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Saudi Adults Average of Normal Spleen Size and Echogenicity

A Phantom Study comparing Ultrasound

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مستخلص

مقدمة: يعد الطحال أحد أكثر الأعضاء حيوية في جسم الإنسان ، وهو عضو بحجم قبضة اليد يقع في الربع العلوي الأيسر من البطن. تختلف أحجام الطحال لدى الأفراد ، وحتى داخل نفس الشخص ، قد تتغير بمرور الوقت. يتراوح طول الطحال المعتاد بين ٥ و ١٣ سم وقطر أمامي خلفي من ٥ إلى ٨ سم ، وسمك من ٣ إلى ٤ سم.

الهدف: مقارنة حجم وصدى الطحال بين الموجات فوق الصوتية الوهمية والبالغين السعوديين.

المنهجية: الدراسة هي دراسة استشرافية ارتباطية تصحيحية أجريت في محافظة نجران بالمملكة العربية السعودية. وشملت الدراسة جميع حالات البالغين ذات الحجم الطبيعي للطحال والصدى الطبيعي؛ تم حذف الحالات التي لم تكن طبيعية. باستخدام معدات

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الموجات فوق الصوتية تسمىGE-LOGIC9 ، تم جمع حالات البحث. باستخدام نموذج جمع البيانات ، تم جمع جميع الحالات. تم استخدام جهاز الموجات فوق الصوتية للبطن بوزن ١٢ كجم ، تم إنشاؤه في اليابان باستخدام مادة مطاط صناعي من البولي يوريثين للمساعدة في تدريب البطن الناجح ، كمعيار. مع وضع المريض ضعيفا وفي الوضع الجانبي الأيمن ، يتم استخدام محول طاقة محدب يتراوح بين ٣-٥ ميجاهرتز لتقييم الطحال. يتم وضع المسبار في مستوى القوس من النهج الأمامي ، وعندما يتم مسح الطحال طوليا وعرضيا ، قد يكون من الضروري إجراء درجات مختلفة من المسح الوربي الوربي. تم استخدام Microsoft Excel 2016 لتقييم البيانات التي تم جمعها. تم استخدام ٤ أجهزة كمبيوتر محمولة لتحليل البيانات. تم استخدام الجداول والرسوم البيانية لتقديم البيانات بعد التحليل ، وتمت مقارنة النتائج بالقياسات المأخوذة على شبح التصوير بالموجات فوق الصوتية في البطن. ونوقشت النتائج واستخلاص استنتاج.

النتيجة: شملت الدراسة ٣٣ متطوعا سعوديا بالغا (١٧ ذكرا و ١٦ أنثى) من التين (٢) بحجم طحال طبيعي وصدى صوتي. متوسط العمر هو ٢٣ سنة في كلا الجنسين. وكان متوسط طول الطحال في كلا الجنسين ١٠. ٤١ سم ، العرض ٥,٠٤ سم ، العمق ٤,٧٨ سم ومتوسط الحجم ١٣٢,٣٤٤ سم٣. وبلغ متوسط حجم الطحال لدى الذكور ١٤١,٥٧٧ سم ٣ بينما بلغ في الإناث ١٢٢,٥٣٣ سم٣. كان طول الطحال في الموجات فوق الصوتية الوهمية ١١,٢٧ سم ، والعرض ٦,٤ سم والعمق ٢,٧٣ سم.

الاستنتاج: هناك تغيرات طفيفة في الصدى واختلاف ± ١ سم في قياس الطحال، وفقا لمقارنة طول الطحال الطبيعي وصدى البالغين السعوديين والتصوير بالموجات فوق الصوتية فانتوم.

الكلمات المفتاحية: الطحال – الموجات فوق الصوتية الوهمية – البالغين.

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ABSTRACT

Introduction: One of the most vital organs in the human body, the spleen is a fist-sized organ that is situated in the upper left quadrant of the abdomen. Individuals' spleen sizes vary, and even within the same person, they might change over time. The spleen's usual range of measurements is 8 to 13 cm in length, 7 to 8 cm in anteroposterior diameter, and 3 to 4 cm in thickness.

Aim: To compare the size and the echogenicity of the spleen between ultrasound phantom and Saudi adult.

Methodology: The study is a correctional correlational prospective study that was carried out in the Saudi Arabian province of Najran. All adult instances with normal spleen size and echogenicity were included in the study; cases that weren't normal were omitted. Using an ultrasound equipment called the GE-LOGIC9, the research cases were gathered. Using a data collection form, all cases were collected. A 12-kg abdominal ultrasound phantom, created in Japan with polyurethane elastomer material to assist successful abdominal training, was utilized as a benchmark. With the patient supine and in the right lateral position, a convex transducer between 3-5 megahertz is used to evaluate the spleen. The probe is positioned in the Sagittal plane from the anterior approach, and when the spleen is scanned longitudinally and transversely, different degrees of intercostal scanned may be necessary. Microsoft Excel 2016 was used to evaluate the collected data. 4 laptops were used to analysis the data. Tables and graphs were used to present the data after analysis, and the findings

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were compared to measurements taken on an abdominal ultrasonography phantom. The findings were discussed and a conclusion drawn.

result: The study included 33 volunteers' Saudi adults (17 male, 16 female) fig (2) with normal spleen size and echogenicity. Average age is 23 years in both genders. Average spleen length in both genders was 10.41CM, width 5.04CM, depth 4.78CM and the average volume was 132.344CM3. Average spleen volume in males was 141.577CM3 while in in females was 122.533 cm3. The spleen length in ultrasound phantom was 11.27CM, width 6.4CM and depth 2.73CM.

conclusion: There are minor changes in echogenicity a

nd ± 1CM difference in spleen measurement, according to a comparison of the normal spleen length and echogenicity of Saudi adults and the ultrasonography Phantom.

Keywords: Spleen - Mock Ultrasound – Adults.

INTRODUCTION:

One of the most vital organs in the human body, the spleen is a fist-sized organ that is situated in the upper left quadrant of the abdomen, close to the stomach., The largest lymphatic organ is considered to be the spleen [(1)]. Because of its position, the spleen is extremely vulnerable to damage in trauma patients. [(2)]. It is in charge of phagocytosis, which is the process of engulfing and killing damaged, old, or foreign cells and their detritus. The spleen is mostly made up with lymph nodes. Despite being a part of the body's defense mechanism [(3)].

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ANATOMY:

The spleen is shaped like an oval. A capsule that serves as protection surrounds it. Anatomically, the spleen's external surface can be separated into diaphragmatic surface and visceral surface [4]. From the celiac trunk, the splenic artery extends. From the trunk the splenic artery extends laterally in the direction of the spleen. The splenic hilum, which is superior and anterior to the splenic vein, is where the splenic artery enters the spleen. The splenic hilum, which is placed on the spleen's medial surface [5].

APPERANCE:

The normal spleen is isoechoic to the liver on ultrasound, although, it might be a little less echogenic. The adult spleen has a convex superior border and a concave, pointed inferior margin. It loses its form as it enlarges and instead takes on a rather rounded appearance, sometimes appears extending beyond the Left kidney [6].

Size:

Individuals' spleen sizes vary, and even within the same person, they might change over time. The spleen's usual range of measurements is 8 to 13 cm in length, 7 to 8 cm in anteroposterior diameter, and 3 to 4 cm in thickness [7]. Normal Adult Spleen measurement (fig1). <13 cm superior to inferior axis, 6-7cm in the medial to lateral axis, 5 to 6cm in the anterior to posterior plane and average volume is approximately 350mls [8]. If the entire left kidney is covered by the spleen, it is considered enlarged.

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NORMAL MEASUREMENTS	
Anatomy	**Measurement**
Spleen long axis	8 to 13 cm
Spleen anteroposterior diameter	7 to 8 cm
Spleen thickness	3 to 4 cm
Splenic volume	60 to 200 mL
Splenic index	107 to 314 cm^3

Fig (1) normal spleen measurement

Objectives:

- **general objective**

  To compare the size and the echogenicity of the spleen between ultrasound phantom and Saudi adult.

- **Specific objective**

  To measure the size of the spleen in sagittal and transverse in Saudi adult both males and females.

  To compare and note the variation in echogenicity and size length and width between males and females.

  To make sure and verify that the ultrasound phantom is suitable for education and training.

- **Problem of the study:**

  The investigation was necessary to determine whether the Phantom was appropriate for Saudi students' education and training given the ethnic distinctions between Saudis and Japanese.

- **Importance of the study:**

  Ensuring that all ultrasound phantoms match the spleen size and echogenicity of average Saudi adult.

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- **Hypotheses:**

  There are some variations in spleen size and echogenicity when using the Japanese ultrasound phantom for training purposes.

- **Pervious study :**

  Various researchers have discussed how to assess spleen size and echogenicity. Walter's Kluwer did ultrasound on Nigerian adult. Their study population was on 200 adult, 91 males and 109 females. They found average male spleen length were 11.1CM, width 4.4CM, depth 7.8CM, and volume 202CM^3. For females they found average spleen length were 10.1CM, width 4.0CM, depth 7.1CM, and volume 153.7CM^3 [9]. ÇELIKTAS et al did ultrasound on Turkish adult. Their study population was on 150 adult, 78 males and 72 females. They found average male spleen length were 11.01CM, width 8.75CM, depth 4.12CM, and volume 220CM^3. For females they found average spleen length were 9.87 CM, width 7.58CM, depth 3.34CM, and volume 136CM^3[10]. Mustafa Ahmed did ultrasound on Sudanese adult. Their study population was on 70 adult, 31 males and 39 females. They found average males spleen length were 9.4CM, width 4.2CM, depth 4.05CM and volume 88.7CM^3. For females they found average spleen length were 8.8CM, width 3.9CM, depth 4.02CM and volume 74.6CM^3[11]. Yared Tekle, Deepali Rajabhau, et al did ultrasound of adult in north-west Ethiopia region. Their study population was on 380 adult, 180 males and 200 females. They found average males spleen length were 10.5CM, width 4.6CM, depth 4,0CM and volume 107.7CM^3. for

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females They found average spleen length were 9.95CM, width 4.3CM, depth 3,8CM and volume 92CM^{3}[12].

- **Design of the study:**

  The study was in Najran city, Kingdom of Saudi Arabia, at Najran university College of Applied Medical Sciences, the study preformed on Saudi adult and a Japanese made phantom to compare between the size and the echogenicity of the spleen.

- **Duration of the study:**

  The study was conducted in the period between September to November 2022.

- **Method of the study:**

  The study was performed on phantoms in Najran University, College of Applied Medical Sciences, this study includes all adult cases of normal spleen size and echogenicity, abnormal cases was excluded.

Methodology :

The study is a correctional correlational prospective study that was carried out in the Saudi Arabian province of Najran. All adult instances with normal spleen size and echogenicity were included in the study; cases that weren't normal were omitted. Using an ultrasound equipment called the GE-LOGIC9, the research cases were gathered. Using a data collection form, all cases were collected. A 12-kg abdominal ultrasound phantom, created in Japan with polyurethane elastomer material to assist successful abdominal training, was utilized as a benchmark. With the patient supine and in the right lateral position, a convex transducer between 3-5 megahertz is used to evaluate the spleen. The

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probe is positioned in the Sagittal plane from the anterior approach, and when the spleen is scanned longitudinally and transversely, different degrees of intercostal scanned may be necessary. Microsoft Excel 2016 was used to evaluate the collected data. 4 laptops were used to analysis the data. Tables and graphs were used to present the data after analysis, and the findings were compared to measurements taken on an abdominal ultrasonography phantom. The findings were discussed and a conclusion drawn.

Result:

The study included 33 volunteers' Saudi adults (17 males, 16 females) fig (2) with normal spleen size and echogenicity. Average age is 23 years in both genders. Average spleen length in both genders was 10.41CM, width 5.04CM, depth 4.78CM fig (3), and the average volume was 132.344CM^3. Average spleen volume in males was 141.577CM^3 while in in females was 122.533 cm^3 fig (4). Average spleen length in males was 10.8 CM, width 5CM and depth 4.8CM while the average spleen length in females were 9.9 CM, width 5CM and depth 4.6CM. The spleen length in ultrasound phantom was 11.27CM, width 6.4CM and depth 2.73CM fig (5). The number of medium echogenicity was 24, the hyperechoic level was 4 and the hypoechoic level was. The echogenicity of ultrasound phantom spleen was hypoechoic fig (6).

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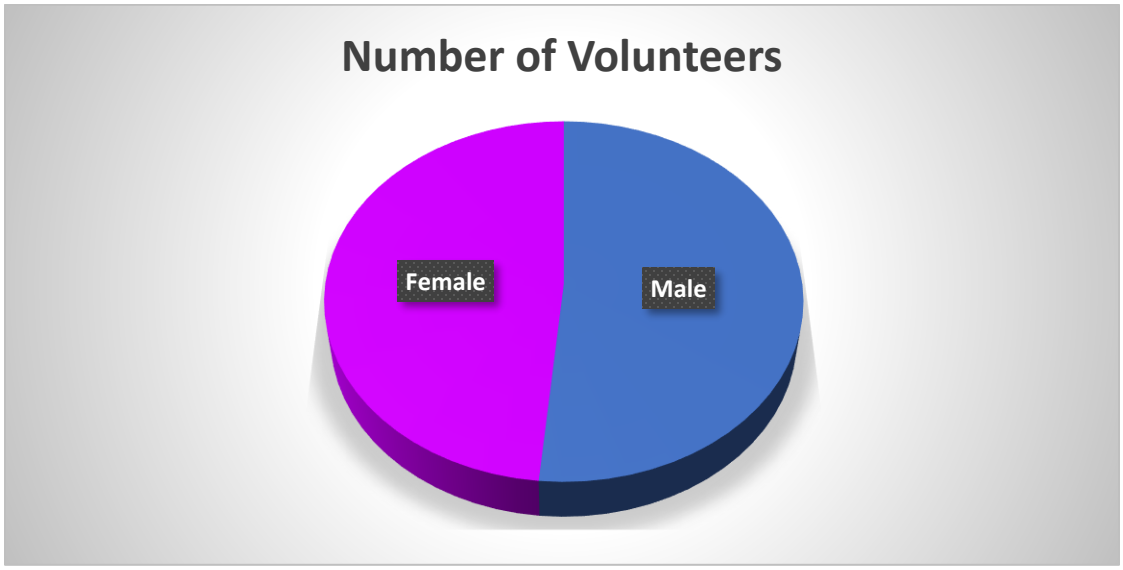

Figure (2) volunteers' number of male and females

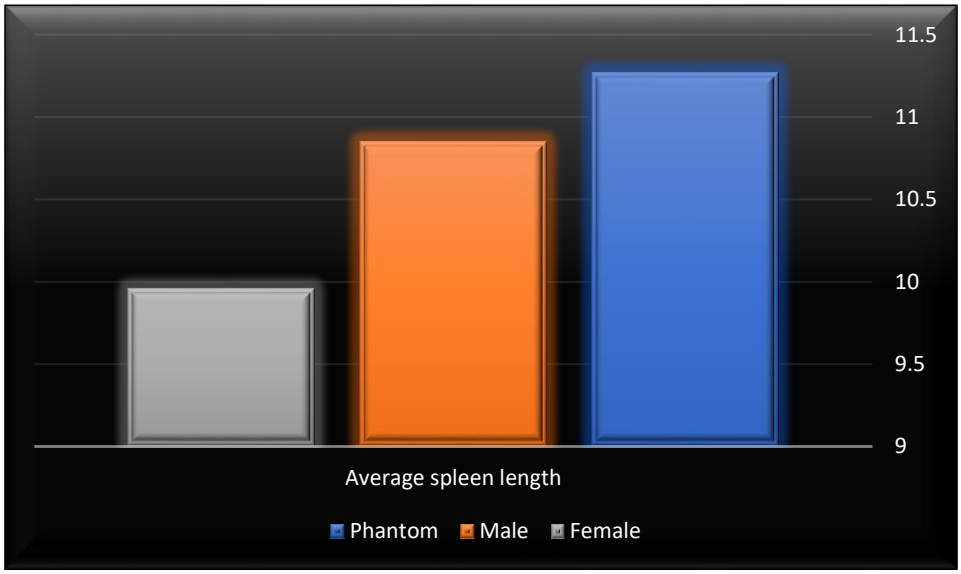

Figure (3) average spleen length

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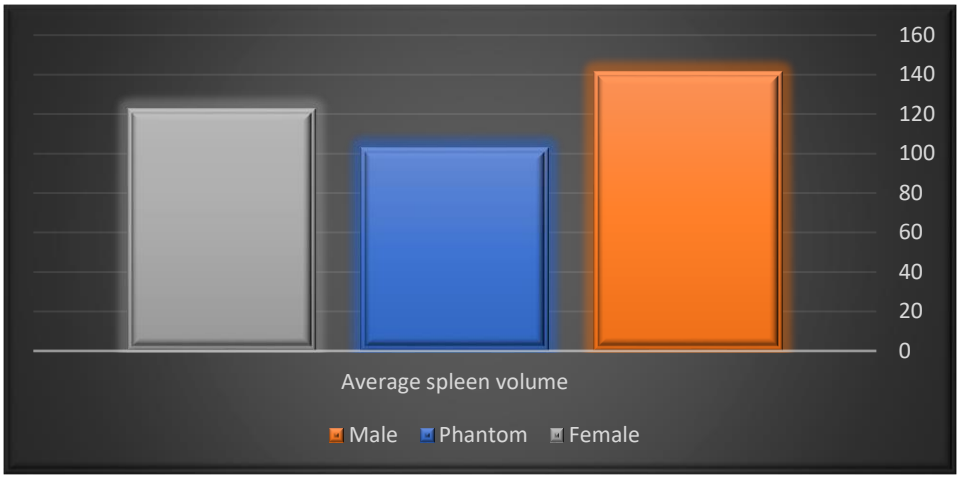

Figure (4) average spleen volume

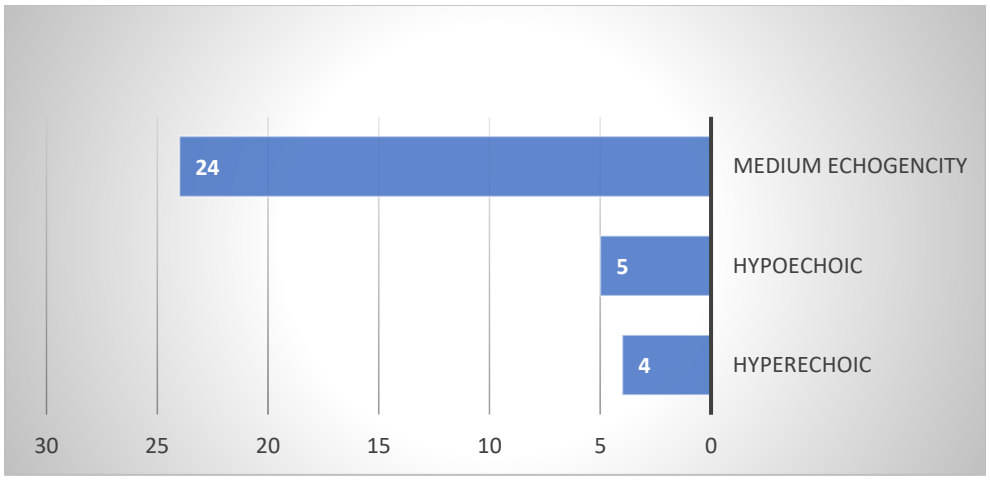

Figure (5) echogenicity level

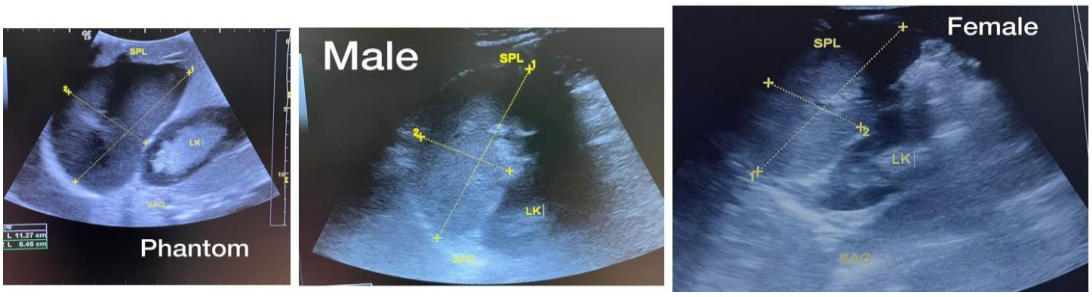

Figure (6) echogenicity of phantom, Male and Female

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Discussion:

The largest lymphatic organ is considered to be the spleen. Depending on anthropological circumstances, the spleen of males and females differ in size and echogenicity. Spleen length should not exceed 13CM and not less 8CM in long axis, 8CM in anteroposterior diameter and thickness 5CM. The average spleen volume in this study was 132.344CM^3 with males average were 141.577 cm^3 and females were 122.533 cm^3 . ÇELIKTAS et al (2015) from Turkey their result was nearly the same as our result for females average spleen volume, but there result in male was different than our result. The amount of cases that were looked into, together with anthropological and ethnic factors, may have contributed to these measurement differences.

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Conclusion:

The average spleen measurement of healthy Saudi adults nearly matching the standard measurement of spleen size and echogenicity, which is a medium echo level

There are some changes in echogenicity and a ± 1 cm difference in spleen size, according to a comparison of Saudi adults' normal spleen length and echogenicity using ultrasonography Phantom data.

The ultrasound Phantom is appropriate for teaching and training in Saudi Arabia, depending on the findings of this study.

limitations and recommendations:

Due to the limited time available for research, there are very few cases. We advised giving the research adequate time.

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