Original article:

Study efficacy of sonomammography as screening test for breast carcinoma

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Abstract:

Objective: This study aimed to evaluate the efficacy of sonomammography as a screening test for breast carcinoma at B.K. L. Walawalkar Rural Medical College & Hospital in Maharashtra, India. The specific objectives were to assess the correlation between sonomammographic findings and histopathology results, analyze the distribution of patients based on echogenicity and orientation, and determine the mean age of the study population.

Methods: A prospective cross-sectional study design was employed, and the study was conducted for one year. The study population consisted of patients referred for diagnostic workup and screening of breast cancer. Inclusion criteria encompassed an age range of 14-75 years and the absence of breast lump or asymptomatic breast swelling, while exclusion criteria included age below 14 years or above 75 years and unwillingness to undergo sonomammography. The sample size was determined based on the desired error level, and a total of 456 participants were included. Sonomammographic findings were compared with histopathology reports, and statistical analysis was performed using Pearson Chi-Square tests.

Results: The mean age of the study population was 44.54 years (SD = 10.53). Analysis of echogenicity distribution revealed a higher number of benign cases (387) compared to malignant cases (69), with anechoic lesions being the most common. The correlation between echogenicity and the benign or malignant nature of breast lesions was significant (Pearson Chi-Square = 170.654, $p < 0.01$). Orientation analysis indicated a significant correlation between nonparallel orientation and malignant cases, while parallel orientation was more frequently associated with benign lesions (Pearson Chi-Square = 142.087, $p < 0.01$). The correlation between sonomammography findings and histopathology results was also significant (Pearson Chi-Square = 211.163, $p < 0.01$), with a strong positive correlation coefficient of 0.680.

Conclusion: The findings of this study support the efficacy of sonomammography as a screening test for breast carcinoma. Sonomammography demonstrated significant correlations with histopathology results, indicating its accuracy in detecting and characterizing breast lesions. Echogenicity and orientation were found to be valuable indicators for distinguishing between benign and malignant cases. The mean age of the study population was 44.54 years. Further research and the integration of sonomammography into breast cancer screening programs are recommended to optimize early detection and improve patient outcomes.

Introduction:

Breast carcinoma, commonly referred to as breast cancer, is one of the most prevalent types of cancer affecting women worldwide.[1] Early detection and prompt treatment are crucial factors in improving survival rates and reducing mortality associated with breast carcinoma. Screening programs have been established to detect breast cancer at its earliest stages, allowing for timely intervention and improved patient outcomes.[2,3]

Conventional mammography has long been the standard screening tool for breast carcinoma, providing valuable information about the presence of suspicious lesions or abnormalities in breast tissue. However, this imaging technique has certain limitations, including discomfort during compression and lower sensitivity in women with dense breast tissue. These limitations have prompted the exploration of alternative screening methods to enhance early detection capabilities and overcome the drawbacks of mammography.[4]

Sonomammography, also known as breast ultrasound, has emerged as a promising adjunct or alternative to mammography in breast cancer screening. Sonomammography utilizes sound waves to produce detailed images of breast tissue, enabling the identification and characterization of breast lesions. This technique offers several advantages, such as non-invasiveness, lack of ionizing radiation, and suitability for use in women with dense breast tissue.[5]

The efficacy of sonomammography as a screening test for breast carcinoma has been the subject of extensive research and clinical evaluation. Numerous studies have investigated its sensitivity, specificity, and overall accuracy in detecting breast cancer, particularly in populations with specific risk factors or limitations with conventional mammography. These studies aim to determine whether sonomammography can improve early detection rates, reduce false-negative results, and contribute to more precise diagnoses.[6]

This research paper aims to review and analyze the existing body of evidence on the efficacy of sonomammography as a screening test for breast carcinoma. By synthesizing the findings of various studies, we seek to assess the diagnostic performance of sonomammography and its potential role in optimizing breast cancer screening programs. Furthermore, we will explore the advantages, limitations, and current guidelines regarding the integration of sonomammography into routine breast cancer screening protocols.[7,8]

Ultimately, a comprehensive understanding of the efficacy of sonomammography as a screening tool for breast carcinoma is crucial for healthcare providers, policymakers, and researchers involved in breast cancer detection and management. The findings of this study may provide valuable insights into the potential benefits and challenges associated with incorporating sonomammography into breast cancer screening programs, ultimately guiding future research efforts and clinical decision-making.[9]

Study Methodology:

The study was conducted at B.K. L. Walawalkar Rural Medical College & Hospital in Maharashtra, India for one year. It employed a prospective cross-sectional design to evaluate the efficacy of sonomammography as a screening test for breast carcinoma.

The study population consisted of patients who presented to the Department of Radiology for breast cancer screening and were referred for diagnostic workup. Participants were included in the study if they met the following inclusion criteria: age between 14 and 75 years, absence of any history of breast lump or

asymptomatic breast swelling, and post-operative patients of breast carcinoma undergoing screening for the other breast. Patients below 14 years or above 75 years of age and those unwilling to undergo sonomammography were excluded from the study.

The sample size was determined using the formula $N = 4 * p * q / L^2$, where p represents the incidence or prevalence of the disease, q is 1 minus p, and L denotes the desired error level. Based on the incidence of breast cancer in India, which is reported as 25.8%, and an error level of 5%, the minimum required sample size was calculated to be 156 participants. However, considering this study focused on screening, a total of 456 patients were included.

Consecutive sampling method was employed to recruit patients. Those without a breast lump during the study period were consecutively enrolled if they fulfilled the inclusion criteria.

The outcomes of the study focused on various features of sonomammography, including the shape of the mass (oval, round), margins (circumscribed, microlobulated, indistinct, angular, spiculated), orientation (parallel, non-parallel), posterior acoustic features (enhancement, shadowing, none), lesion boundary (abrupt interface, echogenic halo), echopattern (hyperechoic, hypoechoic, isoechoic, complex), and presence or absence of microcalcifications.

Data collection involved obtaining detailed patient information and clinical history, including menstrual history, mastalgia history, lactation history, past and family history of any breast problems. This information was recorded in a structured pre-prepared case proforma. Sonomammography was performed as a screening imaging test, and the findings were later compared with histopathology results.

Results:

Mean age in years is 44.54 years with standard deviation 10.53

Table 1: Distribution of Patients Based On Echogenicity with Sonomammography

Echogenecity	Benign	Malignant
Anechoic	377	33
Hyperechoic	3	2
Hypoechoic	6	34
Normal	1	0
Total	387	69

Pearson Chi-Square 170.654, pvalue<0.01, significant

Table 2: Distribution of Patients Based On Orientation with Sonomammography

Orientation	Benign	Malignant
Nonparallel	0	24
Parallel	387	45
Total	387	69

Pearson Chi-Square 142.087, pvalue<0.01, significant

Table 3: Correlation of somnomammography with histopathology report

Usg	Hpe Diagnosis No	Hpe Diagnosis Yes	Total
No	385	2	387
Yes	32	37	69
Total	417	39	456

Pearson Chi-Square211.163, p-value<0.01, significant

Table 4: Correlation of Somnomammography with Histopathology Report

Correlation Coefficient	0.680
Sig. (2-tailed)	<0.01
N	456

Correlation of somnomammographic findings and breast carcinoma findings on histopathology was significant

Discussion:

The present study aimed to evaluate the efficacy of sonomammography as a screening test for breast carcinoma. The findings from the analysis of the data indicate significant correlations between sonomammographic findings

and histopathology results, supporting the utility of sonomammography in detecting and characterizing breast lesions.

The mean age of the study population was 44.54 years, with a standard deviation of 10.53. This age distribution reflects the inclusion criteria of the study, which encompassed a broad age range of 14 to 75 years. The inclusion of patients across different age groups is important for assessing the efficacy of sonomammography as a screening tool in various populations.

The distribution of patients based on echogenicity revealed a higher number of benign cases (387) compared to malignant cases (69). Among the echogenicity subtypes, anechoic lesions were the most common, followed by hypoechoic and hyperechoic lesions. This distribution aligns with previous studies indicating that anechoic and hypoechoic lesions are often associated with benign conditions, while hyperechoic lesions are less common and may indicate malignant characteristics. The significant Pearson Chi-Square value (170.654) with a p-value less than 0.01 further supports the association between echogenicity and the benign or malignant nature of breast lesions.

Regarding the orientation of lesions detected by sonomammography, a significant correlation was observed between nonparallel orientation and malignant cases, while parallel orientation was more frequently associated with benign lesions. This finding highlights the potential of sonomammography in identifying the orientation of lesions, which may aid in distinguishing between benign and malignant cases. The Pearson Chi-Square value of 142.087, with a p-value less than 0.01, confirms the statistical significance of this correlation.

The correlation between sonomammography findings and histopathology results further emphasizes the efficacy of sonomammography as a screening tool for breast carcinoma. The Pearson Chi-Square value of 211.163, with a p-value less than 0.01, indicates a significant association between sonomammographic diagnoses and histopathology reports. The correlation coefficient of 0.680 suggests a strong positive correlation between these two variables, further supporting the accuracy and reliability of sonomammography in detecting breast carcinoma.

The results of this study contribute to the growing body of evidence supporting the efficacy of sonomammography as a screening test for breast carcinoma. Sonomammography offers several advantages over conventional mammography, such as its non-invasiveness, lack of ionizing radiation, and suitability for women with dense breast tissue. The ability of sonomammography to detect and characterize breast lesions based on echogenicity and orientation provides valuable information for the early detection and management of breast carcinoma.[10]

However, it is important to note that this study has some limitations. The study was conducted in a single medical center, which may limit the generalizability of the findings to other populations or settings. Additionally, the sample size, although exceeding the minimum required sample, may still be relatively small for certain analyses. Future studies with larger sample sizes and multi-center designs would provide more robust evidence on the efficacy of sonomammography.

Conclusion:

In conclusion, the findings of this study support the efficacy of sonomammography as a screening test for breast carcinoma. Significant correlations were observed between sonomammographic findings, such as echogenicity and orientation, and histopathology results. These results highlight the potential of sonomammography in detecting and characterizing breast lesions, aiding in early diagnosis and improving patient outcomes. Further

research and implementation of sonomammography in breast cancer screening programs are warranted to fully exploit its benefits and optimize breast carcinoma detection.

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