

MORPHOMETRY STUDY OF CADAVERIC SPLEEN

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Abstract

Background: The spleen is the largest lymphoid organ located in the left hypochondrium between the fundus of the stomach and the diaphragm where it is entirely covered by the inferior thoracic rib cage. It extends from the 9th–11th ribs on the left side with its long axis runs parallel to the 10th rib. Its shape is ovoid-like with a convex outer diaphragmatic surface and an indented inner visceral surface related to the stomach, left kidney, pancreatic tail, left suprarenal gland and left colic flexure. The apex lies in line with the spine of the 10th thoracic vertebra about 4 cm from the midline and the base does not descend beyond the midaxillary line. The literature revealed that spleen dimensions are affected by geographical differences, races, nutritional status and anthropometric measurements. In clinical practice, palpation is commonly used to detect spleen enlargement. **Materials and Methods:** The present study conducted with total 52 human adult cadaveric spleen of both sexes were included. In our present study we studied for the following parameters of spleen. We have recorded spleen shapes and percentage of different shapes. Weight, Length, thickness and width of the spleen were recorded. Notches on the superior and inferior borders were studied. **Result:** In present study we have noted the different shapes of spleens, that includes wedge shaped, triangular, oval, tetrahedral, heart shaped, semi lunar and irregular. Average weight around 375g. Average length of the spleen was 9.76cm. Average breadth of the spleen was 7.12cm and average thickness was 3.04cm. We have carefully observed the all borders of spleen for splenic notches, most of the spleens presenting notches on superior border and also rarely on inferior border. **Conclusion:** The present study concludes that the morphometric measurements of spleen may be helpful to access splenomegaly cases and pathological changes in spleen, which are helpful in surgery practice.

INTRODUCTION

The spleen is the largest lymphatic organ. It is connected to the blood vascular system. It consists of a large, encapsulated mass of lymphoid and vascular tissues. It is situated in the left hypochondrium and partly in the epigastrium, between the fundus of the stomach and the diaphragm. The shape of the spleen varies from a slightly curved wedge to a domed tetrahedron. The size and weight of the spleen vary with age. In adults, it is usually 12 cm long, 7 cm broad and 3 to 4 cm wide. Its average adult weight is 150 gm, but the normal range is wide, between 80 and 300 gm.^[1] It is a graveyard of RBCs and the storage site of platelets and blood. It filters the blood and protect the body against the infections. It is having two ends and two surfaces- anterior and posterior ends and diaphragmatic or superiolateral and visceral

or inferiomedial surface. The anterior end is broad and faces laterally. The posterior end faces medially towards the vertebral column. The diaphragmatic surface is smooth and convex. It is covered by peritoneum and is related to abdominal surface of left dome of diaphragm which separate it from basal pleura, lower lobe of left lung and ninth to eleventh ribs. Its visceral surface is irregular, and faces infer medially towards the abdominal cavity. It is having impressions for the left kidney, tail of pancreas, left colic flexures and fundus of stomach. The hilum of the spleen is located between the impressions of stomach and left kidney. The long axis of the hilum lies along the line of tenth rib. The spleen is connected to posterior abdominal fold via fold of peritoneum to kidney through lenorenal, to the colon with phrenosplenic ligament and to the anterolateral

abdominal wall and stomach by the gastro splenic ligament.^[2-6]

Measurement of the splenic length in the routine clinical practice is a very good indicator of actual splenic size.^[7] Splenomegaly is an important diagnostic clue to the existence of an underlying disorder.

Splenomegaly indicating to an enlarged spleen. The spleen is located in the left hypochondric region and well protected by rib cage. Spleen functions includes in filtering blood by remove debris cells and helping the body fight infections. It is storage house for white blood cells and platelets. An enlarged spleen is characterized as one that is larger than 12 cm in length or over 400 grams in weight. Splenomegaly is considered a rare condition; it is due to usually occurs because of secondary causes. Infections associated with splenomegaly include viral infections, such as infectious mononucleosis, parasitic infections, such as malaria and leishmania, and bacterial infections. The excessive work of spleen due to infection can cause enlargement of the spleen. Leukaemia, Portal hypertension, Liver cirrhosis, scarring also can cause spleen engorged with blood, leading to splenomegaly. Splenomegaly is a serious condition upon trauma it can rupture spontaneously. It requires splenectomy. Splenomegaly causes abdominal discomfort, which might also be accompanied by localized pain near the spleen. Individuals with splenomegaly caused by cancer may experience night sweats and weight loss. Splenomegaly can usually be diagnosed through palpation during a physical exam and with help of MRI & CT scan. Treatment of splenomegaly primarily focuses on treating the underlying cause. In certain cases, such as with massive splenomegaly caused by cancer, splenectomy, or the removal of the spleen, may be required.^[2,8]

The development of Spleen occurs from dorsal mesogastrium of lesser sac at the end of 4th week. Spleen is the vascular lymphatic organ and is of mesodermal origin. A mesenchymal condensation develops near the body wall and this condensation differentiates during the 5th week to form a spleen. The spleen is in lobular form in foetus, but the lobules normally fuse before birth. The notch in the superior border of adult spleen are remnants of grooves that separated the fetal lobules. Normally spleen is not palpable, but it may become palpable when its size increases two or three time of normal. Clinically enlarged spleen is detected by palpating the splenic notch in the superior border. Spleen increased in size due to increased demand of splenic function for removal of defective erythrocytes like thalassemia, sickle cell anaemia and pernicious anaemia.^[2,6,8] The

aim of present study is to find morphometric measurements of spleen and Splenomegaly in cadaver and measurements of it, which may be helpful to clinical practice and knowledge of morphometric measurements helpful for surgical procedures of spleen.

MATERIALS AND METHODS

Total 52 cadaveric spleens were used, both male and females' spleens included in study. The spleens measured for present study were conducted in multiple medical colleges in Karnataka. The present study conducted with total 52 human adult cadaveric spleen of both sexes were included. Spleen was removed from the abdominal cavity after ligating the splenic vessels. If any attracts like adipose tissue was removed by dissection after the spleen was cleaned with tap water. All the spleens were studied for the following parameters. Spleens were studied for their shapes and percentage of different shapes were calculated. Weight of the spleen was measured by electronic weighing machine. Length of the spleen was recorded as the distance between the two poles of the spleen. Greatest distance between two points at the same level on the superior and inferior borders was taken as its breadth and the maximum thickness of all the spleens were recorded. Notches on the superior and inferior borders were studied and the presence of multiple notches was also noted. The range of parameters studied, and average values were tabulated.^[9]

RESULTS

Out of 52 spleens studied 29 (55.7%) were wedge shaped, 06(11.5%) were triangular, 9 (17.3%) were oval, 3 (5.7%) were tetrahedral, 2(3.8%) were heart shaped and 1 (1.9%) were semi lunar and 2(3.8%) spleens were irregular. We have observed for the notches on the borders of all spleens. 36 spleens (69.2%) had notches on its superior border, 6 spleens (11.53%) had notches on its inferior border, 8 spleens (15.38%) had notches both in their superior and inferior borders, 2 spleens (3.84%) were found with absence of notch on either of its borders. The number of notches varied from zero to four, but in most of the spleens there were one prominent notch or two notches. Weight of the spleen ranged from 150 to 550 g and average weight around 375g. Length of the spleen ranged from 5.5 cm to 15.78 cm average being 9.76cm. Breadth of the spleen ranged from 3.9cm to 9.2 cm average being 7.12cm. Thickness of spleen ranged from 3.2cm to 4.84 cm average being 3.04cm.

Table 1: Parameters which are showing morphological variations and morphometric measurements.

No of Spleens	Average weight	Average length	Average Breadth	Average Thickness		
52	375g	9.76cm	7.12cm	3.04cm		
Shapes of Spleens (total Number of Spleens (78))						
Wedge	Triangular	Oval	Tetrahedral	Heart shaped	Semilunar	Irregular

29(55.7%)	06(11.5%)	9(17.3%)	3(5.7%)	2(3.8%)	1(1.9%)	2(3.8%)
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DISCUSSION

The present study has observed the variations in the morphometry of spleen. The most common shape was the wedge shaped, followed by triangular, tetrahedral, heart shape and irregular. Among all different shapes noted, more commonly were wedge shaped (41.02%) similar to studies of Shivanal U,^[3] the studies of Sangeetha et al,^[5] and Subhash et al,^[6] next most observed shape of spleen was triangular shaped spleens (19.2%) similar to the studies of Shivanal U,^[3] and R Siva Chidambaram.^[7] Length of the spleen ranged from 4.2 cm to 16.2 cm average being 8.67cm. in study of Shivanal U,^[3] the average length of spleen in was 10.29cm, in studies done by Rao et al,^[8] it was 10.5cm and Michels et al. it was 11 cm.^[9] In present study breadth of the spleen ranged from 3.6cm to 8.5 cm average being 6.26cm. The average breadth of spleen in study of Shivanal U,^[3] was 6.37cm, in studies done by Sangeetha et al,^[5] it was 6.84 cm and Subhash et al it was 6.4 cm.^[6] Thickness of spleen ranged from 2.9cm to 4.64 cm average being 3.35cm. The average thickness of spleen in study of of Shivanal U,^[3] was 3.4cm, in the studies done by Sangeetha et al. it was 3.61 cm,^[5] Subhash et al it was 3.3 cm and Sudharani et al it was 3.7 cm.

In present study we were observed in 46 spleens (58.9%) had notches on its superior border, 4 spleens (5.12%) had notches on its inferior border, 21 spleens (26.92%) had notches both in their superior and inferior borders, 7 spleens (8.9%) were found with absence of notch on either of its borders. The number of notches varied from zero to four, but in most of the spleens there were one prominent notch or two notches. Presence of notches on the superior margin is useful for the physician to palpate the spleen during enlargement of spleen.^[10] In previous studies regarding the site of notches on the spleen have revealed the presence of notches on the superior order in 98% Das et al,^[11] 78.6% by Skandalakis et al,^[12] 50% by Sateesha et al,^[12] and in study of Sangeetha et al it was observed only on superior border.^[5] In study of Sangeetha et al,^[5] it was shown the presence of notches on both superior and inferior aspects of spleen was not found. Notched superior border results from improper fusion of the splenic nodules along the superior margin.^[5] To conclude, knowledge

of the anatomy and function of the spleen is essential for the assessment of its role in disease. The contribution of spleen to the immune response and defence against infections mandates the preservation of spleen by a conservative approach in the management of ruptured spleen. Studies on the morphometry of spleen will be of interest not only from academic point of view but also for operating surgeons and interventional radiologists. The detailed knowledge on spleen is important to avoid and prevent any complications and to obtain a good operative, as well as diagnostic intervention.

CONCLUSION

The present study concludes that the morphometric measurements of spleen may be helpful to access splenomegaly cases and pathological changes in spleen, which are helpful in surgery practice.

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