e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2023; 13(9); 155-158

Original Research Article

The Relationship between Tumor Size and Immunochemistry Status with Lung Metastasis in Breast Carcinoma

Prakash Kumar Mansangbhai Chaudhary[1], Jignesh Kumar D. Damor[2], Gaurav Gattani[3], Deval Kumar Manharbhai Patel[4]

[1]Senior Resident, Department of General Surgery, Geetanjali Medical College, Udaipur, Rajasthan
[2,3,4]Assistant Professor, Department of General Surgery, Geetanjali Medical College, Udaipur, Rajasthan

Received: 18-06-2023 / Revised: 21-07-2023 / Accepted: 26-08-2023
Corresponding author: Dr. Deval Kumar Manharbhai Patel
Conflict of interest: Nil

Abstract:

Background and Aim: Tumour size and lymph node metastases are critical factors in the progression of breast cancer. Currently, therapy options for bone metastasis include pain relief, reduction of pathological fractures, and prevention of cord compression in spinal metastasis. Radiotherapy and chemotherapy are used to accomplish this. The study's goal was to investigate the relationship between tumour size and lung metastasis, as well as the relationship between ER, PR status, and lung metastasis.

Materials and Methods: This study included 100 patients with breast cancer who visited the general surgery and oncology department at a tertiary care institute in India. Case specifics and a complete history were acquired. Blood tests were performed on a routine basis. Clinical examination and imaging are used to determine the size of a tumour. Core needle biopsy is performed on all patients to confirm the diagnosis and receptor status. The pathologist determines the IHC status of the tumour. CECT chest was used to confirm the presence of lung metastases.

Results: The prevalence of lung metastasis in patients with carcinoma breast was 10% in this study. In this study, patients are divided into three groups based on their age: those under 40, those between 41 and 60, and those over 60. In our study, the prevalence of breast cancer is 19% (19 cases) in the age group under 40 years, 55% (55 cases) in the age group, and 26% (26 cases) in the age group over 60 years. In this investigation, 55 of 100 cases were determined to be ER positive, representing a 55% prevalence rate.

Conclusion: The prevalence of lung metastasis in cancer of the breast is 10%. There appears to be no link between ER, PR, and HER-2 neu status and lung metastases. There is also no link between clinically T2 and T3 tumours and lung metastasis, whereas clinically T4 tumours appear to have a higher frequency of lung metastasis.

Keywords: Breast carcinoma, Lymph node metastasis, Lung, Tumor.

Introduction

Breast cancer is the most frequent type of cancer in the world and the second biggest cause of cancer deaths among women.[1] Because of the advancement of biomolecular diagnostics, four subtypes of breast cancer have been recognised (luminal A, luminal B, HER2-neu overexpressed, and triple-negative breast cancer [TNBC]). Each subtype's specific clinical characteristics and prognosis have been investigated. Breast cancer prognosis has improved due to hormonal therapy, clinical usage of trastuzumab (HER2-neu targeting drug), and the emergence of efficient chemotherapy.

Metastasis can occur after treatment has begun or at the time of diagnosis.[2] The tumor's prognosis and metastasis are affected by the stage at which it first appears and its underlying biology. Tumour size, grade, nodal involvement, lymphovascular invasion, oestrogen and progesterone receptor (ER, PR) status, and human epidermal growth factor receptor 2 (HER2) statuses are all risk factors for metastasis and recurrence. However, we must first gain a thorough grasp of the pattern of propagation and precise areas of recurrence.[3] Metastatic spread models depict a complex combination of elements involving tumour intravasation, circulation, extravasation, proliferation, angiogenesis, and the tissue microenvironment. Metastatic tumour characteristics usually follow the initial tumour.[4]

Some connections with metastatic disease have been discovered in breast cancer patients. There are gene signatures for lung and bone metastasis, and HER2 and ER expression levels have been linked

to an increased risk of dissemination to specific regions.[5] An increased number of metastatic lymph nodes is associated with rising tumour growth.[6] According to certain research, a positive link between tumour size and nodal metastasis does not exist in patients with basal-like breast cancer (BLBC) or BRCA-1. TNBC is the largest of the subtypes and has a modest connection with lymph node metastasis.[7,8]

Currently, therapy options for bone metastasis include pain relief, reduction of pathological fractures, and prevention of cord compression in cases of spinal metastasis. It is accomplished through radiotherapy and chemotherapy. Chemotherapy is the only treatment option for lung metastases.[9]

Material and Methods

This study included 100 patients with breast cancer who visited the general surgery and oncology department of an Indian tertiary care institute. The study period lasted about a year.

Case details and a comprehensive history were acquired. Routine blood tests were performed. Clinical examination and imaging are used to determine tumour size. A core needle biopsy is performed on all patients to confirm the diagnosis and receptor status. The pathologist determines the tumor's IHC status. CECT chest revealed the presence of lung metastases. The core needle biopsy was performed under aseptic circumstances, with the components prepared and draped. A Trucut biopsy needle is placed into the suspicious lump, and a piece of tissue is extracted. The method is repeated 5 to 8 times until a suitable sample is obtained. The location is chosen such that the scar is incorporated in the surgical incision. The prevalence of lung metastases in patients with breast cancer, Clinical T staging and lung metastases are related. There is a link between tumour size bigger than 6 cm and lung metastasis. There is a link between ER status and lung metastases. There was a correlation between PR status and lung metastasis, as well as a correlation between HER-2 neu status and lung metastasis.

Statistical Analysis

The collected data was assembled and input into a spreadsheet programme (Microsoft Excel 2007) before being exported to the data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). The confidence level and level of significance for all tests were set at 95% and 5%, respectively.

Results

The prevalence of lung metastasis in cancer breast patients was 10% in this study. There are 100 cases of Carcinoma Breast, with 10 cases of lung metastasis and 90 cases of CECT chest being normal. (Table 1)

In this study, patients are divided into three age groups: those under 40, those between 41 and 60, and those above 60 to see if there is a link between age and lung metastasis.

In our study, the prevalence of breast cancer is 19% (19 cases) in the age group under 40 years, 55% (55 cases) in the age group between 40 and 60 years, and 26% (26 cases) in the age group beyond 60 years. The prevalence of lung metastasis is 5.26% (1 case) among the 19 cases in this age group. There are 5 incidences of lung metastasis among the 55 patients in the age group 41-60 years. As a result, the prevalence of lung metastasis in those aged 41-60 years is 9.09%. The prevalence of lung metastasis is 15.38% (4 instances) among the 26 patients above the age group.

In this study of 100 cases, 41 instances were classified as clinical tumor staging T2, with a 41% prevalence rate. T3 clinical tumor staging is assigned to 47 patients, with a 47% prevalence incidence. T4 clinical tumor staging is assigned to 12 patients, with a 12% prevalence incidence.

In this investigation, 55 of 100 cases were determined to be ER positive, resulting in a 55% prevalence rate. In ER-positive patients, lung metastasis occurs at a 10% rate. In ER-negative individuals, lung metastasis occurs at a rate of 11%. In this study of 100 patients, 51 were determined to be PR positive, with a 51% prevalence rate. Metastasis is present in 10% of PR-positive patients. In PR negative patients, metastasis occurs at a rate of 11%. In this study, 41 of 100 cases were HER-2 neu receptor positive, representing a 41% prevalence rate. With a prevalence rate of 9.09%, four patients with HER-2 positive status reported with lung metastases.

Table 1: The prevalence of lung metastasis among breast carcinoma patients

Lung metastasis	Number	Percentage (%)
Present	10	10
Absent	90	90

Table 2: The prevalence age and prevalence of metastasis among breast carcinoma patient

Age (Years)	Lung Metastasis N (%)	No Lung Metastasis N (%)
Upto 40	19 (19)	1
41-60	55 (55)	5
Above 60	26 (36)	4

Discussion

Carcinoma of the breast is one of the most frequent malignancies in terms of incidence and one of the leading causes of cancer-related mortality. The lifetime risk of acquiring breast cancer is roughly 1 in 8% to 1 in 12%, and the lifetime risk of mortality from the disease is approximately 2.4%. Breast maturation is complete only after pregnancy. As a result, because the disease is linked to the action of estrogen on the immature breast, the age at first childbirth is an important risk factor for carcinoma breast. The risk of malignancy is directly related to the age at first childbirth.[10] In most cases, distant metastasis spreads through the circulation. Because malignant cells have low cell adhesion, they are seeded into blood arteries supplying cancerous mass and transported through the bloodstream.[11] Spinal metastasis is caused by venous drainage of the breast, also known as the Batson plexus. BRCA1 is an autosomal dominant characteristic with a high penetrance, 90% probability of breast cancer, 40% chance of ovarian cancer, employing high-grade tumor, with negative receptor status, impacting younger age groups, and a higher frequency of bilateral breast cancer. BRCA2 is an autosomal dominant characteristic with a high penetrance, Carrier 100-fold risk in the male population, IDC type, and receptor status positive.[12] The prognosis is favorable; however, in the event of mixed variations, the prognosis is comparable to that of invasive ductal carcinoma.

Because estrogen has been shown to suppress the expression of VEGF [13], its level of expression in luminal types was relatively low, whereas HER2 and TNBC showed increased VEGF expression. TNBC exhibits increased microvascular density and VEGF expression.[14] Based on these assumptions, patients with TNBC were expected to have larger tumors and a higher rate of hematogenous metastasis.[15-18] These chemicals, however, are not the only ones that influence the risk of lymph node metastasis and tumour progression. As a result, more research is needed to fully comprehend these occurrences and utilise them in clinical practice. In this study, patients are divided into two groups: those with tumors smaller than or equal to 6 cm and those with tumors larger than 6 cm. The link between tumor size and lung metastasis is investigated.[19] with an incidence of%, 17 of 100 cases reported with tumor sizes less than or equal to 6 cm. This study discovered a link between LVD and tumor size, grade, lymph node status, and LVI. Schoppmann et al [20] discovered a similar finding, however El Ghohary et al [21] did not. Tumor size is the most powerful predictor of local recurrence, regional and systemic dissemination, and thus overall survival in breast cancer. When compared to low grade slow growing tumor, high-grade fast-growing tumour produces more growth factors and has a greater clonal variety of tumor cells capable of invading lymphatic arteries.

Conclusion

The prevalence of lung metastasis in breast cancer is 10% in this study. There appears to be no link between ER, PR, or HER-2 neu status and lung metastases. Furthermore, there is no link between clinically T2 and T3 tumours and lung metastasis. T4 tumours, on the other hand, appear to have a higher incidence of lung metastasis. Patients with tumours larger than 6cm in size had a greater incidence of lung metastasis. A larger study with a higher sample size is still required to obtain a reliable study outcome.

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