

Assessment of Pattern of Acute Radiation Dermatitis and its Influencing Factor in Breast Cancer Patients Undergoing Radiation Therapy

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ABSTRACT

Background: Breast cancer remains a significant global health concern and radiation therapy plays a vital role in reducing disease-related mortality and recurrence rates. However, Radiation Dermatitis (RD) is a common adverse effect experienced by breast cancer patients undergoing Radiation Therapy (RT). This study assessed the prevalence of acute radiation dermatitis and its influencing factors in breast cancer patients receiving radiation therapy and observed the response to treatment for acute radiation dermatitis. **Materials and Methods:** A prospective cross-sectional study was conducted in the Department of Radiation Oncology, Sri Ramachandra Institute of Higher Education and Research (DU). A total of 87 patients were recruited for the study, of which 51 patients developed radiation dermatitis. **Results:** Nearly, 58.6% of the breast cancer patients who received radiation therapy developed radiation dermatitis. The majority of the patients had Grade 3 radiation dermatitis. Radiation dermatitis was completely healed for the majority of patients. Influencing factors like type of clothing, texture of cloth, use of lukewarm water, soft soap, bed sheets, electric razor and avoidance of heating pads/ice packs were improved after counseling and distribution of patient information leaflet. **Conclusion:** Among various grades of acute radiation dermatitis, majority of the patients (44.82%) had grade 3 radiation dermatitis. The counseling sessions appear to have influenced various factors related to clothing and skincare. Influencing factors like type of clothing, texture of cloth, use of lukewarm water, soft soap, bed sheets, electric razor and avoidance of heating pads/ice packs were improved after providing counseling and distribution of patient information leaflet.

Keywords: Breast cancer, Radiation therapy, Radiation dermatitis, Influencing factors.

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INTRODUCTION

Breast Cancer (BC) is the most common cancer among Indian urban women.¹ BC ranks second among women in terms of cancer-related deaths, after lung cancer.² Breast cancer risk factors include early menarche, late menopause and nulliparity.³ The mortality rate of BC can be decreased by increased screening techniques through mammography and adjunctive conventional treatment of mastectomy or breast-conserving surgery, sentinel node biopsy, or axillary lymph node dissection, followed by adjuvant Radiation Therapy (RT) to the afflicted areas.⁴⁻⁶ The biological effects of radiation therapy manifest between hours

to weeks of radiation exposure.⁷ When RT targets tumor cells, it causes double-stranded DNA to break causing harm to the surrounding normal tissue and lead to cell death.⁸ RT triggers growth factors and proinflammatory cytokines, which in turn cause inflammation and a buildup of cytokines.⁹ However, radiation dermatitis, is the most frequent side effect among patients receiving radiation therapy and these symptoms have been linked to a decline in health-related quality of life.¹⁰

The prevalence and severity of radiation-induced dermatitis vary significantly between populations. Radiation dermatitis may be influenced by many extrinsic and intrinsic factors. Extrinsic factors include radiation dose, target volume, fraction size, type and texture of clothing, rubbing/scratch, use of mild soap, use of lukewarm water, use of soft fabric bedsheets, shaving/electric razors, avoidance of heating pads/ice packs and radiation technique. Intrinsic factors include genetic background and molecular subtypes.¹¹



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Implementation of routine patient education for all breast cancer patients before radiation therapy is essential. Hence, education of patients through appropriate methods such as information leaflets is highly significant in the management of radiation dermatitis. At present, there is no consensus on the appropriate management of radiation dermatitis.^{7,12} A greater understanding is desperately needed to ensure that radiation dermatitis can be effectively treated using a variety of therapy approaches.¹³ This study focused on assessing the prevalence of acute radiation dermatitis and its influencing factors and observed the response to treatment for acute radiation dermatitis in breast cancer patients at a tertiary care hospital.

MATERIALS AND METHODS

A prospective cross-sectional study was conducted at the Department of Radiation Oncology, Udayar Block, Sri Ramachandra Institute of Higher Education and Research (DU) from February to July, 2023. Institutional Ethical Committee (CSP/22/AUG/115/445) approval was obtained for the study. The inclusion criteria were patients receiving radiation therapy for breast or chest wall, patients above 18 years of age, who have a history of histological confirmed breast cancer and patients willing to give informed consent to participate in the study and exclusion criteria were patients who are unwilling to give consent and patients who have already terminated radiation therapy. After obtaining IEC approval, informed consent was obtained from the patient undergoing RT. Patients were educated before radiation therapy by using a patient information leaflet. The grading of acute radiation dermatitis due to radiation was categorized according to RTOG criteria (Radiation Therapy Oncology Group: Grade 0-4). The role of influencing factors like texture and type of clothing, Rubbing/scratch, Use of mild soap, Use of lukewarm water, Use of soft fabric bedsheet, Shaving/electric razor and avoidance of heating pads/icepacks were assessed before and after counseling. The response to treatment for dermatitis was observed for all patients. Data analysis and interpretation were done using IBM SPSS software version 23.0.

RESULTS

A total of 87 patients were recruited for the study, of which 51 patients developed radiation dermatitis. The largest proportions of patients were within the age range of 41-50 years. The most common comorbid condition among patients was diabetes mellitus and hypertension, which affects 23% of patients. Other co-morbid condition observed were diabetes mellitus and hypothyroidism (5%), hypertension (5%), hypothyroidism (5%) and diabetes mellitus, hypercholesterolemia and hypothyroidism (5%) and 18% of patients have no co-morbid condition. Nearly 67% of patients attained menopause and 33% did not attain menopause. 20% of patients had a positive family history of breast cancer, while the majority of patients (80%) did not have a family history of breast cancer. Educational status varied among

the patients, with 57% being literate and 43% being illiterate. The left breast tumor was found to be more pronounced (57%) compared to the right breast tumor (43%). Table 1 shows the baseline characteristics of patients.

The majority of patients were irradiated with 2D Conventional Radiation Therapy (2DCRT) (76%) followed by 3D Conventional Radiation Therapy (3DCRT) (22%) and Intensity Modulated Radiation Therapy (IMRT) (2%). Nearly 47% of patients received photon therapy. A small percentage of patients (2%) underwent electron therapy, while a combination of photon and electron therapy was used in 51% of patients. The majority of patients (98%) received a total dose of 40-50 Gy, while a very small percentage (2%) received a higher dose of 51-60 Gy. The prevalence rate of radiation dermatitis in breast cancer patients was found to be 58.6%, of which 4.59% of patients had grade 1 radiation dermatitis, 9.19% of patients had grade 2 radiation dermatitis, 44.82% of patients had grade 3 radiation dermatitis and none of the patients showed grade 4 radiation dermatitis. Table 2 shows the grading of radiation dermatitis among patients. Table 3 shows the response to treatment among patients. The majority of patients (76%) in the study achieved complete healing as a response to treatment, while a smaller portion experienced a delay in the healing process. None of the patients experience an unhealthy wound environment and no healing which reflects the effectiveness of the treatment provided. It is important to note that delayed healing was observed in a quarter of the patients.

In this study, 80% of radiation dermatitis patients favored loose-fitting dresses, with 20% preferred normal-fitting dresses. Furthermore, approximately 55% of the patients reported choosing cotton clothes for their comfort. The type of clothing influenced both the patients' daily routines and their psychological well-being. Table 4 represents the influencing factor.

Following counseling, positive changes were observed in various influencing factors related to personal care and clothing choices. Individuals shifted towards healthier practices, including a preference for loose-fitting clothing, the use of cotton fabric, reduced rubbing/scratching behavior, increased use of mild soap and lukewarm water, a preference for soft fabric bedsheets and better adherence in avoiding heating pads/icepacks. These improvements suggest that counseling was effective in promoting lifestyle changes and encouraging healthier self-care habits.

DISCUSSION

Radiation dermatitis is one of the most common side effects of radiation therapy.¹⁴ Consequently, the management of radiation-induced skin lesions is an important aspect of cancer treatment. The cutaneous damage is observed 10 to 14 days after the first fraction. Understanding the grading of radiation dermatitis can help healthcare professionals manage the side effects associated with radiation treatment, potentially leading to improved patient care and outcomes. In this study, the majority

Table 1: Baseline characteristics of patients.

Sl. No.	Category		No of patients <i>n</i> (%)
1	Age (yrs)	21-30	1 (2)
		31-40	5(10)
		41-50	23 (45)
		51-60	15 (29)
		61-70	7 (14)
2	Comorbid conditions	Diabetes Mellitus and hypertension.	05 (23)
		Diabetes Mellitus and Hypothyroidism.	01 (5)
		Hypertension	01 (5)
		Hypothyroidism	01 (5)
		Diabetes Mellitus, Hypercholesteremia and Hypothyroidism.	01 (5)
		No known comorbidities	04 (18)
		Diabetes Mellitus	07 (32)
		Polio	01 (5)
3	Family history	Yes	10 (20)
		No	41 (80)
4	Educational status	Literate	29 (57)
		Illiterate	22 (43)
5	Tumor location	Left breast	29 (57)
		Right breast	22 (43)
6	Technique of RT	2D Conventional therapy	39 (76)
		3D CRT	11 (22)
		IMRT	1 (2)
7	Mode of treatment	Photon	24 (47)
		Electron	1 (2)
		Photon+electron	26 (51)
8	Menopause status	Yes	34 (67)
		No	17 (33)
9	Total dose	40-50 Gy	50 (98)
		51-60 Gy	1 (2)

Table 2: Grading of acute radiation dermatitis.

Sl. No.	Grading of radiation dermatitis	No of patients <i>n</i> (%)
1	Grade 1	4 (4.59)
2	Grade 2	8 (9.19)
3	Grade 3	39 (44.82)
4	Grade 4	0

of patients experienced grade 3 RD (44.82%). These results were contradicted by the study conducted by Alexopoulou *et al.*, which included 122 breast cancer patients and stated that at the end of radiation treatment, 48 patients (39.4%) experienced grade I skin

toxicity, while 31 patients (25.4%) developed grade II and 12 patients (9.8%) experienced grade III radiation dermatitis. None of the participants showed grade IV skin toxicity. In total, 74.6% of the patients experienced any degree of skin toxicity.¹⁵ This difference highlights the unpredictability of treatment results and the necessity of customized methods for managing skin toxicity. Tailored therapies targeted at improving patient outcomes can be informed by an understanding of the factors that contribute to variations in dermatitis severity.

The findings from Table 3 indicated a positive response to treatment among the patients. The majority of patients achieved complete healing, demonstrating the effectiveness of the treatment approach employed. Additionally, a smaller proportion

experienced a delay in healing. These results highlight the success of the treatment in promoting wound healing and maintaining a healthy healing environment for the patients. The positive response observed in this study provides valuable insights that can guide future treatment decisions and enhance patient outcomes in wound healing.

Overall, there was a shift towards more comfortable choices in clothing, such as loose-fitting garments and soft fabric bedsheets. This suggested that the counseling sessions were effective in promoting the well-being of the patient. There is an increased preference for using mild soap, lukewarm water and avoiding heating pads/ice packs after counseling. This indicates that individuals become more aware of the importance of gentle

skincare practices and may have received guidance on managing pain or discomfort. The use of tight-fitting clothing, cotton and silk blends, rubbing or scratching and certain grooming practices (shaving/electric razor) decreased after counseling. Overall, these changes imply that the counseling sessions had a positive impact on individuals' choices and behaviors related to clothing and skincare. These results were in harmony with the study conducted by Miswak N which states that Actual size and loose cutting were linked to fit preference. Loose fitting is the greatest choice because they may move freely and simply wear the clothes without the need for assistance.¹⁶ The congruence of these findings emphasizes how appealing comfortable clothes options are to all people and how they may improve patient comfort and wellbeing. After counseling sessions, there have been noticeable changes in how individuals wear and how they manage better care of themselves. These changes demonstrate how successful patient education and support programs are in encouraging self-care habits and giving patients the tools they need to actively manage side effects of therapy. Healthcare professionals can help breast cancer patients receiving radiation therapy achieve better treatment adherence, symptom management and overall quality of life by listening to their concerns and offering helpful advice.

Nearly 58.6% of the breast cancer patients who received radiation therapy developed radiation dermatitis. The majority of the patients had Grade 3 radiation dermatitis. Radiation dermatitis was completely healed for the majority of patients. The counseling sessions appear to have influenced various factors related to

Table 3: Response to the treatment.

Sl. No.	Response to treatment	No of patients <i>n</i> (%)
1	Completely healed.	39 (76)
2	Completely healed but Delayed.	12 (24)
3	Incomplete but healthy Healing of wound.	0
4	No instigation of healing but the environment is healthy.	0
5	No healing.	0

Table 4: Influencing factors associated with radiation dermatitis.

Sl. No.	Influencing factors	Before counseling	After counseling
1	Type of clothing	Loose fitting	10(19.6)
		Tight fitting	30(58.8)
		Normal	11(21.6)
2	Texture of cloth	Cotton	28(55)
		Cotton and silk	6(11.7)
		Cotton and synthetic	17(33.3)
3	Rubbing/scratch	Yes	34(66.6)
		No	17(33.4)
4	Use of mild soap	Yes	27(52.9)
		No	24(47.1)
5	Use of lukewarm water	Yes	24(47.1)
		No	27(52.9)
6	Use of soft fabric bedsheet	Yes	39(76.4)
		No	12(23.6)
7	Shaving/electric razor	Yes	18(35.2)
		No	33(64.8)
8	Avoidance of Heating pads/icepacks	Yes	38(74.5)
		No	13(25.5)

clothing and skincare. Influencing factors like type of clothing, texture of cloth, use of lukewarm water, soft soap, bed sheets, electric razor and avoidance of heating pads/ice packs were improved after providing counseling and distribution of patient information leaflet.

CONCLUSION

In summary, radiation dermatitis management is still a crucial part of breast cancer treatment, with a big impact on quality of life and patient outcomes. Health care professionals can maximize treatment outcomes and reduce treatment-related side effects by using a proactive, patient-centred approach to managing skin toxicity. Patient education programs and counselling sessions are essential in equipping patients with the information and tools necessary to properly manage skin toxicity. In order to manage radiation dermatitis in patients with breast cancer, more study is necessary to investigate innovative therapies and management techniques.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

BC: Breast cancer; **RT:** Radiation Therapy; **RD:** Radiation Dermatitis; **RTOG:** Radiation Therapy Oncology Group; **2D-CRT:** 2D Conventional Radiation Therapy; **3DCRT:** 3D Conventional Radiation Therapy; **IMRT:** Intensity Modulated Radiation Therapy.

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