



## SONOGRAPHIC MEASUREMENTS OF THE SPLEEN IN RELATION TO AGE; A PROSPECTIVE STUDY IN EASTERN NEPALESE ADULTS.

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### ABSTRACT

To establish the normal range of the splenic dimensions in East Nepalese adult population ,we used ultasonography to examine 120 subjects ( 60 males and 60 females ),15 each of age group 31-40yrs,41-50yrs,51-60yrs,61-70yrs ; not known to have any condition likely to be associated with splenic enlargement . Splenic length was measured on longitudinal coronal image from dome to tip though the hilum. On transverse coronal plane, measurement of the width of the spleen was made at the hilum, followed by thickness measurement taken in the longitudinal coronal plane a at a point bisecting the line indicating length .The results show that the splenic length ,width and thickness decreased with increase in age in both male and female .All the dimensions were greater in male than in female.

**KEY WORDS:** Sonography , Length , width, thickness ,Spleen ,Age.

### INTRODUCTION:

The spleen is an intra-abdominal organ that is affected by several diseases. In a variety of clinical conditions the spleen enlarges, most often due to the reactive proliferation of the lymphocyte or reticuloendothelial cells. Splenomegaly is also present in the malignancies of the haematopoietic system such as lymphoma, condition related to the portal hypertension, disseminated tuberculosis, malaria, Kala azar, cirrhosis, collagen storage diseases etc.

The estimation of the splenic size invivo is often important in the diagnosis, treatment and prognosis of a variety of disorders. Spleen size varies widely according to age. Many diseases can affect their size, ranging from infective processes to malignant disorders (1,2). Palpation and percussion are the standard bedside techniques to document spleen size, but are far from accurate to detect small increase in size(1,2) The precise measurements of the spleen by palpation is not reliable , since in some of the cases a normal sized spleen in palpable whereas a non-palpable spleen is not always normal sized . Image of the spleen can be obtained by a simple X ray (Schindler et. al. 1976)3 but it exposes the patient to the radiation which could be avoided further if there is a left upper quadrant mass, then it is most often not helpful to differentiate the visible soft tissue arising from the spleen or the adjacent

organs. Radionuclide imaging is also used for estimating the splenic size but its accuracy depends upon the vascular integrity of the organ and it unduly exposes the patients to gamma radiations (Frank 1970)4. Angiography is another method but it exposes the patient to the radiation and the allergic reaction of the dye and is also invasive . Sulfur colloid and Scintigraphy (Roberts et al 1973)5 can also be used for measuring the splenic size but these procedures are time consuming and have the potential hazard of the radiation. C.T. Scan and M.R.I. can also be used but they are very costly. Ultrasound has been found to be both accurate and reliable (Petzoldt. et .al. 11976)6. We measured the splenic length, breadth, and thickness in different age group of adult population of East Nepal and compared these measurements with those found in other reports.

### MATERIALS AND METHODS:

Before starting study, clearance from the institutional research committee was obtained. 140 cases were taken for the present study. With the help of ultrasound the length, breadth and thickness of spleen were measured. To estimate the dimensions of the spleen, ultrasonography was done with SIEMENS ultrasound machine with curvilinear 3.5 MHz trasducer.

An age and sex related random sample of 120 patients including 60 male and 60 female from 20-60 years of age living in the eastern part (Morang, Sunsari, Jhapa) of Nepal were drawn from the department of Anatomy and Radiology, Nobel Medical College, Biratnagar. A patient selected for the study being evaluated sonographically for abdominal or pelvic problem unrelated to the spleen, must often because of UTI or abdominal pain. 4 cases of pregnancy and 7 cases of splenomegaly were excluded. The dimensions of a number of spleens in which abdominal gas prevented reliable size measurements were excluded. All measured spleen had normal position, shape and texture. The patients were examined for splenomegaly. After conforming it by physical examination, the patients were taken for study. For ultrasound examination of spleen, first the patients were placed in supine position and coupling gel was applied in the abdominal wall in left hypochondriac region to assure optimal transmission of energy between the patient and the probe. The subject did not need prior preparation. Now the subject was asked to lie in the right lateral position with the left side elevated. Splenic measurements were taken during deep inspiration, to minimize masking by the lungs. Splenic length and width were measured on longitudinal coronal plane from dome to tip through hilum, and transverse coronal plane at the Hilum respectively. Followed by thickness measurement

taken in the longitudinal coronal plane at a point bisecting the line indicating length (Fig 1 in female and fig 2 in male). To determine reproducibility, each measurement was repeated at least 3 times and most repeated value was recorded.

#### RESULTS:

The splenic length, width and thickness were measured with respect to the sex and age with the help of ultrasound. The observations were as listed in the table below. The length, width and thickness of spleen were larger in male as compared to that of the female. The splenic thickness in male decreased slowly from age group 31 to 60 years and after 60 years the length decreased rapidly. Similarly the splenic thickness in female also decreased at a slow rate upto 60 yrs and after 60 yrs the thickness decreased rapidly. The splenic length in male also decreased at a slow rate upto 60 yrs and after 60 yrs, it decreased rapidly. The splenic length in female also decreased slowly upto 60 yrs after which there was a rapid decrease in length. The splenic width in male decreased upto 50 yrs after which it increased in 60 yrs age group. The width decreased rapidly after 60 yrs. The splenic width in female also decreased rapidly after 40 yrs, after which the width increased slightly. After 60 yrs the rapid decrease in splenic width was seen.

Table 1: Splenic Thickness in different age group in male

AGE	N	Mean(mm) +/- S.D.	Range (mm)	F Ratio
31-40 yrs	15	40.53+/-7.51	31-62	F=2.88 P<0.05
41-50 yrs	15	39.70+/-5.32	32-53	
51-60yrs	15	39.83+/-5.50	30-64	
61-70yrs	15	35.41+/-6.47	28-55	

Table 2: Splenic Thickness in different age group in female

AGE	N	Mean(mm) +/- S.D.	Range (mm)	F Ratio
31-40 yrs	15	36.45+/- 7.50	21.3-52.80	F=2.74 P<0.05
41-50 yrs	15	35.37+/-6.77	23.70-52.30	
51-60yrs	15	35.87+/- 5.60	25.50-52.30	
61-70yrs	15	30.90+/-5.58	22.0-48.40	

Table 3: Splenic length in different age groups in males

Age	N	Mean(mm)+/-S.D.	Range(mm)	F Ratio
31-40 yrs	15	105.14+/-12.18	87-132	F=9.096 p<0.001
41-50 yrs	15	102.40+/-10.12	85-128	
51-60 yrs	15	100.21+/-13.11	75-121	
61-70 yrs	15	85.65+/-12.13	65-120	

Table 4: Splenic lengths in different age groups in female

Age	N	Mean(mm)+/-S.D.	Range(mm)	F Ratio
31-40 yrs	15	96.14+/-15.18	74-131	
41-50 yrs	15	94.60+/-13.12	73-125	
51-60 yrs	15	92.21+/-12.11	73-121	F=4.096
61-70 yrs	15	85.65+/-10.13	65-108	p<0.05

Table 5: Splenic width in different age groups in males

Age	N	Mean(mm)+/-S.D.	Range(mm)	F Ratio
31-40 yrs	15	56.07+/-10.18	43.2-75.8	
41-50 yrs	15	47.43+/-9.12	35.0-60.9	
51-60 yrs	15	50.21+/-11.11	54-69.3	F=8.44
61-70 yrs	15	43.65+/-7.13	33.4-63.4	p<0.001

Table 6: Splenic width in different age groups in females

Age	N	Mean(mm)+/-S.D.	Range(mm)	F Ratio
31-40 yrs	15	48.07+/-14.18	35.2-84.8	
41-50 yrs	15	44.43+/-10.12	33.0-60.9	
51-60 yrs	15	45.21+/-12.11	32-69.3	F=3.64
61-70 yrs	15	39.65+/-8.13	32.4-63.4	p<0.05

Figure 1: Showing measurement of length,width and thickness in female

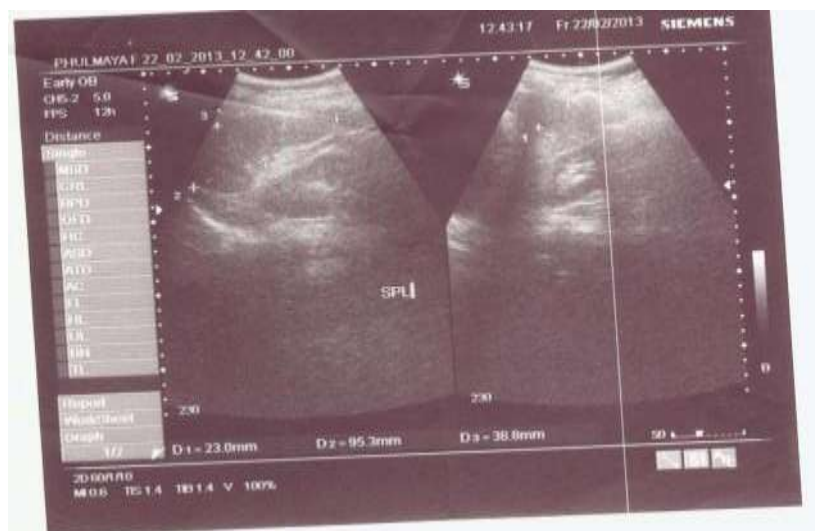


Figure 2: Showing measurement of length, width and thickness in male



DISCUSSION:

The splenic size may give information about the diagnosis and course of the GIT and haematological disease (Niederau . et.al. 1983)7. In one study the splenic size was evaluated in patients with sarcoidosis and thrombocytosis, the splenomegaly was present in 57% of the patients (using sonographic criteria to evaluate the size), but only clinically palpable in 8% of the patients (Kataoka et al 1990)8. That's why the imaging has become essential for the exact measurement of size of spleen, the serial monitoring of the size of spleen over the course of the patient's illness in development of the guideline for return to play. Earlier studies have lead to the development of standard for the size of spleen such as C.T. scan, P.E.T. scan, MRI, and ultrasonography. The conventional ultrasonography was found to be a well-established, widely used and relatively inexpensive means of evaluating the size of spleen without ionizing radiation. In the present study, it was observed that the length of spleen decreased with age in both males and females. The length of spleen decreased at a slow rate upto the age of 60 years after which it decreased rapidly. This was similar to the findings of (Loftus and Metreweli 1997) 9. They observed rapid growth in the length of spleen upto the age of 20 yrs followed by a slight decrease upto the age of 60 yrs and then rapid fall after the age of 60yrs.

In the present study, the splenic length was found to be less than 10 cm in most of the cases. In the present study, the width and thickness of spleen was observed to be less than 6 cm and 4cm respectively in most of the cases. This was different from the findings of (Frank et al 1986) 10, who observed the width of spleen below 7cm and thickness below 5cm in most cases. This may be due to the difference in geographical distribution, and environmental factors.

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