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BREAST CANCER DETECTION USING COMPLIMENTARY ULTRASOUND IN WOMEN WITH MAMMOGRAPHICALLY DENSE BREASTS

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Abstract:
Objective: The purpose of this study was to assess the effectiveness of US scanning for detecting breast cancer in women with mammographically dense breasts.
Material and Methods: The current descriptive cross-sectional was conducted at the Department of Diagnostic Radiology, Khyber Teaching Hospital Peshawar from January 2021 to July 2021. Women with mammographically dense breasts and from 35 to 70 years of age were selected for the study. Age, gender, menopausal state, rationale for mammography, mass lesion appearance on mammography, sonographic BI-RADS descriptors, BI-RADS final evaluation classification, and histological diagnosis are examples of sociodemographic information.. All subjects underwent bilaterally complete breast ultrasound scans using a Toshiba Xario 200 machine. SPSS version 24 was used to create frequency tables and proportions that summarized both nominal and categorical data.
Results: In the present study, a total of 178 mammograms were performed, out of which 88 patients with BI-RADS density grade 3 or 4 (mammographically dense breast tissue) underwent bilateral breast ultrasound scans. The mean age of the participants was 55 years, additionally, the BI-RADS lexicon was used to identify and describe 62 lesions, which were then categorized for final assessment. As the most common histological type, ductal carcinoma was responsible for 47% of cases, second only to adenocarcinoma.

Conclusion: The present concluded that breast ultrasounds may significantly increase the diagnostic rate of breast cancer in symptomatic patients having mammographically dense breast tissue (about 29.50%). There it would be better to do a complimentary ultrasound on a daily basis in those patients having mammographically dense breasts in limited resource settings, in order to diagnose breast cancer accurately.

Keywords: Sonography, Mammography, BI-RADS, Breast Cancer, Biopsy

Introduction:

One of the main causes of cancer death for women globally is breast cancer, which is prevalent in women [1]. It has been shown that mammography, a common screening and diagnostic procedure, lowers the

mortality rate from breast cancer [2,3]. Nevertheless, mammography's sensitivity is decreased by extensive glandular structures, leading to a late diagnosis and more adverse outcomes [4]. When used in in combination with mammography, ultrasonography as well as MRI (magnetic resonance imaging) can help detect breast lesions in breasts with dense tissue. Moreover, In dense breasts, US is a frequently used modality for early breast cancer detection [5,6]. The overlap between nodules that are benign and malignant on sonography might lead to unnecessary biopsies, which is a significant restriction in the US. US elastography (ES), a new technology, enhances the diagnostic usefulness of the US [7,8]. The American College of Radiology's (ACR) fifth version of the Breast Imaging Report and Data System (BI-RADS), which recommends risk categorization of breast lesions based on questionable conventional US characteristics and elastography, now includes ES [9]. Breast density reflects the makeup of breast tissue as well as the different x-ray attenuation characteristics of glandular as well as fat tissues. If a woman's breast tissue is extremely dense or varied, she is considered to possess high mammographic density. There are two primary problems for women with dense breasts: first, more breast density lowers both the specificity and the sensitivity of mammography, and second, the breast density itself raises the probability of breast cancer [10]. The cancer of the breast is the most prevalent type of cancer in women, accounting for around an additional 2.3 million cases (11.7%) globally and having a high fatality rate [11]. The GLOBOCAN 2020 report states that over half a million people worldwide die from breast cancer each year, with an age-standardized incidence of 47.8 per million [12]. In recent years, the prevalence of breast carcinoma has been rising globally, and Pakistan has seen a similar pattern of increase. Pakistan has an age-standardized occurrence rate of 104 cases of breast cancer per million people and a death rate of 65 cases per million [13]. Ultrasonography (US) is a popular complement to MMG in China, providing additional patient benefits. Observational studies suggest that combining MMG with the US can improve detection rates in women with dense breasts [14]. Therefore, due to the trend and high incidence of breast cancer among females, this study was conducted by using complimentary ultrasound in women with mammographically dense breasts for the early and accurate diagnosis of breast cancer.

Materials and Methods:

The current descriptive cross-sectional was conducted at the Department of Diagnostic Radiology Khyber Teaching Hospital Peshawar from January 2021 to July 2021. Women with mammographically dense breasts and from 35 to 70 years of age were selected for the study, in addition, informed consent was obtained from each participant and they were assured that their privacy and confidentiality would be maintained therefore codes were assigned to each. Moreover, those who were on hormonal replacement therapy were excluded from the study. Age, gender, menopausal state, rationale for mammography, mass lesion appearance on mammography, sonographic BI-RADS descriptors, BI-RADS final evaluation classification, and histological diagnosis are examples of sociodemographic information. Needle gauge 14 was used for US-guided core biopsies. In KTH patient first undergo x-ray mammography, which was performed by female technicians, but prior to the imaging each female was guided regarding the procedure to remove the cloths and jewelry as well as electronic devices and only gown was provided to each from the hospital side. Each patient breast was place in bucky tray which was a platform for the placement of breast during mammography. 8 x10 inches cassette was used, moreover, breast and armpit were compressed by using compressing paddle as well as, any skin folds were removed. During the process of imaging the patients were advised to hold the breath and both craniocaudal along with mediolateral views images were taken. After that, patients were advised to get dressed after the imaging. X-ray machine general electronics was used with molybdenum target and molybdenum filters. The ACR BI-RADS atlas density of breasts categories, which were 1, 2, 3, or 4, was used to classify the mammographic breast density category. The principal investigator documented

on the questionnaire the team's final decision about the breast density category and final mammography diagnosis. The team had access to the BI-RADS atlas, which helped resolve disputes between observers that came up during interpretation. All subjects underwent bilaterally complete breast ultrasound scans using a Toshiba Xario 200 machine. SPSS version 24 was used to create frequency tables and proportions that summarized both nominal and categorical data.

Results:

In the present study, a total of 178 mammograms were performed, out of which 88 patients with BI-RADS density grade 3 or 4 (mammographically dense breast tissue) underwent bilateral breast ultrasound scans. The mean age of the participants was 55 years, additionally, the BI-RADS lexicon was used to identify and describe 62 lesions, which were then categorized for final assessment. US-guided biopsy was performed on patients having BI-RADS final assessment category 4 or 5 lesions. Lesion Shape, Growth Orientation, Lesion Borders, Borders Features, Internal Texture, Posterior Acoustic Changes, Calculation, Maximum Lesion Size, and Lymph Node Involvement are some of the BIRADS sonographic descriptors that were used, as shown in Table 2. Table 3 explains and illustrates the diagnostic performance of the ultrasonic scan and mammography. As the most common histological type, ductal carcinoma was responsible for 47% of cases, second only to adenocarcinoma. Table 4 shows that the most prevalent benign tumors were fibroadenomas as shown in Table 4, all 22 of the cases of breast cancer were accurately identified by sonography and included women who were very young, with a mean age of 53.

Table 1: Distribution of BI-RADS Ultrasound Characteristics and Their Relationship to Malignant vs Non-Malignant Results

Ultrasound feature (BI-RADS)	Occurrences : n (%)	Malignant cases: n (%)	Benign cases: n (%)	p-value
Lesion Shape				
Oval shape	10 (16.1)	2 (20.0)	8 (80.0)	0.002
Round shape	24 (38.7)	14 (58.3)	10 (41.7)	
Irregular shape	28 (45.2)	26 (92.9)	2 (7.1)	
Growth Orientation				
Aligned with skin	35 (56.5)	7 (20.0)	28 (80.0)	0.004
Perpendicular to skin	27 (43.5)	25 (92.6)	2 (7.4)	
Lesion Borders				
Wel-defined	30 (48.4)	4 (13.3)	26 (86.7)	0.002

Non- well defined	32 (51.6)	29 (90.6)	3 (9.4)	
Borders Features				
Sharp Interface	42 (67.7)	30 (71.4)	12 (28.6)	0.001
Echogenic Halo	20 (32.3)	18 (90.0)	2 (10.0)	
Internal Texture				
Anechoic	6 (9.7)	3 (50.0)	3 (50.0)	0.114
Hypoechoic	38 (61.3)	25 (65.8)	13 (34.2)	
Complex	16 (25.8)	15 (93.8)	1 (6.2)	
Hyperechoic	2 (3.2)	0 (0.0)	2 (100.0)	
Posterior Acoustic Changes				
No change	0 (32.3)	12 (60.0)	8 (40.0)	0.431
Enhancement	18 (29.0)	11 (61.1)	7 (38.9)	
Shadowing	12 (19.4)	11 (91.7)	1 (8.3)	
Mixed effect	12 (19.4)	10 (83.3)	2 (16.7)	
Calcification				
Microcalcification	16 (25.8)	15 (93.8)	1 (6.2)	0.005
Macrocalcification	3 (4.8)	3 (100.0)	0 (0.0)	
No calcification	43 (69.4)	27 (62.8)	16 (37.2)	
Maximum Lesion size				

< 1 cm	5 (8.1)	1 (20.0)	4 (80.0)	NA
1-2.5 cm	20 (32.3)	12 (60.0)	8 (40.0)	
>2.5 cm	37 (59.7)	34 (91.9)	3 (8.1)	
Lymph node involvement				
Present	39 (62.9)	33 (84.6)	6 (15.4)	NA
Absent	23 (37.1)	10 (43.5)	13 (56.5)	

Table 2: Comparing the Effectiveness of Ultrasound and Mammography in Detecting Breast Masses in Women with Dense Breast Tissue

Mass identified	Mammography results	Ultrasound results	Mammographic Evaluation (BI-RADS Final Rating)	Combined Ultrasound & Mammogram Findings
Yes	58 (65.9)	84 (95.5)	62 (70.45)	88 (100)
No	30 (34.1)	4 (4.5)	26 (29.54)	0 (0)
Total	88 (100)	88 (100)	88 (100)	88 (100)

Table 3: Breast Lumps' Histopathological Distribution

Malignant Conditions	Number (N)	Frequency (%)
Invasive Ductal Carcinoma	7	47%
Infiltrating Lobular Carcinoma	2	13%
Adenocarcinoma	3	20%
Lymphoma	2	13%
Alveolar rhabdomyosarcoma	1	7%

Total	**15**	**100 %**
Non- malignant conditions		
Chronic inflammation	4	33 %
Sclerosing adenosis	3	25 %
Cystic mastopathy	2	17 %
Fibroadenoma	1	8 %
Other benign lesions	2	17 %
Total	**12**	**100 %**

Discussion:

Globally, breast cancer is among the most prevalent cancers. The reduction of cancer-specific mortality is made possible by early identification of women with breast cancer. Mammography nodules can be obscured by dense breasts, and an unfavorable outcome does not always mean that there are no breast lesions present. The most popular supplemental screening methods for people with dense breast tissue are US and MRI; however, there isn't enough data to help decide whether to use both or just one. The goal of the current study is to examine the additional breast cancer detection rate of breast ultrasound as an additional imaging modality used in the assessment of women with dense breasts who exhibit symptoms (BIRADS 3 & 4). We discovered that compared to mammography, US Scan identified 29.50% more malignant tumors. The largest diameter of the missing lesions was probably 10 mm or less. The dense tissues that obscure the view of those little tumors on mammograms may be the cause of these malignant mass lesions being missed. Nevertheless, a US scan that is not influenced by breast density found all of the missed lesions. These results are significant because tumors that are smaller than 20 millimeters are typically early-stage breast cancers that can be treated curatively. Furthermore, according to a study ultrasonography is more widely available than mammograms in our setting, making it a desirable adjunct to mammography [15]. In the present study the total malignancy prevalence in the current study is 17% (15/88), four times higher than the average prevalence of 4.2% found in a previous study among patients who had symptoms with dense mammography [16]. Women with breast cancer were generally young. This result is consistent with research showing that about 29% of women over 52 have thick breasts and are at higher risk for cancer, as are over fifty percent of women between the ages of 37 and 52 [17]. It is challenging to differentiate between cancer and the metabolically active breast tissue that is normal on mammography because tumors and glandular tissue seem similarly dense. Consequently, mammography performance in women with significant breast density is Poor [18,19]. Invasive ductal carcinoma was the most frequent malignancy, accounting for 47% of the results of the histopathology test. This histopathology result is consistent with earlier research [20,21].

Conclusion

The present concluded that breast ultrasounds may significantly increase the diagnosis rate of breast cancer in symptomatic patients having mammographically dense breast tissue (about 29.50%). There it would be better to do a complimentary ultrasound on a daily basis in those patients having mammographically dense breasts in limited resource settings, in order to diagnose breast cancer

accurately.

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