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A Study on Morphometry of Human Adult Cadaveric Speen

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BSTRACT

Spleen is a haemo-lymphatic organ in the human body. It is the largest and clinically important lymphoid organ. It can show a wide range of variation the knowledge of which is important for physicians, surgeons and radiologists. Spleen is a part of circulatory system, it is generally described with the lymphatic organs because of very large population of lymphocytes present in it. In surgical and medical history spleen has been described as a mysterious organ. Clear understanding and appreciation of its function emerged only later half of the 20th century. The present study conducted with total 78 human adult cadaveric spleen of both sexes were included. 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. Length, thickness and width of the spleen were recorded. Notches on the superior and inferior borders were studied and the presence of multiple notches were also noted. In our study we have found the different shapes of spleens, that includes wedge shaped, triangular, oval, tetrahedral, heart shaped, semi lunar and irregular. We have observed for the notches on the borders of all spleens. The number of notches varied from zero to four, but in most of the spleens there were one prominent notch or two notches. Average weight around 325g. Average length of the spleen was 8.67 cm. Average breadth of the spleen was 6.26 cm and average thickness was 3.35 cm.

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Key Words
Spleen, Accessory Spleens, Haemo-lymphatic organs, abdominal visera

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INTRODUCTION

Through spleen is a part of circulatory system it is generally described with the lymphatic organs because of very large population of lymphocytes present in it. In surgical and medical history spleen has been described as mysterious organ. Clear understanding and appreciation of its function emerged only in the later half of 20th century. Lymphatic system is defence against illness. The cells which deals with invasion by harmful agents originated, developed, matured and stored in lymphatic organs. For these reasons the lymphatic system id intimately related both structurally and functionally to the blood vascular system. Certain specialized organs devoted to processing and modifying lymph and lymphoid cells are present in all normal mammals. The largest and best example for lymphatic organ in spleen. Spleen is flaccid bag that serves as a storage site of blood and processing station for scavenging of aged erythrocytes. Spleen is one of the dispensable organs, because mammal get along quite nicely without a spleen. In athletes the spleen was thought to be a source of discomfort sometimes felt as "A stitch in the site" and that if it were removed or ablated would be able to run faster. Ancient Greece athletes may have had their spleen ablated to improve their performance. This hypothesis was studies by John F by conducting studies on splenectomised mice and control mice to evaluate their ability to run a race where the splenectomised mice were reported to be faster. Vasalius performed spleenectomy in mice and some other animals and determined that the spleen is not essentials to life and did not observe any changes following removal of spleen. Rosh M H identified the spleen as the site of red cell destruction in autoimmune haemolytic anaemia[1,2].

The spleen is a haemo-lymphoid organ which belongs to the reticulo-endothelial system. It is located in the left hypochondrium and partly in the epigastrium between the fundus of the stomach and the diaphragm. Spleen is reddish purple in colour. The size and weight of the spleen varies with age and gender. In adults it is usually 12 cms in length, 7 cms broad and 3-4 cms in thickness. It weighs around 150 gms. Spleen usually measures 2.5 cms in thickness, 5 cms width and 12 cms long in a normal adult and weighs about 150- 220gms. Spleen has anterior and posterior ends, superior and inferior borders and two surfaces; diaphragmatic and visceral surfaces. On the superior border, near the anterior end, there may be one or two notches, persisting from the lobulated form of the spleen in early foetal life. The spleen is the most vascular organ in the human body which is involved in the regulation of circulating blood volume. Approximately 350 liters of blood passes through it per day. The spleen receives approximately 5% of the cardiac output and 40% source of the blood in the portal circulation[3].

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 Etc. (b)-response to infection like AIDS, tuberculosis and malaria ect. due to abnormal splenic blood flow like cirrhosis and portal hypertension ect. Infiltration of spleen like lymphoma, AML, CML and idiopathic splenomegaly like iron deficiency anaemia[4]. The Present study is conducted to evaluate morphological and morphometric features of human adult cadaveric spleen, which may be helpful to clinical practice and knowledge of morphometric measurements helpful for surgical procedures of spleen.

MATERIALS AND METHODS

The present study was conducted in different medical college in India. The present study conducted with total 78 human adult cadaveric spleen of both sexes were included. Spleen was removed from the abdominal cavity after ligating the splenic vessels. Fatty tissue was removed by dissection after the spleen was washed in 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 [5].

Results

Out of 78 spleen studied 32 (41.02%) were wedge shaped, 12 (15.3%) were triangular, 15 (19.2%) were oval, 6 (7.69%) were tetrahedral, 4 (5.1%) were heart shaped and 4 (5.1%) were semi lunar and 5 (6.41%) spleens were irregular. We have observed for the notches on the borders of all spleens. 46 spleens

Table 1: Showing the morphometric and morphological results of spleen.

No of spleens	Average weight	Average length		Average breadth		Average thickness
78	325 g	8.67 cm		6.26 cm		3.35 cm
Wedge	Triangular	Oval tetrahedral	Heart shaped	Semilunar	Irregular	
Shapes of spleens (total number of spleens (78)						
32 (41.02%)	12 (15.3%)	15 (19.2%)	6 (7.69%)	4 (5.1%)	4 (5.1%)	5 (6.41%)

(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. Weight of the spleen ranged from 110-515 g and average weight around 325 g. Length of the spleen ranged from 4.2 cm to 16.2 cm average being 8.67cm. Breadth of the spleen ranged from 3.6cm to 8.5 cm average being 6.26 cm. Thickness of spleen ranged from 2.9 cm to 4.64 cm average being 3.35cm.

DISCUSSIONS

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[3] the studies of Sangeetha *et al*.[5] and Subhash et al.[6], next most observed shale of spleen was triangular shaped spleens (19.2%) similar to the studies of Shivanal[3] and Siva Chidambaram[7]. Length of the spleen ranged from 4.2 cm to 16.2 cm average being 8.67 cm. in study of Shivanal[3] the average length of spleen in was 10.29 cm, in studies done by Rao *et al*.[8] it was 10.5 cm and Michels *et al*.[9] it was 11 cm. In present study breadth of the spleen ranged from 3.6cm-8.5 cm average being 6.26cm. The average breadth of spleen in study of Shivanal[3] was 6.37cm, in studies done by Sangeetha *et al*.[5] it was 6.84 cm and Subhash *et al*.[6] it was 6.4 cm. Thickness of spleen ranged from 2.9 cm-4.64 cm average being 3.35 cm. The average thickness of spleen in study of of Shivanal[3] was 3.4 cm, in the studies done by Sangeetha *et al*.[5] it was 3.61 cm, Subhash *et al*.[5] it was 3.3 cm and it was 3.7 cm.

In present study we was 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*.[13] it was observed only on superior border. 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.

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