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NEWS, VIEWS, & REVIEWS

Overview of Radiation Dermatitis: The Dermatologist's Role

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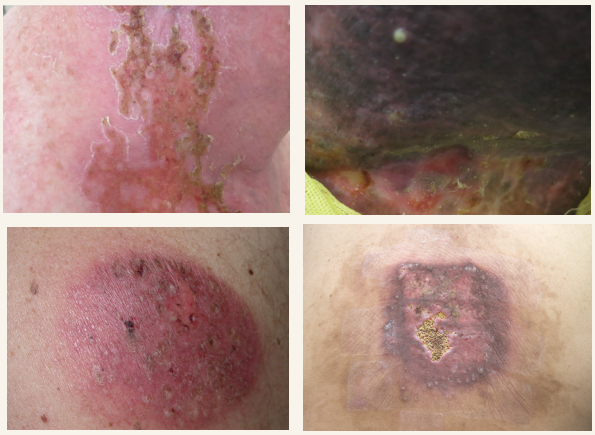
INTRODUCTION

Among the most common side effects, radiation dermatitis (RD) affects up to 95% of patients receiving radiotherapy,[1] significantly impacting the quality of life of those affected and leading to poor medication compliance.[2] Acute RD occurs within 90 days of beginning treatment. It may initially present as mild, transient erythema, before progressing to persistent erythema or hyperpigmentation associated with pruritic scaly skin (dry desquamation); tender erythematous skin accompanied by serous exudate, hemorrhagic crusting and possible bullae (moist desquamation) develops in over 30% of patients,[3] and may evolve into full-thickness ulceration or necrosis (Figure 1).[1] The degree of severity of RD depends on multiple risk factors. Patient related risk factors include, but are not limited to, age, sex, smoking, poor nutritional status, high body mass index, comorbid conditions, ultraviolet exposure, and Staphylococcus aureus colonization.[1,4] Treatment-related factors include total radiation dose, dose fractionation schedule, concurrent chemotherapy, the site of treatment, and the volume and surface area of irradiated tissue.[1] Notably, RD occurs with increased frequency in patients being treated for sarcoma, breast, anal, vulva, and head and neck cancers due to the proximity of the radiation target to the skin.[1] Intensity-modulated radiotherapy significantly improves dose distribution compared with conventional radiation therapy and has been shown to reduce the occurrence of moist desquamation, which is associated with increased pain and reduced quality of life.[5]

Figure 1. Clinical presentation of radiation dermatitis across multiple skin tones.



Pathogenesis

Radiation-induced DNA damage impairs the mitotic processes of stem cells in the basal layer of the skin, reducing the capacity to regenerate the epidermis and promoting cellular senescence in keratinocytes. Pro-inflammatory cytokines and chemokines recruit neutrophils to the irradiated skin, exacerbating inflammation and inducing reactive hyperplasia, causing structural dysfunction of the epidermal barrier.[6] Evolving data suggests that *Staphylococcus aureus* may play a role in the pathogenesis of RD. *S. aureus* produces exogenous erythrotoxins and expresses superantigens – which have the capacity to activate T-cells and promote a robust inflammatory sequela.[4] Like processes occurring with atopic dermatitis, it is thought that inflammation disrupts the skin barrier, making the skin susceptible to microbial colonization, propelling inflammation, and preventing re-epithelialization of keratinocytes exposed to radiation.[4] A recent cohort study supported the association between *S. aureus* colonization and RD, demonstrating that the prevalence of baseline nasal *S. aureus* colonization was higher among patients with breast or head and neck cancer who developed grade 2 or higher RD compared with those who developed grade 1 RD (34.5% vs 12.8%; P=0.2 by X^2 test).[7]

Prevention and Management

There is currently no gold standard treatment for RD, though recommendation guidelines on the best prevention and management strategies of acute RD given the current evidence following a four-round Delphi consensus process have recently been published.[8] For prevention of acute RD, the following 6 interventions reached consensus (≥75%) to recommend: polyurethane film (Hydrofilm), mometasone, betamethasone, and olive oil, and specifically photobiomodulation or low-level laser therapy and silicone-based polyurethane (Mepitel film) in patients with breast cancer.[8] The use of silver sulfadiazine (SSD) reached near-consensus supporting recommendation (60-74%) for prevention of acute RD due to insufficient evidence. Conflicting evidence exists for the utility of SSD in managing wound healing and infections in burn wounds. Clinically, non-silver dressings have been found to be as effective as SSD[9] and an in vivo study using a full-thickness burn mouse model found treatment with SSD delayed wound closure and reduced expression of proinflammatory cytokines integral to wound healing.[10] For the management of acute RD, only foam

dressings (Mepilex light) reached consensus to recommend, while doexpin, hydroactive colloid gel, and silicone-based polyurethane (Mepitel film) reached near-consensus supporting recommendation.[8] Previously encouraged,[11] the Delphi consensus was split for washing affected areas with mild soap and water, and thus no recommendation could be made.[8] It is recommended that all radiotherapy patients apply a mid-potency, topical steroid, such as mometasone furoate, twice daily from the first day of treatment until 2 weeks following the end of radiotherapy treatment.[10] This recommendation is supported by a double-blinded, randomized trial demonstrating a significantly reduced incidence of desquamation with application of 0.1% mometasone furoate relative to barrier cream (43.8% vs 66.7%; *P*=0.12).[12] Though the use of silver nylon dressings reached near-consensus,[8] they may be recommended for use daily throughout and 2 weeks after radiation therapy if favored by the treating clinician.[11] For additional symptomatic relief, 3% urea, polidocanol, and hyaluronic acid lotions may be implemented into the treatment plan, as their use reached near consensus.[8] Statins, calendula, aloe vera, chamomile, trolamine, and sucralfate (lotion or gel) are not recommended. Often, a trial-and-error approach is necessary to determine the most efficacious and suitable regimen.

CONCLUSION

RD management is often overseen by the treating radiation oncologist, yet dermatologists are well-equipped to effectively treat the condition given its overlapping features with other skin conditions and should be included in the care team when managing cutaneous toxicities of cancer treatments. Multidisciplinary care teams improve patient quality of life and overall survival, and cancer patients have been shown to hold positive perceptions when treated for cutaneous toxicities.[13] Including dermatologists in the management framework of radiotherapy side effects and cancer treatment teams is vital for enhancing patient care and effectively addressing common complications of RD, including secondary infection and contact dermatitis.[14]

DISCLOSURE

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