

Original Research Article

Trends of breast tumour laterality and age-wise incidence rates in North Indian population

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Received: 26 June 2020

Revised: 13 July 2020

Accepted: 14 July 2020

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ABSTRACT

Background: The breast is a paired organ. The two breasts share many of the risk factors known to contribute to the development of cancer genetics, environmental exposure, diet, and estrogen exposure, etc. By studying differences in the occurrence of breast cancer between the left and right breast, we can control for these common risk factors. Previous studies of breast cancer asymmetry have established that the laterality ratio is greater than 1.0 in women.

Methods: We have taken 420 total cases to study the breast tumour laterality in women and age wise incidence of carcinoma breast in northern India. The study included all consecutive adult patients with histologically confirmed breast cancer, either invasive or carcinoma in situ. Multiple cancers were defined as two or more primary cancers occurring in an individual that were not an extension, recurrence, or metastasis. Based on the chronology of presentation, they were categorized as synchronous or metachronous primaries.

Results: Out of 420 cases of breast cancer it was seen that 193 patients i.e. 45.95% of women under observation had left sided breast tumour, 225 patients i.e. 53.57% of women had right sided breast tumour and only 2 patients i.e. 0.48% patients had bilateral lesions in the breast.

Conclusions: This result suggests the possible role of estrogen hormone in the reversed lateralization of breast cancer in comparison to other paired organ cancers in post-menopausal women suggesting that North Indian population has higher incidence of right sided breast cancer.

Keywords: Breast cancer, Laterality, North Indian, Tumor

INTRODUCTION

The World cancer report issued by the International Agency for Research on Cancer (IARC), tells us that cancer rates are set to increase at an alarming rate globally. Cancer rates could increase by 50% to 15 million new cases in the year 2020.¹

Breast cancer is the most common female malignancy accounting for 22.9% of all female cancer's World-wide. Breast cancer was reported to afflict the left breast more than the right one. Despite the causes for left-sided pre-

dominance (LSP) being unclear, it may reflect etiologic factors not yet well recognised.

However, the minimal increase in size does not explain the magnitude of increased cancer risk in the left compared to the right breast. In a large study of a UK cohort involving over a quarter of a million cancer patients, right-sided lateralisation was reported for lung, testis, ovarian and kidney cancers while breast cancer demonstrated left-side lateralisation.²

Despite extensive study of breast cancer incidence, including specific studies of the relationship between age

and breast cancer incidence, the picture remains confusing. This article examines not only the relationship between age and breast cancer, but also trends over time related to this relationship to discern the underlying true age-incidence pattern. The age-incidence curve changes around the menopausal period, most likely due to hormonal changes 10 to 15 years earlier, flattens out in the 40 to 50 years old age range, and then increases as age increases.

METHODS

A total of 420 primary breast cancer patients admitted over a 5 years period from June 2015 to 2020 in different surgical and onco-surgical wards of Sri Guru Ram Das Institute of Medical Science and Research, a tertiary care centre in North India. Details were collected on side, demography, tumor stage, surgical procedures, lymph node count, metastatic lymph nodes, intra- and post-operative complications, and hospital stay. The association between laterality and treatments and their outcomes was assessed in these patients.

The medical records of breast cancer patients previously seen and closely followed by the author were retrospectively reviewed, with special emphasis on clinical presentation, tumor characteristics, family history, and subsequent survival. The study included all consecutive adult patients with histologically confirmed breast cancer, either invasive or carcinoma in situ. All data collected were identified to comply with the Health Information Protection Act.

Patient age was estimated based on that at the time of the initial diagnosis of cancer. Elderly patients were defined as being aged above 65 years. Body mass index (kg/m^2) was categorized as underweight (<18.4), normal (18.5 - 24.9), or overweight (>25). Patients were questioned about any previous history of thromboembolic events, and closely followed for such a possibility. Patients were asked about their handedness. Primary tumor laterality was classified as left side, right side, or bilateral. Tumor blocks for each case were studied using immunohistochemical staining for estrogen and progesterone receptors and human epidermal growth factor receptor 2 (HER2/neu) scoring or the fluorescent in situ hybridization technique, using established methods. Because of the small number of events, hormone receptor status was classified as a two-level variable, namely estrogen receptor-positive and/or progesterone receptor-positive, and both estrogen receptor-negative and progesterone receptor-negative. Presence or absence of lympho-vascular invasion was determined in some patients. Stage of disease was defined according to the American Joint Committee of Cancer Staging Classification (eighth edition, 2017).³ Multiple cancers were defined as two or more primary cancers occurring in an individual that were not an extension,

recurrence, or metastasis. Based on the chronology of presentation, they were categorized as synchronous or metachronous primaries. Synchronous primaries were defined as malignancies presenting within 6 months of diagnosis of the index tumor (initial malignancy). This includes simultaneous primaries that were diagnosed at the same time during the staging workup of the first malignancy. Metachronous primaries were considered to be those presenting more than 6 months following the diagnosis of the index tumor. All patients with simultaneous bilateral breast cancer were considered to have a single primary if they shared the same histological diagnosis. For patients with multiple malignancies, the date of the first primary diagnosis was considered the date of initial cancer diagnosis.

Patients were questioned about their family history of cancer, and in particular, the occurrence of breast or ovarian cancers among their first-degree relatives (biological mother, father, sister, brother, son, and daughters) and second-degree relatives (paternal or maternal uncles, aunts, grandmother, and grandfather). They were also asked to provide information regarding the type of cancer, age at initial diagnosis, tumor laterality, and any other hereditary disorders.

Statistical analysis

All analyses were done using Microsoft Excel® version 16 and SPSS® version 23. Chi squared test or Fisher's Exact test were used to compare right and left-sided BCs with other variables.

RESULTS

Out of 420 cases of breast cancer it was seen that 193 patients i.e. 45.95% of women under observation had left sided breast tumour, 225 patients i.e. 53.57% of women had right sided breast tumour and only 2 patients i.e. 0.48% patients had bilateral lesions in the breast.

Table 1: Frequency of carcinoma breast depending on laterality.

Side	Number	%
Bilateral	2	0.48
Left	193	45.95
Right	225	53.57
Total	420	100

Out of 420 patients, it has been observed that the age group with highest incidence of breast cancer was between 41-50 years of age accounting for 26.6% of total patients. Whereas those above 60 years of age had only 21.6% incidence. This data depicts that age wise incidence of breast carcinoma is highest around peri-menopausal age and it falls on both sides of this age group.

Table 2: Age wise incidence of carcinoma breast.

Age group in years	Fine needle aspiration biopsy						Total	
	Benign		Infiltrating ductal carcinoma		Infiltrating lobular carcinoma		N	%
	N	%	N	%	N	%		
<20	3	0.71	8	1.90	0	0.00	11	2.62
21-30	4	0.95	17	4.05	0	0.00	21	5
31-40	1	0.24	82	19.52	5	1.19	88	20.95
41-50	3	0.71	107	25.48	2	0.48	112	26.67
51-60	1	0.24	95	22.62	1	0.24	97	23.10
>60	7	1.67	78	18.57	6	1.43	91	21.67
Total	19	4.52	387	92.14	14	3.33	420	100.00

DISCUSSION

There was a statistically significant left-sided lateralisation in the pre-menopausal patients but not in the post-menopausal patients because of the differences in breast size were considered a contributing factor, relative breast volumes were computed from the mammograms of healthy women, and 55% were found to have a larger left breast. It has been suggested that the asymmetry of breast carcinoma reflects differences in the sensitivity of the mammary glands to hormonal stimulation, resulting in unequal volumes of tissue which is at risk to develop carcinoma.

This result suggests the possible role of estrogen hormone in the reversed lateralization of breast cancer in comparison to other paired organ cancers in post-menopausal women.

Possible explanations have included the left breast is slightly larger than the right.⁴ Breast feeding preferentially on the right breast protects from cancer.⁵ Although the excess of left-sided tumors is not large and does not appear to have major clinical implications.⁶ Breast or chest wall irradiation leads to higher radiation doses to the heart in left-sided tumors compared to the right side.⁷

In the most recent data from surveillance, Epidemiology and end results program (SEER), the incidence rate for female breast cancer rises with advancing age until approximately 45 years of age when there is a levelling referred to as Clemmesen's hook. The curve then rises until its peak at 75 years of age and then begins to decline. This is a sharply different pattern than the age-incidence curve in 1973.

Erendeeva et al performed a comparative analysis of right and left-sided BC on 45 clinico-morphological parameters.⁸ Results from this analysis revealed a number of statistically significant characteristics, including size of the primary centre, histological type of tumor, existence of metastasis in regional lymph nodes and background pathology. This study established that primary tumors localized on the right side were significantly more in size

compared with tumors of the left side, and had a significant tendency to metastasize in regional lymph nodes.⁹

CONCLUSION

This result suggests the possible role of estrogen hormone in the reversed lateralization of breast cancer in comparison to other paired organ cancers in post-menopausal women suggesting that North Indian population has higher incidence of right sided breast cancer.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kakkar V, Sharma R, Singh K, Randhawa A. Trends of breast tumour laterality and age-wise incidence rates in North Indian population. *Int Surg J* 2020;7:2523-6.