

MORPHOMETRY OF SPLEEN

D. Radhika¹, B. Vijayanirmala²

¹Associate Professor, Department of Anatomy, Guntur Medical College, Andhra Pradesh.

²Assistant Professor, Department of Anatomy, Guntur Medical College, Andhra Pradesh.

ABSTRACT

INTRODUCTION

Spleen is organ of lymphatic system located on left side of abdominal cavity under diaphragm. It is a secondary lymphatic organ that plays an important role in cell mediated immunity. Foetal spleen is erythropoietic in nature.

MATERIAL & METHODS

Present study was done in 50 adult spleens and 50 foetal spleens.

RESULTS

Morphometric features like length, breadth, thickness & weight are measured. Length varied from 6.3 to 12.5 cm, breadth varied from 2.6 to 8.6 cm, thickness ranged from 2 cm to 4.6 cm, weight ranged from 65 g to 225 g. Average total length of spleen is 2.52 cm x 1.76 x 2 cm, weight 6.5 g. Shapes of spleens observed wedge shape spleen-48%, tetrahedral spleen-24%, triangular spleen-28%. Splenic notches on superior border & inferior border are observed. Incident of accessory spleen in 1% of cases.

CONCLUSIONS

Present knowledge of study may be helpful for surgeons in surgical procedures like splenectomy, resection of tumours and extirpation of cysts.

KEYWORDS

Spleen, Length, Breadth, Thickness, Notches, Accessory spleen.

HOW TO CITE THIS ARTICLE: Radhika D, Vijayanirmala B. Morphometry of spleen. J. Evid. Based Med. Healthc. 2016; 3(28), 1297-1300. DOI: 10.18410/jebmh/2016/298

INTRODUCTION: Spleen is the important secondary immune organ needed for generating immune reactions to blood-borne antigens and for purifying the blood from foreign substances and aged or damaged erythrocytes.¹ It is closely associated with circulatory system. The spleen is a vascular organ² which is involved in regulation of blood volume.³ Spleen lies mainly in left hypochondriac region and its upper left posterior edge extending into epigastric region. It is soft, friable, vascular, dark purple in colour. Shape varies with the state of viscera and excursion of diaphragm with posture and adjacent viscera. Shape varies from slightly curved wedge to tetrahedral.⁴ Long axis lies in the plane of 10th rib, anterior border reaching mid axillary line.⁴

Spleen is an intraperitoneal organ with two surfaces namely superolateral or diaphragmatic surface & inferomedial surface or visceral surface.^{4,5} Spleen has diaphragmatic and visceral surfaces superior and inferior borders, anterior and posterior extremities. The diaphragmatic surface is convex and smooth faces posterosuperiorly. It is related to abdominal surface of diaphragm. It is related to 9th and 10th ribs.

Visceral surface facing abdominal cavity presents gastric, renal, pancreatic and colic impressions. Spleen is entirely covered by peritoneum and 2 folds of gastrosplenic ligament and lienorenal ligament. Size of spleen is subjected to great changes during life depending on amount of blood contained in it. Adult spleen is 12.5 cm in length, 7.5 cm in breadth, 3.5 cm in thickness, weight 150 g ranging from 50-250 g observed by Michel.⁵ Orange segment 44%, tetrahedral 42%, triangular spleen 14%.⁶

Regarding diaphragmatic surface, smooth convex is separated from visceral surface by anterior and posterior border. Visceral surface is related to stomach, left kidney, left colic flexure and tail of pancreas and renal impression. Borders of spleen include anterior border, posterior border and intermediate border. Tubercles, thumb like notches, pits present along intermediate border & hilum. Notches are seen on superior margin; notches are rare at inferior margin. Spleen is lobulated in foetus. These lobulations usually disappear before birth. Notches in superior border are remnants of grooves that are separated from foetal lobules.⁷ Measurement of splenic length in routine clinical practice is a very good indicator of actual splenic size. Spleen is gaining wide spread clinical importance due to its immunological & functional role.⁸ Splenomegaly is an important diagnostic clue of underlying disorders of human spleen.⁹

Submission 08-03-2016, Peer Review 21-03-2016,
Acceptance 29-03-2016, Published 07-04-2016.

Corresponding Author:

Dr. D. Radhika,

Associate Professor, Department of Anatomy,
Guntur Medical College, Andhra Pradesh.

E-mail: radhika.dabbiru@gmail.com

DOI: 10.18410/jebmh/2016/298

MATERIALS AND METHODS: The present study was conducted in Department of Anatomy, Andhra Medical College, Vishakhapatnam, Andhra Pradesh. Total of 50 adult cadaveric spleens (Fig. 1) and 50 foetal spleens (Fig. 2) of both sexes are collected. Spleens were removed through anterior abdominal wall approach. Peritoneal attachments were detached and ligated near hilum. Cadaveric spleens of both sexes are included. Length, breadth and thickness of spleens were measured. Borders, surfaces, poles of surfaces are observed. Notches on borders are observed. The data obtained were tabulated, compared with previous studies.

RESULTS: Out of 100 spleens 50 were adult spleens and 50 were foetal spleens. Total length of adult spleen varied from 6.3 to 12.5 cm. Total breadth varied from 2.6 cm to 8.6 cm. Variation in thickness was 2 cm to 8.6 cm. Weight ranged from 6.5 to 255 g. Average length of foetal spleen 2.5 cm, breadth 1.76 cm, thickness 1 cm (Table 1, Table 2). Regarding the types of spleen, 48% were wedge shaped (Fig. 3), 26% were tetrahedral spleen (Fig. 4), 24% were triangular spleen (Fig. 5). Diaphragmatic surface

measurements were ranging from 7 cm to 12 cm, average is 10.4 cm. Width ranges from 2 cm to 9 cm, average being 5.98 cm.

Diaphragmatic surface of foetal spleen ranges from 4 cm to .6 cms, average being 2.03 cm. Visceral surface of spleen is related to stomach, kidney, left colic flexure, pancreas. Gastric impression was largest, length and breadth being 7.8 cm x 4.5 cm, in foetus it was 1.6 x 1.2 cm. Average Length of colic impression 4.2 x 1.5 cm and in foetus 1.6 cm x 1.2 cm. Renal impression average length and breadth were 4.24 x 2.1 cm. Table 1, Table 2). The present study of variations was compared with others. (Table 3, 4) Superior border was deeply notched; ranging from 2 to 5 notches. Inferior border was notched in 2 spleens (Fig. 6.) Hilum of spleen—depending upon shape can be classified into 1. Dumbbell shaped hilum 2. Crescent shaped hilum 3. Triangular shaped hilum. Dumbbell shaped hilum is the commonest.⁷

Accessory spleen resembling lymph node observed in 1% of cases among gastrosplenic ligament. (Fig. 8).

Sl. No.	Diaphragmatic surface		Gastric surface		Renal surface		Colic surface	
	Length	Breadth	Length	Breadth	Length	Breadth	Length	Breadth
Adult spleen	10.4 cm	5.98 cm	7.75 cm	4.52 cm	4.24 cm	1.5 cm	7.18 cm 3.9 cm	
Foetal spleen	3.25 cm	1.60 cm	2.23 cm	1.32 cm	2.06 cm	1.25 cm	1.63 cm	1.18 cm

Table 1: Average length of surfaces of spleen

Sl. No.	Total length	Total breadth	Total thickness	weight
Adult spleens	10.4 cm	6.5 cm	3.4 cm	133 g
Foetal spleens	2.52 cm	1.76 cm	1 cm	5.25 g

Table 2: Average measurement of spleens

Shape	Rao et al	Hollinshead	Chaware et al	Chowdary et al	Present Study
Wedge	40%	44%	61.26%	33.81%	48%
Triangular	32%	42%	12.61%	19.35%	28%
Tetrahedral	20%	14%	3.6%	32.25%	24%
Oval	-	-	0.90%	8.06%	-
Irregular	-	-	-	6.5%	-

Table 3: Variations in shapes of spleens

Measurement	Text. bk. Gray's anatomy	Michels NA	Rao. et al	Chaware et al	Chowdary et al	Present study
Length	12 cm	11 cm	10.5 cm	9.66 cm	9.59 cm	10.4 cm
Breadth	7 cm	7 cm	8.3 cm	6.22 cm	6.59 cm	6.5 cm
Thickness	3-4 cm	3 cm	-	3.06 cm	4.54 cm	3.4 cm

Table 4: Variations in measurements of spleen

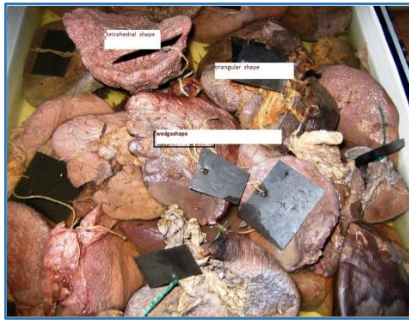


Fig. 1: Adult spleens



Fig. 2: Foetal spleens



Fig. 3: Wedge shaped spleen



Fig. 4: Triangular shaped spleen



Fig. 5: Tetrahedral shaped spleen

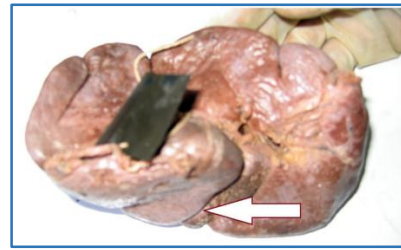


Fig. 6: Notches in superior border and inferior border



Fig. 7: Accessory spleen

DISCUSSION: Average measurement of spleen in adult: Length 10.4 cm, breadth 6.5 cm, thickness 3.5 cm. Average weight 133.1 g. Foetal spleen: 2.52 cm in length x 1.76 cm in breadth x 2 cm thickness. Average weight is 6.5 g. Above figures correlate with Gray and Cunningham's. Regarding shapes of spleen, 48% were wedge shaped, 24% tetrahedral, 28% triangular. Adult spleen is 12.5 cm in length, 7.5 cm in breadth, 3.5 cm in thickness weight is 150 g, ranges from 50-250 g observed by Michel. Shape of spleen varies, wedge shaped 44%, tetrahedral 42% and triangular spleen 14%. Regarding notches of spleen, superior margin of spleen has 2 to 5 notches and several ridges, no notches in inferior border. In our study, notches were seen in the inferior border of spleen. Dr. Sivanageswara Rao and Dr. Rajasekhar in their study reported notches in inferior border in 10% of cases in their study. Reyhan Ka et.al in their study reported 1 to 2 distinct notches in inferior margin in 27.14% of samples.^{10,11} Regarding accessory spleens, they are not uncommon, found in 10% of population. Moore and Dolly Reyhan reported the incidence of accessory spleens in 24-28%. But in our study we got only one spleen in gastrosplenic ligament.¹²

CONCLUSION: Morphometry of spleen is helpful in surgery and paediatrics because its fundamental knowledge furnishes many insights on splenic size utility and significance.

REFERENCES:

1. Cesta MF. Normal structure, function histology of spleen Toxicology pathology 2006;34(5):455-65.
2. Klepac SR, Samett EJ. Spleen, Trauma. Available from:<http://emedicine.medscape.com/article/373694/overview>. [Accessed on 20. 12. 2010].
3. Mebius RE, Kraal G. Structure and function of spleen Nat Rev Immunology 2005;5(8):606-16.

4. Standring S. Gray's anatomy. The anatomical basis of clinical practice. England: Elsevier, Churchill, living stone 2006;39thedn:1239-44.
5. Michels NA. The variational anatomy of the spleen and the splenic artery. American Journal of Anatomy 1942;70(1):21-72.
6. Hollinshead WH. Anatomy for Surgeons. Ne: Harper and Row 1982;2(3rd ed):436-45.
7. Sant S. Embryology for medical students. New Delhi, India, Jaypee brothers medical publishers (p) ltd 2002;203-04.
8. Blackbourne LH. Surgical Recall. Philadelphia, United States, Lippincott Williams & Wilkins 2008;5th ed:25.
9. Kumar V, Abbas AK, Fausto N. et al. ed. Robbins and Cotran pathologic basis of disease. New Delhi. D: Saunders Elsevier 2010;8th ed:63.
10. Sivanageswara Rao Sundara Setty, Raja Sekhar Kartiki redid. Morphometric study of human spleen. International Journal of Biological & Medical ResearchInt J Biol Med Res 2013;4(3):3464- 3468.
11. Rayhan KA, Ara S, Nurunnabi ASM. Morphometric study of the post-mortem Human spleen J. Dhaka med coll. 2011;20(1):32-36.
12. Moore KL, Dally AF. Clinically oriented anatomy. Philadelphia: Lippincott Williams & Wilkins 2006;5th ed:218-6.