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ESTIMATION OF SPLENIC VOLUME IN INDIAN ADULT POPULATION BY ULTRASONOGRAPHY & ITS COMPARISION WITH CT SCAN

V. K. Singh*[1], Rekha Khare[1], Pratap Shankar[2], Dheeraj Singh[2], Preet Lakhani[2], Sachin Tutu[2], Amod Kumar[2], R. K. Dixit[2]

[1]Department of Radiodiagnosis Hind Institute of Medical Sciences Safedabad, Barabanki.

[2]Department of Pharmacology K. G. M. U. Lucknow.

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***Correspondence for Author**
Dr. V. K. Singh
Department of Radiodiagnosis Hind Institute of Medical Sciences Safedabad, Barabanki.

ABSTRACT

In this study we estimated spleenic volume in normal Indian adults by ultrasonography and compare the volume with CT Scan**.** A prospective study was conducted with 70 persons (42 Male & 28 Female) not known to have any conditions likely to be associated with spleenomegaly. Spleen volume measured by USG and by the CT Scan using volumetric software. The average spleenic volume was 140 to 184 cm^3 and USG data was matched with the volumetric estimation by CT scan showing that USG is highly sensitive & accurate in detecting spleenic volume as result. In present study the conclusion was that the USG is highly accurate for volume estimation of spleen.

KEYWORDS: Splenic volume, Ultrasonography, CT scan.

INTRODUCTION

Evaluation of spleen size is important in every physical examination of the abdomen by physicians. It is enlarged in a variety of clinical condition including infections, hematological, infiltrative immunologic and malignant states.[1] Hypersplenism is a pancytopenia (Low platelets count, while cell count and hemoglobin concentration) caused by splenic enlargement. Hematological disorders causing splenomegaly commonly, but not invariably, also causes enlargement of the liver. Hemolytic anemia causes mild splenomegaly without hepatomegaly. The spleen has to increased in size three fold before it becomes palpable, so a palpable spleen always indicates splenomegaly.[2-7]

The spleen is the largest lymphoid organ located in left hypochondriac region of abdomen wedged between stomach and diaphragm. It has two ends, two borders and two surface and measuring 1 x 3 x 5 inches (2.5 x 7.5 x 12.5 cm), weight 7 oz. and lies deep to left 9^{th}-11^{th} ribs. The spleen is anchored to stomach by means of gastro-spleenic ligament and to posterior abdominal wall by leino-renal ligament. Several studies utilizing a variety of imaging techniques such as computed tomography, scintigraphy, magnetic resonance imaging and sonography have been reported to determine to splenic volume and hence to develop standards for splenic size.[4-8] The aim of this study is to determine the normal range of spleen size in adult Indian population and to determine its accuracy & sensitivity volume in comparison with volumetric estimation of CT considering it as gold standard.[9,10]

MATERIAL AND METHOD

The study was performed at the radiology department HIMS December 2014 to August 2015. (42 males and 28 Females) were included in this study, and written & informed consent was taken for each case. The inclusion criteria were subjects underwent physical examination and completed a short standardized interview questionnaire. For our study group, the following exclusion criteria were used: clinical or laboratory evidence of infection; hematopoietic diseases; genetic diseases; lyphadenopathy; liver diseases; renal failure; history of splenic trauma; non-traumatic benign splenic lesions.[11,12]

Baseline data including age, height, and weight were recorded for all participants. The BSA and BMI were calculated by the following formulas: BSA = (height [cm] x weight [kg]/3600)1/2 and BMI =weight [kg]/height [m2]. All ultrasonographic examinations were performed by 2 experienced senior radiologists. The examinations were performed using Hitachi & GEV-5 ultrasound machine equipped with 3.5 MHz curvy – linear probe.[13]

The subject were placed and examined in the spine and/or right posterior oblique positions, and the spleen was scanned during suspended respiration. The splenic length (in centimeters) is defined as the maximum distance between the most super medial and the most inferolateral points on a longitudinal plane. The splenic width, defined as the maximum anteroposterior dimension, was measured on a transverse plane. The splenic depth is defined as the mediolateral distance from the hilum to the capsule, being measured on the same transverse plane. To express spleen volume, the splenic index was calculated using the standard prolate ellipsoid formula (Length x width x depth x0.523); this formula is frequently used for estimating the volume of many irregularly shaped organs.[14]

For volumetric estimation by CT scan the technical parameter were 130 KV potential, 95 MA current, and 5 mm slice with identical reconstruction index and rotation time of 0.6 second. Splenic volume was measured by volumetric & surgical rendering technique of able 3D doctor software.[15]

RESULT

The range of splenic volume by USG and by CT scan to there is strong correlation between the height of patient & volume of spleen. Volume estimation by USG & CT scan was indicating that USG is reliable in measuring spleen. We did not observed any significant difference in volume of spleen in relation the sex of person on age of person. Age of subjects included in this study ranged between 20-70 years the mean splenic volume by USG is 162.8±11.2 cm^3 and by CT Scan was 161.4 ± 11.7 cm^3 and range of volume was 140 cm^3 to 184 cm^3.

DISCUSSION

Spleenomegaly is considered to be an important clinical finding because it results from a variety of disorders involving liver, hematopoitic and immune systems and infection and malignant state. Early detection of this clinical sign is very important. Detection by physical examination is very late (Spleen is never palpable till it is enlarged 2to 3 tomes its own size) so a variety of imaging modalities have been used for this purpose. Several prior studies have sought to develop the standards for the splenic size by different techniques such as CT Scan, scintigraphy, MRI and sonography.[16] The conventional sonography was found to be a well established, widely used and relatively inexpensive means of assessing the splenic size without ionizing radiation. Considering volume estimation by CT Scan as gold standard USG seen to be highly reliable & accurate. In the present study, it was also observed that spleenic volume have a correlation with the height of patient. Volume of spleen in cubic cm, in none of cases exceeds the figures of height of subject in cm. In our study population the means of spleenic dimensions were fairly similar to those recorded by other studies.[17] The main limitation was the small sample size, which certainly has affected the generalization of our estimation. A larger study sample is required in order to improve the accuracy of our measurements.[18]

CONCLUSION

In conclusion, a local reference of spleenic volume was established in this study, and Ultrasound has been found to be both accurate & reliable for measurement of spleen.

REFERENCE

1. Das S, Abd Latiff A, Suhaimi FH, Ghazalli H, Othman F. Anomalous splenic notches: a cadaveric study with clinical importance. Brastist Lek Listy, 2008; 109(11): 513-6.
2. Gayer G, Hertz M, Strauss S, Zissin R. Congenital anomalies of the spleen. Semin Ultrasound CT MR, 2006; 20(5): 358-69.
3. Jakubovsk J, Porubsk J. Functional morphology of the spleen. Bratisl Lek Listy, 1995; 96(12): 637-41.
4. Sadler, TW, Longman's Medical Embryology. Baltimore, Lippicott Williams & Wilkins, 2000; 277.
5. Safak AA, SimsekE, Bahcebasi T. Sonography assessment of the normal limites and percentile curves of liver, spleen, and kidney dimension in healthy school-aged children. J Ultrasound Med, 2005; 24(10): 1359-64.
6. Souparis A, Papaziogas B et al. An unusual case of retroperitoneal accessory spleen with vascular supply directly from the aorta. Minerva Chir, 2002; 57(4): 513-5.
7. Sony LA, Tanyeli E, et al. Splenic artery and relation between the tail of the pancreas and spleen in a surigal anatomical view. Karadeniz Tip Dergisi, 1996; 9: 103-7.
8. Ungor B, Malas MA, Sulak O, Albay S. Development of spleen during the fetal period. Surg Radiol Anat, 2007; 29(7): 543-50.
9. Weiand G, Mangold G. Accessory spleen in the pancreatic tail-a neglected entity? A contribution to embryology, topography and pathology of ectopic splenic tissue. Chirurg, 2003; 74(12): 1170-7.
10. Schindler G, Longin F, Helmschrott M. The individual limit of normal spleen size in routine X-ray film. Radiologe, 1976; 16(4): 166-71.
11. Deland FH. Normal spleen size. Radiologe, 1970; 589-2.
12. Roberts JG, Wisbey ML, Newcombe RG, Leach KG, Baum M. Prediction of human spleen size by computer analysis of splenic scintigrams. Br J radio, 1976; 49: 151-5.
13. Petzoldt R, Lutz H, Ehler R, Neidhardt B. Determination of splenic size by ultrasonic scanning.Med Klin, 1976; 71: 2113-6.
14. Niederau C, Sonnenberg A, Muller JE, Erckenbrecht JF, Scholten T, Fritsch WP. Sonographic measurements of the normal liver, spleen, pancreas and portal vein. Radiology, 1983; 149(2): 537-40.
15. Katoaka M, Nataka Y, Maeda T et al. A ultrasonographic analysis of splenomegaly in patients with sarcoidosis (In japenese). Nihon Kyobu Shikkan Gakkai ZAsshi, 1990; 28: 750-5.

16. Loftus WK, Metreweli C. Normal Splenic size in a Chinese population. J Ultrasound Med, 1997; 16(5): 345-7.
17. Rosenberg HK, Markowits RI, Kolberg H, Park C, Hubbard A, Bellah RD. Normal splenic size in infants and children: Sonographic measurements. Am J roentgenol, 1991; 157(1): 119-21.
18. Frank K, Linhart P, Kortsik C, Wohlenberg H. Sonographic determination of the spleen size: normal dimensions in adults with a healthy spleen. Ultraschall inder Med, 1986; 7(3): 134-7.