MANAGING RADIATION DERMATITIS:

Skin Care Support Using Viniferamine® Small Molecule Technology

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INTRODUCTION

Nearly two-thirds of all cancer patients receive radiation therapy\(^1\). Although many technological advances have resulted in improved treatment protocols, skin damage is still a common side effect of radiation therapy\(^2,3\). Radiation dermatitis, induced by ionizing radiation, affects a large proportion (up to 95\%) of patients receiving this type of cancer therapy\(^4\). Radiation dermatitis is an acute skin reaction to radiation therapy that ranges from a mild rash to skin ulceration\(^5\). The severity of radiation dermatitis is dependent upon treatment factors including the total radiation dose, the schedule of dosing, the type and quality of beam utilized, and the volume and surface area of irradiated tissue, as well as patient physical factors such as nutritional status, skin quality and integrity, or physical condition including obesity with skin folds.

Health conditions and immune status or genetics can also increase the severity of radiation dermatitis such as immunosuppression due to diabetes or chemotherapy, genetic conditions in which DNA repair is decreased, or autoimmune diseases including scleroderma or systemic lupus erythematosus (SLE). In addition, certain medications known as “radiosensitizers” can increase skin reactions to radiation therapy\(^1,4,5,6,7\). Skin changes following radiation treatment, including radiation dermatitis, affect the quality of life for patients receiving radiation therapy due to potential pain, discomfort, itching, burning, changes in appearance and reactions from family or loved ones, difficulty wearing clothing, and restrictions in movement\(^7\). Moreover, these skin changes can result in alterations or cessation of therapy leading to significant health consequences\(^2,6,7\).

Acute skin changes typically occur within 90 days after radiation treatment. Generalized erythema (redness) that is often undetectable may occur within hours after radiation exposure and fade within hours or days. Another phase of more sustained erythema, detectable from 10 days up to 4 weeks after exposure, is characterized by a blanchable pink hue. The National Cancer Institute has graded the severity of dermatitis from 1 to 4. Grade 1 includes faint erythema and dry desquamation (skin cell shedding) whereas grade 2 includes brighter erythema with moist desquamation. One to two weeks following the cessation of radiation therapy, this level of dermatitis typically subsides.
More severe radiation dermatitis includes grade 3 that involves moist desquamation and edema (swelling) and grade 4, which is characterized by ulcerated tissue. In addition, chronic radiation dermatitis can occur resulting in delayed ulcers, telangiectasia (spider veins), fibrosis, alterations in skin pigmentation, and loss of hair follicles and sebaceous (oil) and sweat gland functioning that may manifest weeks to years following radiation exposure²,⁸.

**EFFECTS ON SKIN RENEWAL AND INFLAMMATION**

The epidermis, which includes the outermost stratum corneum and deeper basal layer, is continuously renewed by a homeostatic generation of new cells (derived from basal layer stem cells) in response to normal shedding of the stratum corneum. This process requires both the proliferation and maturation of new skin cells that completely replace the epidermal layer approximately every 28 days⁷. Radiation exposure interferes with normal skin maturation, proliferation, and renewal by damaging skin cell DNA as well as epidermal stem cells. Moreover, repeated skin exposure during radiation therapy may not allow enough time for the repair of tissue or DNA damage⁴,⁹.

Radiation also triggers molecular signaling between epidermal and dermal cells including keratinocytes and fibroblasts, which along with vascular endothelial cells, stimulate immune cells to produce various inflammatory molecules such as cytokines. These cytokines induce endothelial cells to up-regulate adhesion molecules that increase the migration of immune cells from the blood into skin tissues. Radiation also directly affects skin immune cells including epidermal Langerhans cells and dermal dendritic cells that are depleted after radiation therapy, as well as mast cells that release histamine contributing to inflammation following exposure to radiation⁴.

In addition, inflammation amplifies the skin response to radiation by inducing endothelial dysfunction and increasing cytokine and growth factor production including transforming growth factor beta (TGF-beta) resulting in a delayed re-epithelialization. TGF-beta is also the main cytokine involved in the development of chronic radiation dermatitis and skin fibrosis due to its affect on fibroblasts².
OXIDATIVE STRESS AND ENDOTHELIAL DYSFUNCTION

During radiation exposure, skin damage occurs instantaneously, due to a burst of generated free radicals known as reactive oxygen species (ROS). Irradiated cells produce ROS that can damage skin DNA, protein, and lipids. Oxidative stress is generated at the time of exposure as well as in the days following exposure due to the continual propagation of ROS. In addition, inflammation can result in a chronic generation of ROS, and it has been shown that many of the inflammatory factors generated in response to each radiation dose (fraction) are not dissipated within 24 hours, which can result in an accumulating response known as the fractionated inflammatory insult.

In response to radiation and oxidative stress, DNA repair and oxidative defense enzymes are activated. The up-regulation of natural antioxidant enzymes including superoxide dismutase (SOD), glutathione peroxidase, and thioredoxins has been found in healing skin following radiation. In addition, SOD has been used successfully in various studies to induce the regression of skin fibrosis and reduce the severity of acute radiation dermatitis. Radiation exposure also damages skin vasculature. Radiation induces vascular permeability and vasodilation leading to erythema and edema. Direct affects of radiation and ROS on endothelial cells result in endothelial dysfunction, activation of the coagulation system and the release of thrombin, a critical activator of platelets and an important regulator of cell proliferation, inflammation and tissue remodeling.

SUPPORTING SKIN HEALTH WITH VINIFERAMINE® SMALL MOLECULE TECHNOLOGY

A consistent care regimen is essential in the management of radiation dermatitis. Viniferamine®, a comprehensive skin and wound care line, contains vital skin nutrients to help reduce inflammation, normalize skin barrier function, and promote cell renewal. Moreover, the barrier cream and cleansing lotion include a sophisticated silicone complex to protect compromised skin and promote skin repair.

MORE ABOUT HOW VINIFERAMINE® CAN HELP

Viniferamine® skin care products can help reduce dermatitis caused by radiation therapy and help restore skin for many months following radiation treatment. The Viniferamine® At Home™ products are designed for use in the comfort of home, where healing happens.

Radiation therapy patients can easily apply the products, participating in their own care and healing process. The Viniferamine® skin and wound care products contain small molecule skin nutrients including antioxidants, vitamins and amino acids that combat oxidative stress and inflammation and enhance skin repair. Various ingredients help improve the skin barrier function for individuals managing radiation dermatitis. Certified organic and pharmaceutical-grade ingredients ensure that pesticides and contaminants are excluded. In fact, Viniferamine® skin and wound care products are non-sensitizing and non-irritating.
Managing Radiation Dermatitis: Skin Care Support Using Viniferamine® Small Molecule Technology

VINIFERAMINE® INGREDIENTS HELP IMPROVE THE SKIN BARRIER

Quantitating transepidermal water loss (TEWL) is a way to assess the quality of the skin barrier and how well it functions. Oleuropein has been shown to reduce TEWL indicating its ability to increase skin barrier function. Evidence also demonstrates that melatonin has a stimulatory role in building and maintaining the epidermal barrier. Moreover, the advanced silicone complex in the barrier cream and cleansing lotion provides a breathable barrier to protect skin and promote skin repair.

VINIFERAMINE® INGREDIENTS DECREASE INFLAMMATION AND COUNTERACT OXIDATIVE STRESS

Many of the small molecule ingredients have potent anti-inflammatory activities to help decrease skin inflammation involved with radiation dermatitis, including the polyphenols oleuropein, resveratrol, and epigallocatechin-3-gallate (EGCG) from olives, grapes and green tea respectively, as well as the important small molecules, melatonin and L-glutathione. In addition, dipotassium glycyrrhizinate from licorice, avenanthramides in oats, aloe vera and shea butter possess anti-inflammatory activities. Various ingredients also counteract oxidative stress typically found with radiation dermatitis including oleuropein, resveratrol and EGCG, as well as melatonin and L-glutathione. Some of the beneficial ingredients found in Viniferamine® skincare products activate natural antioxidant enzymes that promote skin healing including SOD. In a model where manganese SOD (MnSOD) was deactivated, oleuropein induced MnSOD activity. Resveratrol has been shown to increase the expression of MnSOD in endothelial cells. EGCG has been shown to increase SOD activity in human skin fibroblasts. In addition, EGCG was shown to protect skin cells from ionizing radiation by increasing expression of the antioxidant enzyme, heme-oxygenase-1 (HO-1), which was found to ameliorate radiation-induced skin injury.

VINIFERAMINE® INGREDIENTS HELP IMPROVE ENDOTHELIAL FUNCTION

Endothelial dysfunction resulting from radiation exposure contributes to inflammation, compromised epidermis, impaired skin repair and wound healing. Oleuropein restores endothelial progenitor cell function. Resveratrol and EGCG have been shown to inhibit endothelial dysfunction and enhance wound healing. In addition, many other ingredients found in Viniferamine® skin and wound care products are helpful for individuals managing radiation dermatitis, including L-carnosine, L-glutathione, asiaticoside and aloe vera that improve skin repair and wound healing.
VINIFERAMINE® OFFERS AN AT HOME™ RADIATION SKIN CARE KIT TO HELP INDIVIDUALS MANAGING RADIATION DERMATITIS TAKE CARE OF THEIR SKIN IN THE COMFORT OF THEIR HOMES

The Radiation Skin Care Kit includes two highly beneficial products: Clean N Moist and Silicone Skin Barrier, as well as a Radiation Dermatitis Care Booklet written by healthcare professionals to guide patients with radiation dermatitis on the care of their skin. Clean N Moist cleanses, moisturizes, nourishes, provides a protective barrier, and is perfectly pH balanced to ensure the most fragile skin is gently cleansed without causing irritation. Silicone Skin Barrier is an advanced 34% silicone cream that is non-occlusive, providing a “second skin” for patients that have compromised epidermis.

SUMMARY

In summary, radiation therapy typically results in radiation dermatitis that involves inflammation, oxidative stress and endothelial dysfunction. Viniferamine® skin and wound care products include beneficial ingredients that promote skin repair, improve skin barrier function and help protect skin from irritation. The Viniferamine® Radiation Skin Care Kit was created for individuals undergoing radiation therapy to help them decrease negative skin effects and the risk of skin changes leading to the termination of their treatment plan, as well as long-term negative effects including skin fibrosis.
REFERENCES


ABOUT THE AUTHORS

D. Elizabeth McCord, Ph.D., FAPWCA
Dr. McCord is a renowned biochemist that has worked in the field of skin and wound care for over 30 years. She has been awarded six patents and two medical devices in the field. She currently has more than 60 health products marketed around the world and her most current product line is Viniferamine®. Previously, Dr. McCord commercialized skin and wound care products under the Remedy® Olivamine® brand, which has held a dominant position in the medical marketplace for many years. Both product lines are based on proprietary blends of small molecules that provide corneotherapeutic support, with Viniferamine® incorporating over 10 years of further scientific advancements and improvements.

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Dr. Ray is the Science Officer at McCord Research. Dr. Ray currently writes articles and provides presentations concerning diabetes skin care and other health issues for McCord Research to advance skin care and wound healing awareness. She received her PhD in Biochemistry and Biophysics at Oregon State University and was a postdoctoral fellow at NIH, Harvard University and Dana-Farber Cancer Institute, and the University of Iowa. She also earned B.S. degrees in Chemistry and Microbiology from the University of Montana.

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