Section: Radiology

Original Research Article

COMPARATIVE INCIDENCE OF MALIGNANCY IN DIFFERENT BREAST PARENCHYMAL PATTERNS

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Abstract

Background: Breast cancer is a leading malignancy among women worldwide, with a high mortality rate. Early detection is essential, and mammography remains the gold standard for breast cancer screening, offering insights into breast parenchymal patterns and guiding biopsies. Our study aimed to investigate the association between breast parenchymal patterns and malignancy risk, comparing radiological findings with histopathological confirmation. **Materials and Methods:** This prospective study was conducted on 50 patients with suspected breast carcinoma at Dhiraj General Hospital and Muni Seva Ashram over 18 months. Mammographic imaging in standard and additional projections was performed, followed by stereotactic biopsy for definitive histopathological diagnosis. Clinical and demographic data were also analyzed. **Result:** The highest incidence of breast cancer was observed in the 40–50 years age group (46%), with a family history in 14% of cases. Parenchymal Pattern I had the highest association with malignancy (58%), followed by Pattern II (30%). Surprisingly, Pattern V, despite its density, showed a relatively low risk (10%). Most tumors were located in the upper outer quadrant (52%) and presented with spiculated margins (52%). Histopathology confirmed infiltrating ductal carcinoma Grade III as the predominant type (54%). Lymph node involvement was seen in 98% of cases, with 60% showing nipple-areola complex involvement. **Conclusion:** This study underscores the role of mammography in early breast cancer detection and highlights the association of specific parenchymal patterns with malignancy risk. The findings emphasize the need for targeted screening and histopathological confirmation to optimize diagnostic accuracy and improve patient outcomes.

INTRODUCTION

Breast cancer is among the most prevalent human malignancies, accounting for approximately 25% of all cancers in females worldwide and 27% of cancers in developed nations with a Western lifestyle.[1] It is a carcinoma originating from breast tissue, most commonly from the inner lining of ducts (ductal carcinoma, 80%) or from the lobules that supply milk to the ducts (lobular carcinoma, 10–15%). Less common subtypes include inflammatory breast cancer, medullary carcinoma, phyllodes tumor, angiosarcoma, mucinous carcinoma, mixed tumors, and Paget's disease, which primarily affects the nipple.[1]

In 2022, an estimated 2.3 million women were diagnosed with breast cancer, resulting in approximately 670,000 deaths globally. Breast cancer occurs universally in women of all ages post-puberty, with incidence rates increasing in later life.[2] Therefore, the development of non-invasive or minimally invasive diagnostic techniques with high sensitivity and optimal specificity is essential to facilitate early detection of breast cancer.

Mammography remains the cornerstone of breast imaging and is the most effective screening tool for breast cancer detection. Advances in film-screen mammography, including high-resolution imaging that enhances visualization of spiculations and microcalcifications, and high-contrast imaging that highlights subtle differences in soft tissue densities, have significantly improved its diagnostic performance. Studies have demonstrated that modern film-screen mammography effectively identifies both palpable and non-palpable breast cancers,

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contributing to a statistically significant reduction in breast cancer mortality.[3]

Additionally, mammography enables characterization of breast parenchyma types. A seminal study by J. Wolfe (1976) established a correlation between different breast parenchyma patterns and the risk of malignancy. Our study aims to further investigate this association and determine the comparative incidence of malignancy across various parenchymal types.[4]

MATERIALS AND METHODS

Study Sample: The study was conducted on 50 suspected cases of breast carcinoma who presented to the Radiology Department of Dhiraj General Hospital and Muni Seva Ashram until May 30, 2012. All patients were evaluated using mammography, with stereotactic biopsy performed as necessary to confirm the diagnosis.

Source of Study Population: The study population included individuals from Baroda city and its surrounding suburbs, as well as a diverse cross-section of patients from the states of Rajasthan, Madhya Pradesh, and Maharashtra, who sought care at Dhiraj General Hospital and Muni Seva Ashram.

Inclusion Criteria:

1. Patients who provided written informed consent to participate in the study.
2. Individuals referred to the radiology department for mammography and/or sonography and found to have suspicious breast lesions.
3. Previously diagnosed cases of breast malignancy referred for follow-up radiological investigations.
4. Patients undergoing plain X-rays, sonography, or CT scans for non-breast-related conditions who were incidentally found to have breast parenchymal lesions.

Exclusion Criteria:

Patients unwilling to undergo the necessary examinations or provide written consent were excluded from the study.

Clinical Assessment: All 50 patients underwent a comprehensive clinical evaluation, including a detailed history and physical examination, as documented in the study proforma (Appendix I).

Routine Laboratory Investigations:

The following blood tests were performed for all participants:

1. Complete hemogram, including hemoglobin levels, total and differential leukocyte counts, and erythrocyte sedimentation rate (ESR).
2. Renal function tests, including blood urea and serum creatinine levels.
3. Random blood sugar estimation, with fasting and postprandial blood sugar tests conducted if indicated.
4. Screening for HIV and hepatitis markers when necessary.

Radiological Investigations: Mammographic imaging was performed in cranio-caudal and medio-lateral oblique projections. Additional views such as lateral, Cleopatra, tangential, cleavage, spot, and magnification views were acquired in specific cases to provide further diagnostic clarity.

Stereotactic Biopsy: Lesions identified on imaging were subjected to stereotactic biopsy to establish a definitive histopathological diagnosis.

RESULTS

Table 1 presents the demographic and baseline clinical characteristics of the study participants. Age distribution is detailed in six categories, with the majority of participants falling within the 40–50 years age group (46.00%), followed by the 50–60 years group (36.00%). Other age groups, including 30–40 years and 60–70 years, each accounted for 6.00% of participants, while smaller proportions were observed in the 70–80 years (4.00%) and above 80 years (2.00%) groups. Regarding past medical history, the majority of participants had no prior history of medical conditions (88.00%), with only 12.00% reporting a past history, which included hysterectomy (8.00%) and lumpectomy (4.00%). Family history was absent in 86.00% of participants, with only 14.00% reporting a positive family history.

Table 2 summarizes the clinical characteristics of breast cancer among the study participants. Breast involvement was nearly evenly distributed, with right breast cases accounting for 52.00% and left breast cases for 48.00%. Regarding parenchymal patterns, Type I was most prevalent (58.00%), followed by Type II (30.00%) and Type V (10.00%), while Type IV (2.00%) was rare, and Type III was absent (0.00%). Tumor localization revealed the upper outer quadrant as the most commonly affected region (52.00%), followed by the retroareolar area (36.00%), with lower inner and upper inner quadrants each contributing 6.00%. Tumor margins were predominantly spiculated (52.00%) or irregular (46.00%), with only 2.00% having regular margins. Architectural distortion was observed in 78.00% of cases, while 22.00% showed no distortion. Calcifications were present in 66.00% of participants, whereas 34.00% exhibited no calcifications.

Table 3 highlights the area involvement and cancer grading among the study participants. Lymph node involvement was observed in 98.00% of cases, with bilateral lymph node involvement being the most common (88.00%), followed by right-sided involvement (10.00%). Only 2.00% of participants had no lymph node involvement. Nipple-areola complex involvement was present in 60.00% of cases, with 48.00% showing nipple retraction and 12.00% exhibiting peri-areolar involvement, while 40.00% of participants had a normal nipple-areola complex.

Breast Imaging-Reporting and Data System (BIRADS) classification revealed that 52.00% of cases were categorized as BIRADS IV, and 48.00% as BIRADS V, with no cases classified under BIRADS I, II, III, or VI. The contralateral breast

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showed involvement in 58.00% of participants, while 42.00% exhibited no abnormalities.

Table 4 compares the radiological diagnosis and histopathological findings among the study participants. Radiodiagnosis revealed an equal distribution of cases, with 50.00% categorized as suspiciously benign and 50.00% as suspiciously malignant. Histopathological evaluation identified infiltrating ductal carcinoma (IDC) Grade III as the most frequent diagnosis (54.00%), followed by IDC Grade II (40.00%). In contrast, 6.00% of cases showed no evidence of malignancy. This comparison underscores the concordance and discrepancies between radiological and histopathological findings in the diagnosis of breast cancer.

Table 1: Demographic and baseline clinical characteristics of study participants.

Parameters		Number	Percentage
Age groups (in years)	30-40	3	6.00%
	40-50	23	46.00%
	50-60	18	36.00%
	60-70	3	6.00%
	70-80	2	4.00%
	Above 80	1	2.00%
Past History	Absent	44	88.00%
	Present	6	12.00%
History	Hysterectomy	4	8.00%
	Lumpectomy	2	4.00%
Family History	Present	7	14.00%
	Absent	43	86.00%

Table 2: Clinical Characteristics of breast cancer

Parameters		Number	Percentage
Breast Involvement	Right	26	52.00%
	Left	24	48.00%
Parenchymal Pattern	I	29	58.00%
	II	15	30.00%
	III	0	0.00%
	IV	1	2.00%
	V	5	10.00%
Quadrant	Upper outer	26	52.00%
	Lower inner	3	6.00%
	Upper inner	3	6.00%
	Retro areolar	18	36.00%
Margins	Spiculated	26	52.00%
	Irregular	23	46.00%
	Regular	1	2.00%
Architectural distortion	Present	39	78.00%
	Absent	11	22.00%
Calcification	Present	33	66.00%
	Absent	17	34.00%

Table 3: Area involvement and Grading of Cancer

Parameters		Number	Percentage
Lymph node involvement	Present	49	98%
	Absent	1	2%
Present lymph nodes	B/L	44	88.00%
	Rt sided	5	10.00%
Nipple areola	Normal	20	40.00%
	Involved	30	60.00%
Nipple areola Involved part	Peri areolar involvement	6	12.00%
	Retracted	24	48.00%
BIRADS	I	0	0.00%
	II	0	0.00%
	III	0	0.00%
	IV	26	52.00%
	V	24	48.00%
	VI	0	0.00%
Other breast BIRADS	Normal	21	42.00%
	Involved	29	58.00%

Table 4: Comparison between Radiodiagnosis and Histopathological incidence

Parameters		Number	Percentage
Radiodiagnosis	Suspiciously Benign	25	50.00%
	Suspiciously Malignant	25	50.00%
Histopathology	Infiltrating uct Ca; grade II	20	40.00%

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	Infiltrating duct Ca; grade III	27	54.00%
	No e/o malignancy	3	6.00%

DISCUSSION

Most common age group in our study is 40-50 yrs (46%) followed by 50-60 yrs (36%). Study done by Cancer Registry Ireland (2012) show it is most common in 55 – 65 years.[5] Past history of hysterectomy was seen in 8% cases whereas lumpectomy was seen in only 4% cases. Family history of carcinoma breast was seen in 14% cases. Patient with family history have almost double the risk of being diagnosed with breast cancer themselves. The study done by Cancer research UK (July 2012) reveal that patients with family history have almost double the risk of being diagnosed with breast cancer themselves.

In our study the right breast (52%) was more commonly involved than the left breast (48%). Study done by Cancer Registry Ireland (2012) show it is to be more common in the left breast than the right.[5]

In our study there is an increased risk of breast cancer with Tabar pattern I (58%). Pattern I corresponds to pattern P1 by Wolfe classification which is known to be associated with low risk for breast cancer. In a comparative study conducted by Vacek PM et al,[6] and Xu K et al,[7] interpreted that there is an expected finding of an increased risk of breast cancer with Tabar pattern IV. Pattern IV corresponds to pattern P2 by the Wolfe classification and this is known to be associated with increased breast cancer risk.

The incidence of breast cancer with parenchymal pattern in our study is Patter I (58%) followed by pattern II (30%) then pattern V (10%), pattern IV (2%) and lastly pattern III (0%). A more surprising result is the relatively low risk associated with pattern V. Vacek PM et al,[6] and Xu K et al,[7] show a relatively low risk of Ca breast with pattern V.

Interestingly, in our study, the increased risk associated with Tabar pattern I is most pronounced for the aggressive, more poorly differentiated grade 3 cancers. Study conducted by Vacek PM et al,[6] and Xu K et al,[7] show similar findings for Tabar pattern IV. Our study suggests that increasing breast density is associated with an increased risk of breast cancer. Study conducted by Vacek PM et al,[6] and Xu K et al,[7] show increased risk of breast cancer with increasing breast density.

The most involved quadrant in our study is the upper outer (52%) followed by retro areolar area (36%). Study done by Cancer Registry Ireland (2012) show that upper outer quadrant is most involved followed by retro areolar area. In our study 52% of cases presented with speculated margins whereas 46% cases presented with irregular margins. In our study 52% of cases presented with speculated margins whereas 46% cases presented with irregular margins.

CONCLUSION

Breast carcinoma remains a significant health burden, with early detection and diagnosis being critical for effective management. This study highlights the association of breast cancer with specific parenchymal patterns, particularly the unexpected high risk in Tabár Pattern I. The most affected age group was 40–50 years, with family history and previous lumpectomy as notable risk factors. Tumor characteristics such as spiculated margins, architectural distortion, and lymph node involvement were prevalent, with most cases classified as BIRADS IV or V. Histopathological findings confirmed infiltrating ductal carcinoma as the predominant type. These results emphasize the role of mammography and histopathology in guiding breast cancer diagnosis and treatment strategies.

REFERENCES

1. Lakhani SR, Ellis IO, Schnitt SJ, Tan PH, Van de Vijver MJ, editors. WHO Classification of Tumours of the Breast. Fourth ed. IARC; Lyon: 2012. ISBN.13.
2. Breast Cancer, WHO. [Accessed on 08/11/2024.] https://www.who.int/news-room/fact-sheets/detail/breast-cancer#:~:text=Breast%20cancer%20caused%20670%20000,and%20670%20000%20deaths%20globally.
3. Anandarajah A, Chen Y, Colditz GA, Hardi A, Stoll C, Jiang S. Studies of parenchymal texture added to mammographic breast density and risk of breast cancer: a systematic review of the methods used in the literature. Breast Cancer Research. 2022 Dec 30;24(1):101.
4. Wolfe JN. Risk for breast cancer development determined by mammographic parenchymal pattern. Cancer. 1976 May;37(5):2486-92.
5. Cancer in Ireland 1994-2019. (Accessed on 08/11/2024) https://www.ncri.ie/sites/ncri/files/pubs/NCRI_Annual%20Report_2021.pdf
6. Vacek PM, Geller BM. A prospective study of breast cancer risk using routine mammographic breast density measurements. Cancer Epidemiol Biomarkers Prev. 2004 May;13(5):715-22. PMID: 15159301.
7. Xu K, Ao-rong T, Bing-zhang S, et al. Relationship between breast parenchymal pattern and breast cancer incidence. Chin Med J (Engl) 1986;99:277–80.

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