



MORPHOLOGICAL STUDY OF HUMAN CADAVERIC SPLEEN AND ITS CLINICAL SIGNIFICANCE

Anatomy

Udayasree L	Assistant Professor, Department of Anatomy, Guntur Medical College, Guntur.
Savithri P	Professor & HOD, Department of Anatomy, Rangaraya Medical College, Kakinada.
Yesupadamu K	Professor, Department of Anatomy, Rangaraya Medical College, Kakinada.

ABSTRACT

Introduction: The spleen is placed in the left hypochondriac region between the fundus of stomach and diaphragm. It's important functions are filtering of blood, immunity and phagocytosis. Variations in the morphology of spleen is important for the physicians, surgeons and radiologists to deliver their appropriate treatment to the patients. **Material & Methods:** The present study was done on 42 formalin fixed cadaveric spleens obtained during regular dissection for 1st MBBS students in the Department of Anatomy, Guntur Medical College, Guntur. Morphological parameters like weight, length, breadth, thickness, shape, number of notches present over superior and inferior borders and lobulations were observed, measured and studied their clinical significance. **Results:** In the present study on 42 spleens, we observed the weight ranges from 45grams to 375grams and the average was 174grams. The average length was 10.3cms and ranging from 5.9cms – 14.2cms. The average breadth was 7.75cms and ranging from 4.4cms – 10.8cms. The average thickness was 4.5cms and ranging from 2.5cms – 6cms. The shape of the spleens were wedge shaped in 20(47.6%), triangular in 9(21.4%), oval in 7(16.6%), tetrahedral in 5(11.9%) and irregular in 1(2.4%). The most common shape was wedge shaped. The notches on the superior border were observed as 1 notch in 10(23.8%) spleens, 2 notches in 9(21.4%) spleens, 3 notches in 9(21.4%) spleens, 4 notches in 2(4.8%) spleens and along the inferior border 1 notch in 11(26.2%) spleens, 2 notches in 5(12%) spleens and no notch in 9(21.4%) spleens were observed. The notches were varied from 0-4 on the superior border and along the inferior border from 0-2. Deep fissure was identified in 2(4.8%) spleens on the diaphragmatic surface and in 5(12%) spleens along the inferior border. In 1(2.4%) spleen, the fissure was so deep and appeared as lobulated spleen. In 4(9.5%) spleens, tongue shaped expansion was observed. **Conclusions:** The present study was useful for the physicians, surgeons and radiologists for the proper diagnosis of diseases related to spleen and to treat the patients.

KEYWORDS

spleen, morphology, splenic notches.

INTRODUCTION:

The spleen is essentially concerned in phagocytosis, immune responses, cytopoiesis and erythrocyte storage. In the fetus, it is a site of haemopoiesis. It lies mainly in the left hypochondriac region of the abdomen, its posterior edge extending into the epigastric region. It is situated between the gastric fundus and the diaphragm. Its shape varies from a slightly curved wedge to a tetrahedron. It is soft, friable, highly vascular and of a dark purple colour¹.

It has two surfaces. The diaphragmatic surface is smooth, convex & faces postero-superiorly and to the left. it is related to the abdominal surface of diaphragm, left lung & pleura and 9, 10, 11 ribs on left side². The costo-diaphragmatic recess extends down as far as the inferior border of the spleen. The visceral surface is facing the abdominal cavity & presents gastric, renal, pancreatic and colic impressions. The superior border is separating the diaphragmatic surface from the gastric impression, is convex, has one or two notches indicating the lobulated form of the spleen in early fetal life. The inferior border separates the diaphragmatic surface from the renal impression. It is more blunt & rounded and corresponds with the lower margin of the 11th rib³.

The size and weight of the spleen vary at different ages in different individuals and in the same individual at under different conditions. In adults, it is usually about 12cm in length, 7cm in breadth and 3-4cm in thickness and tends to diminish in size and weight with age. Its average weight in adults is 150grams, ranging between 80-300grams¹.

Near the spleen, within the gastrosplenic ligament and greater omentum, small encapsulated nodules of splenic tissue may occur. They are either isolated or connected to spleen by thin bands of splenic tissue. They are accessory spleens or splenunculi. The spleen may retain its fetal lobulated form or show deep notches on its diaphragmatic surface and inferior border in addition to those usually present on its superior border. The functions of spleen are phagocytosis, immune responses, cytopoiesis, erythrocyte storage and haemopoiesis during fetal life¹.

Splenomegaly, the enlargement of spleen, occurs in many clinical conditions like bacterial or viral infections, in conditions of increased erythrocyte breakdown like malaria and in massive immune responses. In granulocytic leukemia, it may enlarge to 10 or more times². Splenectomy is removal of spleen either partial or complete after its

injury or damage. In view of these so many clinical conditions and to do interventions or surgical procedures on spleen, the knowledge of Morphological Anatomy of spleen is important.

MATERIALS AND METHODS:

The present study was conducted on 42 formalin fixed dissected cadaveric spleens of both sexes, in the department of Anatomy, Guntur medical college, Guntur, Andhra Pradesh. The spleens were removed from the cadavers as per the standard methods⁴ and stored in the jars containing 10% formalin and observed & measured the following morphological parameters with the use of vernier's callipers, scale and digital weighing machine and studied their clinical importance in detail.

- Weight of the spleen
- Length, breadth and width of the spleen
- Shape of the spleen
- Presence of notches on the borders of the spleen
- Presence of any abnormal fissures on the surfaces of the spleen
- Presence of any lobulated masses of spleen.

RESULTS:

In the present study on 42 spleens, we observed the weight ranges from 45grams to 375grams and the average was 174grams. The average length was 10.3cms and ranging from 5.9cms to 14.2cms. The average breadth was 7.75cms and ranging from 4.4cms to 10.8cms. The average thickness was 4.5cms and ranging from 2.5cms to 6cms.

The shape of the spleens were wedge shaped in 20(47.6%) (figure 1), triangular in 9(21.4%) (figure 2), oval in 7(16.6%) (figure 3), tetrahedral in 5(11.9%) (figure 4) and irregular in 1(2.4%) (figure 5). The most common shape was wedge (table 1).

Table 1: Showing Number Of Various Shapes Of Spleens And Their Percentages

Shapes of spleens	Number of spleens	Percentages (%)
Wedge	20	47.6
Triangular	9	21.4
Oval	7	16.6
Tetrahedral	5	11.9
Irregular	1	2.4

The notches over the superior border were observed as 1 notch in 10(23.8%) spleens, 2 notches in 9(21.4%) (figure 1) spleens, 3 notches

in 9(21.4%) (figure 2) spleens, 4 notches in 2(4.8%) spleens and along the inferior border, 1 notch in 11(26.2%) spleens, 2 notches in 5(12%) spleens and no notch was observed in 9(21.4%) (figure 3) spleens. We observed notches on both borders in 14(33.3%) spleens (table 2). The number of notches on the superior border were varied from 0-4 and along the inferior border from 0-2.

Table 2: Showing Presence Of Notches Over The Borders Of Spleen And Percentages

Border of spleen	Presence of notches & percentage	Absence of notches & percentage
Superior	30(71.4%)	11(26.2%)
Inferior	17(40.5%)	24(57.1%)
Both	14(33.3%)	9(21.4%)

Deep fissures were observed along the diaphragmatic surface and the inferior border. Deep fissure was observed in 2(4.8%) spleens over the diaphragmatic surface and in 5(12%) spleens along the inferior border (figure 6).

DISCUSSION:

The spleen is an important haemo-lymph organ and belongs to the reticulo-endothelial system. It is the major repository of mononuclear phagocytic macrophage cells in the red pulp and of lymphoid cells in the white pulp⁵. The size and weight of the spleen show considerable variations because it contains large quantities of blood⁶.

According to Gray's Anatomy¹ and other standard books, the length of the adult spleen is about 12cms, the breadth is 7cms and 3-4cms thickness. In the present study the average length was 10.3cms, the average breadth was 7.75cms, the thickness was 4.5cms and the average weight was 174grams. In the study done by Divya Agrawal et al⁷, the weight of the spleens ranged from 70-300grams and the average was 156.01grams. According to M. Chelladurai et al⁸, in their study on 50 spleens, the weight of spleens was ranging from 50-200grams in 86%, 201- 350grams in 12% and >350 grams in 2% of spleens.

According to R. Siva Chidambaram et al⁹, in their study on 60 spleens, they observed wedge shape in 73.33% spleens, triangular in 13.33% spleens, tetrahedral in 6.67% spleens, and oval in 6.67% spleens and wedge shape was the most common followed by triangular, tetrahedral and oval shapes. In the present study, we observed wedge shape as most common type followed by triangular, tetrahedral, oval and irregular shape as least common. In the study done by Chaudhari ML et al¹⁰ on 62 spleens, they observed wedge shape as the most common followed by tetrahedral, triangular, oval and irregular shapes.

According to Manisha SM et al¹¹, they observed that the notches were most commonly present on the superior border and they were ranging from 0-6. In the present study, the notches were mostly present along the superior border followed by inferior border and both were ranging from 0-4 and 0-2 respectively. Presence of notches over the borders of spleen and the deep fissures were indicated the development of spleen occurs by the fusion of mesodermal masses in the dorsal mesogastrium¹². The knowledge of these notches was useful for the physicians, the surgeons and the radiologists to palpate, identifying the preliminary diagnosis and do the necessary interventions on the spleen.

CONCLUSIONS:

The knowledge of morphological variations of spleen, its shape and the variable number of notches and fissures is very important for physicians during clinical evaluation of pathology of spleen, for radiologists and for surgeons to do interventions or surgical procedures over the spleen. Irregular shape and notches represent the lobulated development of spleen.



Figure 1: Wedge shaped Spleen and two notches along the superior border



Figure 2: Triangular shaped spleen having 3 notches along the superior border and 1 along the inferior border



Figure 3: Oval shaped spleen and no notches along the both borders



Figure 4: Tetrahedral shaped spleen



Figure 5: Irregular shape & lobulated appearance of spleen



Figure 6: Deep notch along the inferior border

REFERENCES:

1. Peter L. Williams, Roger Warwick, Mary Dyson, Lawrence H. Bannister. The lymphatic system. In: Gray's Anatomy, 37th edition. ELBS with Churchill Livingstone, 1993; 827-833.
2. Keith L. Moore, Arthur F. Dally. Abdomen. In: Clinically oriented Anatomy, 5th edition. Lippincott Williams & Wilkins, 2006; 281-286.
3. Vishram Singh. Abdomen and Lower Limb. In: Text Book of Anatomy, Vol 2, 3rd edition, Elsevier, New Delhi, 2018; 98-102.
4. Romanes G J. The Abdomen. In: Cunningham's manual of practical Anatomy, 15th edition. Oxford University press, New York, 2013; 126-127.
5. Datta A K. The alimentary system. Chapter 2. In: Abdomen. Essentials of Human Anatomy, part 1, 7th edition. Current books International, Calcutta, 2006; 238-244.
6. Russell T Woodburne. The Abdomen. In: Essentials of Human Anatomy, 2nd edition. Oxford University press, New York, 1961; 402-403.
7. Divya Agrawal, G. B. Sujatha, Biswa Bhusan Mohanty et al. Morphometric variations in spleen: A study in dissected cadavers in Anatomy Department of a teaching hospitals of India. Indian journal of Anatomy, Vol 7(3), 2018: 237-241.
8. M. Chelladurai, J. Sujitha Jacinth, T. Ramamani et al. Morphological study of spleen and variations in South Indian population. Int J Anat Res 2019, Vol 7(2.3): 6663-67.
9. R. Siva Chidambaram, Soorya Sridhar. Morphological variations of spleen; A cadaveric study. Journal of Evidence based Medicine and Healthcare; Vol 2(29), 2015: 4248-54.
10. Chaudhari M L, Maheria P B, Lakhani C et al. Morphological variations of Human spleen and its clinical significance. International Journal of Medical research and review; Vol 2(1), 2014: 16-20.
11. Manisha S More, Manoj D Togale, Shilpa Bhimalli. Morphometric study of human adult cadaveric spleen. MedPulse – International Journal of Anatomy, Vol 11(1), 2019: 11-18.
12. Datta A K. Essentials of Human embryology, 5th edition. Current books International, Kolkata, 2007: 144.