

Spleen/kidney ratio in the assessment of mild splenomegaly

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Abstract

Background: Ultrasound may detect mild splenomegaly before it is clinically palpable. Knowledge of the normal range of spleen size in the population being examined is a prerequisite. Racial difference in splenic length could result in incorrect interpretation of splenic measurement. **Methodology:** Ultrasound was used to measure maximum spleen and left kidney length in 100 Indian children between age group of 1 to 15 years. To obtain the normal values for spleen length and to determine the spleen / left kidney ratio. **Results:** Splenic length in Indian children is similar to western children up to age about 15 years. The spleen / left kidney ratio is strikingly constant with a mean value of 1. Using 2SD above the mean as a guide. The upper limit of normal for spleen / left kidney ratio is 1.25. **Conclusion:** Splenomegaly should be considered in children if the spleen / left kidney ratio is more than 1.25.

Key Words: Splenomegaly, Spleen Size, Spleen / Left Kidney Ratio, Nomogram, Ultrasound.

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INTRODUCTION

Spleen is an intra abdominal organ that is affected by several group of disease: inflammatory, hematopoietic, reticuloendothelial proliferation, portal hypertension, storage disease. Gross splenomegaly can be detected clinically and sonographically. It has been suggested that there may be racial difference in splenic size. Such differences would make it difficult to standardize expected splenic length and to determine non palpable splenic enlargement. Evaluation of splenic size by percussion and palpation is notoriously inaccurate. Radiologic methods and scintigraphy, although dependable, require radiation exposure^{1,2}. The purpose of this study is to establish guidelines for normal splenic size at different ages by using a simple and reproducible sonographic method. The calculation of splenic volume in children by using sonographic measurements can be

cumbersome and time-consuming and therefore impractical for routine clinical use³ Ultrasonography is a non-invasive, established, safe, quick and accurate method for measurement of kidney and spleen size⁴ Spleen kidney ratio is said to be more accurate method of assessing splenomegaly as per western and Chinese study. We intend to assess the Indian children and compare the ratio with that of the western children.

MATERIAL AND METHODS

All the children referred to department of radiology for ultrasound underwent ultrasonographic assessment of the spleen size on the same day by a single radiologist, using a Philips Color Doppler HD-6 system with a multi-frequency 3.5 to 5 MHz probe. The measurement of spleen length is the optically maximum distance at the hilum on the longitudinal coronal view (between the most supero-medial and the most infero-lateral points) as the spleen length at the hilum is considered the most reproducible linear measurement. Longitudinal dimensions of left kidney shall be obtained in the coronal plane passing through the renal hilum with children in the supine or slightly right lateral decubitus position. The measurements are to be made during quiet breathing in younger children and during breath-holding in older children. Neither preparation nor sedation will be used. Ultrasound shall be done under the guidance of qualified radiologist. Informed consent shall be taken from patient.

Data collected was analyzed statistically using descriptive statistics namely mean and standard deviation. Comparative statistics was used. The depiction of results was in the form of percentages and diagrams.

Inclusion Criteria

1. All children who came to the radiology department for ultrasound examination between ages of 1 to 15 years

Exclusion Criteria

1. Congenital renal anomalies, renal injury, renal disease.
2. Congenital anomalies of spleen
3. Non Indian children are excluded

RESULTS

Table 1: Age distribution of patients studied

Age in years	No. of patients	%
1-2 years	10	10.0
3-6 years	38	38.0
6-12 years	40	40.0
12-15 years	12	12.0
Total	100	100.0

The study population was 100 paediatric patients in the age group of 1-15 years. Numbers of patients in the age group of 1-2 years were 10 patients which was 10.0% of the study population. Numbers of patients in the age group of 3-6 years were 38 patients which was 38.0% of the study population. Numbers of patients in the age group of 6-12 years were 40 patients which was 40.0% of the study population. Numbers of patients in the age group of 12-15 years were 12 patients which was 12.0% of the study population.

Table 2: ultrasound abdomen: spleen length

Ultrasound Abdomen: Spleen Length(Cms)	No. Of Patients	%
<6	8	8.0
6-8	43	43.0
8-10	33	33.0
>10	16	16.0
Total	100	100.0

Numbers of patients with spleen length less than 6cms were 8 (8%). Numbers of patients with spleen length 6-8cms were 43 (43%). Numbers of patients with spleen length 8-10cms were 33 (33%). Numbers of patients with spleen length more than 10cms were 16 (16%).

Table 3: Ultra sound findings

Ultra sound findings	No. of patients	%
Normal	61	61.0
Splenomegaly	17	17.0
Other abnormalities	22	22.0
Total	100	100.0

Out of the 100 patients, 61 patients(61%) had normal diagnosis, 17 patients(17%) had splenomegaly and the rest (22%) had other abnormalities.

Table 4: Mean Values of USG Spleen and Kidney and Spleen Kidney ratio according to Diagnosis

	Normal (n=61)	Splenomegaly (n=17)	Other diagnosis (n=22)	P value
Spleen	7.49±1.27	11.17±1.35	7.99±1.29	<0.001**
Kidney	7.54±1.14	8.23±1.29	7.46±0.96	0.062+
Spleen Kidney ratio	0.99±0.11	1.35±0.11	1.05±0.14	<0.001**

ANOVA test was used to compare the difference in mean of three groups [normal, splenomegaly and other abnormalities] with reference to spleen length, left kidney length and spleen kidney ratio. The difference in spleen length of normal, splenomegaly and other abnormalities group seen is statistically highly significant [p<0.01] The difference in left kidney length of normal, splenomegaly and other abnormalities group seen is not statistically significant [p>0.05] The difference in spleen kidney ratio of normal, splenomegaly and other abnormalities group seen is statistically highly significant [p<0.01]

Table 5: Mean Values of USG Spleen and Kidney and Spleen Kidney ratio according to Diagnosis (Normal +Other abnormalities)

	Normal (n=83)	Splenomegaly (n=17)	P value
Spleen	7.62±1.29	11.17±1.35	<0.001**
Kidney	7.53±1.09	8.23±1.29	0.019*
Spleen Kidney ratio	1.00±0.12	1.35±0.11	<0.001**

Student t test was used to compare the means of two group [normal and splenomegaly] with respect to following continuous variables spleen length, left kidney length and spleen kidney ratio. The difference seen in spleen length between normal and splenomegaly group is statistically highly significant. [p<0.01] The difference seen in left kidney length between normal and splenomegaly group is statistically not significant. [p>0.05] The difference seen in Spleen Kidney ratio between normal and splenomegaly group is statistically highly significant. [p<0.01]

Table 6: Comparison of Spleen/Kidney ratio

Spleen/Kidney ratio	Normal (n=83)	Splenomegaly (n=17)
<1.0	36(42.2%)	0
1.0-1.25	46 (54.2%)	0
1.25-1.50	1(3.6%)	14(88.2%)
>1.50	0	3 (11.8%)

Out of the 83 normal patients, Spleen kidney ratio less than 1.0 were 36 patients (42.2%), Spleen kidney ratio between 1.0 and 1.25 were 46 patients (54.2%), Spleen kidney ratio ratio between 1.25 and 1.50 was 1 patient (3.6%), Spleen kidney ratio more than 1.50 was zero. Out

of the 17 patients with splenomegaly, Spleen kidney ratio less than 1.0 was zero, Spleen kidney ratio between 1.0 and 1.25 was zero, Spleen kidney ratio ratio between 1.25 and 1.50 were 14 patients (88.2%), Spleen kidney ratio more than 1.50 were 3 patients (11.8%). Spleen /Kidney Ratio is significant with Splenomagaly with $p < 0.001$

DISCUSSION

The study group was divided in to same age group (1–15 years) as those used by Rosenberg *et al*⁵ Loftus and Metreweli⁶ and al-Imam O, Suleiman A⁷ in order that comparisons with their results could be made out. Among 100 study population, 10 (10.0%) patients were between age group 1-2 year, 38 (38%) patients were between age group 3- 6 years, 40 (40%) patients were between age group 6- 12 years, 12 (12%) patients were between age group 12-15. Out of the total study population, 69 were male (69%), and 31 were female (31%). In these study population of 100 patients, 63 patients (63%) came with complaints of fever, 18 patients (18%) came with history of pain abdomen, 5 patients (5%) came with history of cough, 3 patients (3%) came with history of burning micturation, 5 patients (5%) came with history of vomiting, 1 patient (1%) came with complaints of breathlessness, 1 patient (1%) came with complaints of diarrhoea, 1 patient (1%) came with complaints of involuntary limb movements, 2 patients (2%) came with history of irregular periods, and 1 patient (1%) came with complaints of generalized weakness. On ultrasound finding, spleen length was as such: Out of 100 patients, spleen length in 8 (8%) patients was less than 6 cms, in 43 (43%) patients between 6- 8 cms, in 33 (33 %) patients between 8 – 10 cms and in 16 (16%) patients more than 10 cms. On ultrasound finding left kidney length was as such: Out of 100 patients, spleen length in 4 (4%) patients was less than 6 cms, in 64 (64%) patients between 6- 8 cms, in 31 (31 %) patients between 8 – 10 cms and in 1 (1%) patients more than 10 cms. Following ultrasound diagnosis obtained during study: Out of the 100 patients, 61 patients (61%) had normal study, 17 patients (17%) had splenomegaly and the rest (22%) had other abnormalities. With relation to mean Values of USG Spleen and Kidney and Spleen Kidney ratio according to Diagnosis, difference in spleen length and spleen kidney ratio of normal, splenomegaly and other diagnosis shows statistically highly significant ($p < 0.01$) but difference in left kidney length of, normal, splenomegaly and other diagnosis group shows not statistically significant [$p > 0.05$] With relation to mean Values of USG Spleen and Kidney and Spleen Kidney ratio according to Diagnosis (Normal +Other abnormalities), difference

seen in spleen length and spleen kidney ratio between normal and splenomegaly group is statistically highly significant ($p < 0.01$) but difference in left kidney length of, normal, splenomegaly group shows not statistically significant [$p > 0.05$] Finally by comparing the spleen kidney ratio⁸ we obtained result as such: out of the 83 normal patients, Spleen kidney ratio less than 1.0 were 36 patients (42.2%), Spleen kidney ratio between 1.0 and 1.25 were 46 patients (54.2%), Spleen kidney ratio ratio between 1.25 and 1.50 was 1 patients (3.6%), Spleen kidney ratio more than 1.50 was zero. Out of the 17 patients with splenomegaly, Spleen kidney ratio less than 1.0 was zero, Spleen kidney ratio between 1.0 and 1.25 was zero, Spleen kidney ratio ratio between 1.25 and 1.50 were 14 patients (88.2%), Spleen kidney ratio more than 1.50 were 3 patients (11.8%).

CONCLUSION

This study confirms that the spleen / left kidney ratio is another easy and reliable way to exclude splenic enlargement. In India as such no availability of previous data belonging to this study, so spleen / kidney ratio in the assessment of splenomegaly in Indian pediatric age group would be useful. With above results conclude that, splenomegaly should be considered in children if the spleen / left kidney ratio is more than 1.25.

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