



COMPARISON OF ACUTE RADIATION SKIN TOXICITY IN IMRT VERSUS 3D-CRT FOR POST-MASTECTOMY IRRADIATION OF CHEST WALL AND REGIONAL NODES IN BREAST CANCERS .

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Abstract: Objective: Compare the effect of Intensity Modulated Radiotherapy (IMRT) vs. 3D-Conformal Radiotherapy (3D-CRT) technique on the occurrence and severity of acute treatment-related skin toxicities in post-mastectomy irradiation in breast cancers.

Material and methods: It is a prospective study conducted on 100 eligible patients who were divided equally between two groups; the first, are patients received adjuvant radiotherapy using IMRT technique and the second group were those who received 3D-CRT.

Results: Severe acute skin toxicity or moist desquamation in IMRT group was 6% vs. 18% in 3DCRT group ($p < 0.05$). The IMRT technique resulted in statistically significant lower incidence of severe acute skin toxicities when compared with 3D-CRT technique.

Conclusion: The IMRT technique resulted in less incidence of acute skin toxicities when compared with 3D-CRT technique.

Index Terms - Mastectomy, Breast cancer, Adjuvant radiotherapy, IMRT, 3D-CRT, skin toxicities.

I. INTRODUCTION

Breast cancer (BC) is the most frequent female cancer worldwide. The new cases of BC accounted for 23% of all female cancers, the incidence rates of BC varies dramatically across the globe, which is higher in more developed regions. Although the utilization of breast conserving surgery (BCS) for early-stage disease has increased rapidly in last decade modified radical mastectomy (MRM) remains the most-accepted surgical modality in operable breast cancer (BC) [1]. In the recent ten to twenty years, there is a substantial progress in the diagnosis and treatment of breast cancer. A rapid development of various curative options has led to the improvement of treatment outcomes [2].

Early-stage breast cancer is treated with a multi-modality postsurgical approach that can include chemotherapy, radiotherapy, targeted therapies and hormonal therapy. Radiotherapy, an integral part in the treatment of early breast cancer. Radiation for breast cancer is well tolerated in general by most patients and does not significantly impair their daily activities. Acute toxicities of radiotherapy are generally self-limiting, and resolve within 4-6 weeks after the treatment is completed. Skin reactions or acute radiation dermatitis and the constitutional symptom of fatigue are the most common early toxicities from irradiation in breast cancer patients. The acute radiation dermatitis is defined as a skin changes occurring within 30-90 days of radiation exposure. These skin reactions are ranging from erythema to wet desquamation or ulceration [3-5]. Intensity-modulated radiation therapy (IMRT) was developed in the 1990s as a modern technique aiming to spare normal tissues from toxic effects of radiotherapy. Its main goal is to allow for dose escalation to the tumor while limiting dose to adjacent normal tissues. There are many randomized trials compared the standard 2D radiotherapy vs. IMRT in early-stage breast cancer, one of those trials showed that Breast IMRT significantly reduced the occurrence of moist desquamation anywhere in the breast, with an absolute reduction of 16.6% ($p = 0.002$), as well as moist desquamation in the inframammary fold by 17% ($p = 0.001$) [6-8]. There is no study which compares the IMRT technique vs. the 3D-conformal radiotherapy technique (3D-CRT) regarding the incidence of acute skin toxicity

II. OBJECTIVE

The objective was to compare the effect of a new radiotherapy technique, which is the Intensity Modulated Radiotherapy (IMRT) vs. the 3D-Conformal Radiotherapy (3D-CRT) technique on the occurrence and severity of acute treatment-related skin toxicities in post mastectomy irradiation of breast cancer patients.

III. MATERIALS AND METHODS

It is a Prospective study conducted between July 2013 to September 2015 at our hospital, which compared two groups of patients regarding the severity of the acute skin toxicities. One group were planned to receive their adjuvant radiotherapy using IMRT technique vs. another group were receiving radiotherapy using 3D-CRT technique. There were 50 patients in each group Inclusion criteria

- 1) Aged 18 years to 60 years
- 2) Female patients
- 3) Stage I-IIIa breast cancer (AJCC 7th edition)
- 4) Adjuvant locoregional radiotherapy.

Exclusion criteria

- 1) Collagen vascular disease.
- 2) Simultaneous presence of other malignancy.
- 3). Stage IV breast cancers

The radiotherapy dose and fractionation which was received by the eligible patients was 50 Gy at 2 Gy/fraction to whole breast in case of conservative breast surgery, or chest wall in case of postmastectomy irradiation, and 50 Gy at 2 Gy/fraction to supraclavicular fossa (when included).

IV. STATISTICAL ANALYSIS: To test the association between the experimental and control groups the chi square test was used. For comparing averages between the groups the student's Independent 't' test was used. If the number of mean categories is more than two ANOVA (analysis of variance) was carried out to compare the averages. SPSS (statistical packages for social sciences) version 9 software was used to analyse the data

V. RESULTS Age: In group I (IMRT group), age ranged from 22-60yrs with mean value 43.1 ± 10.1 and in group II (3D-CRT group) ranged from 26-60yrs with mean value 45.2 ± 11.6 . There was no statistical significant difference between two studied groups regarding age ($p > 0.05$). Stage: There was no statistical significant difference between the two studied groups regarding stage ($p > 0.05$).

Lymphnode status: There is 60% with positive LNs in the group I and 58% in the group II. There was no statistical significant difference between the two studied groups regarding LNs ($p > 0.05$).

Hormonal receptors status: The ER/PR negative patients were 14% in the group I and 12% in the group II. There was no statistical significant difference between two studied groups regarding ER/PR ($p > 0.05$). Her2/neu over-expression by IHC: There is 12% of patients who were positive for Her2 by IHC in group I and 14% in group II. There was no statistical significant difference between the two studied groups regarding Her2 ($p > 0.05$).

Skin toxicity: There was significant difference in severity of skin toxicity between the two groups, where the IMRT group showed less severe skin toxicity incidence (3 patients) compared to 22 patients in the 3D-CRT group. Table 1, shows comparison between the two studied groups regarding severe skin toxicity or moist desquamation. In IMRT group the toxicity was 6.0% in the patients, while in 3DCRT (group II), there were 44.0% of the patients had severe skin toxicity. There was statistical significant increase in the number

of patients had severe skin toxicity in group II more than group I ($p < 0.05$).

Severe skin toxicity or moist desquamation		Group		Total
		Gp. I "IMRT	Gp. II "3DCRT	
Yes	Num	3	22	25
	%	6	44	25
No	Num	47	28	75
	%	94	56	75
Total	Num	50	50	100
	%	100	100	100
X ²		22.26		
p		0.00001		

Table 1: Comparison between the two studied groups regarding Severe skin toxicity or moist desquamation.

V.DISCUSSION The objective of this study is to compare the effect of a new radiotherapy technique, which is the Intensity Modulated Radiotherapy (IMRT) vs. the 3D-Conformal Radiotherapy (3D-CRT) technique on the occurrence and severity of acute skin toxicities in chest wall and locoregional adjuvant irradiation of breast cancers. It was a prospective study carried out on 100 patients and different variables and data was collected, in chosen the patients was considered that the patients in the two groups be matched as match as possible to eliminate the basic demographic and clinical data to effect on the net results. Regarding the age of the patients, the mean age in group I and II was matched, in group I the mean age was 43.1 ± 10.1 , while in group II was 45.2 ± 11.6 years and median age for all groups was 48.0 years, there was no significant difference between the two groups regarding age. In agreement without study Nagia et al., selected their patients in the same age group to compare between IMRT and 3DCRT the mean age for all patients show a median 52.0 years [9]. In our study the pathological data of the two groups show insignificant difference, regarding stage from IA to IIIA in both groups, without significant difference, also the grade and positive lymph nodes show insignificant difference between the two groups. In agreement without study, may studies show insignificant difference between the two compared groups regarding pathological and clinical data to eliminate the effect on the net results of the study [10,11]. In our study the hormonal receptors of the patients show an increasing in ER/PR –ve receptors more than the other types of ER/ PR results, on comparing the two groups regarding hormonal receptors it was found that there was no significant difference, the Her2 show insignificant difference between the two studied groups. In agreement with our results, the study of Clarke et al., which showed similar results regarding the ER/PR and Her2 results [12]. In this study the skin side effect shown as severe skin toxicity or moist desquamation. In IMRT group the toxicity was 6.0% in the patients, while in 3DCRT (gp II), there were 18.0% of the patients had severe skin toxicity. There was statistical significant increase in the number of patients had severe skin toxicity in group II more than group I ($p < 0.05$). Pignol et al., reported the results of a Canadian multicenter randomized control trial evaluating the occurrence of acute skin toxicity in 331 patients using either IMRT or non-IMRT wedge RT. All patients were randomized to receive whole breast treatment to a total dose of 50 Gy in 2.5 Gy fractions. The study reported an overall reduction of approximately 17% in the rate of occurrence of moist desquamation, and on multivariate analysis reported that smaller breast size and treatment technique (IMRT) were significantly associated with a decreased risk occurrence of moist desquamation. The results of the present meta-analysis support those of the Pignol et al., in that the authors report a protective association between moist desquamation and IMRT [7].

V.CONCLUSION: The IMRT technique resulted in less incidence of acute skin toxicities when compared with 3D-CRT technique. However, larger number of patients should be studies to validate these results and to reach a statistical power which could be a practice changing guide

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