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Mammographic and Sonographic Findings in Breast Cancer Screening

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Abstract

Breast cancer is the most common malignancy in women. Screening is very important to identify precancerous lesions, which is why the use of diagnostic imaging is one of the first steps in cancer diagnosis. Mammography is one of the detection tools, that are able to detect breast abnormalities in their early stage, while breast sonography is more helpful in cases with dense breast tissue. In this study, we compared mammography and ultrasonography findings among women who are 40 - 60 years old undergoing breast cancer screening.

This study included 30 asymptomatic women aged over 40 years, who have no history of breast cancer. All were assigned to undergo screening by both mammography and ultrasonography. The diagnoses were scored based on ultrasound BI-RADS, and the findingsof mammography and breast ultrasound were compared to analyze the differences between both examinations.

The result of mammography and ultrasound show that, at the same scale BI-RADS, different images could be obtained. Further studies are needed to demonstrate the significance of the differences in examination findings on the same BI-RADS scale.

***Keywords**: Breast Cancer, Mammography, Screening, Sonography*

Introduction

Female breast cancer is the most commonly diagnosed cancer. Based on Global Cancer Statistics data in 2020, which involve 185 countries, estimatedthat there were 2.3 million new cases (11.7%) of breast cancer around the world. This number is the highest number of new cancer cases followed by lung cancer (11.4%), colorectal cancer (10.0 %), prostate cancer (7.3%), and stomach cancer (5.6%) (Sung et al., 2021). Breast cancer often comes with a lack of early symptoms, which results in late detection of the disease(Milosevic et al., 2018).As a result, it is important to detect this cancer in its early stage toimprove outcomes by providing care at the earliest possible stage and, offering more effective treatment, i.e., less cost and less complexity.Screening aims to identify unrecognized cancer or its precursor lesions in an apparently healthy, asymptomatic population by means of tests, examinations, imaging, or other procedures that can be applied rapidly and accessed widely by the target population(WHO, 2017).

Screening for breasts cancer with mammography has been shown to decrease mortality. Mammography is the mainstay of screening for clinically occult diseases. However, mammography has limitations, and recently, other imaging modalities including ultrasound and magnetic resonance imaging (MRI) have been used as adjunctive screening tools, mainly for women who may be at increased risk for the development of breast cancer (Lee et al., 2010).A previous study, showed that,annual mammography in women aged 40–49 years within the first 10 years of follow-up reduces breast cancer mortality (Duffy et al., 2020).

The sensitivity of mammography is reduced in women with dense breast tissue. Additionally, women with dense breasts have an increased risk of developing breast cancer. In this case

ultrasound has an important role in detecting mammographically occult cancer in women with dense tissue. Studies have shown that ultrasound significantly increases the detection of clinically important, small, largely invasive, node-negative cancers(Thigpen et al., 2018). A study by Devolli-Disha et. al. in 2009 showed that the sensitivity and specificity of ultrasound are statistically significantly greater than mammography in patients with breast symptoms for the detection of breast cancer and benign lesions particularly in dense breast and in young women (Devolli-Disha et.al., 2009).A previous study by Harada-shoji et. al. that included 72.998 asymptomatic women, asserted that adjunctive ultrasonography has the potential to improve the detection of early-stage and invasive cancers for both dense and non-dense breasts (Harada-Shoji et al., 2021). The aim of this study is to compare the findings of mammography and ultrasonography among women40 to 60 years undergoing breast cancer screening.

Methods

This study is conducted at the Radiology Department of dr.Saiful Anwar Hospital, Malang, East Java, Indonesia, fromOctober 2021 to November 2021. We examined 30participants, of allwhom were assigned to undergo screening by either bothmammography and ultrasonography. Theparticipants were asymptomatic women aged over 40 years, who have no history of breast cancer. Mammography examination used Hologic Selenia Dimensions,with at least two views per breast: medio-lateral oblique view and cranio-caudal view.Mammograms results were interpreted according to the Breast Imaging Reporting and Data system (BI-RADS)diagnostic categories on a five-point scale, consisting of BI-RADS 1 (negative), 2 (benign finding), 3 (probably benign), 4 (suspicious abnormality), and 5 (highly suggestive of malignancy).A breast ultrasound was performed by a radiologist using GE S8 Ultrasound Machine. All ultrasound examinations were performed with participants in a supine position, and the whole breasts were scanned. The diagnoses were scored based on ultrasound BI-RADS categories on a five-point scale. The results from mammography and breast ultrasound were compared to analyze the differences in finding between both examinations.

Result and Discussion

This study included 30 asymptomatic women, all of whom underwent both mammography and breast ultrasonography. The baseline characteristics of the study participants are shown in Table 1. From the distribution of the samples, the distribution of age and menopausal status is evenly distributed. Based on risk factors for breast tumors among participants, all participants have a history of giving birth, with 10% never breastfeeding. From a history of using hormonal contraception, 30% of participants use hormonal contraception, which is one of the risk factors for breast cancer. Regarding family history of breast tumors, 20% of participants have a family history of breast cancer.

Table 1 Baseline Characteristics of Study Participants

	Number (Participants)	Percentage (%)
Age Group		
40-50	14	46.67
50-60	16	53.33
Age at Menarche, y		
<9	0	0
10-15	29	96.67
>16	1	3.33

Menopausal Status		
Pre-menopause	14	46.67
Menopause	16	53.33
Pregnancies Delivered, no		
1	2	6.67
2	11	36.67
3	11	36.67
4-7	6	20
Breastfeeding		
Y	27	90
N	3	10
History of Using Hormonal Contraception		
Y	9	30
N	21	70
First-Degree Relative with Breast Cancer		
Y	6	20
N	24	80

The results of mammography and breast sonography are shown in Table 2. The data show that 46.67% give different scales of BI-RADS. There are 33.33% of participants whohave negative findings(BI-RADS 1)from breast sonography, and have benign calcification (BI-RADS 2) based on mammography. These different results are consistent with the existing literature, that mammography is sensitive for detecting breast calcifications (Nalawade, 2009). Calcifications are a common finding in the breast, which are formed by calcium deposition within mucin accumulating in the duct, lobular acini, or cavities associated with the lesion. Calcifications can also occur in the stroma of fibrous lesions or calcium deposition within collagen as a response to post-traumatic or hematoma(Arancibia Hernández et al., 2016; Kameswari et al., n.d.). The morphology and size of calcifications are the most important factors in deciding whether calcifications are typically benign, indeterminate and warranting follow-up imaging or biopsy, or suspicious and requiring biopsy (Demetri-Lewis et al., 2012). In this study, all of the calcifications showed characteristics of benign calcification.

Table 2 Mammography and Breast Sonography Examination Results Based on BI-RADS Scale

BIRADS Scale	Mammography (%)	Breast Sonography (%)
1	43.33	73.33
2	50	20
3	6.67	6.67
4	0	0
5	0	0

In 4 participants, despite showing the same BI-RADS scale (BI-RADS 1), their mammography showed focal asymmetrical.In this case, the participants are advised for a follow up 6 months later (Figure 1). Asymmetrical breast density is an uncommon finding (Leung & Sickles, 2007; Samardar et al., 2002). Asymmetric breast tissue is usually benign and secondary to variations in normal breast tissue, postoperative change, or hormone replacement therapy. However, an asymmetric area may also indicate a developing mass or underlying cancer. Ultrasound has no important role in this case (Samardar et al., 2002). Normal sonographic findings do not exclude malignancy

in the case of developing asymmetry(Leung & Sickles, 2007).

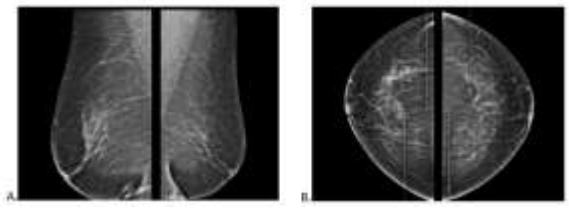

Figure 1 Focal Asymmetric Breast on Mammography

A.MLO projection; B.CC projection; Mammography shows focal asymmetry of the right breast, which produce a negative finding on breast ultrasound examination.

Five (16.67%) participantswith BI-RADS 2 based on the result of mammography and breast sonography in this study show a difference in the imaging finding. This study identified benign calcification at the mammography result, that is not shown at breast sonography. Furthermore, in 5 participants, breast sonography cannot detect calcification, though anechoic cyst with less than 1 cm size was identified instead. According to mammography, those participants have heterogenous breast density. This finding is consistent with previous studies comparing ultrasonography with mammography, in which ultrasonography is more sensitive in detecting small lesions, especially in dense breasts(Berg et al., 2008). The calcification finding in these cases, can be associated with cysts, Itaniet.al. in 2013 mentioned in their journal that calcification is often associated with fibrocystic changes, and calcium deposition can also be found in the walls of cysts or observed with fat necrosis or oil cyst (Itani et al., 2013).

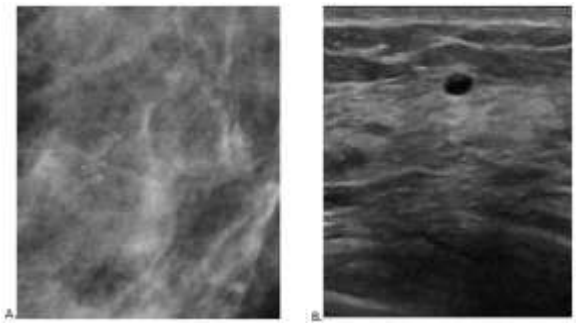

Figure 2 Mammography and Breast Sonography Indicating BI-RADS 2

Both images come from the same participant and are concluded as BI-RADS 2. A.Mammography result showing benign calcification; B.Breast sonography depicting cystic lesion with less than 1mm in size.

Conclusion

Mammography and ultrasound are complementary in screening for breast tumors. In this study, it was shown that, at the same BI-RADS scale, different images can be obtained, e.g. the findings of calcified and asymmeteric breasts on mammography, or small cysts on ultrasound. Further studies are needed to demonstrate the significance of the differences in examination findings on the same BI-RADS scale.(Nalawade, 2009)

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