

Comparison between Mammography and Breast Ultrasound in the Detection of Breast Cancer in Dense Breast Tissue among a Sample of Iraqi Women

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Abstract:

Background: Breast cancer is the most common cancer reported in women worldwide. In Iraq, it is the most common registered malignancy. Mammography plays a major role in the early detection of breast cancers. Dense breast parenchyma has been reported to be the most important inherent factor that limits depiction of breast cancer on mammogram, and often needs supplementary breast ultrasound for complete assessment.

Objectives: To evaluate and compare the diagnostic performance of mammography and ultrasound in the detection of breast cancer in dense breast tissue.

Patients and methods: A record review study was performed in the Oncology Teaching Hospital/ Medical City from April 2018 to December 2018. The study included forty five females, who attended the Main Referral Center for Early Detection of Breast Tumors during 2017 and 2018 were diagnosed with breast cancer histopathologically. They had dense breast tissues on mammography (either heterogeneously dense breast tissue i.e. category C or extremely dense breast tissue i.e. category D). All patients underwent subsequent breast ultrasound. Their information including the mammogram findings, breast ultrasound, fine needle aspiration (FNA) and biopsy results were reviewed analyzed and compared.

Results: Twenty four patients (53.3%) had heterogeneously dense breast tissue (ACR category C) and 21 patients (46.6%) had extremely dense breast tissue (ACR category D). The mammogram detected 36 from 45 breast cancers (80%) while 9 (20%) were not detected by mammogram, so the mammogram had a detection rate of breast cancer of 80% in mammographically dense breast, while breast ultrasound had higher detection rate of about 97.7%. The sensitivity of mammography in extremely dense breast tissue was about 71% and in heterogeneously dense breast was about 87% while ultrasound had shown a higher sensitivity with increasing tissue density (98% vs. 100%).

Conclusion: Breast cancer can be easily obscured and missed in mammographically dense breast tissue due to overlapping surrounding fibroglandular tissue and additional complementary breast ultrasound is highly recommended for a thorough evaluation and to depict mammographically occult breast carcinoma.

Keywords: mammography, ultrasound, dense breast tissue, obscured breast cancer.

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Introduction:

Breast cancer is the most common cancer reported in women worldwide, accounting for 16% of all female malignancies (1, 2). Previous studies from Iraq have reported that breast cancer is the most common registered malignancy (3) and most of the cases are often reported in middle aged women (4). Mammography plays a major role in the early detection of breast cancers, detecting about 75% of cancers at least a year before they can become symptomatic (5,6). Missed breast cancers on mammogram may be attributed to several factors which include dense breast parenchyma that may obscures a small lesion, poor patient positioning or improper technique, misinterpretation of a suspicious

breast lesion as benign, errors of perception, gradual growth of a lesion, and subtle features of malignancy (7). Dense breast parenchyma has been reported to be the most important inherent factor that limit depiction of breast cancer on mammography, and often needs supplementary breast ultrasound for complete assessment (8). Furthermore, dense breast tissues by itself is associated with increased risk of breast malignancy and also reduces the sensitivity of mammogram in cancer detection to as low as 30-48% (9). Breast density is the relative amounts of glandular tissue and fat in the breast and it ranges from nearly completely fatty tissue to nearly completely fibroglandular tissue, which affects the appearance of the breast on mammograms. The American College of Radiology (ACR) -Breast Imaging Reporting and Data System (BI-RADS) Atlas had classified breast density

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into four categories (7). Breast tissue that is almost entirely fatty is classified as category A, scattered fibroglandular tissue classified as category B, heterogeneously dense breast tissue as category C and extremely dense breast tissue as category D.

Patients and Methods:

A retrospective record review was performed in the Oncology Teaching Hospital/ Medical City in Baghdad from April 2018 to December 2018. The study included forty five females, who attended the Main Referral Center for Early Detection of Breast Tumors during 2017 and 2018 and diagnosed with breast cancer histopathologically. They had dense breast tissue on mammogram (either heterogeneously dense i.e. category C or extremely dense breast tissue i.e. category D). Their information including the mammogram findings, breast ultrasound, FNA and biopsy results were reviewed analyzed and compared.

All mammogram were performed using the Analoge mammogram-Seimens. Two mammographic views were taken; craniocaudal and mediolateral oblique views. The mammographic images were analyzed by a specialist radiologist. The mammographic findings are recorded according to the BIRADS lexicon and include: Any detectable breast mass and its morphology(shape, margin, density, site), microcalcifications (grouped , scattered, regional,...) , an architectural distortion , skin thickening , nipple retraction , etc.....

The mammogram findings of those patients were either: No detectable abnormality because the breast density obscured it and further evaluation is needed, focal asymmetry, findings that were suspicious for malignancy such as architectural distortion, grouped microcalcification, etc.... and mammographic findings that are highly suggestive of malignancy i.e. an irregular radiodense mass. Complementary breast ultrasound was done for all patients by a specialist radiologist. The ultrasound findings were subsequently performed and the findings were classified. Ultrasound-guided FNA had been performed for all

patients and then biopsied .The corresponding cytological and histopathological results were registered.

Inclusion criteria:

Women aging 35 years old and older with dense breast tissue (category C and D) were included.

Exclusion criteria:

Women on hormone replacement therapy.
Lactating and pregnant women.
Postoperative cases.

Statistical analysis:

The collected data were tabulated and analyzed using Microsoft Excel 2010. The categorical data were presented as frequency and percentage tables.

Results

Forty five female patients with dense breast tissue (ACR breast density category C or D) and with histopathologically proven breast cancer were included. All patients had breast ultrasound and mammogram. Twenty four patients (53.3%) had heterogeneously dense breast tissue (ACR category C) and 21 patients (46.6%) had extremely dense breast tissue (ACR category D). The mean age of the patients was 44.5 years, ranging from (35 to 62 years). The mammogram detected 36 out of 45 breast cancers (80%) while 9 (20%) were not detected by mammogram. Of these nine patients, 6 had extremely dense breast (category D) and 3 had heterogeneously dense breast tissue (category C). No mammographic abnormality was detected in seven of 9 cases. The other two cases appeared as an area of focal asymmetry on mammogram. All these overlooked breast cancers on mammography were detected by subsequent ultrasound examination, which revealed features suggestive of malignancy (BI-RADS IV & V) and all proved to be malignant by subsequent histopathological study. The characteristics of breast cancer not depicted by mammogram are summarized in table 1.

Table 1: The characteristics of breast cancer cases not detected by mammogram

cases	Age (Years)	BI-RADS density	Mammography findings	Maximal Tumor size by US (mm)	US BI-RADS
1	41	D	focal asymmetry	8	BIRADS IV
2	38	D	No detectable abnormality	15	BIRADS V
3	55	C	No detectable abnormality	18	BIRADS V
4	40	C	No detectable abnormality	9	BIRADS IV
5	45	C	focal asymmetry	10	BIRADS IV
6	35	D	No detectable abnormality	13	BIRADS V
7	43	D	No detectable abnormality	14	BIRADS V
8	36	D	No detectable abnormality	16	BIRADS V
9	52	D	No detectable abnormality	10	BIRADS V

The 36 detected breast cancer on mammogram (80%); appeared as an irregular radiodense mass in 13 cases (28.8%), a radiodense mass with partially obscured margin in 11 cases (24.4%), grouped malignant appearing microcalcifications in 5 cases (11.1%), grouped microcalcifications with architectural distortion in 4 cases (8.88%), only architectural distortion in one case (2.2%), and a thickened skin with edematous breast tissue in two cases (4.44%). Malignant features were detected in breast ultrasound of all of these cases except one which appeared on mammography as an area of architectural distortion.

Table 2: Appearance of detected breast cancer on mammography

Mammographic findings	NO.	Percentage*
Irregular spiculated radiodense mass	13	13/45 (28.8%)
radiodense mass with partially obscured margin	11	11/45 (24.4%)
Grouped microcalcification +architectural distortion	4	4/45 (8.88%)
Grouped microcalcification	5	5/45 (11.1%)
Architectural distortion	1	1/45 (2.2%)
Thickened skin with edematous breast parenchyma	2	2/45 (4.44%)
TOTAL	36	36/45 (80%)

* Calculated out of a total of 45 cases

In this study, mammography had a detection rate of breast cancer of 80% in mammographically dense breast, while breast ultrasound had the higher detection rate of about 97.7%. Similarly, the sensitivity of breast ultrasound in heterogeneously dense breast and extremely dense breast was found to be higher than mammography. In the current study, the sensitivity of mammography in extremely dense breast tissue was about 71% and in heterogeneously dense breast was about 87% while ultrasound had shown a higher sensitivity with increasing tissue density (98% VS 100%). Sensitivity was measured based on histopathological results as the gold standard.

Discussion

Previous studies evidence revealed that mammography can depict breast malignancy early in apparently healthy women aging 50 to 70 years and subsequently decreasing the mortality rates from breast cancer. Mammography, however, is not so perfect to depict all breast cancers and may miss some cancers in certain cases, particularly in dense breasts. In those women with dense breasts, the normal breast parenchyma and the tumor are difficult to differentiate from each other mammographically. For this reason, some supposed that the addition of ultrasound for those women along with the mammography will detect these tumors that are obscured and missed by mammography alone (10).

In the current study, 24 patients (53.3%) had heterogeneously dense breast tissue (ACR category C) and 21 patients (46.6%) had extremely dense breast tissue (ACR category D). The mammogram detected 36 out of 45 breast cancer cases, missing 9 cases, so the detection rate of the mammogram in this study was 80%. This was in agreement with the study of Okello J. et al in which mammograms detected about 16 out of 22 breast cancer cases, missing six cases, with the detection rate of mammogram of 73% (11). Breast ultrasound had a higher detection rate of about 97.7% in dense breast tissue in this study.

Similarly, this study showed that the sensitivity of mammogram in heterogeneously dense breast was 87% and in extremely dense breast tissue was 71% ,i.e. ; decreasing mammographic sensitivity with increasing breast density ,while ultrasound had a higher sensitivity with increasing tissue density (98% in heterogeneous dense breast VS 100% in extremely dense breast) . These results were in accordance with those of Disha et. al. and many other previous studies (12-15).

Two cases of breast cancer which appeared on mammogram as focal asymmetry (i.e. no typical malignant features were present), the ultrasound had showed an ill-defined hypoechoic area at corresponding region (US BIRADS IV) and subsequently proved to be malignant histopathologically. This was in agreement with what was reported by Samarder et.al. in that focal asymmetrical breast density although is repeatedly seen at mammography and usually due to overlapping fibroglandular tissue but sometimes it is due to a hidden malignancy (16).

All obscured breast cancer cases on mammogram in this study were less than 20 mm in maximal diameter when subsequently evaluated by ultrasound and these represent early stage of breast cancer which expected to have favorable prognosis .These findings were in accordance with what was reported by Okello et.al (11).

Conclusion:

Breast cancer can be easily obscured and missed in mammographically dense breast tissue due to overlapping surrounding fibroglandular tissue. Additional complementary breast ultrasound is highly recommended for a thorough evaluation and to depict mammographically occult breast carcinoma.

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مقارنة بين فحص الثدي بالأشعة السينية (الماموگرافي) والفحص بالموجات فوق الصوتية (سونار الثدي) في كشف سرطان الثدي في نسيج الثدي ذو الكثافة العالية وسط عينة من النساء العراقيات

م.د. هبة محمد عبد الواحد

الخلاصة:

خلفية البحث: يعد سرطان الثدي من أكثر السرطانات شيوعاً في النساء في العالم، وهو سرطان الثدي هو أكثر السرطانات المسجلة في العراق. يلعب فحص الثدي بالأشعة السينية (الماموگرافي) دور أساسي في الكشف المبكر عن سرطان الثدي. ويعد نسيج الثدي الكثيف من أهم العوامل المتصلة التي تحد من كشف وتحري سرطان الثدي بواسطة أشعة الماموگرام وغالباً ما يحتاج لفحص الثدي بالموجات فوق الصوتية (السونار) لإكمال تقييم الحالة. إضافة إلى ذلك، نسيج الثدي الغدي الكثيف يحد ذاته مصحوب بزيادة خطر الإصابة بسرطان الثدي ويقلل من حساسية الماموگرام في اكتشاف السرطان.

هدف الدراسة: لتقييم ومقارنة الأداء التشخيصي للأشعة السينية (الماموگرام) والموجات فوق الصوتية (سونار الثدي) في اكتشاف السرطان في نسيج الثدي الكثيف.

المرضى وطرق العمل: دراسة مراجعة للملفات تمت في مستشفى الأورام التعليمي في مجمع مدينة الطب في بغداد للفترة من نيسان 2018 إلى كانون الأول 2018. شملت الدراسة 45 مريضة ممن راجعوا المركز المرجعي الرئيسي للكشف المبكر عن أورام الثدي خلال 2017 و 2018 وتم تشخيصهن بسرطان الثدي بواسطة الفحص النسيجي. كان نسيج الثدي لهؤلاء المريضات ذو كثافة عالية وهو إما نسيج كثيف غير متجانس (مجموعة C) أو نسيج كثيف جداً (مجموعة D). فحص الثدي بالسونار أجري لكل المريضات. تمت مراجعة معلومات المريضات واضبارتهن فيما يخص نتائج أشعة الماموگرام وسونار الثدي ونتائج السحب بالابر (FNA) ونتائج الخزعة تمت مراجعتها وتم تحليل النتائج وتسجيلها.

النتائج: تمت دراسة خمسة وأربعون مريضة ذات نسيج الثدي كثيف ومشخصة بسرطان الثدي. وجد أن 24 مريضة (53.3%) لديهن نسيج الثدي كثيف غير متجانس (مجموعة C) و 21 مريضة (46.6%) لديهن نسيج الثدي كثيف جداً. أشعة الماموگرام اكتشفت 36 حالة سرطان الثدي من بين 45 حالة (80%) بينما 9 حالات مرت غير مكتشفة بأشعة الماموگرام (20%) فتكون نسبة اكتشاف سرطان الثدي بواسطة أشعة الماموگرام (80%) في نسيج الثدي الكثيف. بينما فحص الثدي بالسونار لديه نسبة اكتشاف أعلى حوالياً (97.7%). كانت حساسية الأشعة السينية (الماموگرام) في نسيج الثدي الكثيف جداً 71% وفي نسيج الثدي الكثيف غير المتجانس 87% بينما تزيد حساسية الموجات فوق الصوتية لاكتشاف الورم مع زيادة كثافة النسيج الغدي للثدي (98% للنسيج الكثيف غير المتجانس و 100% للنسيج الكثيف جداً).

الاستنتاجات: سرطان الثدي يمكن أن يمر غير مشخص في أشعة الماموگرام للنسيج الغدي الكثيف بسبب تراكم وتداخل النسيج الغدي للثدي وسونار الثدي المكمل مطلوب في هذه الحالات لتقييم الحالة تفصيلاً ولوصف واكتشاف سرطان الثدي العابر غير المشخص بأشعة الماموگرام.

الكلمات المفتاحية: أشعة الثدي (الماموگرافي)، فحص بالموجات فوق الصوتية، نسيج ذو كثافة عالية، سرطان الثدي المستتر