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Original Research Article

A Sonographic Measurement of Spleen in Relation to Age and Gender

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Abstract

Methods: The cross-sectional study was conducted in Anatomy and Radiology Department SMS Medical College from June 2020 to 31 December 2022 on 130 subjects on morphometric analysis of spleen size and it's correlation with age and sex. The mean and standard deviation of all parameters was calculated accordance to acceptedstatistical methods (Microsoft excel 2007). The difference in mean of various parameters were tested for significance using unpaired 't' test and Chi square test.

Results: In our study we found that mean spleen length in males was 9.644 ± 0.6978 whereas the mean spleen length was 9.181 ± 0.1509 in females i.e. the mean lengthof spleen was more in males as compared to female and application of t test showed that thisdifference was statistically significant.

Conclusion: It can be concluded that the basic knowledge of splenic dimensions by ultrasonography may be essential for providing the guideline and reference value to the radiologists, surgeons and clinicians for splenic diseases in Jaipur region.

Keywords: Spleen, Anatomy, Ultrasonography.

Introduction

The Spleen is an organ found in virtually all vertebrate animals. In humans, the spleen is brownish color and is located in the left upper quadrant of the abdomen1 . The spleen is the largest lymphoid soft organ that lies in the left hypochondrium between the fundus of the stomach and the diaphragm Its long axis extends from 9th to 11th ribs on the left side with its long axis running parallel to the 10th rib . [1,2]

The shape of the spleen is ovoid-like pulpy mass about the size and shape of one's fist with a convex outer diaphragmatic surface and an indented inner visceral surface . The diaphragmatic surface of spleen is convex and smooth to fit the concavity of the diaphragm, while the visceral surface is irregular and related to the stomach, left kidney, left suprarenal gland, and left colic flexure. The medial end (apex) lies in line with the spine of 10th thoracic vertebra about 4 cm from the midline, and the lateral end (base) does not descend beyond the midaxillary line [3,4,5].

The functions of the spleen are centred on the systemic circulation. It contains two functionally and morphologically distinct compartments: the red pulp and the white pulp. The red pulp functions as a blood filter that removes foreign material and

damaged erythrocytes, and the white pulp initiates immune responses to blood-borne antigens [6-7]

Material and methods

Place of study: Department of Anatomy, S.M.S. Medical College and Hospital, Jaipur Rajasthan.

Study Duration: From approval of institutional ethics committee till completion of work.

Study Design: Cross sectional study.

Study type: Descriptive observational study.

Inclusion criteria

• All apparently healthy individuals and age greater than 13 years

Exclusion criteria

1. Individuals with a recurrent clinical history of malaria
2. Recurrent history of typhoid fever
3. Individuals with a history of infections (infectious mononucleosis, kala-azar, endocarditis, sarcoidosis, toxoplasmosis).
4. Recent history of upper abdominal surgery
5. Individuals with any case finding on sonographic examinations (cirrhosis, melanoma, lymphoma, metastasis, any cystic or solid massive lesions)
6. Individuals with Diabetic Mellitus (DM) cases.
7. Hypertensive individuals
8. Individuals with a history of heart disease
9. Individuals with a recent abdominal traumatic condition (within the previous 6 months)
10. Pregnant women \
11. History of sickle cell anemia.
12. Very old age

Method of data collection

The present study were conducted in radiology department SMS Medical College and Hospital where patients coming for sonography were examined for spleen measurement after applying the exclusion and inclusion criteria. All dimensions of spleen were measured and its relation with age and gender will be analyzed.

Statistical analysis

Collected data will be entered in Microsoft excel 2016 software. Quantitative data will be measured in terms of mean, median and standard deviation and qualitative data in terms of proportions.

Results

Table 1:

Parameters	Male Age in Year Group	No. of cases	Mean in cm	Std. Deviation	95% Confidence Interval for Mean		P value (ANOVA)
					Lower Bound	Upper Bound	
spleen length	21-30	23	10.465	0.3446	10.316	10.614	<0.001
	31-40	19	9.811	0.4458	9.596	10.025	
	41-50	20	9.175	0.1585	9.101	9.249	
	51-60	16	8.850	0.1414	8.775	8.925	
	Total	78	9.644	0.6978	9.486	9.801	
spleen width	21-30	23	4.526	0.1630	4.456	4.597	<0.001
	31-40	19	4.442	0.1895	4.351	4.533	
	41-50	20	4.330	0.2003	4.236	4.424	
	51-60	16	4.000	0.3967	3.789	4.211	
	Total	78	4.347	0.3057	4.279	4.416	
	21-30	23	3.457	0.1754	3.381	3.532	

spleen thickness	31-40	19	3.405	0.1079	3.353	3.457	0.067
	41-50	20	3.395	0.1849	3.308	3.482	
	51-60	16	3.306	0.1982	3.201	3.412	
	Total	78	3.397	0.1743	3.358	3.437	

Table 2: Tukey post hoc test

Parameters	Male Age in Year Group	Male Age Group	P value
Spleen Length	21-30	31-40	<0.001
		41-50	<0.001
		51-60	<0.001
	31-40	21-30	<0.001
		41-50	<0.001
		51-60	<0.001
	41-50	21-30	<0.001
		31-40	<0.001
		51-60	.0012
	51-60	21-30	<0.001
		41-50	<0.001
		51-60	0.012
Spleen Width	21-30	31-40	0.680
		41-50	0.048
		51-60	<0.001
	31-40	21-30	0.680
		41-50	0.477
		51-60	<0.001
	41-50	21-30	0.048
		31-40	0.477
		51-60	0.001
	51-60	21-30	<0.001
		41-50	<0.001
		51-60	0.001
Spleen Thickness	21-30	31-40	0.764
		41-50	0.637
		51-60	0.039
	31-40	21-30	0.764
		41-50	0.998
		51-60	0.320
	41-50	21-30	0.637
		31-40	0.998
		51-60	0.407
	51-60	21-30	0.039
		41-50	0.320
		51-60	0.407

Table 3:

Parameters	Female Age in Year Group	N	Mean in cm	Std. Deviation	95% Confidence Interval for Mean		P Value (ANOVA)
					Lower Bound	Upper Bound	
spleen length	21-30	20	9.190	0.1071	9.140	9.240	0.002
	31-40	11	9.309	0.1578	9.203	9.415	
	41-50	8	9.125	0.1282	9.018	9.232	
	51-60	13	9.092	0.1498	9.002	9.183	
	Total	52	9.181	0.1509	9.139	9.223	
spleenwidth	21-30	20	4.060	0.1353	3.997	4.123	<0.001
	31-40	11	4.209	0.1446	4.112	4.306	
	41-50	8	4.225	0.1488	4.101	4.349	
	51-60	13	3.800	0.2972	3.620	3.980	
	Total	52	4.052	0.2469	3.983	4.121	
spleen thickness	21-30	20	3.265	0.1531	3.193	3.337	0.099
	31-40	11	3.191	0.2119	3.049	3.333	
	41-50	8	3.088	0.1126	2.993	3.182	
	51-60	13	3.208	0.1706	3.105	3.311	
	Total	52	3.208	0.1725	3.160	3.256	

Discussion

Relatively few studies have been performed in past to formally assess the variation in the morphometry of spleen dimensions and compare the presence of a significant difference between sex and age with help of USG in our tertiary centre. The present study was conducted on subjects of different age attending OPD or admitted in SMS and attached hospitals, Jaipur. It was carried out on 130 subjects (78 males versus 52 females) whose morphometry of spleen dimensions was performed with help of USG.

The sonography assessment of spleen dimensions provides essential inputs for clinicians in daily clinical practice for the proper diagnosis of splenomegaly. The study provides estimates of spleen to help radiologist for the diagnosis of diseases related to splenomegaly and atrophy also used for hematologist and immunologist for the diagnosis of various gastrointestinal and hematological diseases in addition to forensic studies.

Spleen Length: In our study we found that mean spleen length in males was 9.644 ± 0.6978 whereas the mean spleen length was 9.181 ± 0.1509 in females i.e. the mean length of spleen was more in males as compared to female and application of t test showed that this difference was statistically significant.

Sharma et al [8] (2021) in their study found that that spleen length among males (9.74±1.44 cm) were longer than those of females' splenic length (9.40±1.31 cm) which is consistent toour results.

Capaccioli et al [9] in his study finds spleens of men being 0.5cm longer than those of women splenic length which is consistent to our results. The mean spleen length was lower among females than males. This is due to fewer red cell mass in female and other genetic factors.

The difference in mean spleen length in various studies could be explained on basis of difference in sample size and racial and genetic factors among subjects in various studies.

In the study done by Mittal et al. [10] in Rajasthan the splenic length in males and females measure 9.4cm and 9.34cm

respectively which is comparable to our results.

In contrast to our findings Ahmed OF et al. [11] study in Egypt found that splenic length infemales than males.

Conclusion

It can be concluded that the basic knowledge of splenic dimensions by ultrasonography may be essential for providing the guideline and reference value to the radiologists, surgeons and clinicians for splenic diseases in Jaipur region

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