

Morphometric Variations in Spleen: A Study in Dissected Cadavers in Anatomy Department of a Teaching Hospital of India

Divya Agrawal¹, G.B. Sujatha², Biswa Bhusan Mohanty³, V. Subhashini Rani⁴

Abstract

Introduction: The spleen is a large lymphoid organ situated mainly in left hypochondrium wedged between the fundus of stomach and the diaphragm. The spleen serves a large number of functions in humans starting from fetal life & continuing till adulthood. It is the site for manufacture of erythrocytes in fetus & takes up the immunological function in adult life. A large number of variations are observed in the morphology of spleen like different shapes, sizes, notches in the inferior border, accessory spleens etc. In present day medical practice, the stress is on non-invasive procedures & imaging techniques for various diagnosis and treatment. So, a thorough knowledge of the anatomy & variations observed in splenic morphology becomes very important. **Materials & Methods:** A total of 36 spleens of both sexes which were obtained during routine dissection classes of undergraduate MBBS students were included in this study. These spleens were removed from the cadavers by standard dissection method. **Observations & Results:** In our study, five different shapes of spleen were observed. Among them the commonest was wedge shaped (41.66%) and the least common was irregular shape (5.55%). The average length of spleen found is 10.152 cm, breadth is 6.014 cm & thickness is 3.236 cm. The average weight of our spleen in our study was 156.01 gms. One case of accessory spleen was seen in this study. **Conclusion:** Study and documentation of these variations is important for surgeons and radiologists who are going for surgeries and imaging studies.

Keywords: Spleen; Accessory Spleen; Notched Spleen; Shapes.

Introduction

The spleen is a large encapsulated haemolymphoid organ situated in the left hypochondrium & partly in the epigastrium. It is placed between the fundus of stomach & diaphragm opposite to the 9th to 11th ribs. It is a very vascular, soft and friable organ which is purple in colour and moves with respiration.

The size and weight of spleen is different in different age groups [1]. In adults, it is usually 12 cm in length, 7cm in breadth and 3-4 cm in width. Its weight ranges between 80-300gm with an average of around 150 gm [1,2].

The spleen presents two ends- medial & lateral, two surfaces-diaphragmatic and visceral, two borders- superior & inferior and two angles- anterior basal & posterior basal [3]. The diaphragmatic surface is smooth & convex whereas visceral surface presents impressions for the stomach, left kidney, left colic flexure & tail of pancreas [3]. The superior border is important as it presents with notches which indicates that spleen is lobulated in development. The posterior pole is directed towards the vertebral column & the anterior pole is broad & faces laterally [3].

The spleen is surrounded by peritoneum which passes from its hilum to fundus of stomach as gastrosplenic ligament and to left kidney as lienorenal ligament [3]. Accessory spleens may be found in the hilum, gastrosplenic ligament, lienorenal ligament, in greater omentum, along splenic vessels & very rarely scrotum [4].

Its incidence varies from 10-30% in autopsy series [5,6]. The spleen serves a large number of functions in humans starting from fetal life & continuing till adulthood. It is the site for manufacture of erythrocytes in fetus & takes up the immunological function in adult life. It filters the unwanted elements from blood

Author's Affiliation: ¹Associate Professor ²Lecturer ⁴Professor & Head, Department of Anatomy, GSL Medical College, Rajahmundry, Andhra Pradesh 533296, India. ³Associate Professor, Department of Anatomy, IMS & SUM Hospital, SOA University, Bhubaneswar, Odisha 751030, India.

Corresponding Author: Divya Agrawal, Associate Professor, Department of Anatomy, GSL Medical College, Rajahmundry, Andhra Pradesh 533296, India.

E-mail: drdivyaagrawal.ntr@gmail.com

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by phagocytes. Ageing or abnormal RBCs are also destroyed by the spleen & thus it serves as the graveyard of RBCs [3].

As the spleen has an open type of circulation, blood borne antigens have a direct access to splenic lymphatic tissue which can be phagocytosed by red pulp macrophages. Thus the spleen performs both haematological & immunological functions.

Splenectomy is a surgical procedure which involves removal of spleen either partially or completely. This is indicated in conditions like splenic rupture after trauma, lymphomas, cysts, hypersplenism etc. The present surgeon always tries to preserve as much splenic tissue as possible because its removable diseases immunity. Thus a sound knowledge of the various morphological variations in anatomy of spleen becomes important. With this in mind, a study of splenic morphology was taken up.

Materials & Methods

The present study was conducted in the Dept. of Anatomy, GSL Medical College and General Hospital, Rajamahendravaram, Andhra Pradesh. A total of 36 spleens of both sexes which were obtained during routine dissection classes of undergraduate MBBS students were included in the study. These spleens were removed from the cadavers by standard dissection method. They were separated from the nearby structures & the vessels were ligated & cut near the hilum. Then they were washed with tap water to remove all fat & other tissue attached to them. They were weighed on scale & then morphometric measurements were taken using calipers and tape. As suggested by Michels [7] the greatest distance between 2 poles is taken as length, the greatest distance between two points at same level on superior

& inferior border as breadth & the greatest breadth of spleen. Also an observation over the surfaces, notches on borders, presence of accessory spleens & visceral impressions was made. The data obtained was tabulated, statistically analysed & compared with previous authors.

Observations and Results

Table 1 shows various shapes of spleen seen in our study. The most common shape seen was wedge shape. The wedge-shaped spleen accounted for 41.67% of the total count. Table 2 shows that the weight of spleen varied from a minimum of 70 gms to a maximum of 300gms. Most of the spleens weighed between 141-200gm. The average weight of the spleen was 156.01gms.

The length of spleens varied between 4.5 cm and 13 cm with mean length being 10.152cm. The width of spleen varied from 3cm to 10 cm with a mean of 6.01388cm. The thickness of spleen ranged from 1.5 -6 cm with an average width of 3.236 cm.



Fig. 1: Wedge Shaped Spleen with Its Pedicle

Table 1: Shapes of spleen in our study expressed as percentages

Shape of Spleen	Expressed as %
Wedge	41.67%
Tetrahedral	27.7%
Oval	16.67%
Triangular	8.33%
Irregular	5.56%

Table 2: Tabulation of various spleen specimens according to weight

Weight of Spleen (Range)	No. of Specimens	Percentage
<70 gms	3	8.34%
70-140 gms	17	47.23%
141-200gms	11	30.56 %
201-250 gms	3	8.34%
251-300 gms	2	5.56%



Fig. 2: Wedge Shaped Spleen with Its visceral impressions



Fig. 3: Tetrahedral Spleen removed along with Pancreas and duodenum



Fig. 4: Tetrahedral Spleen with numerous notches on the superior border



Fig. 5: Oval Spleen with notched inferior border



Fig. 6: Triangular spleen showing visceral surfaces



Fig. 7: Accessory spleen present in the greater omentum



Fig. 8: Irregular spleen with multiple notches at the upper border



Fig. 9: Spleen with multiple notches at the upper border

Out of 36 spleens, 27 showed notches. All of these spleens showed notches in the superior border which were 2-6 in number. 5 of these also showed notches in the inferior border.

One case of accessory spleen was also seen. It was seen to be present in the greater omentum.

Discussion

In present day medical practice the stress is on non invasive procedures & imaging techniques for various diagnosis and treatment. So, a thorough knowledge of the anatomy & variations observed in splenic morphology becomes very important.

In our study, five different shapes of spleen were observed. Among them the commonest was wedge shaped (41.66%) and the least common was irregular shape (5.55%). This is in accordance with findings of [2,7] in which the wedge shaped spleen was found in 44% of subjects. In a study done by Chaware [8] in Maharashtra 61.26% of spleens were wedge shaped, 21.62% were tetrahedral, 12.61% triangular in shape, 3.60% were oval & 0.9% were irregular.

The average weight of our spleen in our study was 156.01 gms which is very close to that obtained by Chaware who reported it as 145.76 gms. The average length of spleen found is 10.152 cm, breadth is 6.014 cm & thickness is 3.236 cm. This is similar to the findings of Sugat G Kawale et al. who reported length as 9.66 cm, width as 6.22 cm & thickness as 3.06 cm respectively. The variations observed in different studies can be due to differences in body constitution, geographical conditions, genetic factors, dietary habits and socioeconomic conditions.

The spleen develops in the left layer of dorsal mesogastrium in the form of lobules which later fuse with one another. This lobulated development of spleen is indicated by notched upper border [9]. Notches were observed mainly in the superior border, but 5 spleens also showed notches in inferior border. Satheesha Nayak et al. [10] in her study observed that out of 50 spleens studied, 25 spleens had notches & 25 did not have any notches. The number of notches observed were 2-6. This is in accordance with study by other workers [2,7]. One case of accessory spleen was seen in this study. Some researchers [4,12] have reported the incidence of accessory spleens ranging from 10-35%. The knowledge of presence of accessory spleen is important as they may be located in the gastrosplenic ligament, greater omentum, pancreas etc. and may be left behind during splenectomy. This will result in failure of the indication for splenectomy like in splenic anemia [12].

Conclusion

The present study makes us feel that the study of spleen and its morphological variation in a south

Indian population is very crucial to perform safe and effective surgeries. Presence of notches in the inferior border occasionally should become a part of splenic morphology and must be mentioned in standard anatomy textbooks. This variation is important for surgeons and radiologists who are going for surgeries and imaging studies. These variations should be kept in mind during routine clinical examination of abdomen like in splenomegaly and splenic traumas.

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