

Original Research Article

Breast ultrasound diagnostic performance and outcomes for mass lesions in Dharma Yadnya general hospital in 2018-2023

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ABSTRACT

Background: The latest report by the world health organization and international agency for research on cancer told that the incidence and mortality of breast cancer is the most among female cancer patients.

Methods: This is descriptive study which uses medical record of 50 samples patients in Dharma Yadnya general hospital. This study include patients at least 25 years old who presented to the Dharma Yadnya general hospital between January 2019 to March 2023 which get breast ultrasound examination and pathology examination, benign or malignant mass.

Results: In ultrasound findings, there are 43 (86%) people with benign cancer, 7 (14%) people with malignant cancer, 43 (86%) people with hypoechoic density and solid lesion, 7 (14%) people with isoechoic density and cystic lesion, 43 (86%) people with regular margin, 7 (14%) people with irregular margin, 43 (86%) people without lymph nodes axillary, 7 (14%) people with lymph nodes axillary, and by Doppler there are 43 (86%) people without neovascularization inside lesion and 7 (14%) people with neovascularization inside lesion. There are statistically significant relationship ($p < 0.05$) between diagnosis (benign and malignant) with age of patients, density, margin, existence of lymph nodes axillary, and neovascularization inside the lesion by doppler.

Conclusions: Breast sonography is the modality of choice for further investigation of palpable breast findings that are not clearly benign and mammographic screen-detected abnormalities.

Keywords: Breast, Benign, Malignant, Ultrasound, Lesion

INTRODUCTION

Breast cancer is the most common cancer in women, and its prevalence is increasing.¹ The latest report by the world health organization and international agency for research on cancer showed that the incidence and mortality of breast cancer ranked the first place among female cancer patients.² In 2020 it is estimated that there will be 1.7 million new cases of breast cancer with the most cases and deaths occurring in LMICs.¹ In addition, it is estimated that there has been an increase of almost 60% in breast cancer incidence and mortality in LMICs in the past 20 years.¹ At present, the clinical methods of detecting breast tumors mainly include palpation, puncture and medical imaging technologies.³ Medical imaging techniques used in breast

tumors are mainly ultrasound imaging, mammography and magnetic resonance imaging.³ Compared with other commonly used breast tumor detection methods, the main advantages of ultrasound imaging are simple and convenient operation, non-invasive and no harm to the human body, no radiation, safe and reliable, high real-time, rapid imaging, facilitating patient specifically for conducting targeted inspection, and low price, suitable for large-scale promotion.³ It is of great significance to the clinical diagnosis and treatment of breast cancer to explore the deep pathological features of breast ultrasound images and obtain the results of benign and malignant tumors noninvasively.³ The straight forward approach is to rely on highly qualified and experienced radiologists to assess benign and malignant tumors by manually analyzing the

texture and morphological features in the images.⁴ Early detection, early diagnosis, and early treatment are the keys to increasing breast cancer cure rates and reducing mortality.⁴ Previous clinical literature reported that there are many differences in imaging morphology of benign and malignant breast cancer cases, such as orientation, margins, calcifications, and internal echoes.³ The goal of this study was to describe amount early diagnosis of benign and malignant breast cancer by ultrasound.

METHODS

This is descriptive study which uses medical record of patients in Dharma Yadnya general hospital. This study include 50 samples patients at least 25 years old who presented to the Dharma Yadnya general hospital between January 2019 to March 2023 which get breast ultrasound examination and pathology examination, benign or malignant mass. A radiologist with 10 years of experience in breast imaging interpreted the images by consensus. The patients who were not confirmed by pathology examination were exclude. The ultrasound images were assessed for masses (shape, margin, size, and echo pattern posterior), calcifications, vascularization by doppler, and special features such as intracystic mass. Patient charts were retrieved from the medical records and were reviewed for the following data: patient age, indication for presentation (screening versus diagnostic), chief complaint on presentation, family history of breast cancer, follow-up period, and pathology reports. Statistical analysis was performed on the SPSS software (release 23.0; SPSS Inc.) for Windows (Microsoft). Quantitative data were described as mean, range (minimum-maximum). Qualitative parameters were compared using the chi-square test. Results were considered statistically significant at $p \leq 0.05$ (2-sided). This study was approved by the administration committee of Dharma Yadnya general hospital in Denpasar, Bali, Indonesia.

RESULTS

We had a total of 50 patients with a mean age of 38.5 years (range: 11-78 years). All women were presenting for diagnostic purposes (palpable breast/axillary mass) and presenting to bigger institution (Sanglah central general hospital) for a biopsy.

Table 1: Patients findings.

Analysis	Total (%)	Chi-square (with diagnosis)
Age (Years)		
<45	33 (66)	
46-55	10 (20)	
>56	7 (14)	
Total	50 (100)	.00

There are 33 (66%) people with age under 45 years, 10 (20%) people with age 46-55 years, and 7 (14%) people with age over 55 years, and there are statistically

significant relationship ($p < 0.05$) between age of patients and diagnosis (benign and malignant) (Table 1).

Table 2: Ultrasound findings.

Analysis	Total (%)	Chi-square (with diagnosis)
Diagnosis		
Benign	43 (86)	
Malignant	7 (14)	-
Total	50 (100)	
Density		
Hipoechoic-solid	43 (86)	
Isoechoic-cystic	7 (14)	0.00
Total	50 (100)	
Margin		
Regular	43 (86)	
Irregular	7 (14)	0.00
Total	50 (100)	
Lymph axilla		
No	43 (86)	
Yes	7 (14)	0.00
Total	50 (100)	
Neovascular		
No	43 (86)	
Yes	7 (14)	0.00
Total	50 (100)	

In ultrasound findings, there are 43 (86%) people with benign cancer, 7 (14%) people with malignant cancer, 43 (86%) people with hipoechoic density and solid lesion, 7 (14%) people with isoechoic density and cystic lesion, 43 (86%) people with regular margin, 7 (14%) people with irregular margin, 43 (86%) people without lymph nodes axillary, 7 (14%) people with lymph nodes axillary, and by Doppler there are 43 (86%) people without neovascularization inside lesion and 7 (14%) people with neovascularization inside lesion. There are statistically significant relationship ($p < 0.05$) between diagnosis (benign and malignant) with age of patients, density, margin, existence of lymph nodes axillary, and neovascularization inside the lesion by doppler (Table 2). Most of patient diagnosed with benign/fibroadenoma (86%) histopathologically.

DISCUSSION

When breast ultrasound combined with mammography, it detects additional early-stage invasive breast cancer, relevant limitations include a shortage of trained operators, operator dependency, and poor visibility.⁵ Breast sonography has been chosen because of its positive side, such as non-ionizing, high resolution, low cost, highly sensitive (81.7%) and specific (88%) instrument for investigating symptomatic patients.⁶ The relationship between the glandular, fat, and tissue components of the breast based on the different acoustic impedances of these tissues can be determined by breast ultrasound.⁶ Breast ultrasound is one of the four main imaging for diagnosing

breast disease, besides mammography, magnetic resonance imaging, and image-guided needle biopsies.⁷ Importantly, ultrasound (US) does not expose women to radiation and the associated risks, while US waves cause no injury to human tissue, allowing for a highly safe diagnostic approach, so there are no contraindications for US breast. Because of the US has limited depth of penetration, it makes practical difficulties may be encountered in women with severe disabilities preventing correct positioning or in obese women. The cost of a breast ultrasound is comparable to that of a mammography and much lower than that of a breast MRI.⁷ US is a very powerful diagnostic tool, often finding breast tumors that mammography misses in dense breast tissue.⁸

Benign mass is often found on breast US examination and this is a problematic category because definitive management depends on whether it is upgraded to malignancy or downgraded to benign.⁹ In the study of Raza the peak incidence of benign lesions is between 21-30 years and malignant lesions between 31-50 years.¹⁰ When a woman has focal symptoms, usually a palpable lump, US is performed as a targeted examination and has high sensitivity.⁷ US is useful for distinguishing cysts from solid masses, characterizing solid masses, and deciding whether a US-guided needle biopsy should be performed.⁷ Malignant masses are showed predominately hypoechoic lesions with a irregular and unclear boundaries.¹¹ Posterior enlargement and may reflect rapid tumor growth may showed necrotic or cystic degeneration mass.¹¹ Hooley et al features of benign US include multiple (two or three) soft lobulations, an ellipsoid shape, and a thin capsule, as well as a homogeneous echogenic echotexture while features of malignant US include spiculation, orientation higher than width, angular margins, microcalcification, and posterior acoustic shadow, all of them make a negative predictive value of 99.5% and a sensitivity of 98.4% for the diagnosis of malignancy were achieved.¹² US possible to exclude malignancy in cases of pathognomonic findings such as simple cysts or when suspicion is low. US is an established tool that complements screening, clinical, and mammography at all ages in patients with symptoms or signs suspicious for breast cancer, which usually consist of a palpable lump (but also, nipple inversion, local skin retraction or other modification, serous or bloody nipple discharge).⁷ The likelihood of malignancy is low as 1% when a patient presents with unilateral, localized, non-cyclic breast pain.⁷ A benign biphasic tumor that originates in the lobar duct terminal unit as a localized tumor and exhibits a proliferation of epithelial and fibrous tissue components is known well as fibroadenoma.¹³ Elliptical or slightly lobulated shape, greater elongation on transverse and craniocaudal views than on anterior-posterior views, isoreflexive to hyporeflexive echotexture when compared with adipose tissue, completely surrounded by a smooth echogenous capsule, normal sonic transmission or accentuated in comparison with surrounding tissue, shadows smooth margins, unrestricted movement during palpation, easily compressed were ultrasound findings in classic fibroadenoma.¹³

Color-Doppler exploits the Doppler effect, which the wavelength of a wave changes for an observer moving relative to the source of the wave.⁷ Typical examples are the pitch changes heard when vehicles sound their approaching, passing, and away sirens.⁷ Color-Doppler representations of ships, obtained with no use or minimal stress to prevent the ship from collapsing, are usually superimposed on a standard gray-US drawing scale (duplex modality) it possible to identify blood vessels in the context of breast tissue, particularly around and within a mass lesion.⁷ The presence of blood vessels can be an additional criterion that helps differentiate malignant from benign lesions, but is not sufficient alone to characterize lesion.⁷ Characteristic of malignant lesions is increase vascularity by the use of color, power, and quantitative Doppler spectral breast ultrasound.¹² Demonstration of irregular branching of central vascularization or deep penetration of a solid mass raises the suspicion of malignant neovascularization, and the parallel arterial and venous sign has been described a reliable feature that has the potential to allow prediction of benign solid masses so that biopsy can be avoided.¹²

For up to 15% breast cancer if found invasive cancer that is generally very small, behind the nipple or a lesion that is difficult to distinguish from normal gland or adipose tissue or from fibrocystic changes, such as invasive lobular cancer.¹⁴ Axillary lymph node is one of the most important factors in predicting treatment decisions in breast cancer. Depending on the patient's condition, sometimes the axillae is not fully evaluated although some axillary lymph nodes at level 1 can be visualized and fatty underarms make it easier to see the lymph nodes.¹⁵ Although US is normal, suspicious findings on clinical examination, mammography, or MRI should not be discounted, even when US has been targeted to areas thought to harbor such findings.⁷ In addition, US is less sensitive than mammography for non-invasiveness. Because of the presence of calcifications, breast cancer (ductal carcinoma in situ, DCIS) is usually detectable on mammography.⁷ The European commission initiative on breast's guideline development group (ECIBC's GDG) advise for asymptomatic women with high mammographic breast density and negative mammographic results, in the context of the organized screening programme to apply hand-held ultrasound-adjusted screening over mammography screening alone if it is not already practice.¹⁶ Differentiation of benign from malignant tumors is essential for early evaluation of the biologic behavior and prognosis of the tumor prior to arrest or other interventions.¹⁷ Histopathological examination of tumor biopsy samples serves as the gold standard for confirming tumor malignancy.¹⁷ Limitations of this study include its small sample size.

CONCLUSION

Breast sonography is the modality of choice for further investigation of palpable breast findings that are not clearly benign and mammographic screen-detected

abnormalities. It will be better if ultrasound adjunct with mammography for next study.

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REFERENCES

1. Marini TJ, Benjamin C. A New Horizon in Expanding Imaging Access for Breast Cancer Detection. J Ultrasound Med. 2023;42:817-32.
2. Ouyang Y. A review of ultrasound detection methods for breast microcalcification. Mathematical Biosciences and Engineering. 2019;16(4):1761-85.
3. Gong H, Mengjia Q, Gaofeng P, Bin H. Ultrasound Image Texture Feature Learning-Based Breast Cancer Benign and Malignant Classification. Comput Math Methods Med. 2021;2021:6261032.
4. Wei M, Yongzhao D, Xiuming W, Qichen S, Jianqing Z, Lixin Z, Guorong L et al. A Benign and Malignant Breast Tumor Classification Method via Efficiently Combining Texture and Morphological Features on Ultrasound Images. Comput Math Methods Med. 2020;2020:5894010.
5. Vourtsis A. Breast Density Implications and Supplemental Screening. Eur Radiol. 2019;29(4):1762-77.
6. Moloney BM, O'Loughlin D, Elwahab SA, Kerin MJ. Breast Cancer Detection-A Synopsis Of Conventional Modalities And The Potential Role Of Microwave Imaging. Diagnostics. 2020;10:103.
7. Evan A, Trimboli RM, Athanasiou A, Balleyguier C, Baltzer PA, Bick U et al. Breast Ultrasound: Recommendations for Information to Women And Referring Physicians By The European Society Of Breast Imaging. Insights Imaging. 2018;9:449-61.
8. Jabeen K. Breast Cancer Classification from Ultrasound Images Using Probability-Based Optimal Deep Learning Feature Fusion. Sensors. 2022;22:807.
9. Sefiya A, Yunusa GH, Aliyu H, Hamidu AU. Breast Imaging Reporting and Data Systems Category 3 (Probably Benign) Breast Lesions Detected On Diagnostic Breast Ultrasound: The Prevalence, Outcome And Malignancy Detection Rate In Zaria, Nigeria. Nigeria. S Afr J Rad. 2018;22(2):1315.
10. Raza AM. Histopathological Audit Of Breast Tissue Specimen In A Medical College Hospital Of Bangladesh. Narayana Med J. 2017;6(1).
11. Haliloglu N. Breast Ultrasound during Lactation: Benign and Malignant Lesions. Breast Care. 2019;14:30-34.
12. Hooley RJ, Scoutt LM, Philpotts LE. Breast Ultrasonography: State of the Art. Radiology. 2013;268(3):642-59.
13. Paepke S. Benign Breast Tumours-Diagnosis and Management. Breast Care. 2018;13:403-12.
14. Sun Q. Deep Learning Vs. Radiomics For Predicting Axillary Lymph Node Metastasis Of Breast Cancer Using Ultrasound Images: Don't Forget The Peritumoral Region. Front Oncol. 2020;10:53.
15. Jahed DA. Automated Breast Ultrasound (ABUS): A Pictorial Essay Of Common Artifacts And Benign And Malignant Pathology. J Ultrason. 2022;22:222-35.
16. Schunemann HJ, Donata L. Breast Cancer Screening and Diagnosis: A Synopsis of the European Breast Guidelines. Ann Intern Med. 2020;172:46-56.
17. Yan F. Ultrasound Molecular Imaging For Differentiation Of Benign And Malignant Tumors In Patients. Quantitative Imaging in Med Surg. 2018;8(11):1078-83.

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