**Original article:**

**Study of characterize the breast masses into benign and malignant, based on sonomammographic findings**

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**Abstract:**

Background: Sonomammography is a valuable imaging technique for characterizing breast masses into benign and malignant categories. This study aimed to assess the effectiveness of sonomammography in breast mass characterization and explore specific sonographic features associated with benign and malignant lesions.

Methods: A prospective cross-sectional study was conducted at B.K. L. Walawalkar Rural Medical College & Hospital in Maharashtra State. A total of 456 patients undergoing breast cancer screening were included. Sonomammography was performed using high-frequency transducers, and additional techniques such as color Doppler imaging and elastography were employed when necessary. Histopathological analysis served as the gold standard for determining the benign or malignant nature of the breast masses.

Results: The majority of participants belonged to the age groups of 31-50 years (48.5%) and 51-60 years (34.2%). Among the screened patients, 39 lesions were identified as cancerous (8.6%) and 417 as noncancerous (91.4%). Only 33 participants had attained menopause. Most participants were married (98.0%). The majority of breast lesions exhibited dense breast tissue (69.3%), and a posterior acoustic shadow was observed in the majority of lesions (70.6%). Lesions with a parallel orientation were predominant (94.7%), and regular margins were identified in most cases (90.6%). Anechoic lesions were the most common (89.9%).

Conclusion: Sonomammography demonstrated its effectiveness in characterizing breast masses into benign and malignant categories. Dense breast tissue, posterior acoustic shadowing, parallel orientation, regular margins, and anechoic appearance were frequently observed in the study population. These findings highlight the importance of sonomammography as a reliable tool for accurate breast mass characterization.

Keywords: Sonomammography, breast mass characterization, benign

**Introduction:**

Breast cancer is one of the leading causes of cancer-related deaths among women worldwide. Early detection and accurate characterization of breast masses play a crucial role in improving patient outcomes and reducing mortality rates.1 Sonomammography, a non-invasive imaging technique utilizing ultrasound, has emerged as a valuable tool for the evaluation of breast abnormalities due to its high sensitivity and ability to differentiate between benign and malignant masses. The primary goal of sonomammography is to detect breast masses and provide information about their nature. A breast mass refers to an abnormal tissue growth or lump found in the breast, which may be discovered during routine screening or self-examination. While the majority of breast masses turn out to be benign, a significant proportion are found to be malignant, warranting further diagnostic and therapeutic interventions.2

Characterizing breast masses into benign and malignant categories is essential to guide appropriate clinical management decisions. Benign breast masses include a diverse range of conditions such as fibroadenomas, cysts, papillomas, and lipomas, which are typically non-cancerous and pose no significant health risks. Malignant breast masses, on the other hand, encompass various forms of breast cancer, including invasive ductal carcinoma, lobular carcinoma, and less common subtypes.4

Sonomammography provides a comprehensive evaluation of breast masses by assessing their morphological features, such as shape, size, margin, and internal characteristics. Benign masses often exhibit well-defined borders, smooth contours, and uniform internal echoes, while malignant masses frequently display irregular shapes, spiculated or indistinct margins, and internal heterogeneity.5

Advancements in ultrasound technology, including high-frequency transducers and real-time imaging capabilities, have significantly improved the diagnostic accuracy of sonomammography. Additional techniques such as color Doppler imaging and elastography can further enhance the characterization of breast masses by evaluating vascularity and tissue stiffness, respectively.6,7

Accurate differentiation between benign and malignant breast masses is crucial for optimizing patient care. While benign masses typically require periodic monitoring or minimally invasive procedures, malignant masses necessitate prompt and appropriate management, including biopsies, surgical interventions, and adjuvant therapies. Thus, the ability to reliably characterize breast masses using sonomammographic findings has a direct impact on patient outcomes, treatment planning, and overall prognosis.8

In this study, we aim to investigate the effectiveness of sonomammography in characterizing breast masses into benign and malignant categories. By analyzing a large cohort of patients with histopathologically confirmed breast masses, we will assess the diagnostic performance of sonomammography and explore the specific sonographic features associated with benign and malignant lesions. The findings of this study have the potential to enhance the accuracy of breast mass characterization, inform clinical decision-making, and contribute to improved patient care in the field of breast imaging.

**Study Methodology:**

A prospective cross-sectional study was conducted at B.K. L. Walawalkar Rural Medical College & Hospital in Maharashtra State. The study aimed to evaluate the effectiveness of sonomammography in characterizing breast masses into benign and malignant categories. The study population consisted of patients who visited the Department of Radiology for breast cancer screening and were referred for diagnostic workup.

Patients who met the inclusion criteria were enrolled in the study. The inclusion criteria included an age range of 14 to 75 years, absence of any history of breast lump or asymptomatic breast swelling, and post-operative patients of breast carcinoma undergoing screening of the contralateral breast. Patients who did not meet these criteria were excluded from the study.

The study employed a standardized sonomammography protocol for all participants. Sonomammograms were performed using high-frequency transducers and real-time imaging techniques to assess the morphological features of the breast masses. Additional techniques such as color Doppler imaging and elastography were employed when necessary to enhance the characterization of the masses.

Following the sonomammographic evaluation, the patients underwent further diagnostic procedures, including biopsies or surgical interventions, as deemed necessary based on the sonographic findings. The histopathological analysis of the excised or biopsied specimens served as the gold standard for determining the benign or malignant nature of the breast masses.

Data regarding the patients' demographic characteristics, clinical history, sonomammographic findings, and histopathological results were collected and recorded. Statistical analysis was performed using appropriate tests to evaluate the diagnostic performance of sonomammography in characterizing the breast masses. Specific sonographic features associated with benign and malignant lesions were identified and analyzed.

Ethical approval was obtained from the institutional review board, and informed consent was obtained from all participants before their inclusion in the study. Confidentiality of patient information was maintained throughout the study, and the data collected were analyzed and reported in aggregate form to ensure anonymity.

The study methodology followed a rigorous and systematic approach to investigate the utility of sonomammography in distinguishing between benign and malignant breast masses. The findings from this study have the potential to contribute valuable insights to the field of breast imaging and aid in improving the accuracy of breast mass characterization for better patient care and management.

**Results:**

Majority of women who were screened belong to 31-50yrs followed by 51-60 years Out of total 456 patients screened 39 lesions were cancerous and 417 were noncancerous.

Only 33 participants in our study had attained menopause.

Majority 447 participants were married,5 were divorced and 4 were unmarried

**Table 1: Type of Breast of Participants**

|  |  |  |
| --- | --- | --- |
| **Breast** | **Frequency** | **%Ages** |
| Dense | 316 | 69.3 |
| Fatty | 140 | 30.7 |
| Total | 456 | 100.0 |

Majority had dense breast

**Table 2: Presence of Posterior Acoustic Shadow On Ultrasonography**

|  |  |  |
| --- | --- | --- |
| **Posterior Acoustic Shadow** | **Frequency** | **%Ages** |
| No | 134 | 29.4 |
| Yes | 322 | 70.6 |
| Total | 456 | 100.0 |

Majority had lesion that show posterior acoustic shadow

**Table 3: Presence of Orientation On Ultrasonography**

|  |  |  |
| --- | --- | --- |
| **Orientation** | **Frequency** | **%Ages** |
| Non Parallel | 24 | 5.3 |
| Parallel | 422 | 94.7 |
| Total | 456 | 100.0 |

Majority had lesion that was parallel

**Table 4: Margins On Ultrasonography**

|  |  |  |
| --- | --- | --- |
| Margins | Frequency | % |
| Iregular | 33 | 7.2 |
| Iregular, Angular | 1 | 0.002 |
| Spiculated,Irregular | 1 | 0.002 |
| Regular | 413 | 90.6 |
| Well Defined | 7 | 1.5 |
| Well Defined, Regular | 1 | 0.002 |
| Total | 456 | 100.0 |

Majority had regular margins

**Table 5: Echogenecity On Ultrasonography**

|  |  |  |
| --- | --- | --- |
| **Echogenecity** | **Frequency** | **%** |
| Anechoic | 410 | 89.9 |
| Hyperechoic | 5 | 1.1 |
| Hypoechoic | 40 | 8.8 |
| Normal | 1 | 0.2 |
| Total | 456 | 100.0 |

Majority of breast lesions were ancheoic

**Discussion:**

The present study aimed to evaluate the effectiveness of sonomammography in characterizing breast masses into benign and malignant categories. The results obtained from the analysis of the study population provide valuable insights into the demographic characteristics and sonomammographic findings of the participants. The majority of women who underwent screening belonged to the age group of 31-50 years, followed by 51-60 years, indicating that these age ranges are critical for breast cancer detection and surveillance. This finding aligns with existing evidence that suggests an increased incidence of breast cancer in these age groups, emphasizing the importance of targeted screening and early detection efforts within these populations. Out of the total 456 patients screened, 39 lesions were identified as cancerous, while 417 were determined to be noncancerous. These results underscore the significance of accurate characterization of breast masses, as a substantial number of screened individuals were spared from unnecessary invasive procedures due to the identification of benign lesions. The overall low malignancy rate of 8.6% suggests the effectiveness of sonomammography in distinguishing between benign and malignant breast masses.

 A notable observation from the study is that only a small proportion (33 participants) had attained menopause. This finding highlights the need for increased awareness and emphasis on breast cancer screening among postmenopausal women, as they remain at risk despite the hormonal changes associated with menopause. Regarding the marital status of the participants, the majority (447 participants) were married, while a small number were divorced (5) or unmarried (4). This distribution reflects the representation of married individuals in the general population and suggests that marital status may not significantly influence the incidence or detection of breast masses. The analysis of breast density revealed that a majority (69.3%) of the participants had dense breasts. This finding aligns with previous studies, which have shown that dense breast tissue can make it more challenging to detect breast abnormalities on mammography alone. Sonomammography, with its ability to provide detailed imaging of the breast tissue, becomes particularly valuable in such cases.8,9

 In terms of sonomammographic findings, the presence of a posterior acoustic shadow was observed in the majority (70.6%) of the lesions. The presence of a posterior acoustic shadow can be indicative of malignancy, as it suggests increased density or calcification within the lesion. This finding underscores the importance of evaluating posterior acoustic shadowing during sonomammography for accurate characterization of breast masses.

 Regarding lesion orientation, the majority (94.7%) of the lesions were found to have a parallel orientation. A parallel orientation is often associated with benign masses, while a non-parallel orientation may indicate malignant characteristics. This finding suggests that the majority of the lesions in the study population were likely benign in nature. The analysis of lesion margins revealed that the majority (90.6%) of the lesions had regular margins, indicating a more benign nature. However, a small proportion of lesions displayed irregular, spiculated, or angular margins, which are features often associated with malignancy. These findings emphasize the importance of evaluating margin characteristics during sonomammography to differentiate between benign and malignant breast masses. Regarding echogenicity, the majority (89.9%) of the breast lesions were identified as anechoic. Anechoic lesions are typically cystic or fluid-filled and are more likely to be benign. However, a small proportion of lesions exhibited hypoechoic characteristics, which are associated with increased cellularity and may indicate malignancy. These findings further highlight the significance of assessing echogenicity during sonomammography for accurate characterization of breast masses.

 Overall, the findings from this study support the utility of sonomammography in characterizing breast masses into benign and malignant categories. The ability to assess breast density, identify posterior acoustic shadowing, evaluate lesion orientation, margin characteristics,

**Conclusion:**

In conclusion, this prospective cross-sectional study demonstrated the effectiveness of sonomammography in characterizing breast masses into benign and malignant categories. The majority of the study population consisted of women in the age groups of 31-50 years and 51-60 years, highlighting the importance of targeted screening efforts in these age ranges. The low malignancy rate of 8.6% among the screened patients emphasizes the significance of accurate characterization to avoid unnecessary invasive procedures.

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