

The need for a holistic guide to prevent and manage radiation dermatitis in patients' with breast cancer: a case report

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Background: Radiation therapy (RT) is often indicated in the treatment of breast cancer following breast conserving surgery or mastectomy, yet carries a 95% risk of radiation dermatitis (RD) of varying severity within 1 to 4 weeks of treatment. The burdens of RT include skin breakdown, pain, psychological distress, and functional challenges. Given limited patient education regarding the prevention and management of RD, a Clinician Guide and Evidence-based Skin Care Plan were developed to offer a holistic, patient-centered approach to care, with optimal RD prevention and management strategies to enhance patients' quality of life and survival.

Case Description: M.R. (a pseudonym) was a 64-year-old Caucasian woman, diagnosed with invasive adenocarcinoma of the left breast, underwent a lumpectomy with a positive sentinel node biopsy. Within 4 weeks of surgery, she received RT, 5 days a week for 6 weeks. Within 1 week, the skin of her breast and axilla was red and hyperpigmented with skin damage progressing to dryness, itching and flaking. At this point, she asked the Radiology team for a skin care protocol to prevent or reduce RD, but limited information was provided. Ultimately, her skin cracked, blistered and crusted, with the development of a skin infection. She expressed the significant impact on her physical, emotional and functional well-being, and lamented about the shortfalls in her care, specifically the limited availability of information to prevent and reduce RD.

Conclusions: In order to prevent and minimize RD and to promote health, this case study highlights the need for an all-encompassing, patient-centered approach to care, which may be achievable by implementation of a Clinician Guide and an Evidence-based Skin Care Plan. Highlighted in the Clinician Guide are the importance of developing a trustworthy patient-clinician relationship, emotional support, social support, education, weekly physical assessments, assessment of overall adjustment to a cancer diagnosis and treatment, promotion of patient engagement and self-care, reinforcement of healthy lifestyles, and patient adherence to the Evidence-based Skin Care Plan during RT. These strategies are expected to decrease the physical, mental, and functional difficulties associated with RT, avoid treatment delays or discontinuation, and increase the likelihood of disease-free survival and quality of life.

Keywords: Case report; breast cancer; radiation dermatitis (RD); clinician guide; skin care plan

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Introduction

As of 2023, the American Cancer Society (ACS) indicates that breast cancer is the second most common cancer death in women, affecting one out of eight women across the life span (1). The incidence rate of breast cancer in women has

been increasing 0.5% yearly, given the prevalence of excess body weight and increasing age at first birth (1). According to ACS [2023] statistics, it has been estimated that 297,790 women and 2,800 men will be diagnosed with invasive breast cancer, with approximately 43,700 breast cancer deaths yearly (1).

The treatment of breast cancer generally involves local treatment, such as surgery and radiation therapy (RT), with the possible need for additional systemic therapy, such as chemotherapy and hormonal therapy. Surgical treatment may involve a lumpectomy, which is breast conserving surgery, involving the removal of the tumor and a rim of surrounding normal tissue, along with radiation treatments to the breast and/or local lymph nodes (1). For larger tumors with or without lymph node involvement, the removal of the entire breast (mastectomy) with RT may be indicated (1).

The morphology and physiology of the skin can be impacted by radiation treatments, depending on the dose, fraction size, tissue volume, duration, energy, and type of radiation, as well as bolus doses (2). Radiation disturbs the equilibrium between the synthesis of new cells and the shedding of old ones at the level of the epidermis, the outer layer of the skin, causing mild to severe radiation dermatitis (RD). Histamine and serotonin are released during radiation exposure, which causes a vascular reaction and dermal capillary dilatation. Beneath the epidermis, the dermis contains hair follicles, nerve endings, and blood vessels (2). Erythema, hair loss, pigmentation changes, and

the breakdown of sebaceous glands and perspiration are some of the skin's reactions to radiation (3,4).

Within 1 to 4 weeks of RT, there is a 95% chance that patients receiving RT will develop RD of varying severity. This condition may last for an additional 2 to 4 weeks after RT is finished (5,6). Transient erythema, or heated, red skin that resembles a small rash, and skin sensitivity and tightness are possible side effects within the first 24 hours of RT (7,8). A higher dose of 30 to 40 Gy causes extracapillary cell damage with increased edema, while a dose of radiation up to 20 Gy may lead to a greater risk of dry desquamation, which is characterized by dry, itchy, or flaking skin (7). At 45 to 60 Gy RT dosages, moist desquamation can occur with skin blistering, bleeding, sloughing, and oozing serous fluid with possible crusting and a significant risk of infection (9-11).

The Universal Radiation Therapy Oncology Group (RTOG) assessment tool, which has grades ranging from 0 (normal skin) to grade 4 (ulceration and necrosis), was used by Rosenthal *et al.* (7) to describe the clinical presentation of RD. However, this tool does not measure the intensity of pain. The Common Terminology Criteria for Adverse Events (CTCAE) tool, established by the National Cancer Institute (12), measures the escalating severity of RD and associated pain and discomfort in order to address the RTOG's limitation, and respond with appropriate treatment approaches. Grade 1 of the instrument indicates erythema, or dry desquamation; grades 2 and 3 indicate moist desquamation with increased pain and discomfort; and grades 4 and 5 indicate severe RD indicated by skin ulceration and necrosis. With each subsequent dose of radiation, the tissue damage increases, further delaying skin healing (13).

A number of risk factors, some of which are changeable and others of which are not, have been identified in relation to the development of RD. Older age, smoking status, body mass index (BMI), type 2 diabetes mellitus, poor nutrition, prolonged sun exposure, long-term immunosuppression, autoimmune disease, and the patient's tumor histology and condition are among the variables specific to each patient (8,14-16). There are other treatment-related aspects that are risk factors, such as the location of the tumor, the length of treatment, the type of energy employed, the timing and dose for whole breast fractionation, and the boost dose for the tumor bed (15-17). The incidence and severity of radiation skin reactions may decrease with the introduction of novel radiation treatments, such as intensity-modulated radiation therapy (IMRT), which delivers radiation to smaller quantities of non-targeted tissue (4).

Highlight box

Key findings

- A Clinician Guide to the clinical care of breast cancer patients receiving radiation therapy (RT) and an Evidence-based Skin Care Plan provides a holistic, patient-centered approach, alleviating the stressors associated with a cancer diagnosis and treatment, and educating patients in the prevention and management of radiation dermatitis (RD).

What is known and what is new?

- This case study demonstrates the development of RD in breast cancer patients, as well as the stress that results from patients not receiving enough information about RT, how to prevent and treat RD, and how to deal with the physical, psychological and practical difficulties that may be associated with treatment. The administration of a topical steroid cream with a potency ranging from medium to high, starting with treatment till 2 weeks after treatment, is crucial for the prevention and management of RD. These strategies are delineated in the Evidence-based Skin Care Plan.

What is the implication and what should change now?

- Breast cancer patients' short- and long-term quality of life, as well as their tolerance to finish the course of RT, may improve when they receive holistic, patient-centered care, as recommended by the Clinician Guide and Evidence-based Skin Care Plan, with the potential for positive impact on their disease-free survival.

Beyond the physiological effects of RT, there are psychological concerns, such as disturbed sleep, anxiety, depression, and body image issues that are equally important to address (17). Furthermore, RD may lead to changes in functional status, as severe RD may become a debilitating, painful condition, interfering with performing activities of daily living, and negatively impacting a patient's quality of life. Severe RD may have serious implications regarding the continuation of RT as a treatment, resulting in a patient's or provider's decision to terminate therapy (9-11), with potential jeopardy to local-regional control and disease-free survival (2). Therefore, the prevention and reduction of RD are important and require a holistic approach to care in which clinicians address physiologic, psychologic, and functional goals (4).

The physiologic goals throughout the course of radiation treatment are to maintain skin integrity, protect from additional skin trauma, prevent and manage skin infections, promote healing of the wound bed, while reducing pain (4). A clinician's ability to evaluate, treat, and prioritize patients' comfort in the face of RT-induced skin responses is essential to achieving these objectives. Encouraging comfort extends much beyond the mere healing of a wound; it also involves creating a healing atmosphere where the patient feels heard, understood, and supported by the health care team, who employ a patient-centered approach to care throughout the course of the therapy. A patient-centered approach to care requires an understanding of the physical, emotional, social, spiritual and cultural needs and preferences of the individual patient, and guides the development of a comprehensive plan of care to address patients' unique needs. This should be a central focus during each patient interaction and can be achieved through such strategies as genuine and caring discussions and behaviors of all members of the healthcare team, establishing trust, guiding patients in self-care, reducing their stress, instilling hope, and encouraging a healthy lifestyle during and following radiation treatments (18). Promoting access and continuity of care are also important to advancing health and limiting complications of cancer and its treatment and in improving positive health outcomes (19).

However, the experience of M.R. (a pseudonym), as presented in the case study, identifies serious shortfalls in the care offered to this patient during radiation treatment. Providing standardized care rather than an individualized approach to care, with limited education in the prevention and ultimately the management of RD, significantly impacted the patient's immediate, as well as long-term

quality of life. I present this article in accordance with the CARE reporting checklist (available at <https://tbc.amegroups.org/article/view/10.21037/tbcr-23-52/rc>).

Case presentation

M.R. was a 64-year-old Caucasian female who came to the breast clinic for evaluation after identifying a lump in the upper left quadrant of her left breast, based on a self-breast exam. She had no family history of breast or ovarian cancer, and was post-menopausal at the time. A stereotactic needle biopsy led to the diagnosis of adenocarcinoma of the left breast. Following a left breast lumpectomy (breast-conserving surgery), the pathology report indicated invasive, infiltrating, well-differentiated ductal cell carcinoma, 3.0 cm in size, nuclear grade 2/3, with a large intraductal component with papillary and cribriform types. Adjacent breast tissue showed extensive intraductal papillomatosis with atypia, duct cell hyperplasia with atypia, as well as microcalcifications. The superior and inferior margins contained ductal cell carcinoma in situ (DCIS). Based on recommendations by her breast surgeon, M.R. was brought back to the operating room to have the DCIS margins removed before beginning radiation treatments. Sentinel node biopsy of the left axilla indicated one positive lymph node. The tumor was hormone receptor (HR) positive and human epidermal growth factor receptor-2 (HER2) negative.

M.R. was scheduled to receive RT to the left chest wall and axilla 4 weeks after surgery, when her surgical site was healed. RT included one radiation treatment a day, Monday through Friday, for 6 weeks. On the first day of treatment, M.R. was examined by the Radiation Oncologist to measure and mark the area on the chest wall for radiation. Each week, she was seen briefly by the clinic nurse who took her vital signs and accompanied her to the room where RT took approximately 15 min to administer.

RD began within 1 week of treatment, starting with a faint diffuse erythema and hyperpigmentation (Grade 1 Radiation Dermatitis Severity Score on the RTOG). In the next week, as the dose of radiation increased to 20 Gy, M.R. experienced dry desquamation in which her skin became itchy, dry, and began to flake. M.R. brought this to the attention of the RT team, but she was told that this could be expected, along with an increase in fatigue. M.R. was instructed to shower with mild soap and water before each radiation treatment, told not to use deodorant, and was given a sample of aloe vera which she was instructed



Figure 1 Progression of breast cancer RD from Google Images Open Stock. (A) Early-stage RD; (B) advancing RD. RD, radiation dermatitis.

to apply twice a day to the affected area. *Figure 1* indicates progression of RD.

In a conversation with the Radiation Oncologist during her third week of treatment, M.R. asked if there was a skin protocol that may further prevent or alleviate RD. She was directed to a website for written instructions regarding skin care. However, the information on the site provided limited information with no prevention strategies for RD.

By week four, with a radiation dose increasing to 45 Gy, M.R.'s skin cracked and blistered, oozing serous fluid and resulted in crusting. In the last week of treatment, M.R. reported malaise, a low-grade fever, and skin tightness related to the development of a skin infection for which she was prescribed doxycycline 100 mg po twice a day for 7 days. Her suffering increased as she experienced significant pain and discomfort with minimum relief from ibuprofen two 200 mg tablets every 6 to 8 hours as needed. M.R. stated that when she looked in the mirror, it upset her to see the appearance of her breast.

In addition to the physical and emotional pain associated with breast cancer surgery, M.R. now had to overcome the adverse effects of RD. In her follow-up visit five weeks after the start of RT, M.R. reported feeling very depressed and reported limited mobility of her arm. Any movement pulled the skin of her chest wall, and it became even more difficult to care for herself and find comfortable clothes.

One-month post-RT, the patient met with her Radiation Oncologist for a follow-up visit. She cried that she would never be "normal" again. The Radiation Oncologist responded that her skin would heal over time. M.R. was upset at not receiving verbal and written instruction regarding a skin protocol to prevent or lessen RD. Her search of several websites of reputable cancer centers further indicated a scarcity of information to prevent

or manage RD. M.R. discussed how RD affected her quality of life and recommended creating an evidence-based skin care plan to prevent and treat RD, as well as a Clinician Guide to support a patient-centered approach to care. M.R. said that knowledge about RD and RT was essential to making an informed choice about using RT as a therapeutic modality for the treatment of breast cancer. M.R. stated that mid-way through the course of RT, she seriously considered the termination of treatment, but she feared that stopping treatment would potentially shorten her life expectancy. Preventing and treating RD is a serious consideration for health professionals in providing quality care and promoting patients' tolerance of breast cancer treatments. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Based on the Institutional Review Board, patient informed consent was waived for the publication of this case report. However, tacit consent was given by the patient in the case study as she shared her surgical pathology report, described her experience of RT and RD, and reviewed and approved the documentation of the case study for future publication. Furthermore, the identity of the patient has been sufficiently anonymized to ensure that no harm would be caused to the patient or her family. Within 2 years sharing of her clinical experience, the patient died from metastatic breast cancer.

Discussion

Compelled by the case of M.R., there was an identified need to promote an evidence-based approach to care, identifying the highest level of clinical evidence available, coupled with the clinical judgment of radiation team members,

and recognition of patient's needs and preferences. An integrative review of the literature was carried out using the Medline and CINAHL databases to address the crucial problem of RD and put research into practice. The review comprised systematic reviews, literature reviews, quality improvement projects, single randomized controlled trials, practice guidelines, and education-based articles. The highly rated national and international studies (20-30) were identified through the literature appraisal process based on the Quality Assessment Tool (QAT) (31), and served as the basis for the creation of the Clinician Guide and Evidence-based Skin Care Plan (32).

The Clinician Guide (32), which emphasizes four critical strategies to guide the care of patients from the first visit and through the course of radiation treatment, would have been extremely valuable in the care of M.R. The Clinician Guide in table form can be found in the related publication (32). The first strategy is to establish a rapport of trust between the patient and the clinician by providing the names and contact details of the RT team members, stressing a patient-centered, individualized approach to care based on patients' values and preferences, and promoting open communication. Other strategies include figuring out each patient's unique learning needs and preferences, as well as their preferred format for educational materials, and talking about how the patient is adjusting physically, emotionally, spiritually, and functionally to the illness and treatment. The second strategy involves giving each patient specific emotional support and care by identifying and addressing their individual anxieties and concerns about cancer and RT, as well as following up with them after each treatment. The third strategy entails encouraging social support by talking about how receiving treatment affects patient's roles and obligations and the necessity for extra family support when undergoing or recovering from treatment. The fourth strategy involves educating the patient about the benefits of RT, its mechanism of action, the skin changes that may occur, and the significance of preserving healthy tissue in the affected area. It also entails reviewing the anticipated procedures associated with RT in order to allay anxiety and foster emotional comfort, outlining the use of standardized assessment tools that take into account the symptoms of the patient, and reviewing at each visit the Evidence-based Skin Plan in order to prevent and/or manage RD and enhance comfort.

During the second and subsequent weeks of RT, other important strategies include: (I) having a physical examination performed by medical personnel at every

appointment to check for changes in skin tone/color, moisture, texture, and skin integrity, as well as signs of infection, and the assessment of symptoms, such as pain, itchiness, insomnia, anxiety, depressive symptoms, and body image issues using a standardized assessment tool, such as the RTOG (7) or CTCAE (12); (II) offer comprehensive, holistic care by assessing the patient's entire response to the disease and its treatment, and discussing healthy coping mechanisms; (III) promote patient engagement by reminding the patient to perform daily skin checks and record skin changes in a diary; review the diary with the patient and address individual questions and concerns, while attempting to normalize the experience and provide reassurance; (IV) encourage self-care including relaxation techniques, distraction, guided imagery, music, prayer and self-affirmation, including the value of support from mental health professionals, family, or support groups involving those who have successfully completed RT; (V) reinforce healthy lifestyles, including adequate hydration and nutrition, avoidance of tobacco, limiting alcohol or other substances; and (VI) review the Evidence-based Skin Care Plan (32) during each visit, as referred to *Box 1*. With clear guidance and instruction, the expectation would be that M.R. would have a greater sense of control of the situation, and be empowered to actively engage with the radiation team to achieve physical and emotional healing.

With care offered by interprofessional team which has been informed by strategies offered in the Clinician Guide, M.R. may have felt more at ease and in capable hands. Through a holistic, patient-centered approach, M.R. and her team could develop an open and trusting relationship, address not only her physical, but her emotional, social, or spiritual needs, and confront the challenges related to a cancer diagnosis and its' treatment. It would be helpful for M.R. to proceed through treatment and resume her life after cancer and its treatment if there was open communication about reasonable expectations regarding the length of the course of therapy and the healing process. M.R. would be encouraged to identify her fears and concerns within the context of a reassuring, supportive relationship with her providers, and by reaching out for support from family, friends, and other women who have successfully completed RT.

M.R.'s uncertainty and anxiety would be lessened with knowledge about RT, how it works, expected side effects, protective skin care techniques, and methods of preventing and controlling mild to severe skin reactions. Such education may support a sense of optimism and hope,

Box 1 Evidence-based skin care plan to follow during and after radiation (32)

During radiation therapy, many people experience a skin reaction called radiation dermatitis ranging from slight to severe. Our goal is to work with you to protect your skin during radiation therapy and improve your comfort.

Follow this skin care plan throughout treatment and for 2 weeks following treatment

- A clinician will see you weekly or more often if needed. For immediate assistance between visits, you can receive help 24/7 by calling (name and/or phone number). _____
- Keep a daily diary of skin changes/reactions to be shared with your radiation team members at each visit.
 - Skin red or pink color ___ Areas that blister, weep, or peel ___
 - Tanned color of skin ___ Signs of crusting _____
 - Dry, itching, or flaking ___ Signs of ulceration _____
 - Tender to touch ___ Exudate/discharge _____
 - Decrease in sweat ___ Blackening of the skin _____
- Report symptoms of pain, burning, or itching so that your clinician can prescribe oral medications to alleviate symptoms and promote your comfort.
- Please follow the directions below to prevent or lessen radiation dermatitis.
 - Protect the skin in the treatment area from sun and cold.
 - Do NOT use hot packs, cold packs, or heating pads on the treatment area.
 - Do NOT take baths, use hot tubs, or swim in lakes or pools if your skin is not intact.
 - Wear soft, loose comfortable cotton clothing. Avoid underwire bras during the remainder of treatment.
 - Do not rub or scratch the skin in the treatment area. Avoid shaving the armpit with a straight razor. May use an electric razor or do not shave if preferred.
 - Perform standard washing and skin care:
 - ❖ Shower before each treatment with a mild unscented soap (i.e., Dove, Neutrogena, or baby soap) and warm water.
 - ❖ Wash affected area and gently remove the skin product and deodorant during the shower. Do NOT scrub.
 - ❖ Dry treatment area with a clean, soft towel. Gently pat dry.
 - ❖ Apply an emollient cream, such as Aquaphor or Eucerin, to moisturize the skin in the treated area following a shower.
 - You may use a non-metallic or metallic deodorants/antiperspirants as they promote comfort and do not cause harm. Use of deodorants is based on your preference.
 - From the day of your first treatment until two weeks after treatment, apply a thin layer of mid to high potency topical steroid cream (e.g., over the counter: hydrocortisone 1% (twice a day); prescription: betamethasone 0.1% (once or twice a day); fluticasone 0.05% (twice a day), triamcinolone 0.1% (twice a day), mometasone furoate 0.1% (once a day), clobetasol 0.05% (twice a day) to the radiation area after treatment. (Over the counter or prescription steroid creams may be used). NOTE: When using a topical steroid, apply moisturizer after the topical steroid. Use topical steroids only on intact skin. Further, if you are a patient diagnosed with diabetes, consult with your primary care physician regarding the use of steroids.
 - Speak with your clinician if your skin is NOT intact for additional skin treatments.
 - Use no other skin care product on the irradiated area throughout treatment, including perfume or make-up.
 - Avoid the use of tape and adhesives in the treatment area.
 - Realize that fatigue may occur during radiation treatment; however, report to your clinician signs of systemic illness, such as fever, chills, or generalized weakness.
 - Eat a healthy well-balanced diet to promote skin healing and increase your energy.
 - Discuss with your clinician any physical, emotional, social, spiritual or functional issues you are experiencing.
 - Make notes as a reminder of issues to discuss with your clinician.

lessening feelings of depression.

The ongoing evaluation of the treatment area by clinicians, talking about symptoms, and reviewing the skin care plan step-by-step are all crucial tactics to help M.R. take care of her skin, prevent future damage, deal with skin reactions, and lessen symptoms. This is important in providing M.R. with confidence to engage in self-care during treatment, with the goal of avoiding treatment delays or discontinuation. Clinicians, in their roles of practitioner, educator, counselor, and advocate, can relieve the stress of a cancer diagnosis and treatment and possibly shift M.R.'s mindset from feeling overwhelmed to feeling of greater sense of control and resilience.

Conclusions

Before beginning treatment, patients who have been diagnosed with breast cancer and are undergoing surgery and radiation therapy should be informed about the physiological risks associated with RT, as well as the emotional, social, spiritual, and practical challenges they may face. The Clinician Guide discussed in this article assists clinicians to use a holistic, patient-centered approach to care, providing the patient with support, reassurance, and education regarding RT treatment and the prevention and management of RD. The Evidence-based Skin Care Plan addresses patient's assessment of physical changes which may occur throughout the treatment trajectory, and specific skin care strategies and the use topical products, particularly mid to high potency topical steroids to protect, maintain, and restore skin integrity, as well as strategies to promote patients' overall physical, emotional, and functional well-being.

The use of a case study is of great value in understanding the lived experience of an individual receiving radiation treatment for breast cancer and the meaning associated with a cancer diagnosis and its treatment. Further quantitative research is needed to learn more about RD, including the underlying pathophysiology, associated risk factors, including moderating and mediating factors, and efficacy and effectiveness of new RT approaches with the goal of reduced morbidity and increased disease-free survival rates. Qualitative research studies, such as phenomenology and grounded theory, based on the experiences of women treated with RT for breast cancer, may reveal key concepts associated with preparing for, coping during, and recovering from RT. As reflected in the case study of M.R., all members of the radiation team have a valuable role in preventing and alleviating the suffering associated with cancer treatment.

Education, support, reassurance, and individualized patient-centered care are extremely important interventions which support positive coping, promote quality of life, and reduce the trauma imposed by a diagnosis of cancer and its treatment, with significant implications for the patient's present and future health and well-being.

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Footnote

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publication. Furthermore, the identity of the patient has been sufficiently anonymized to ensure that no harm would be caused to the patient or her family. Within 2 years sharing of her clinical experience, the participant died from metastatic breast cancer.

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