



Updates on the Conflict of Postoperative Radiotherapy Impact on Survival of Young Women with Cancer Breast: A Retrospective Cohort Study

Hassan Mohamed Eweidah*, Anis Sameh Hanna, Ahmed Mohamed Eweidah, and Hazem Abdullah El-Sheikh

Faculty of Medicine, Alexandria University, Alexandria, Egypt

*Corresponding e-mail: h_Awaeda2121066@alexmed.edu.eg

ABSTRACT

Purpose: The purpose of the present study is to investigate the impact of postoperative radiotherapy on the survival of young women aged 25-29 years diagnosed with different stages of breast cancer. **Methods:** We conducted a retrospective cohort study that included young women diagnosed with breast cancer from SEER database. The total analytical sample of the present study ($n=4153$) was divided into two separate groups; intervention group ($n=1814$) who did receive postoperative radiation therapy (PORT) and control group ($n=2339$) who did not receive PORT. Chi square test and Kaplan Meier method had been carried out for statistical analysis. **Results:** Relative survival rate of the intervention group, estimated by Kaplan-Meier method was found to be (62.9%, CI 95%) for breast cancer stage I, (66.1%, CI 95%) and (58.2%, CI 95%) for stages IIA, and IIB respectively. (30.9%, CI 95%) (54%, CI 95%) and (32.1%, CI 95%) for breast cancer stages IIIA, IIIB, and IIIC respectively and (10.3%, CI 95%) for breast cancer stage IV. **Conclusion:** Postoperative adjuvant radiotherapy shows a significant positive impact on overall survival of young women diagnosed with breast cancer stages III, and IV ($P<0.05$). Moreover, no significant impact on survival was noted for breast cancer stages I, and II.

Keywords: Cancer, Breast, Post-operative radiation, Survival

INTRODUCTION

Breast cancer is the second most common cancer in the world and the most common cancer that affects women during their lifetime in both developing and developed countries. It is a major cause of morbidity and mortality [1], hence, it has a global concern. In 2012, nearly 1.5 million women were diagnosed with breast cancer, and since 2008, breast cancer incidence has increased by more than 20% [2]. Furthermore, breast cancer survival rates vary greatly, as there are different factors that affect it. One of these factors is radiation therapy that is might be used as a modality of treatment alongside with surgery; e.g. breast conserving surgery or after mastectomy operation. In addition, it plays a critical role in the management of breast cancer as it is shown to decrease the locoregional recurrence [3]. However, its impact on the long-term survival of breast cancer women is unclear. There are various factors that control its indication; stage of breast cancer at time of diagnosis, tumour size, recurrence, etc. In the past few years, different studies showed that radiotherapy following mastectomy may have a favourable impact on survival [4]. Further, various reports had shown that breast cancer in young aged females carries graver course with higher rates of local recurrence and lower survival when compared with older aged patients [5,6]. Thus, we aimed towards investigating whether there is a significant impact of postoperative radiation therapy on the survival of young female patients with breast cancer.

MATERIALS AND METHODS

We conducted a retrospective cohort study that included young female patients who aged 25-29 years at the time of diagnosis with primary breast cancer from 1973 to 2013 from Surveillance, Epidemiology, and End Results (SEER) database ($n=5765$). The age at the time of diagnosis was calculated using the date of birth and date of diagnosis. Patients who were not listed in research database, do not have enough information to be staged, and those who did not diagnosed with a malignant behaviour (carcinoma *in situ*) were excluded from the present study. The pathological staging (Adjusted AJCC 6th Stage 1988+) of the disease was used. Patients were classified into two groups; the first

group consists of breast cancer patients who did receive post-operative radiation therapy (n=1814) and was named intervention group (IG), while the second group consists of breast cancer patients who did not receive postoperative radiation therapy (n=2339) and was named control group (CG). The total number of analytical sample in the present study was (n=4153).

Statistical Analysis

Data analysis was performed using SPSS statistical software package (version 23 for windows). Pearson's chi-square test was calculated to analyze the descriptive data; age, tumour stage, etc. of the study sample (Table 1). Although, Kaplan-Meier method [7] was used to test the relative survival rate of both groups, using SEER*Stat (version 8.3 for windows). An alpha level less than or equal to 0.05 was taken to indicate significant difference.

RESULTS

The total sample of the present study included (n=4153), their descriptive data such as age, tumour stage, SEER specific death classification was presented in Table 1. The study sample have been classified into two groups; intervention group (n=1814), and control group (n=2339). Table 1 shows that the majority of breast cancer patients who had diagnosed with stages I, and IIA tend to be treated without adjuvant postoperative radiation therapy. While stages IIB and IIIA were more likely to be managed by postoperative radiation therapy rather than surgery only (P<0.05). Figures 1-4 showed the survival rate of both groups with different tumour stages. Radiation therapy showed no significant impact on the survival rate of intervention group for stages I (62.9%, CI 95%), IIA (66.1%, CI 95%), and IIB (58.2%, CI 95%). On the contrary, postoperative radiotherapy showed significant improvement of the survival rate of breast cancer young women with stages IIIA (30.9%, CI 95%), IIB (54%, CI 95%), IIIC (32.1%, CI 95%), and IV (10.3%, CI 95%), (Figures 1-4). Statistics could not be calculated for overall survival at 25 years for breast cancer patients with stages IIB, and IV.

Table 1 Descriptive data and different variables of study groups

Variables	Intervention Group (n=1814)	Control Group (n=2339)
Demographic data	Number (%)	Number (%)
Age (years)	25-29	25-29
Female patients	1814 (100%)	2339 (100%)
Race	Number (%)	Number (%)
White	1268 (69.90%)	1647 (70.41%)
Black	342 (18.85%)	445 (19.03%)
Other (American Indian/AK Native, Asian/Pacific Islander)	194 (10.69%)	236 (10.09%)
Unknown	10 (0.55%)	11 (0.47%)
Stage of cancer breast	Number (%)	Number (%)
Stage I	401 (22.07%)	607 (25.95%)*
Stage IIA	459 (25.30%)	746 (31.89%)†
Stage IIB	381 (21.00%)*	391 (16.72%)
Stage IIIA	290 (15.99%)*	209 (8.94%)
Stage IIIB	69 (3.80%)	61 (2.61%)
Stage IIIC	166 (9.15%)*	112 (4.79%)
Stage IV	48 (2.65%)	213 (9.11%)
Survival Months (Mean ±SD)	89.26 ±69.49	81.08 ±74.72
SEER cause-specific death classification	Number (%)	Number (%)
Alive or dead of other cause	1364 (75.19%)	1650 (70.54%)
Dead (attributable to this cancer dx)	401 (22.11%)	514 (21.98%)
N/A not first tumour	49 (2.70%)	175 (7.48%)

*P<0.05; †P<0.01

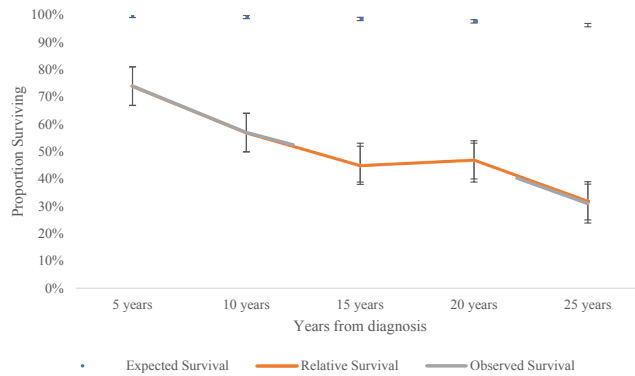


Figure 1 The survival rates of young women with stage IIIA breast cancer in intervention group

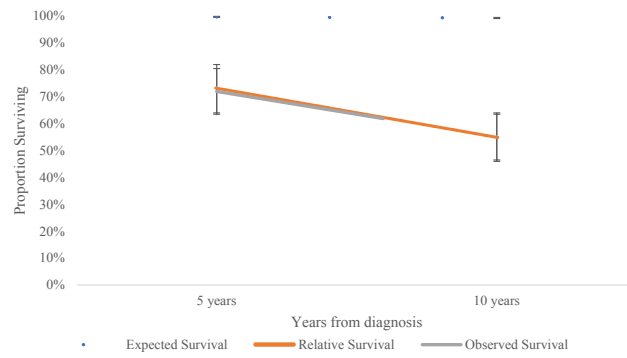


Figure 2 The survival rates of young women with stage IIIB breast cancer in intervention group

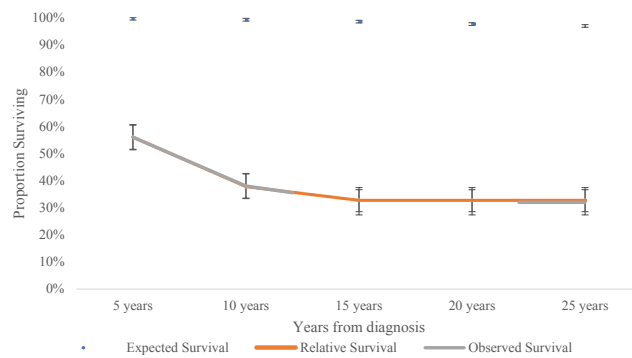


Figure 3 The survival rates of young women with stage IIIC breast cancer in intervention group

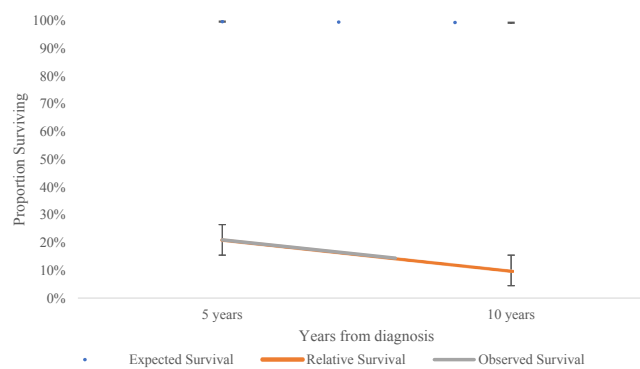


Figure 4 The survival rates of young women with stage IV breast cancer in intervention group

DISCUSSION

Adjuvant radiation therapy has a controversial impact on the survival rate of patients with breast cancer and has shown to be associated with late side effects of cardiac diseases, lymphedema, and neuropathy. Hence, we aimed in this study to investigate its impact on the survival rate for each breast cancer stage. In 2011, Whelan, et al. conducted a randomized clinical study in which the adjuvant radiotherapy has been shown to increase the overall survival rate and decrease the locoregional recurrence [8]. However, only few studies have investigated the impact of adjuvant radiotherapy in younger age group.

For stage I breast cancer: where the tumour is ≤ 2 cm and has not spread to distant sites. It is largely managed by breast conserving surgery which include adjuvant post-operative radiotherapy. However, no significant impact on survival rate was found in the intervention group.

For stage II breast cancer: in contrast to previous reports that showed an improvement of the survival rate in this stage [9], we found no significant association between the relative survival rate and the postoperative radiation in breast cancer women who have been diagnosed with stages IIA, and IIB.

For stage III breast cancer: Our finding showed significant improvement of long-term survival of breast cancer patients with stages IIIA, IIIB, and IIIC in the intervention group by postoperative radiation therapy.

For stage IV breast cancer: Where the tumour has spread to distant sites. A significant impact of postoperative radiation therapy was found on the relative survival rate of breast cancer women who have been diagnosed with stage IV. These findings are in agreement with previous reports that showed reduced recurrence and increase survival rates of breast cancer patients who had received adjuvant radiotherapy [10,11].

CONCLUSION

The intervention group of the present study who had received postoperative radiation therapy (n=1814) and diagnosed with stages IIIA, IIIB, IIIC, and IV showed significant improvement of long-term survival compared with the control group. However, postoperative radiation therapy shows no significant advantage on overall survival for patients who had diagnosed with breast cancer stages I, IIA, and IIB.

Clinical implications and future research

Radiotherapy plays an important role in the management of breast cancer. However, early diagnosis through regular screening, and check-up will be associated with a better prognosis and a higher survival rate. Thus, increasing the awareness toward the importance of early detection of breast cancer is a necessity to achieve a long overall survival, less recurrence rate, and a better outcome. Further research regarding the type, course and duration of radiation therapy should be carried out for understanding the full impact of PORT on patients with breast cancer.

Acknowledgment

We would like to express our profound gratitude and deep regard to the staff of Oncology Department, Faculty of Medicine, Alexandria University, Egypt for their support, advice, and insightful comments.

Conflict of interest

The authors declare no conflict of interest.

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