notches on its superior border, 2 spleens (4%) had notches on its inferior border, 13 spleens (26%) had notches both in their superior and inferior borders, 5 spleens (10%) were found with absence of notch on

either of its borders. The number of notches varied from zero to six, but in most of the spleens there were one or two notches. The presence of splenic fissure on diaphragmatic surface was noted in 3 spleens.

The length of the spleen varied between 7cms to 15cms and most of the specimens

were in the range of 7-11 cms in length. The breadth of the spleen varied between 4cms to 12 cms and most of the specimens were in the range of 4-8 cms in breadth. The thickness of the spleen varied between 2cms to 6cms and most of the specimens were in the range of 2-4 cms.

Table 1: Length of spleen

Length (cms)	No of specimens	Percentage (%)
7-9	18	36
9-11	20	40
11-13	12	24
13-15	4	8

Table 2: Breadth of spleen

Length (cms)	No of specimens	Percentage (%)
7-9	18	36
9-11	20	40
11-13	12	24
13-15	4	8

Table 3: Thickness of spleen

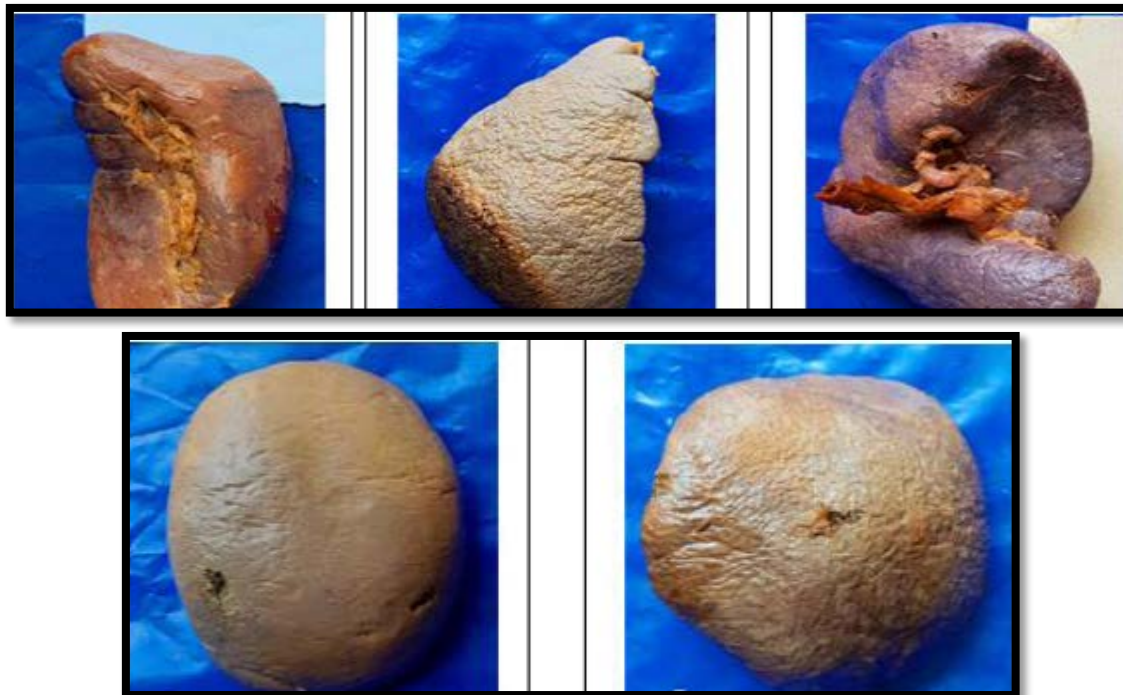
Thickness(cms)	No of specimens	Percentage (%)
2-3	22	44
3-4	22	44
4-5	4	8
5-6	2	4

Table 4: Comparison of measurements of spleen with previous studies

Authors	No of specimens	Shapes of spleen				
		Wedge	Tetrahedral	Oval	Triangular	Irregular
Siva C et al.[10]	60	73.33	6.67	6.67	13.33	-
Sangeetha et al.[11]	53	33.9	15	9.4	33.9	7.6
Subhash et al.[12]	66	40.91	27.27	18.18	4.55	4.55
Sudharani et al.[13]	50	78	18	-	2	2
Present study	50	40	20	12	26	12

Table 5: Comparison of measurements of spleen with previous studies

Authors	No of specimens	Measurements of spleen		
		Length (cms)	Breadth (cms)	Thickness (cms)
Sangeetha et al.[11]	53	9.68	6.84	3.61
Subhash et al.[11]	66	9.4	6.4	3.3
Sudharani et al.[12]	50	9.5	7.1	3.7
Present study	50	10.35	6.41	3.45

**Figure 1: Spleen****Discussion:**

The spleen is an important haemolymphoid organ. Splenomegaly is commonly seen in case of malaria, typhoid, infectious mononucleosis and leukemias. In these conditions, the clinicians can palpate the splenic notches commonly present on their superior border and differentiate it from other organs [10,14].

The present study has observed the variations in the morphometry of spleen. The most common shape was the wedge shaped, followed by triangular, tetrahedral, oval and irregular. Among the 5 different shapes noted, more commonly were wedge shaped (40%) similar to the studies of Sangeetha et al [11]. and Subhash et al [12]., followed by triangular shaped spleens

(26%) similar to the study done by R Siva Chidambaram [10].

The average length of spleen in present study was 10.35cm, which is similar to the studies done by Rao et al [15]. (10.5 cm) and Michels et al [16]. (11 cm). The average breadth of spleen in present study was 6.41cm, which is similar to the studies done by Sangeetha et al [11]. (6.84 cm) and Subhash et al [12] (6.4 cm).

The average thickness of spleen in present study was 3.45cm, which is similar to the studies done by Sangeetha et al [11]. (3.61 cm), Subhash et al [7]. (3.3 cm) and Sudharani et al [13]. (3.7 cm).

In the present study, the splenic notches were observed on the superior border in 60% of the specimens. In the previous

studies, the splenic notches on the superior border were observed in 50% Subhash et al [12]. 80% Sudharani et al [13]., 83% Sangeetha et al [11]., 50% Nayak et al [17]. and Das S et al [18]. _observed in 98% of the specimens. The notch on the inferior border was observed in 4% in the present study similar to the study done by Archana N et al [19]. 3.3%.

Conclusion:

The knowledge of morphometric variations is helpful for clinicians, surgeons and radiologists during routine clinical examinations. These variations are to be considered during splenic transplantations, surgical procedures and differentiate it from splenic injuries.

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