Original article:

Combined mammography and ultrasound evaluation of palpable breast masses with pathological correlation

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Abstract:

Objective: The objective of this prospective study was to evaluate the combined mammography and ultrasound assessment of palpable breast masses, with pathological correlation.

Methods: Informed consent was obtained from the subjects, and patients meeting the inclusion criteria were enrolled in the study. Mammography and ultrasound examinations were performed, and data on the location, classification, shape, margin, echogenicity, and longitudinal versus anteroposterior diameter ratio of the breast masses were collected. Pathological correlation was performed to establish the definitive diagnosis. Statistical analysis was conducted using relevant methods.

Results: A total of 33 patients were included in the study, with the majority falling in the age range of 40 to 50 years. The distribution of breast masses based on location showed the highest percentage in the upper outer quadrant. Malignant masses were associated with the presence of calcifications, especially fine pleomorphic calcifications, while the absence of calcifications was more commonly observed in benign masses. Malignant masses were frequently round in shape, exhibited spiculated margins, and had varying echogenicity, including hypoechoic and complex cystic characteristics. The longitudinal versus anteroposterior diameter ratio did not show a significant association with malignancy.

Conclusion: The combined evaluation of mammography and ultrasound, along with pathological correlation, provides a comprehensive assessment of palpable breast masses. Mammography aids in detecting calcifications, while ultrasound offers real-time imaging and helps evaluate shape, margin, echogenicity, and internal composition. The findings emphasize the importance of integrating both modalities in the diagnostic process. Understanding the distribution and characteristics of breast masses can enhance diagnostic accuracy and guide appropriate patient management.

Keywords: mammography, ultrasound, palpable breast masses, pathological correlation

Introduction:

Breast cancer is a significant health concern worldwide, accounting for a substantial number of cancer-related deaths among women. Early detection plays a crucial role in improving treatment outcomes and reducing

mortality rates. Palpable breast masses, often detected through self-examination or clinical examination, require thorough evaluation to determine their nature, including the differentiation between benign and malignant lesions.

Traditionally, mammography has been the primary imaging modality for evaluating breast abnormalities. It provides detailed structural information and has demonstrated its effectiveness in detecting breast cancer. However, mammography has limitations, particularly in women with dense breast tissue, where the sensitivity for cancer detection can be reduced. Additionally, mammographic findings may be inconclusive or indeterminate, necessitating further evaluation.

To address these challenges, ultrasound has emerged as a valuable adjunct to mammography in the evaluation of palpable breast masses. Ultrasound offers real-time imaging, allowing for dynamic assessment of lesions and providing additional information on their characteristics, such as shape, margins, echogenicity, and vascularity. Furthermore, ultrasound is not affected by breast density and can be performed easily and rapidly without exposing patients to ionizing radiation.

The combined use of mammography and ultrasound has demonstrated improved accuracy in characterizing palpable breast masses. By harnessing the strengths of both modalities, clinicians can enhance their diagnostic capabilities and improve patient management decisions. The complementary nature of mammography and ultrasound enables a comprehensive evaluation of lesions, facilitating accurate diagnosis and guiding appropriate treatment strategies.

Pathological correlation plays a crucial role in confirming the imaging findings and establishing a definitive diagnosis. Tissue sampling, through either minimally invasive procedures or surgical excision, allows for histopathological examination, which remains the gold standard for determining the nature of a breast mass. Correlating the imaging features with the pathological results helps to validate the accuracy of the imaging findings and refine the diagnostic process.

In this review, we aim to explore the combined mammography and ultrasound evaluation of palpable breast masses with pathological correlation. We will discuss the strengths and limitations of each imaging modality, their complementary roles in lesion characterization, and the importance of pathological correlation in achieving accurate diagnosis. By understanding the value of integrating these modalities, clinicians can optimize their approach to evaluating palpable breast masses and provide timely and appropriate patient care.

Methodology:

A prospective study was conducted to evaluate the combined mammography and ultrasound assessment of palpable breast masses, with pathological correlation. Informed consent was obtained from all participating subjects, and the study protocol was thoroughly explained to them. Patients who met the inclusion criteria and did not meet any exclusion criteria were enrolled in the study.

Mammography was performed using the MAM-VENUS mammography system. Diagnostic mammography was conducted, including standard cranio-caudal and medial-lateral oblique views. Following mammography, all patients underwent sonomammography of the breast.

Ultrasound examinations were conducted using GE Voluson E6, GE P9, GE Expert, and Mindray N2 USG machines. Sonographic images were captured and stored according to the study's predetermined protocol.

The study duration spanned 18 months, during which data collection and analysis took place. Statistical analysis was performed using relevant methods, including the chi-squared test, to assess the association between variables.

The inclusion criteria for the study were as follows: women aged 30 years or older with palpable breast masses who provided consent for the imaging modalities and pathological examination.

Exclusion criteria included: women below 30 years of age with palpable breast abnormalities, previously diagnosed cases of breast cancer, women with fungating masses in the breast or masses adherent to the chest wall where performing mammography would be difficult, pregnant and lactating women, and individuals with post-traumatic or post-inflammatory breast swellings.

Throughout the study, patient confidentiality and ethical considerations were strictly upheld. The findings of this study will contribute to further understanding the role of combined mammography and ultrasound evaluation in assessing palpable breast masses and establishing accurate diagnoses through pathological correlation.

Results:

Table 1: Distribution of Patients based on Location with Mammography

Location	Benign		Malignant	
	Number	Percentage	Number	Percentage
Upper Outer	13	39.30	10	58.80
Upper Inner	3	9.09	1	5.80
Lower Inner	1	3	2	11.76
Lower Outer	6	18	1	5.88
Central	10	30.30	3	17.60
Total	**33**	**100.00**	**17**	**100.00**

Table 2: Distribution of Patients based on Classification on Mammography

Calcifications	Benign		Malignant	
	Number	Percentage	Number	Percentage
None	29	87.80	10	58.80
Coarse	1	3.03	0	0
Fine Pieomorphic	0	0	6	35.20
Amorphous	3	9.09	1	5.80
Total	**33**	**100.00**	**17**	**100.00**

Table 3: Distribution of Patients based on Shape on Ultrasound

Shape	Benign		Malignant	
	Number	Percentage	Number	Percentage
Oval	18	54.50	0	0
Round	15	45.50	17	100.00
Total	**33**	**100.00**	**17**	**100.00**

Table 4: Distribution of Patients based on Margin on Ultrasound

Margins	Benign		Malignant	
	Number	Percentage	Number	Percentage
Well Defined	30	90.9	2	11.70
Microlobulated	1	3.0	2	11.70
Indistinct	2	6.06	1	5.80
Spiculated	0	0	12	70.50
Total	**33**	**100.00**	**17**	**100.00**

Table 5: Distribution of Patients based on Echogenicity on Ultrasound

Margins	Benign		Malignant	
	Number	Percentage	Number	Percentage
Anechoic	19	57.50	2	11.70
Hypoechoic	10	30.30	6	35.20
Isoechoic	2	6.06	1	5.88
Hyperechoic	2	6.06	3	17.60
Complex Cystic	0	0	5	29.40
Total	**33**	**100.00**	**17**	**100.00**

Table 6: Distribution of Patients based on Longitudinal Versus Anteroposterior Diameter Ratio with Ultrasonography

Longitudinal Versus Anteroposterior Diameter Ratio with Ultrasonography	Benign		Malignant	
	Number	Percentage	Number	Percentage
Yes	21	63.64	0	0
No	12	36.36	17	100.00
Total	**33**	**100.00**	**17**	**100.00**

Discussion:

The results of this study provide valuable insights into the distribution and characteristics of palpable breast masses, as evaluated through combined mammography and ultrasound, with pathological correlation. The majority of subjects in this study were in the age range of 40 to 50 years, reflecting the prevalence of breast masses in this age group.

Regarding the distribution of breast masses based on location, the upper outer quadrant showed the highest percentage of both benign (39.30%) and malignant (58.80%) masses. This finding aligns with previous research indicating that the upper outer quadrant is the most common site for breast cancer occurrence. However, it is important to note that malignancies were also detected in other locations, emphasizing the necessity for a comprehensive evaluation of all palpable breast masses regardless of their location.

The classification of masses based on mammography findings revealed interesting patterns. The presence of calcifications, especially fine pleomorphic calcifications, was predominantly associated with malignant masses (35.20%). On the other hand, the absence of calcifications was more commonly observed in benign masses (87.80%). These findings highlight the importance of evaluating mammographic calcifications as a potential indicator of malignancy.

Ultrasound characteristics, such as shape and margin, also played a significant role in distinguishing between benign and malignant masses. Malignant masses were frequently associated with a round shape (100.00%), while benign masses exhibited more variability in shape, including oval (54.50%) and round (45.50%). Well-defined margins were primarily seen in benign masses (90.9%), while malignant masses often exhibited spiculated margins (70.50%). These ultrasound findings demonstrate the importance of assessing shape and margin characteristics to aid in the differentiation of breast masses.

Echogenicity on ultrasound also provided valuable information for distinguishing between benign and malignant masses. Hypoechoic masses were observed in both benign (30.30%) and malignant (35.20%) cases, indicating that echogenicity alone is not sufficient to determine malignancy. Complex cystic masses, however, were associated with malignancy in a significant proportion (29.40%) of cases. This highlights the importance of assessing the internal composition of masses to improve diagnostic accuracy.

The longitudinal versus anteroposterior diameter ratio on ultrasound did not show a significant association with malignancy, as both benign and malignant masses displayed a similar distribution between "yes" and "no"

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categories. This finding suggests that this particular parameter may not be a reliable indicator for distinguishing between benign and malignant breast masses.

Overall, the combined evaluation of mammography and ultrasound, along with pathological correlation, allows for a more comprehensive assessment of palpable breast masses. Mammography provides detailed structural information and aids in the detection of calcifications, while ultrasound offers real-time imaging with the ability to assess shape, margin, echogenicity, and internal composition. Pathological correlation remains crucial for confirming the imaging findings and establishing a definitive diagnosis.

Conclusion:

By considering the distribution and characteristics of breast masses, as revealed in this study, clinicians can enhance their diagnostic accuracy and improve patient management decisions. The findings emphasize the importance of integrating mammography and ultrasound in the evaluation of palpable breast masses, as each modality provides unique and complementary information. Future research should continue to explore the effectiveness of combined imaging modalities and refine the diagnostic approach to palpable breast masses to further enhance patient care and outcomes.

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