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Role of Ultrasound in Diagnosis of Fibrocystic Breast Disease

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Abstract

Background: Fibrocystic breast disease is the most typical benign breast disease, which is seen in women worldwide with features of pain and feeling of nodules. Its diagnosis is based on clinical symptoms, ultrasound, mammography, and in doubt cases, biopsy is indicated. For assessment of the breast, we clinically examined the breast, axilla, and both supra and infraclavicular regions for lymph node assessment, followed by ultrasound examination. Detection of lesions in any breast quadrant assessed by BI-RADs, Breast Imaging Reporting, and Data System grouped in five brackets. Scanning by sonography using B-mode and Doppler study was improved for detecting and characterizing benign and malignant lesions.

Objective: To assess a breast lesion by ultrasound with features suggestive of a benign or malignant nature.

Method: This study included 210 women aged 20 - 45 who visited a clinic from October 2020 to April 2022 and were examined by ultrasound machine Samsung HS50 (KOREA) with an LA3-14AD probe. B-mode images obtained detection of the lesion, and we also used Doppler ultrasound for assessment of the vascularity of the lesion. The BI-RADS system was used for the categorization of all findings.

Result: In 210 women, complaints of lumps were involved in our study. Imaging by B-mode ultrasound using the Doppler study assesses the vascularity of the lesion and provides more characterization of benign and malignant lesions. By B–mode imaging, 99 patients had regular ultrasound study, and 79 patients had simple cysts that appeared well defined, had familiar outlines, and had an anechoic rounded or oval shape with posterior enhancement. Twenty-eight patients with fibroadenoma visualized as round or oval-shaped hypoechoic lesions horizontally oriented to the planes of the breast with lateral shadowing. 2 patients had complex cysts that appear as well-defined, irregular outlines, rounded shape, a thick wall with internal echoes with posterior enhancement. 2 patients have a malignant lesion that appears ill-defined rough outline vertically oriented with breast planes and show posterior shadowing.

Conclusion:

Ultrasound was established as the most suitable imaging modality for the categorization of breast lesions and exclusion of malignancy, which is helpful for evading unnecessary biopsies.

دور الموجات فوق الصوتية في تشخيص مرض الثدي الكيسي الليفي

الخلاصة

مرض الثدي الكيسي الليفي هو مرض الثدي الحميد الأكثر شيوعًا والذي يصيب النساء في جميع أنحاء العالم مع وجود ألم وشعور بالعقيدات. يعتمد تشخيصه على الأعراض السريرية، والموجات فوق الصوتية، والتصوير الشعاعي للثدي، وفي حالات الشك يتم إجراء خزعة. لتقييم الثدي، قمنا بفحص الثدي والإبطين وفوق الترقوة وتحت الترقوة سريريًا لتقييم العقد الليمفاوية يليها فحص بالموجات فوق الصوتية. يتم تقييم الكشف عن الآفة في أي ربع من الثدي بالتوافق مع BI-RADsوتقارير تصوير الثدي ونظام البيانات المجمعة في خمس فئات. تم تحسين المسح باستخدام التصوير بالموجات فوق الصوتية باستخدام الوضع. Bودراسة الدوبلر لاكتشاف وتوصيف الآفات الحميدة والخبيثة

الهدف: تقييم آفة الثدي عن طريق الموجات فوق الصوتية مع ميزات توحي بأنها حميدة أو خبيث

الطريقة: هذه دراسة تشمل ٢١٠ امرأة في الفئة العمرية بين ٢٠-٤٥ عامًا زارن إحدى العيادات في الفترة من أكتوبر ٢٠٢٠ الى ابريل ٢٠٢٢ وتم فحصهن بوسطه جهاز الموجات فوق الصوتيه سامسونغ اش اس ٥٠ صناعه كوريا باستخدام مسبار LA3-14AD.

استخدمنا الموجات فوق الصوتية دوبلر تم الكشف عن الافه التي تم الحصول عليها بواسطه صور الوضع بي

وايضا واستخدمنا الموجات فوق الصوتيه دوبلر لتقييم الاوعيه الدمويه للافه. نظام بايردزلتصنيف جميع النتائج. .

النتيجة: في ٢١٠ امرأة كيف تشتكي من الورم المتضمن في دراستنا. التصوير بالموجات فوق الصوتية من النوع بي.

مع استخدام دراسة الدوبلر لتقييم الأوعية الدموية للآفة وإعطاء مزيد من التوصيف للآفة الحميدة من الآفة الخبيثة من خلال التصوير بالوضع B، 99 مريضًا لديهم دراسة بالموجات فوق الصوتية العادية، و٧٩ مريضًا لديهم كيس بسيط يبدو محددًا جيدًا، ومخططًا منتظمًا، وشكلًا مستديرًا أو بيضاويًا عديم الصدى مع تعزيز خلفي. ٢٨ مريضًا مصابين بالورم الغدي الليفي تم تصويرهم على أنهم آفة ناقصة الصدى مستديرة أو بيضاوية الشكل وموجهة أفقيًا إلى مستويات الثدي مع تظليل جانبي. مريضان يعانيان من كيس معقد يظهر بشكل جيد، مخطط غير منتظم، مستدير الشكل، جدار سميك مع أصداء داخلية مع تعزيز خلفي. يعاني مريضان من آفة خبيثة تبدو مخططًا غير منتظم محدد المعالم وموجهًا عموديًا مع مستويات الثدي ويظهر تظليلًا خلفيًا.:

خاتمة :تم إنشاء الموجات فوق الصوتية باعتبارها طريقة التصوير الأكثر ملاءمة لتصنيف آفات الثدي واستبعاد الأورام الخبيثة وهو أمر مفيد لتجنب الخزعات غير الضرورية.

1. Introduction

Fibrocystic change of the breast is a benign condition that involves changes in the terminal ductal lobular unit of the breast, which may or may not associated with fibrosis. Fibrocystic changes (FCC) are established as the most typical benign disorder of the breast (Malherbe, Khan and Fatima, 2019), mainly seen in premenopausal women between age 20-40 years of age, with about half of women affected throughout their lives. Clinically, they presented with breast pain, which increases in severity during ovulation; ultrasound plays an important role in approaching breast pain (Alsalami and Alattabi 2018). Breast pain is associated with swelling and lumps in one or both breasts; sometimes, pain may cause pain under the arm. The etiology of fibrocystic breast changes is not well known, but there is a correlation with reproductive hormones, especially estrogen, like estrogen stimulation and progesterone deficiency.

The American College of Radiology established a system for describing and imaging breasts called BI-RADs system, Breast Imaging Reporting and Data System, which relates to mammography, ultrasound, and MRI. The fifth edition of BI- the RADS system nowadays is commonly used. In ultrasound, this system depends on the shape, margin, echo pattern, and orientation of the lesion (Kaplan *et al.*, 2022) in the breast and is employed to demonstrate any lesion, either benign (Burgess and O'Neal, 2019), (Stachs *et al*., 2019) or malignant lesion (Kim, Kim and Moon, 2020), (Brem *et al.*, 2015) and classified in five brackets (Eghtedari *et al.*, 2021), (Spak *et al.*, 2017).

To perform breast examination by ultrasound, we commonly use B–mode ultrasound, which is a safe, non-invasive, non-radiative screening method for breast lesions. For better demonstration and characterization of the solid lesion as a benign or a malignant lesion, we used Doppler imaging (Choi, Tsunoda and Moon, 2024), both color Doppler flow and power Doppler imaging, to demonstrate vascularity of the lesion like hypervascular mass, or mass with central vessels, which is suggestive malignant masses (Elverici *et al.*, 2015), (Niu *et al.*, 2019). Color Doppler ultrasound allows us to show the flow direction. A little pressure on breast tissue was applied to better demonstrate slow flows within the mass. Power Doppler ultrasound is excellent for displaying slow flow in small vessels as it is Doppler angle independent but has the disadvantage of the increased number of artifacts (Horvath *et al.*, 2011).

Thus, ultrasound plays a vital role in the demonstration and analysis of breast lesions and is usually utilized as an additive to mammography for screening breast lesions (Harada-Shoji *et al.*, 2021).

2. Methodology

Patients' age, marital state, and breast appearance (swelling, redness, and any indentation in skin) were recorded. B-mode and Doppler ultrasound were done using Samsung HS50 (KOREA) in Kerbala, Iraq, with a linear LA3-14AD probe. The preset conditions were imaging gain at 65%, enhancement at 4, depth at 40 mm, and persistence at 6. The patient is lying down slightly obliquely with an arm over the patient's head. We examine the patient. Images were taken in both transverse and longitudinal planes for all breast quadrants. Ultrasound features involved echotexture (as either homogeneous or heterogeneous), size, shape, margin, calcification, and axillary lymph node. These ultrasound features for each mass were categorized according to the BI-RADS (Horvath *et al.*, 2011). Doppler study was done with both color and power to rule out abnormal vascularity; the color gain was adjusted to enable the recognition of low-velocity flow within the mass with negligible background noise.

3. Results

Two hundred ten ultrasounds of ladies who visited the outpatient clinic were involved in this study from October 2020 to April 2022. The mean age is 30.4 SD± 7.76 (between 20 and 45 years old), displayed in Table [1]. From 210 patients, 126 females (60%) were married, and 84 females (40%) were unmarried, as shown in table [2]. Seventy-six females (36.2%) had painful masses, and 134 females (63.8%) had painless masses, as shown in [fig.1]. One hundred twenty-eight females (61%) have non-palpable mass, and 82 females (39%) have palpable mass, as shown in [fig.2]. The exam was done in both planes transverse and longitudinal planes by B-mode for imagining breasts.

The ultrasound findings in our study are shown in the table and figure [3]; 99 females (47.1%) have regular ultrasound studies with no pathology seen. Simple cysts were visualized as rounded or oval-shaped anechoic, shared borders, and thin walls with posterior enhancement in 79 females (37.6%) [Fig.4, 5].

Fibroadenoma was visualized in 28 females (13.3%) as a hypoechoic oval-shaped lesion lying horizontally with lateral shadowing. Most of the masses are pictured in the outer quadrant of both breasts. Doppler study was performed for visualization of the vascularity of the lesion. Small fibroadenoma appears avascular on color Doppler study. However, large fibroadenomas appear vascular with minimal flow and a high resistive index.

Complex cystic lesion seen in 2 patients (1%) as well defined, rounded shape, irregular outline, thick wall, internal echoes causing posterior enhancement. 2 patients (1%) had a malignant mass which was visualized as irregular ill-defined mass vertically oriented with breast planes and causing posterior shadowing.

4. Statistics

Table 1: Descriptive Statistics of Age

No. 210	
Mean	30.40
Std. deviation	7.763
Minimum	19
Maximum	46

Table 2: Frequency of Marital State

Marital state	Frequency	Percent
Married	126	60.0
Un married	84	40.0
Total	210	100.0

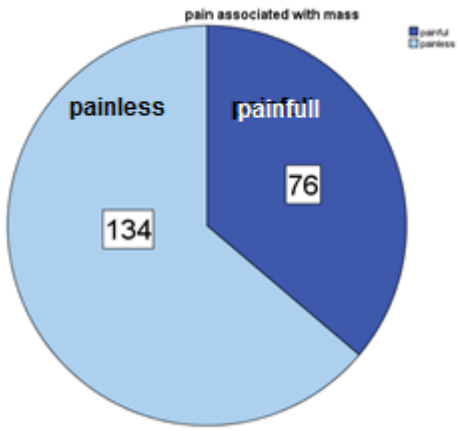

Figure 1: Frequency of Pain Associated with Mass

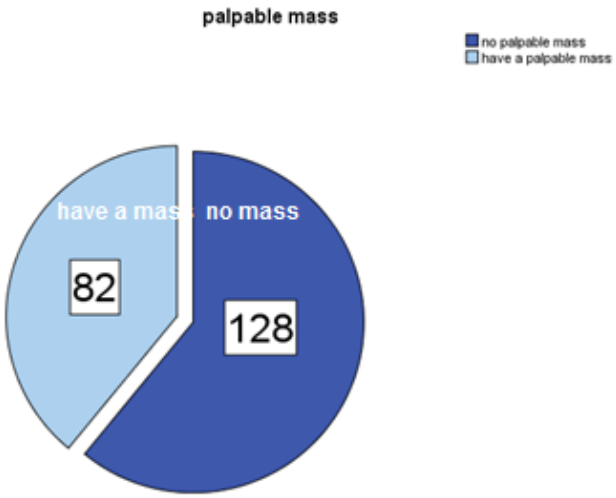

Figure 2: Frequency of Palpable and Non- Palpable Mass

Table 3: Ultrasound Finding

	Frequency	Percent
Normal Breast Tissue	99	47.1
Simple Cyst	79	37.6
Fibroadenoma	28	13.3
Complex Cyst	2	1.0
Solid Mass Suspicious Malignancy	2	1.0
Total	210	100.0

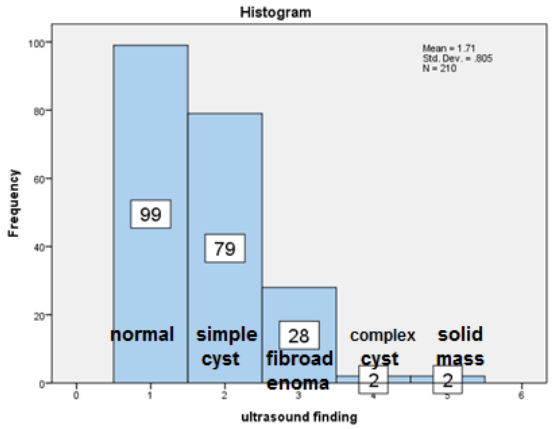

Figure 3: Frequency Ultrasound Finding

5. Discussion

Fibrocystic breast disease is the most typical benign breast disease, which is seen in millions of ladies in the world. It is a broad term that involves a wide spectrum of breast conditions affecting women of childbearing age. Histologically, it is divided into nonproliferative breast lesions and proliferative breast lesions. Nonproliferative breast lesions include simple breast cysts, stromal fibrosis, and apocrine metaplasia. The proliferative type includes ductal epithelial hyperplasia and sclerosing adenosis. The nonproliferative type has a low risk of breast cancer, while a high risk of cancer accompanies the Proliferative lesions with cell atypia.

The patient complains of pain before menstruation bilaterally that may or may not be associated with a palpable mass. Edematous skin and nipple discharge may be seen.

This study was done in an ultrasound clinic with a standard breast with no lesion in 99 females (47.1%). Simple cysts appear with a well-defined anechoic lesion and a thin wall, causing posterior enhancement detected in 79 females (37.6%) (Figure 4, 5). Fibroadenoma has a well-defined oval shape, regular outline, and low-level internal echoes with a transverse diameter more than the anteroposterior diameter seen in 28 females (13.3%). Complex cysts appear in ultrasound as thick wall cystic lesions and lobulated margins, causing posterior shadowing in 2 cases (1%). Suspected malignant lesions were seen in 2 cases (1%). B-mode and Doppler ultrasound are used to characterize lesions, which help differentiate malignant from benign lesions and the precision of making the judgment for biopsy (Lee *et al.*, 2017).

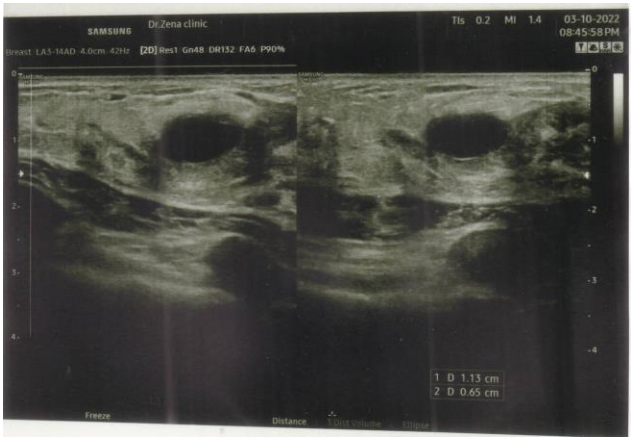

Figure 4: Ultrasound Image of 34 Year Old Female Show Simple Cyst Measure 11x 6.5mm in Left Breast

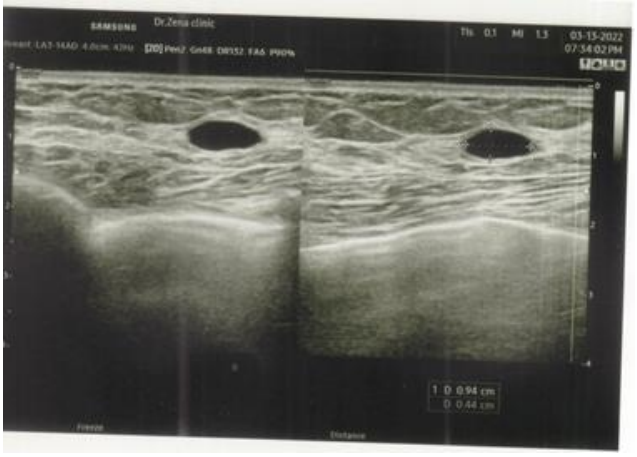

Figure 5: Ultrasound Image of 29 Years Old Female Show Simple Cyst in Right Breast Measure 9.4 x 4.4mm.

Detection of abnormal breast lesions by B-mode ultrasound can be further assessed by additional functions in ultrasound, such as elastography, which helps differentiate lesions. Sonoelastography can determine the relative

elasticity of suspicious masses compared to the surrounding tissue. Strain ratio is used to determine the elasticity of breast lesions compared to adjacent fatty tissue; malignant lesions are stiffer than normal tissue (Gheonea, Stoica and Bondari, 2011), (Ranjkesh *et al.*, 2020). Both color Doppler and elastography can alter how breast lesions are managed, as demonstrated

at screening ultrasound (Sehgal *et al.*, 2006). Both mammography and ultrasound can increase the rate of early detection of cancers even though decreasing interval cancers in females with dense breasts (Hooley *et al.*, 2012), 20. Ultrasound plays a vital role in detecting and differentiating masses, whether benign or malignant, and with the help of elastography, can aid in diagnosing cancer (Sehgal *et al.*, 2006). Ultrasound of the breast is widely used as a screening tool for mass lesions and can differentiate cystic from solid masses. It is also used as an adjunct with mammography for distinguishing solid masses, whether benign or malignant 21.

6. Conclusion

(Kim, Kim and Moon, 2020)Ultrasound is highly

used in breast diseases as it is a simple, non-invasive, non-expensive imaging technique for the detection of breast lesions and also for the characterization of the lesion, which could be either benign or malignant lesions.

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