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ORIGINAL ARTICLE

A Pilot Study Of The Normal Measurements Of The Liver And Spleen By Ultrasonography In The Rajasthani Population

MITTAL R*, CHOWDHARY DS **

ABSTRACT

Aim : To determine the normal standards of liver and spleen by ultrasonography in the Rajasthani population.

Materials And Methods Two hundred subjects (100 males and 100 females) from Rajasthan were evaluated. The dimensions of the organs were measured 3 times and the mean values were recorded. The subjects were divided into 5 groups according to their ages (11-70 yrs.).

Results The average longitudinal diameter of the right lobe of the liver was 12.99±0.76 cm (males) and 12.66±1.07 cm (females) and of the left lobe was 9.28±0.81 cm (males) and 9.17±1.03 cm (females). The average length of the spleen was 9.40±0.91 cm (males) and 9.34±0.95 cm (females). The average width of the spleen in males as well as in females was 3.45±0.59 cm.

Conclusion: The normal values of the dimensions of the liver and spleen are important parameters during a sonographical examination. This study provides valuable data from the Rajasthani population. So, this study will be of importance in the daily practice in radiology clinics.

Key Words: dimensions; liver; spleen; sonography.

*Department of Anatomy, J.N.Medical College, Datta Meghe Institute of Medical Sciences University, Wardha (MH).(INDIA)
**Department of Anatomy, Mahatma Gandhi of Medical College and Hospital (MGMCH), Jaipur (Raj.).(INDIA)
Corresponding Author:
Rashee Mittal
Department of Anatomy,
J.N.Medical College, Datta Meghe Institute of Medical Sciences University, Wardha-442001 (MH), (India).
Tele:+919764853564
E-mail: grasheemittal@yahoo.com

Introduction

The variations in the anthropometric features of various populations, races and regions are an established fact. The climate of the zone and the socio-economic status of Rajasthan make the population of this region special. There is no comprehensive anthropometric study on the normal measurements of liver and spleen by ultrasonography in Rajasthan and therefore, it was thought pertinent to undertake the present study to evaluate the normal measurements of liver and spleen in the population of Rajasthan. Ultrasonography is the method of first choice for the rational work-up of abdominal pathologies [1]. Liver and spleen size vary widely according to age. Many diseases can affect their size, ranging from infective processes to malignant disorders [2, 3]. Palpation and percussion are the standard bedside techniques to document liver and spleen size, but are far from accurate to detect the small increase in size [2], [3]. The spleen has to be enlarged to two to three times its normal size to be clinically palpable [4]. The clinical assessment of hepatomegaly by palpation and percussion has also been shown to lack both accuracy and reliability [3]. Radiography and radionuclide studies expose the patient to gamma radiation [3],[4],[5],[6]. Sonography is routinely used to determine the internal structures of the body because the examination is real time, three-dimensional and independent of organ function. Ultrasonography is a non-invasive, established, safe, quick and accurate method for the measurement of liver and spleen size

[6]. It allows a doctor to see inside a patient without resorting to surgery.

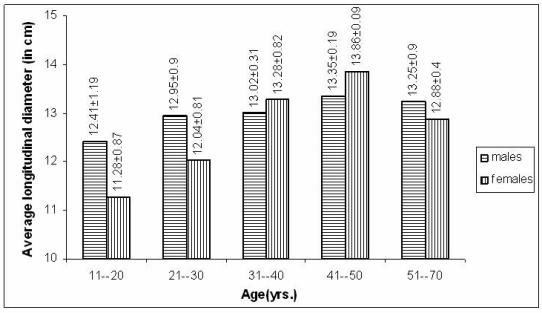
Materials and Methods

This study was conducted in Jodhpur city (Rajasthan) on persons between the age groups of 11 and 70 years. A total of 200 subjects (males: females- 1:1) were examined. Only healthy subjects were included in this study. It was ensured by detailed history, examination and medical record review (if available), that these subjects did not have any pre-existing suspected inflammatory, metabolic, traumatic, collagen or haematopoietic diseases and malignancies that could affect liver and spleen size. Informed written consent was obtained from all the subjects.

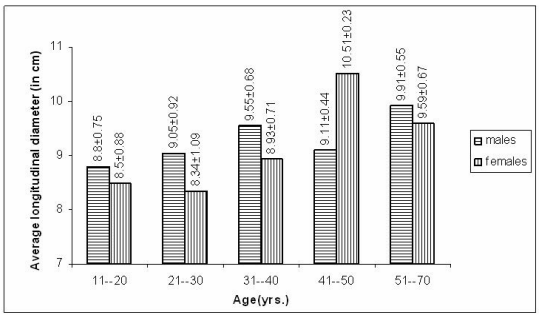
The sonographical examinations were performed with a high-resolution real-time scanner (Toshiba, just vision 400), with a 3.7 MHz convex curved array transducer. The measurements of the dimensions of the organs were made in the supine position and during deep inspiration. Longitudinal scans of the liver were obtained in the midclavicular and midline position, while measuring the normal diameters of the right and left lobe respectively. On a longitudinal coronal image, the maximal splenic length and width (transverse diameter) was also measured. Both organs were measured three times and the mean value was recorded. All measured organs had normal position, shape, and echo texture. All the measurements were classified into 5 groups according to age, i.e., 11-20 yrs. (group1), 21-30 yrs. (group 2), 31-40 yrs. (group 3), 41-50 yrs. (group 4), and 51-70 yrs. (group 5).

Results

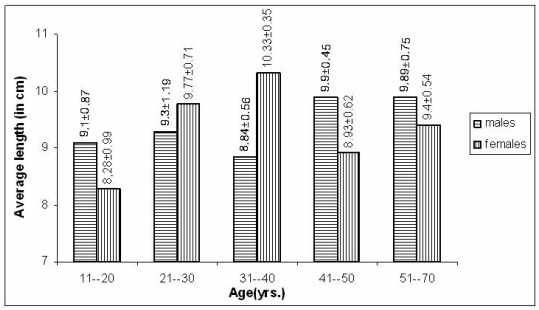
The average longitudinal diameter of the right and left lobe of the liver was calculated, along with standard deviation for each age group (in males as well as in females). This is shown in [Table/Fig 1] and [Table/Fig 2] respectively. The average length and width of the spleen was calculated along with standard deviation for each age group (in males as well as in females). This is shown in [Table/Fig 3] and [Table/Fig 4] respectively.



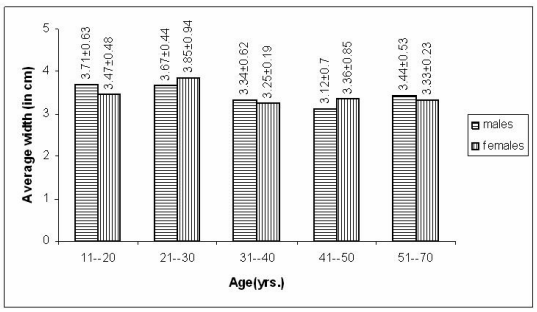
(Table/Fig 1)The relationship between age (yrs.) and average longitudinal diameter (in cm) of right lobe of liver for males as well as females



(Table/Fig 2)The relationship between age (yrs.) and average longitudinal diameter (in cm) of left lobe of liver for males as well as females



(Table/Fig 3)The relationship between age (yrs.) and average length (in cm) of spleen for males as well as females



(Table/Fig 4)The relationship between age (yrs.) and average width (in cm) of spleen for males as well as females

Discussion

Diagnostic imaging techniques are superior to clinical examination in determining the size of organs [7],[8]. Sonography is one of the most common imaging methods which are used in routine practice [9]. There have been quite a few previous reports giving the standard sizes of liver and spleen by ultrasound, but none has been done in the Indian population [10]. In contrast to previous studies which were mainly done on the foreign population, our data was obtained from a large age group (11-70 yrs.) of healthy subjects of the Indian (Rajasthani) population. Liver and spleen size may give information about the diagnosis and the course of gastrointestinal and haematological diseases. Thus, the determination of normal organ size can be significant. In addition to size, there are several palpatory characteristics of the liver and spleen (tenderness, liver edge, nodularity and consistency of the surface, etc.) that contribute significantly to the overall bedside assessment of the organomegaly. Thus, clinical liver span remains a simple practical measurement of liver size, while also providing additional supplemental information which is the most applicable in developing countries. The bedside assessment of liver and splenic enlargement will not obviate diagnostic imaging when such information is vital to further the therapeutic management of the patient.

Both palpating and percussing the abdomen may detect splenomegaly. These techniques appear to be complementary, as each may fail to detect splenic enlargement. Computed tomography, although useful in evaluating splenic size and structure, exposes the patients to ionizing radiation and sometimes contrast agents and is expensive. Ultrasonographical imaging is a noninvasive method which is well suited for the detection of splenic enlargement [11].

By the present study, we found that the average longitudinal diameter of the right lobe of the liver was 12.99±0.76 cm for males and for females, it was12.66±1.07 cm. In adults, the diameter was11.84±1.03cm, while in elderly subjects, the diameter was13.06±0.65cm. In a previous study done by Kratzer et al [12], the average diameter of right lobe of the liver of males was found to be 14.5 ± 1.6 cm and it was 13.5 ± 1.7 cm for females. The average diameter in males was significantly higher than in females. In adults, the diameter was 13.6 ± 1.5 cm, while in elderly subjects the diameter was 14.1 ± 2.0 cm. The diameter obtained by Kratzer et al in their studies was comparatively higher than that obtained by our study. However, if we compare our data of the right lobe of liver for adults with a previous study done by Konus et al [13]; the data is almost similar to the present study. Our data for the right lobe of liver was even similar to the study done by Niederau et al [14].

In our study, we found that the average longitudinal diameter of the left lobe of the liver was 9.28±0.81 cm for males and it was 9.17±1.03 cm for females. In adults, the diameter was 8.65±0.81cm, while in elderly subjects, the diameter was 9.75±0.61cm. The present data was similar to the study done by Konus et al [13], but the data was not similar to the study done by Niederau et al [14]. They reported the diameter of the left lobe to be 8.3±1.7 cm, which is lower in comparison to that obtained by our study.

In the present study, the average length of the spleen was 9.40±0.91 cm in males and 9.34±0.95 cm in females. In adults, the length was 8.69±0.93cm, while in older subjects, the length was 9.64±0.64cm. Comparatively, in a previous study done by Spielmann et al [15], the average length of the spleen was found to be 11.4 ± 1.7 cm in males and 10.3 ± 1.3 cm in females, which was higher than that found in our study. The length of the spleen obtained by Konus et al [13] was slightly higher than that found in our study. Even the value of the length of the spleen obtained by Hosey et al [16] in collegiate athletes was relatively higher than that found in our study. But the average length of the spleen obtained by Niederau et al [14] was similar to that found in our present study.

In our study, the average width of the spleen in males as well as in females was 3.45±0.59cm. In adults, the width was 3.59±0.55cm, while in older subjects, the width was 3.38±0.38cm. The average width of the spleen obtained by Spielmann et al [15] was 5.0 ± 0.8 cm in males and 4.2 ± 0.7

cm in females and both these values were comparatively higher than that found in our study. The value of the width of the spleen obtained by Hosey et al [16] was relatively higher than that found in our study. Even the values obtained by Niederau et al [14] were comparatively higher than that found in our study.

A single radiologist performing the ultrasonograhy removed the inter-observer bias. To the best of our knowledge, our study aimed to investigate the normal limits of liver and spleen is one of the few studies, which provides data from the Rajasthani population. But, there are a few limitations to this study, as our study population number was very less. The data obtained by us is not similar to that of the previous studies which were basically from the foreign population. So, a larger study is required, which might improve the precision of our estimates. We hope that this study contributes to the daily practice in radiology clinics.

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