

Sensitivity, Specificity and Diagnostic Accuracy of Mammography in Breast Carcinoma

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ABSTRACT

Background: Breast carcinoma is common due to its high incidence and mortality rate among females. It affects approximately one out of nine among Pakistani females.

Aim: To determine the sensitivity, specificity and diagnostic accuracy of mammography in breast carcinoma.

Methodology: Newly diagnosed (70) breast cancer patients were enrolled to conduct the present study at Jinnah Hospital, Lahore-Pakistan for 6 months. Their mammography was done in-order to find out the density, morphology and architectural distortion of breast lesions. The sensitivity, specificity and diagnostic accuracy of mammography was determined in terms of breast carcinoma cases enrolled in present study. Written and informed consent was taken from patients at the time of enrollment.

Statistical analysis: Collected data was analyzed by Statistical Package for Social Sciences (SPSS software, version 11). Percentages were given for mammographic findings of breast lesions.

Results: Sensitivity, specificity and diagnostic accuracy of mammography was found to be 92.5%, 76.5% and 88.5%, respectively. **Conclusion:** Mammography is more sensitive than specific for detecting breast carcinoma.

Keywords: Mammography, Breast cancer, Sensitivity and Specificity.

INTRODUCTION

Breast carcinoma is associated with its high incidence and mortality rate among females globally. It affects approximately one out of nine among Pakistani females. According to estimates, in 2002 there were 1.15 million new diagnoses of breast cancer and 410 712 deaths caused by breast cancer worldwide¹. This high incidence in well developed countries is due to screening programs that detect early invasive cancers. Effective screening with self-examination of breast, radiological techniques like mammography, x-rays and even clinical examination, can be fruitful in its early detection and cure thereby decreasing its mortality rate².

They are modified sweat glands which start their embryonic development from the sixth week of gestation. Estrogen and progesterone levels rise during pregnancy that lead to their full development. Fat is deposited in the breast giving them an enlarged somewhat spherical shape³.

Genetic factors like BRCA1 and BRCA2 may account for up to 10% of breast cancer cases in developed countries. The other risk factors for breast carcinoma include reproductive factors, body size/obesity, alcohol, physical activity, exogenous hormones, diet and exposure to ionizing radiation⁴.

Pathologically, it is either invasive or non-invasive. Invasive lobular carcinoma (75%) of all breast cancer types. Other rare types of breast cancer are inflammatory, pagets disease of nipple, phyllodes tumours and angiosarcoma⁵.

Radiological procedures like mammography, breast ultrasound, Doppler studies, CT, MRI, nuclear medicine studies, needle localization of suspicious lesions and image guided breast core biopsies are in clinical practice for

diagnostic purpose of carcinoma. Mammography is routinely done for both screening and diagnostic purposes and is still considered the "Gold standard" in detection of early stage breast cancer.² Correlation of mammography and histopathology findings however, has shown that certain histological types of breast cancer have the propensity to manifest in characteristic mammographic pattern⁶.

The screening mammogram is used to see the complete breast tissue with a minimal radiation exposure. Screening mammogram should not be scheduled during menstruation or during lactation.⁷ Although the role of mammography in early diagnosis of breast cancer is well established, the aim of this study is to determine its sensitivity, specificity and diagnostic accuracy in breast carcinoma.

The objective of the study was to see the sensitivity, specificity and diagnostic accuracy of mammography in breast carcinoma.

METHODS

The sample size of 70 was estimated by 95% confidence level with 5% margin of error and 75% prevalence of invasive ductal carcinoma in breast cancer patients.⁵ This study was conducted in Department of Radiology, Jinnah Hospital, Lahore for 6 months (04-08-2008 to 03-02-2009) following approval from Hospital's ethical committee. Patients were enrolled by non-probability consecutive sampling. 70 cases fulfilling the inclusion criteria were enrolled throughout project. Demographic history was taken and only females (35-55 years) were included. Written informed consent was taken from the patient. Their mammography was done in-order to find out the density, morphology and architectural distortion of breast lesions.

The sensitivity, specificity and diagnostic accuracy of mammography was determined in terms of breast carcinoma.

Data analysis: The collected information was entered into SPSS 11.0 version and analyzed through its statistical programme. The mammographic findings of mass/calcification, were presented as percentages. Sensitivity, specificity and diagnostic accuracy of mammography for detecting breast carcinoma was determined taking histopathology as gold standard.

RESULTS

Distribution of parity was presented as percentage. The number of patients in different ranges are summarized in Table-1. The patients showed variation in the distribution of density among breast lesions. The results of masses with their densities are given below in table-2. Carcinogenic lumps in breast cancer patients showed variety in their morphology. The percentages of various morphologies among enrolled patients are given below in table-3. The patients showed variation in the architectural distortion among breast lesions. The results of architectural distortion are given below in table-4.

Results of true positive and true negative patients on histopathological basis are summarized in table-5. Majority of cases (53) were true positive. Results of sensitivity, specificity and diagnostic accuracy of this technique in carcinomic enrolled patients are in table-6.

Table 1: Distribution of parity among enrolled patients as percentage (n=70)

Parity	Frequency	Percentage (%)
Para 0-2	18	25.7
Para 3-4	34	48.6
Para 5-7	18	25.7
Total	70	100

Table-2: Distribution of patients by density of mass as percentage (n=60)

Density	Frequency	Percentage%
Hyperdense	58	96.7
Hypodense	2	3.3
Total	60	100

*As rest of 10 cases presented as calcification not as mass.

Table-3: Frequency of enrolled patients by morphology of calcification (n=10)

Morphology	Number	Percentage%
Pleomorphic	6	60
Amorphous	2	20
Linear and branching	2	20
Total	10	100

*As rest of 60 cases presented as mass not as calcification

Table-4: Distribution of patients by architectural distortion of mass (n=60)

Architectural distortion	Frequency	Percentage%
Yes	38	54.3
No	32	45.7
Total	70	100

Table-5: Comparison of mammographic findings versus histopathology (n=70)

Patients	Histo-pathological Findings		Total
	True Positive	True Negative	
Number	53	17	70

Table-6: Sensitivity, specificity and diagnostic accuracy of mammography

Parameters	Percentage%
Sensitivity rate	92.45
Specificity rate	76.47
Diagnostic Accuracy	88.5

DISCUSSION

Mammography is a technique that uses x-ray imaging to develop systematic images of soft tissues like breast. It uses low dose x-rays beams.⁸ Its role in early breast carcinoma is signified by the fact that it senses roughly (75%) of breast cancer cases before they can be palpated. Its radiations may be harmful to the patient. Nevertheless, its beneficiary effects outweigh the risks and inconvenience. Radiological techniques on various tissues and bones like spine, hip joints may be done to see evidence of metastasis of carcinoma.⁹ Birdwell et al found that missed cancers constituted 30% calcified lesions showing pleomorphism. Approximately 70% were mass lesions. The most likely reasons for missed diagnosis of carcinoma were dense breasts and distracting lesions.¹⁰ Our work was also in line with previous researches as 85.7% of cases in present study presented as mass in breast.

Our study showed that mammography had a higher sensitivity and specificity rate for detecting invasive ductal carcinoma. The sensitivity of mammogram was calculated as 92.45%. The specificity of mammogram was 76.47% in this study. Overall diagnostic accuracy of mammogram in the diagnosis of invasive ductal carcinoma was 88.5%. This indicates that mammography is an important diagnostic tool for diagnosing breast diseases. Finally, to improve the accuracy of mammographic interpretation, more effective criteria for reporting mammographic findings and selecting assessment categories must be considered. Mammography can diagnose even impalpable tumors of the breast^{11,12}.

CONCLUSION

Mammography is more sensitive than specific but an important diagnostic tool in the field of medicine for detecting breast carcinoma.

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REFERENCES

1. Parkin DM, Bray F, Ferlay J, Pisani P. Global cancer statistics, 2002. CA Cancer J Clin 2005;55:74-108.
2. Sohail S, Alam SN. Breast cancer in Pakistan-awareness and early detection. J Coll Physicians Surg Pak 2007;17:711-2.
3. Urist MM, Bland KI. Indications and techniques for biopsy. In: Bland KI, Copeland EM III, editors. The breast: Comprehensive management of benign and malignant diseases. Philadelphia: WB Saunders Co, 2004:791-802.

4. McPherson K, Steel CM, Dixon JM. ABC of breast diseases. Breast cancer epidemiology, risk factors, and genetics. *BMJ* 2000;321:624-8
5. Yang ST, Tse GMR. Sonographic, mammographic and histopathologic correlation of symptomatic ductal carcinoma in Situ. *Am J Radiol* 2004;182:101-10.
6. Barlow WE, Lehman CD, Zheng Y, Ballard-Barbash R, Bonnie C. Performance of diagnostic mammography for women with signs or symptoms of breast cancer. *J National Cancer Inst* 2002;94:1151-9.
7. Apffelstaedt JP, Steenkamp V, Baatjes KJ. Surgeon-read screening mammography: an analysis of 11,948 examinations. *Ann Surg Oncol* 2010;17:249-54.
8. Schonberg MA, Ramanan RA, McCarthy EP, Marcantonio ER. Decision making and counseling around mammography screening for women aged 80 or older. *J Gen Intern Med* 2006;21:979-85.
9. Wasif N, Garreau J, Terando A, Kirsch D, Mund DF, Giuliano AE. MRI versus ultrasonography and mammography for preoperative assessment of breast cancer. *Am Surg* 2009;75:970-5.
10. Birdwell RL, Ikeda DM, O'Shaughnessy KF, Sickles EA. Mammographic characteristics of 115 missed cancers later detected with screening mammography and the potential utility of computer-aided detection. *Radiology* 2001;219: 192-202.
11. Smith RA, D'Orsi C, Newell MS. Screening for Breast Cancer. In: Harris JR, Lippman ME, Morrow M, Osborne KC, editors. *Diseases of the Breast*. 4th ed. Philadelphia: Lippincott, Williams & Wilkins, 2010.
12. Moody-Ayers SY, Wells CK, Feinstein AR. Benign tumors and early detection in mammography screened patients of a natural cohort with Breast Cancer. *Arch Intern Med* 2000;160:1109-15.