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Agreement of Breast Masses Description using Breast Imaging Reporting and Data System (BIRADS) with Traditional Interpretation of Digital Mammography

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Abstract— Interpretation of mammograms plays a significant role in the final diagnosis, follow-up and treatment.This cross-sectional study aimed to assess breast imaging reporting and data system (BIRADS) agreement with the traditional interpretation in breast mass descriptions. The study was conducted from October 2015 to July 2019 at different Khartoum hospitals with digital mammographic units. The study included 300 mammographic images for women aged 15 to 90 years. A data collection sheet was used, including BIRAD mass assessment factors: presence, shape, margin, and density. Radiologists reported the mammographic images according to the traditional way of reporting; then, images were evaluated according to the BIRAD to define the degree of concordance between them. Kappa value was used to assess the degree of agreement. The study revealed that mass presence had a very good agreement between the methods (k = 0.835), and mass density had a good agreement (k = 0.742). A moderate agreement was seen between the two methods regarding the shape of mass (k = 0.529) and its margin (k = 0.475).The study concluded that there was a degree of difference in the description of the findings.Therefore, it is essential to follow the standard lexicon, which avoids any misunderstanding or confusion and facilitates breast lesions assessment and follow-up.

Keywords: Agreement, Reporting, Breast Mass, BIRADS, Mammography

1. Introduction

Mammography is the first breast imaging procedure used to assess women with breast signs or symptoms that may indicate cancer [1]. For writing a mammography report, many steps should be followed. These stepsare:describe the indications of the study, breast composition, and the important findings, compare results with previous investigations, writethe final assessment and recommendations, and communicate with the referring physician for unsuspected findings [2].

Regarding the final assessment step, the radiologist can use the traditional way of reporting, which means the radiologist uses his own words and terms for describing the results or uses Breast Imaging Reporting and Data System (BIRADS), which is provided by the American College of Radiology (ACR) [3].

In BIRADS, there are specific words and terms that should be used, which is called the BIRADS lexicon. In the lexicon related to mammography (because there are ultrasound and magnetic resonance ones), there are specific terms related to breast composition, mass, asymmetry, architectural distortion, calcifications, and associated features [4].

The results are sorted into categories numbered 0–5 with associated management recommendations [5].

BIRADS Assessment Categories are 0: Inconclusive, 1: Negative, 2: Benign finding(s), 3: Probably benign, 4: Suspicious abnormality, 5: Highly suggestive of malignancy, and 6: Known biopsy-proven malignancy [6]. Concerning "mass" in the mammography lexicon, radiologists describe the shape, including oval, round or irregular mass, margin which includes circumscribed, obscured, microlobulated, indistinct, and speculated, density which includes low, equal, and high [7],Figure(5) and (6).

Because of the wide variability of the mammography practice and the difference in the description of lesions between radiologists, comes the importance of the BIRADS system [8], which provides a complete approach to standardizing both lesion descriptions and management recommendations [9]. Despite this, still there radiologists are using the traditional way of reporting.So, the study aimed to assess the agreement of BIRADS with the traditional interpretation of digital mammography in breast mass description.

2. Methods

2.1 Patient selection and place of the study

Three hundred mammographic images for women aged 15 to 90 years taken craniocaudal (CC) and mediolateral oblique (MLO) were included. The study was conducted with digital mammography units from October 2015 to July 2019 at different hospitals in Khartoum, Sudan.

2.2 Study design

Data collection sheet contained variables are related to mass in BIRAD (the presence of mass, shape, margin, and density) was used to collect data from the picture archiving and communicating system (PACS). First, radiologists reported the mammographic images according to the traditional way of reporting; then, the images were evaluated according to the BIRADS to define the degree of concordance between the two methods.IBM SPSS version 23 software was used for data analysis. Kappa value was used to assess interobserver variability. Perfect agreement is indicated by a kappa value of 1, a value < 0.20 indicates poor agreement, a value between 0.41 and 0.60 shows moderate agreement, a value indicates good agreement between 0.61and 0.80 and a value between 0.81 and 1.00 marks very good agreement.

2.3 Ethical considerations

The study was approved by all relevant ethics committees. Data was only used for study purposes without individual details identifying the patient.

3. Results

Concerning the patients' age, 18 out of 300 aged 15 - 30 years (6%), 69 patients aged 31 -45 years (23%), 120 patients aged 46 - 60 years (40%), this is the most abundant age group. On the other hand, there were 78 out of 300 patients aged 61 - 75 years (26%) and 15 aged 76 - 90 years (5%).

In routine interpretation, mass was present in 207 (69%) patients and absent in 93 cases (31%).However, in BIRAD, the mass present in 186 (62%), absent in 102 (34%), and 12 (4%) of subjects were undefined, Figure (1).

In both ways of reporting, the radiologists use the following terms to describe mass shape: oval, round, irregular and lobulated.The routine interpretation found 51 (24.6%) ovale, 27 (13%) round, 126 (61%) irregular, 3 (1.5%) lobulated masses out of 207. In BIRAD, there are 69 (37%) oval masses, 45 (24%) round, 126 (61%) irregular, and 3 (1.4%) lobulated masses out of 207, Figure (2).

Regarding mass margin, the descriptor words are: circumscribed, obscured, microlobulated, indistinct and speculated. In routine interpretations the readings were 45 (22%), 9 (4%), 3 (1.4%), 66 (32%) and 84 (41%) respectively while in BIRAD there were 45 (22%), 21 (10%), 27 (13%) 33 (16%), 48 (23%) and 12 (6%) respectively, Figure (3).

High-density masses were found in 156 (75%) cases according to routine interpretation and 120 (58%)

according to BIRADS. The equal density masses (isodense) were found in 45 (22%) for routine interpretation and 60 (29%) for BIRAD. The last descriptor is low density (fat-containing) masses.The result in the two methods was equal; 6 (3%), Figure (4).

The concordance of BIRAD findings with the findings in the routine interpretation was tested by Kappa (K) value. Avery good agreement was achieved for the presence of mass (k=0.83). The agreement was moderate for the mass shape, (k= 0.529) and margin (k=0.475). Mass density reflectedgood agreement (k=0.742) ,Table (1).

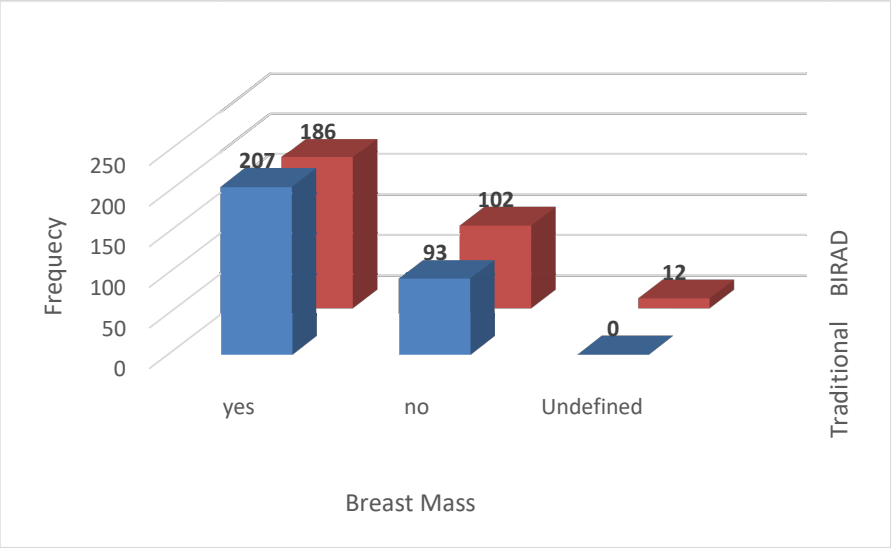

Figure (1): distribution of samples according to the presence of breast masses

Figure demonstrates the frequency of the presence (yes) and absence (no) of the breast mass according to traditional and BIRAD methods

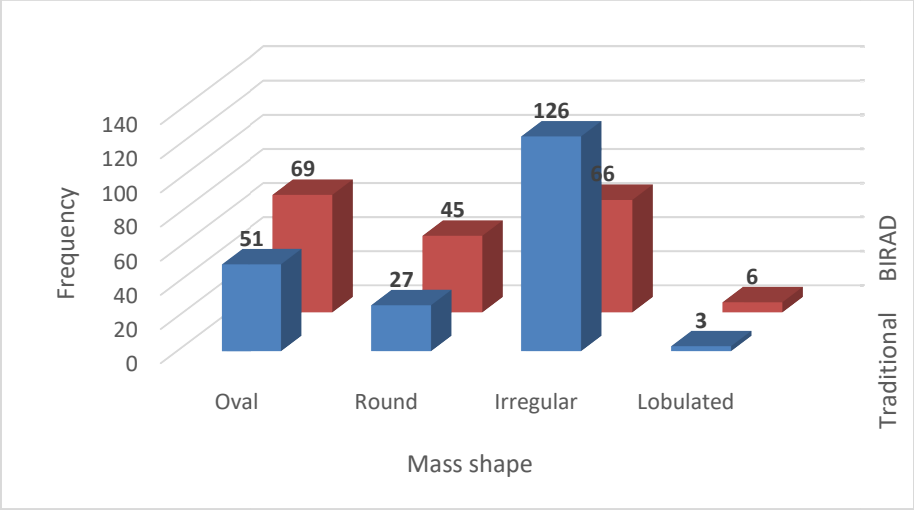

Figure (2): distribution of samples according to the shape of mass.

Figure demonstrates the frequency of the different shapes of breast mass according to traditional and BIRAD methods

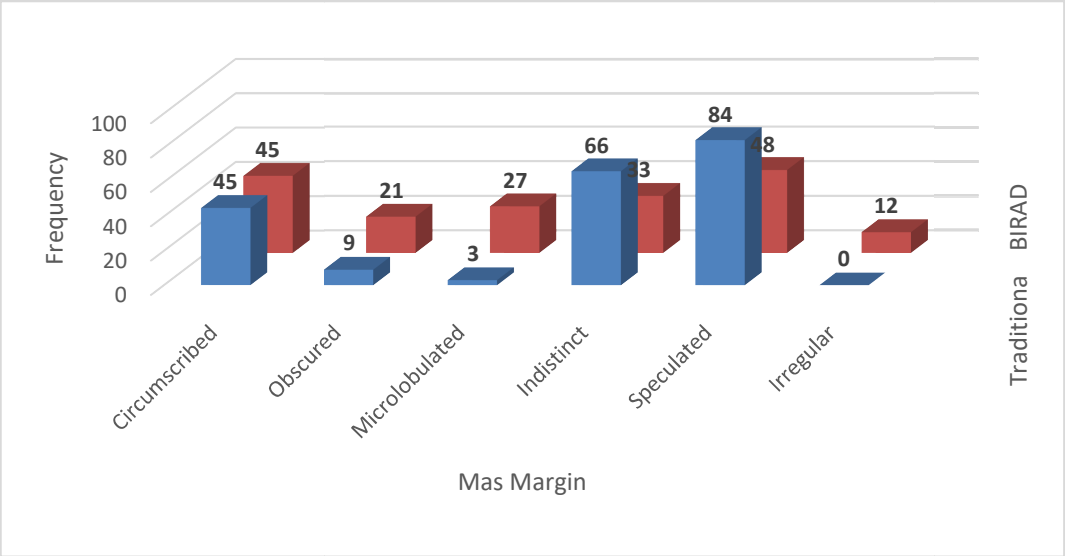

Figure (3): distribution of samples according to the margin of mass.

Figure demonstrates the frequency of the breast mass margin shapes according to traditional and BIRAD methods

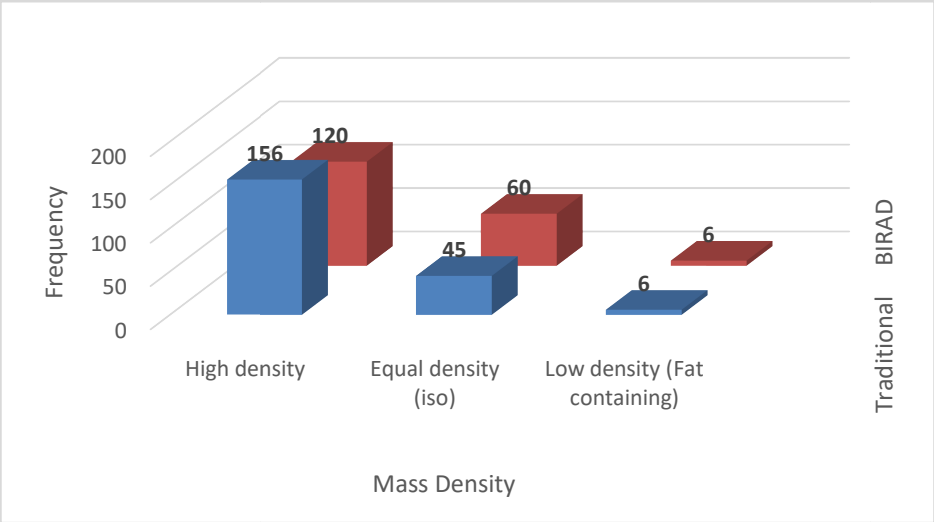

Figure (4): distribution of samples according to the mass density.

Figure demonstrates the frequency of different mass densities according to traditional and BIRAD methods

Table (1): Agreement of BIRADS findings with the findings in the traditional interpretation (Kappa (K) value).

Parameter		K-value
Mass	Presence	0.835
	Shape	0.529
	Margin	0.475
	Density	0.742

4. Discussion

Description of breast mass plays a significant role in the final diagnosis, follow-up, and methods of treatment. In addition, focusing on mass description may help increasethe reliability in mammogram interpretation [3]. BIRAS provides descriptive terms that help the radiologist describe the lesion very well.

This study discusses only the difference between traditional and BIRADS methods regarding mass description.

The age group between 46 and 60 years (40%) was the commonest. The result goes with previous studies[10],which mentioned that sensitivity and specificity for mammography are higher below the age of 50 than for patients above 50.

The study results demonstrated the variability in readings between the two methods. Figure (1) illustrates the interobserver variability according to the presence of breast mass. For example, BIRADS had 12 undefined masses because they were classified as category (1), which needed more investigations while there was no undefined mass in the traditional method.

The shape and margin are the most discriminating morphological criteria between benign and malignant masses. According to figure (2), variability was detected in all types of mass shapes. In routine interpretation, most descriptors used the word irregular (61%) to describe the mass shape.However, most descriptors used in BIRAD the word “oval” (37%) because the lexicon of BIRADS recommended describing the shape regardless of the margin that should be described separately.Most circumscribed masses are benign. Nevertheless, certain malignant lesions with a risk of malignancy may appear in the mammography in this falsely reassuring form [11].

Regarding the distribution of readings according to the mass margin., the frequency of circumscribed mass wasthe same in both methods, and the variability was seen among the other types of mass marginFigure (3). The word “irregular” was present only in the BIRAD lexicon.The irregular shape with spicules growing margin into the surrounding tissue is more likely to be malignant [12].

The mass density is a good indicator of tumor benignancy or malignancy. High density is usually associated withmalignancy[13]. Figure (4) demonstrated the equal frequency of low-density mass, and variability was detected in equal(iso) and high densities.

Table (1) demonstrates BIRADS findings concordance with the traditional interpretation according to Kappa (K) value. All values were less than 1. That means there was no total agreement. This study revealed that the mass's presence indicated a very good agreement. Despite the high agreement level, the discrepancy in the presence and absence of mass can affect patient life. A moderate agreement was found between the two approaches regarding the shape of the mass and its margin. The result indicated a difference in the wordswere used to describe mass shape between BIRADS and routine interpretation. Therefore, Kappa values for shape and margin were less than mass presence and density because the variability among radiologists in the traditional way was high.

The density showed a good agreement between the methods. Determination of the mass density as hyper, iso, or low may differ a little bit visually, but not always an area of disagreement.

5. Conclusion and recommendation

Efforts to reduce variability in interpretations may help increase mammograms' efficacy using BI-RADS. This study showed the difference in the description of findings using mammography. Therefore, it is essential to follow the standard lexicon to diagnose mammography images, avoid misunderstanding, inconsistencies, or confusion, and facilitate assessment and follow-up of breast lesions.

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Appendix

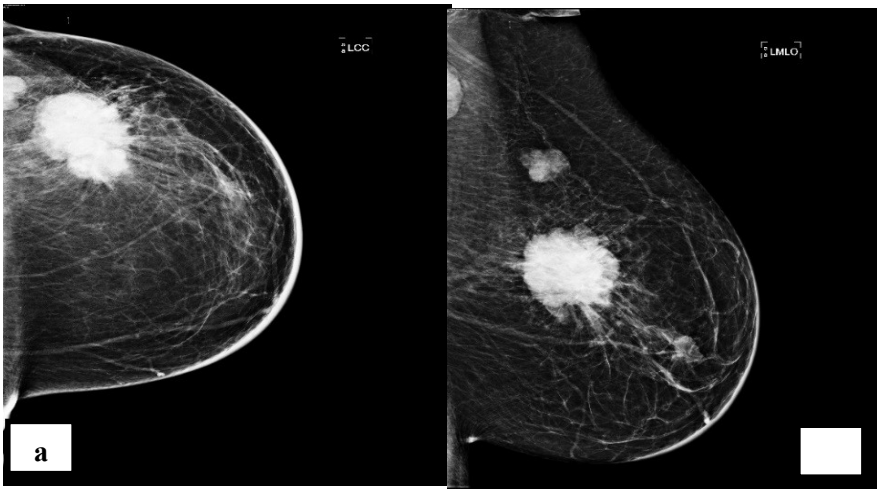

Figure (5): a, CC and b, MLO for the left breast of the patient aged 70 years, show high-density lobulated shape mass with speculated margin, the location of the mass is left upper outer quadrant (central mass).Breast composition is assigned as fatty (a). There is an associated feature as multiple axillary tail and left axillary lymph Adenopathy. The final diagnosis is highly suggestive of malignancy (BITAD 5).

(*The images were taken with the permission of Dar Al Elaj Center, Khartoum*)

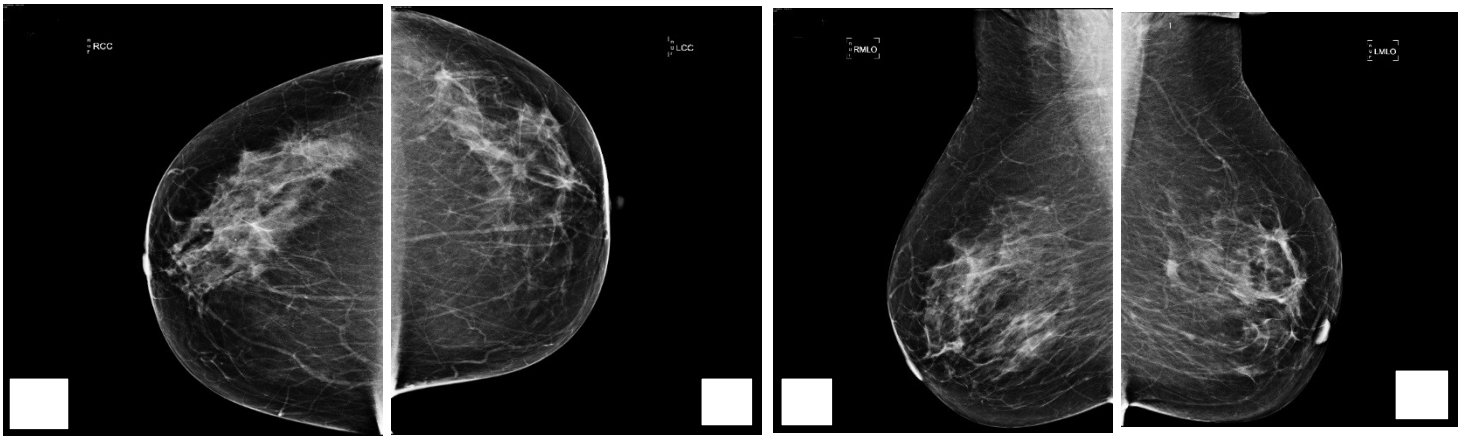

Figure (6): a, CC. c, MLO mammographic image of right breast.b, CC. d, MLO mammographic image of left breast for 60 years old patient. The image shows left breast mass with an irregular shape, ill-defined margin, and high density at the left upper outer quadrant. The breast composition is assigned as scattered fibroglandular (b) with architectural distortion. The final diagnosis is a suspicious malignancy (BITAD 4).

(*The images were taken with the permission of Antalya Medical Center, Khartoum*)