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Impact of Postoperative Radiotherapy in the Survival of Patients Diagnosed with Advanced Lung Cancer Stages: A Retrospective Cohort Study

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ABSTRACT

Purpose: *The aim of our study was to evaluate the impact of postoperative radiotherapy on the survival of lung cancer patients diagnosed with advanced carcinoma stages.* ***Methods:*** *We carried out a retrospective cohort study that consists of patients diagnosed with lung cancer from SEER database. The total analytical sample number of the study (n=130,291) was divided into two groups in regards to receiving Postoperative radiotherapy (PORT); intervention group (n=12,411) who received PORT and control group (n=117,880) who did not receive PORT. Chi-square test and Kaplan Meier method were used for performing the statistical analysis.* ***Results:*** *Observed survival rate of the intervention group, estimated by Kaplan-Meier method was found to be (76%, CI 95%), (65%, CI 95%), and (39%, CI 95%) for stages IIIA, IIIB and IV lung cancer respectively in comparison to the survival rates for patients with the same stages in the control group (55%, CI 95%), (45%, CI 95%), and (24%, CI 95%), respectively.* ***Conclusion:*** *Significant positive impact of postoperative adjuvant radiotherapy was noted on the overall survival of patients diagnosed with advanced lung cancer stages IIIA, IIIB and IV ($p<0.05$).*

Keywords: Lung, Cancer, Radiation, Survival

INTRODUCTION

After prostate cancer in men and breast cancer in women, Lung cancer is the second most common cancer in both genders [1,2]. Thirteen percent of newly discovered cases of cancers are lung cancer; 116,440 in men and 111,710 in women [1]. Lung cancer is known to be the chief cause of cancer death with about 142,670 (76,650 in men and 66,020 in women) deaths by the year 2019 according to American Cancer Society [1]. It is not being diagnosed until an advanced stage with a bad prognosis.

Smoking is the number one risk factor for developing lung cancer increases the risk of having lung cancer or dying from it by 15-30 more than non-smokers. The second important risk factor for lung cancer is Radon. Moreover, asbestos, arsenic, diesel exhaust, some forms of silica and chromium, surviving lung cancer and family history are all risk factors for it.

Primary lung cancer has two main types the first and the commonest is non-small-cell carcinoma (80%) it is classified into adenocarcinoma (most common), squamous cell carcinoma (25%) and large-cell carcinoma (10%). the second one is the less common more aggressive small-cell-lung cancer [3]. The type, size, position, stage and the health status of the patient are the main factors in determining the treatment plan surgery chemotherapy or radiotherapy or may be combined with chemotherapy [4].

According to Surveillance, epidemiology, and end results (SEER) database in a study made in 1988-2002 by Lally, et al., post-operative radiotherapy has a harmful effect on the patient with early stages. On the contrary patients with advanced stages have an improvement in the rates of survival [5]. Another trial was made. The results showed a decrease the overall survival rates between lung cancer patients from 58% to 53% with post-operative radiotherapy

without taking survival quality of life into consideration [6,7]. Therefore, the effect of radiotherapy on advanced-stage lung cancer patient's survival stills under debate. In this research we are going to study the impact of postoperative radiotherapy in the survival of patients with advanced lung cancer stages IIIA, IIIB, and IV.

MATERIALS AND METHODS

Data Collection and Study Parameters

This study was a retrospective cohort study that included patients who were diagnosed with lung cancer in the years 1973 to 2013 from Surveillance, epidemiology, and end results (SEER) database (n=130,291). We excluded from the study all patients who were not listed in the study database; do not have enough information to be staged, and those who did not diagnose with a malignant behavior (carcinoma *in situ*). Recruited patients were classified regarding their age into five categories (20-49 years, 50-59 years, 60-69 years, 70-79 years, and 80 years or older). The race was evaluated in three groups; white, black, and other. We have used the pathological staging (Derived AJCC 7th Stage 2010+) of the disease. Patients were classified into two groups; the first group include lung cancer patients who received postoperative radiation therapy (n=12,411) and was defined as Intervention group (IG), while the second group comprises of lung cancer patients who did not receive postoperative radiation therapy (n=117,880) and was defined as Control group (CG). The total number of our analytical sample in the study was (n=130,291).

Statistical Analysis

All data in this study were analyzed using SPSS statistical software package (version 24 for windows). Pearson's chi-square test was calculated to analyze the descriptive data; age, race, tumor stage, etc. of the study sample (Table 1). Although, the Kaplan-Meier method was used to test the relative survival rate of the intervention and control groups, using SEER*Stat (version 8.3 for windows). An alpha level less than or equal to 0.05 was considered statistically significant.

Table 1 Descriptive data and different variables of study groups.

Descriptive Variables	Intervention Group (n=12,411)	Control Group (n=117,880)
Demographic data		
Age (years)	**Number (%)**	**Number (%)**
20-49	968 (7.8%)	4,586 (3.89%)
50-59	3,138 (25.28%)	18,293 (15.52%)
60-69	4,450 (35.86%)	34,265 (29.07%)
70-79	3,058 (24.64%)	36,146 (30.66%)
80 or older	795 (6.41%)*	24,590 (20.86%)
Gender	**Number (%)**	**Number (%)**
Male patients	6,618 (53.32%)*	64,124 (54.40%)
Female patients	5,793 (46.68%)*	53,756 (45.60%)
Race	**Number (%)**	**Number (%)**
White	10,106 (81.43%)†	95,571 (81.08%)
Black	1,552 (12.51%)	13,990 (11.87%)
Other (American Indian/AK Native, Asian/Pacific Islander)	736 (5.93%)	8090 (6.86%)
Unknown	15 (0.12%)	229 (0.19%)
Advanced Stage lung cancer	**Number (%)**	**Number (%)**
Stage IIIA	3,761 (30.30%)*	19,487 (16.53%)
Stage IIIB	1,835 (14.79%)*	9,211 (7.81%)
Stage IV	6,813 (54.89%)†	89,182 (75.65%)
SEER cause-specific death classification	**Number (%)**	**Number (%)**
Alive or dead of other cause	4,609 (37.14%)	28,152 (23.88%)
Dead (attributable to this cancer dx)	5,367 (43.24%)*	64,208 (54.47%)
N/A not first tumor	2,435 (19.62%)	25,520 (21.65%)

*p<0.05, †p<0.01

RESULTS

Descriptive data collected from participants and the number of variables used in the study are divided into two main groups; intervention group (n=12,411) and control group (n=117,880) (Table 1). Participant's data were classified demographically into age, gender, race, advanced stage lung cancer, and SEER cause-specific death. The number of male patients slightly exceeded the female one. Furthermore, the incidence of lung cancer in white race was found to be 7 times the incidence in the black race. Patients with stage IV lung cancer represent the majority of cases in both the intervention group (54.89%) and control group (75.65%). According to SEER database, deaths attributed to lung cancer comprise 43.24% in control group and 54.47% in the intervention group.

Furthermore, comparisons between the survival rates; expected, relative and observed rates of both intervention and control groups have been made for lung cancer stages IIIA, IIIB, and IV Figures 1-6, in which post-operative radiotherapy showed a positive impact on all intervention groups. In which, Figure 1 showed the survival rates in the interventional group for cases diagnosed with stage IIIA lung cancer. In the second and third year of radiotherapy, there was a steady drop in relative and observed survival from 80% to 40%. Then they reach a plateau in the 4th year. While Figure 2 illustrates the survival rates in control group for patient diagnosed with lung cancer stage IIIA. There is a relatively sharp decrease in the relative and observed survival rates in the second year of the study (from 60-40%) compared with the steady decrease in the subsequent two years (40-20%), ($p<0.05$).

Figure 1 The survival rates of stage IIIA lung cancer patients in the intervention group, $p<0.05$

For patients diagnosed with stage IIIB lung cancer, we found that the survival rates in the interventional group showed a decrease in the relative and observed survival rates from 65% to 40% in the second year of radiotherapy followed by a slower decrease in the following two years (40%-20%). While in the control group the relative and observed survival rates decrease from 40% to 20% in the second year reaching about 10% survival rate in the next 2 years, ($p<0.05$) (Figures 3 and 4).

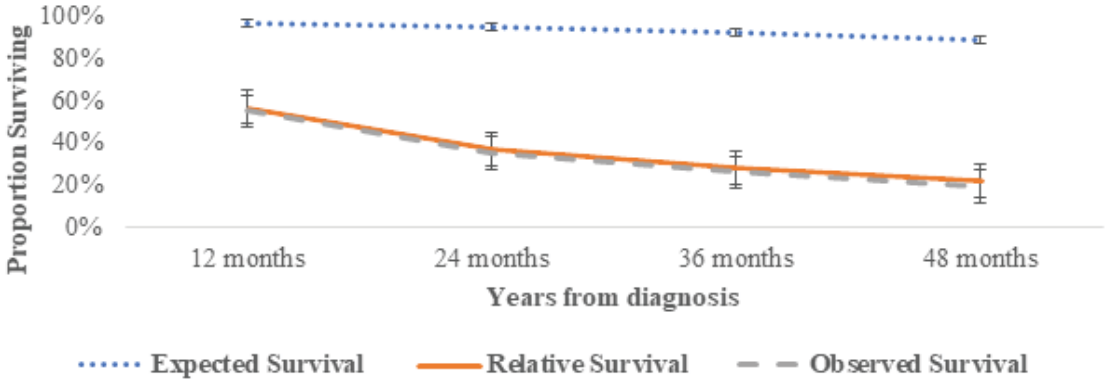

Figure 2 The survival rates of stage IIIA lung cancer patients in the control group, $p<0.05$

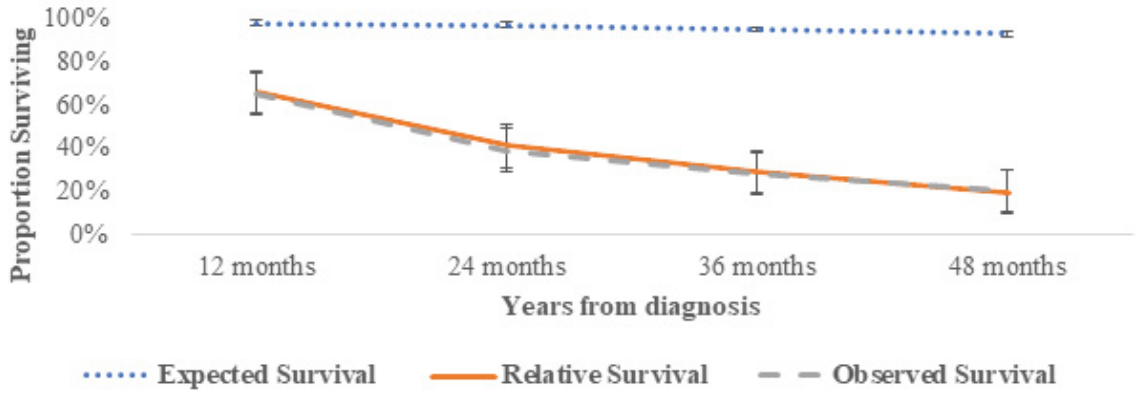

Figure 3 The survival rates of stage IIIB lung cancer patients in the intervention group, p<0.05

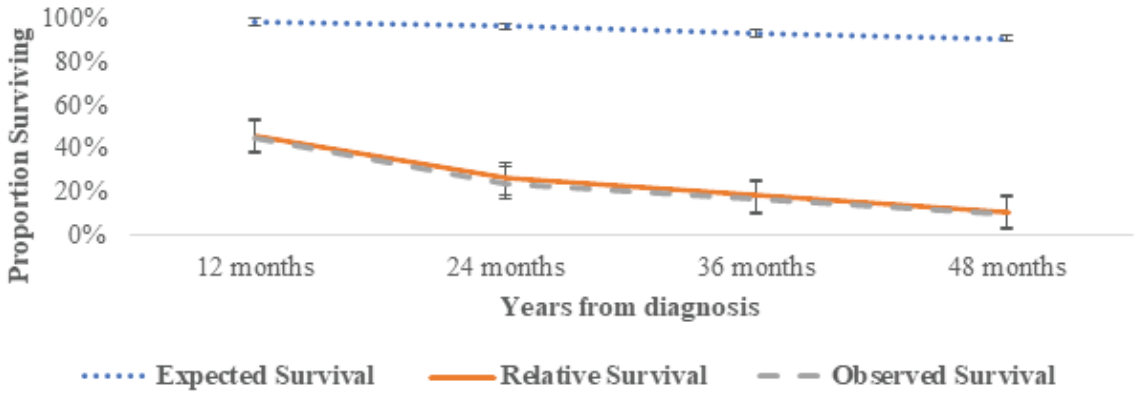

Figure 4 The survival rates of stage IIIB lung cancer patients in the control group, p<0.05

Moreover, patients who were diagnosed with stage IV lung cancer and receive PORT showed a 20% decrease in survival rates in the second year of radiotherapy, and a relatively slow decrease in the next two years reaching about 10% survival at the end of the 4th year (Figure 5). On contrary, patients in the control group showed a 10% decrease in survival rates in the 2nd year and a slow fall in survival rates in the next 2 years (Figure 6) (p<0.05).

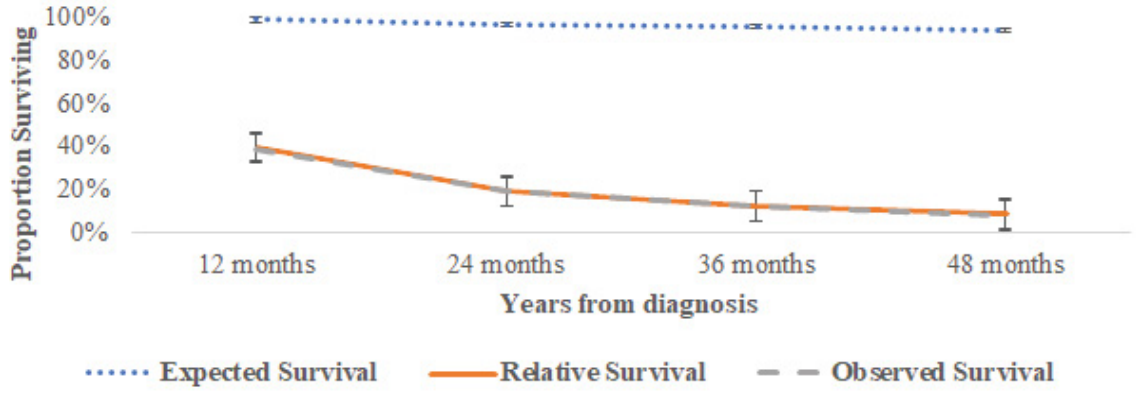

Figure 5 The survival rates of stage IV lung cancer patients in the intervention group, p<0.05

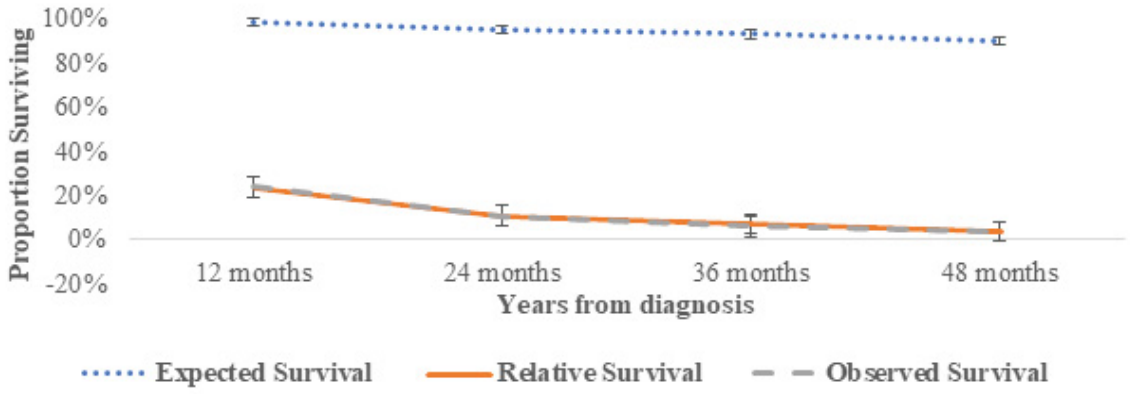

Figure 6 The survival rates of stage IV lung cancer patients in the control group, $p<0.05$

DISCUSSION

The study has investigated the impact of postoperative radiotherapy (PORT) on lung cancer patients who were diagnosed with advanced stages; IIIA, IIIB, and IV. As we recruited cancer patients from SEER database, we found that the incidence of advanced-stage lung cancer was slightly higher in males than females, which is consistent with previous expectations reported by John, et al. Moreover, we assessed the demographic data of recruited patients, namely; age, gender, race, advanced stage lung cancer, and SEER cause-specific death that might play a significant impact on the survival rates of both intervention and control groups.

In order to properly assess the survival rates of both intervention and control group, we have used the Kaplan-Meier method through which we found that PORT had a positive impact on the survival rate for patients in all tested intervention groups. For stage IIIA lung cancer, patients who did not receive a PORT showed an initial observed survival rate of 55% after the first 12 months in comparison to 76% for those who received PORT after the surgical intervention. The observed survival rate showed a grave drop after 48 months to reach 19% in the control group in comparison to 46% for patients in the intervention group. Suggesting the presence of a positive impact of PORT in patients diagnosed with stage IIIA lung cancer.

In addition, lung cancer patients diagnosed with stage IIIB showed a steady decline in the survival rates for both the control and intervention groups. However, in the latter a nearly doubled survival rates of the former one were found throughout the tested 48 months. With an initial observed survival rate of 65% for the intervention group in comparison to 45% for the control group. Reaching the lowest noted value after 48 months of 20% for the intervention group against 10% for the control group.

Nevertheless, lung cancer patients diagnosed with stage IV in the intervention group showed an observed survival rate of 39% in the first 12 months reaching about 8% after 48 months. These findings are nearly the doubled value that was noted for the same patients in the control group where the initial observed survival rate was 24% reaching 4% after 48 months.

CONCLUSION

We concluded from our study that post-operative radiotherapy has a positive impact on the survival rates of lung cancer patients diagnosed with advanced stages IIIA, IIIB, and IV wherein the latter reaches nearly the doubled survival rates of patients who did not receive post-operative radiotherapy.

DECLARATIONS

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Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

[1] American Cancer Society: Cancer Facts and Figures, Atlanta Ga, 2018.

[2] de Groot, Patricia M., et al. "The epidemiology of lung cancer." *Translational Lung Cancer Research*, Vol. 7, No. 3, 2018, p. 220-33.

[3] National Health Service. Lung Cancer Overview, 2018.

[4] Centers for Disease Control and Prevention (CDC) Lung Cancer Risk Factors, 2018.

[5] Lally, Brian E., et al. "Postoperative radiotherapy for stage II or III non-small-cell lung cancer using the surveillance, epidemiology, and end results database." *J Clin Oncol*, Vol. 24, No. 19, 2006, pp. 2998-3006.

[6] Waddle, Mark R., et al. "Postoperative radiation therapy in locally advanced non-small cell lung cancer and the impact of sequential versus concurrent chemotherapy." *Translational Lung Cancer Research*, Vol. 7, No. 2, 2018, p. S171.

[7] Sarah, Burdett, et al. "PORT Meta-analysis Trialists Group. Postoperative radiotherapy for non-small cell lung cancer." *Cochrane Database Syst Rev*, 2016.