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# **Original Research**

# To conduct a morphometric analysis of an adult human spleen in a cadaver

Mohammed Imtiyaz Rajjab Ali

Associate Professor, Department of Anatomy, People's College of Medical Sciences & Research Centre, Bhopal, Madhya Pradesh, India

#### ABSTRACT:

**Aim:** To conduct a morphometric analysis of an adult human spleen in a cadaver. **Material and methods:** The current investigation was carried out on a total of forty adult human cadaveric spleens that were obtained from the Anatomy Department. Every single spleen was scrutinized for its morphometric characteristics, such as its form and the amount of notches on its borders. Additionally, a vernier calliper was used to obtain measurements of the organ's length, width, and thickness. **Results:** There were five distinct forms of the spleen among the total of forty spleens that were examined. 17 spleens had a wedge form, accounting for 52.5% of the total, 9 spleens had a triangular shape, accounting for 10% of the total, 6 spleens had a tetrahedral shape accounting for 15% of the total. It was determined whether or not any of the spleens had notch marks on them. 25 spleens had notches on their superior borders, 2 spleens had notches on either of their borders. The percentage of spleens that did not have any notches on either of their borders was 10%. **Conclusion:** During normal clinical tests, having an understanding of the morphometric variances that might occur is beneficial for clinicians, surgeons, and radiologists. During spleen transplantations and surgical operations, these changes need to be taken into consideration in order to distinguish the condition from splenic damage. **Keywords:** Morphometric, spleen, cadaver.

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**Corresponding author:** Mohammed Imtiyaz Rajjab Ali, Associate Professor, Department of Anatomy, People's College of Medical Sciences & Research Centre, Bhopal, Madhya Pradesh, India

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#### **INTRODUCTION**

The spleen is the biggest lymphoid organ in the human body and may be found in the left hypochondrium, where it rests on the left colic flexure, just across from the 9th to 11th ribs.<sup>1</sup> It is one of the organs that is often harmed when there is blunt force trauma to the abdomen as well as when there is a penetrating injury to the upper left abdominal quadrant.<sup>2</sup> The spleen has anterosuperior and posteroinferior boundaries, as well as a superior and an inferior pole, a superolateral diaphragmatic surface, and an inferior visceral surface. The superior pole is often oriented such that it faces the spinal column and corresponds to the posterior extremity. Anteriorly, the anterosuperior and posteroinferior boundaries are connected by the inferior pole, which has a smaller angle of angulation than the superior pole. The surface of the diaphragm is smooth and convex, and its main orientation is superiorly and laterally; however, the posterior section may have an

orientation that faces posteriorly. The surface of the viscera is uneven and is oriented in a way that faces inferomedially toward the abdominal cavity. In most cases, the anterosuperior border will be convex, and the inferior part of this border could have one or two notches. Both the size and weight of the spleen may change depending on an individual's age, as well as their gender, and even within the same person depending on the circumstances. The adult spleen typically measures 9-14 centimeters in length, 6-8 centimeters in width, and 3-5 centimeters in thickness. Puberty marks the point at which it is at its greatest extent, and it continues to shrink after that. The volume of blood that's in an adult's body affects how much they weigh on average. In vivo, the weight may vary from 150 to 350 grams, and after being drained of blood, it can weigh anywhere from 70 to 120 grams.<sup>3</sup> Spleen lobulation, wandering spleen, auxiliary spleen, polysplenia, and absence of the spleen are all examples of uncommon congenital

defects that may affect the organ during development. Spleen lobulation is the most common of these abnormalities.<sup>4</sup> After birth, the spleen's primary function is to locate, remove, and eliminate damaged red blood cells (RBCs) and platelets. Before birth, the spleen functions as a hematopoietic organ. In addition to these functions, this organ serves as a reservoir of blood and contains red blood cells as well as platelets.1 The spleen plays a role in a wide variety of distinct clinical processes, including generalized haematopoietic and lymphopoietic diseases, systemic infections, sepsis, and immunologic-inflammatory processes. Even though it plays an important role in clinical practice, the spleen sometimes appears to be "the forgotten organ" until it is big, injured, or infected.<sup>5</sup> Numerous studies are of the opinion that radiologists and physicians have to have a comprehensive understanding of the normal spleen variations, in addition to the pertinent congenital and acquired abnormalities, in order to accurately interpret the varied spectrum of results that may involve the organ.<sup>6-9</sup>

#### MATERIAL AND METHODS

After receiving clearance from both the protocol review committee and the institutional ethics committee, this prospective observational research was carried out at the anatomy department. The current investigation was carried out on a total of forty adult human cadaveric spleens that were obtained from the Anatomy Department. Every single spleen was scrutinized for its morphometric characteristics, such as its form and the amount of notches on its borders. Additionally, a vernier calliper was used to obtain measurements of the organ's length, width, and thickness. All of these observations and data were entered into a spreadsheet, subjected to statistical analysis, and compared to earlier research.

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

There were five distinct forms of the spleen among the total of forty spleens that were examined. 17 spleens had a wedge form, accounting for 52.5% of the total, 9 spleens had a triangular shape, accounting for 22.5% of the total, 6 spleens had a tetrahedral shape accounting for 15% of the total, 4 spleens had an oval shape accounting for 10% of the total, and 4 spleens had an irregular shape accounting for 10% of the total.

It was determined whether or not any of the spleens had notch marks on them. 25 spleens had notches on their superior borders, 2 spleens had notches on their inferior borders, 9 spleens had notches in both their superior and inferior borders, and 4 spleens did not have any notches on either of their borders. The percentage of spleens that did not have any notches on either of their borders was 10%. There were a total of zero to six notches in some of the spleens, although the majority of the spleens had either one or two notches. Two of the spleens examined showed evidence of a splenic fissure on the surface of the diaphragm.

The length of the spleen ranged anywhere from 7 cm to 15 cm, with the majority of the specimens having a length that fell between between 7 and 11 cm. The width of the spleen ranged anywhere from 4 centimeters to 12 centimeters, with the majority of the specimens having a width that fell somewhere in the range of 4 to 8 centimeters. It was found that the thickness of the spleen might vary anywhere from 2 cm to 6 cm, with the majority of the specimens falling somewhere in the region of 2-4 cm.

Table 1: Length of spleen				
Length(cms)	No of specimens	Percentage (%)		
7-9	14	35		
9-11	16	40		
11-13	8	20		
13-15	2	5		
Table 2: Breadth of spleen				
Breadth(cms)	Percentage (%)			
4-6	20	50		
6-8	13	32.5		
8-10	6	15		
10-12	10-12 1			

#### Table 3: Thickness of spleen

Thickness(cms)	No of specimens	Percentage (%)
2-3	18	45
3-4	18	45
4-5	3	7.5

		Shapes of spleen				
Authors	No of	f Wedge Tetrahedral Oval Triangular				Irregular
	specimens	_			_	-
Siva C et al <sup>10</sup>	60	73.33	6.67	6.67	13.33	-
Sangeetha et al <sup>11</sup>	53	33.9	15	9.4	33.9	7.6
Subhash et al <sup>12</sup>	66	40.91	27.27	18.18	4.55	4.55
Sudharani et al 13	50	78	18	-	2	2
Present study	50	42.5	15	10	22.5	10

	3-0	1	2.3
Table 4: Comparison of n	neasurements of sp	oleen with previous	studies

 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 <sup>11</sup>	53	9.68	6.84	3.61
Subhash et al <sup>11</sup>	66	9.4	6.4	3.3
Sudharani et al <sup>12</sup>	50	9.5	7.1	3.7
Present study	50	10.36	6.42	3.46

## DISCUSSION

The spleen is a vital organ in the blood and lymphatic systems. Malaria, typhoid, infectious mononucleosis, and leukemia are some of the diseases that often cause splenomegaly in patients. Under these circumstances, doctors are able to separate the spleen from other organs by palpating the splenic notches that are often located on the upper edge of the organ.<sup>10-14</sup>

In the current investigation, observations were made about the morphometric shifts that might occur in the spleen. The wedge form was the most prevalent, followed by the triangular shape, the tetrahedral shape, the oval shape, and the irregular shape. The wedge-shaped spleens made up 42.5% of the total, which is consistent with the findings of Sangeetha et al.<sup>11</sup> and Subhash et al.<sup>12</sup> The triangular-shaped spleens made up 26% of the total, which is also consistent with the findings of R. Siva Chidambaram's research.<sup>10</sup>

The length of the spleen, on average, was measured to be 10.36 cm in this research, which is comparable to the lengths measured in investigations carried out by Rao et al.<sup>15</sup> (10.5 cm) and Michels et al.<sup>16</sup> (11 cm). The average width of the spleen in this research was 6.42 centimeters, which is comparable to the investigations that were conducted by Sangeethe et al.<sup>11</sup> (6.84 centimeters) and Subhash et al.12 (6.4 centimeters).

It was found in this research that the average thickness of the spleen was 3.46 cm, which is comparable to the findings of investigations carried out by Sangeetha et al.<sup>11</sup> (3.61 cm), Subhash et al. <sup>7</sup> (3.3 cm), and Sudharani et al.<sup>13</sup> (3.7 cm).

In the current investigation, the splenic notches were found on the superior border of the specimens in 62.5 percent of the cases. In the prior research, the splenic notches on the superior border were found in 98% of the specimens. These notches were seen in 50% of the cases by Subhash et al.<sup>12</sup>, 80% of the cases by Sudharani et al.<sup>13</sup>, 83% of the cases by Sangeetha et al.<sup>11</sup>, and 50% of the cases by Nayak et al.<sup>17</sup>. In the current investigation, the notch on the inferior border was identified in 5% of cases, which is comparable to the 3.3% found in the study carried out by Forsythe RM et al.<sup>2</sup>

# CONCLUSION

During normal clinical tests, having an understanding of the morphometric variances that might occur is beneficial for clinicians, surgeons, and radiologists. During spleen transplantations and surgical operations, these changes need to be taken into consideration in order to distinguish the condition from splenic damage.

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