Skin care in women receiving external radiation to the breast varies among institutions. Studies have been conducted looking at the effect that various skin care products have on the onset and severity of radiation-induced skin reactions in those patients. Results show that no significant difference exists among these products. The practice of avoiding aluminum-based deodorant on the treated side and avoiding use of any skin care products four hours prior to treatment is not evidence based but often is part of skin care protocols for women receiving breast irradiation. A review of the literature since 1996 in the United States, Canada, United Kingdom, and Australia revealed some evidence to refute the practice but no supporting evidence. Because minimal disruption in a woman’s normal hygiene routine could mitigate anxiety and improve coping during a time of extreme stress brought on by a cancer diagnosis, further research is warranted to support changing the practice.

Some degree of skin reaction will occur in an estimated 90% of women undergoing breast irradiation following lumpectomy or mastectomy (Harper, Franklin, Jenrette, & Aguero, 2004). Reactions can range from faint erythema to painful skin breakdown. They can impact quality of life and affect outcomes if they become a source of significant pain or discomfort, limit daily activities, or interrupt treatment.

Breast irradiation following lumpectomy or mastectomy commonly is delivered through medial and lateral tangential x-ray beams for six to seven weeks. The beam arrangement is designed to avoid normal lung and cardiac tissue (Harper et al., 2004). However, the beam must travel through the skin to reach its target. Porock, Kristjanson, Nikoletti, Cameron, and Pedler (1998) conducted a study to identify risk factors for radiation-induced skin reactions in patients with breast cancer. They found that predictive factors include weight, larger breast size, lymphocele aspiration, cigarette smoking, history of skin cancer anywhere on the body, tumor stage, and radiation dose. Treatment-related factors revealed in the literature are fraction size (dose delivered with each treatment), total dose, volume of tissue treated, type of radiation, and concurrent chemotherapy (Harper et al.). An unexpected finding in the Porock et al. investigation was that the sternal skin reaction at week five was less severe in women 60 years of age or older. The finding may be explained by the reduction in epidermal mitosis with age, rendering the skin less susceptible to radiation damage.

Knowledge of the pathophysiology and sequence of radiation skin reactions enhances understanding of how radiation damages the skin. Normal skin is composed of two layers: the outer epidermis and the underlying connective tissue layer or dermis. The outer layer is formed from the basal layer that lies between the epidermis and the dermis. During a period of 14 days following the application of radiation, 70% of the cells in the basal layer die. (A commercial product containing 5% hydrocortisone, diosone, or clobetasol has demonstrated efficacy for radiation-induced side effects in women receiving radiation therapy. These products are not prescription drugs and are available without a prescription in the United States.)

At a Glance

- Skin care protocols used by women receiving external radiation to the breast vary widely and are not always supported by research.
- Skin products present during radiation treatment do not increase the risk of skin reactions.
- Minimal disruption of a woman’s hygiene routine during treatment may decrease stress and increase quality of life.

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days, basal cells migrate to the surface to be sloughed. The dermis is composed of collagen, fibroblasts, and microvessels that support the epidermis. Hair follicles, nerves, glands, and horizontal and vertical vasculature are scattered throughout the skin layers (Archambeau et al., 1995). Figure 1 illustrates a cross-section of normal skin.

Ionizing radiation causes skin reactions by damaging the ability of stem cells to divide in the rapidly growing, radiosensitive basal layer of the epidermis. Although mild skin redness may be noted as early as the first day of radiation in rare instances, skin changes usually are seen after the second week. During the second to fourth weeks, symptoms may include dryness, epilation, pigmentation changes, and erythema (Archambeau et al., 1995). From the third to the sixth weeks, dry desquamation (scaling and pruritus) can develop when basal-layer stem cells become depleted in the treatment area. Moist desquamation (serous drainage and exposure of dermis) can occur after four to five weeks of therapy, depending on the total dose and dose per fraction as well as the field size and area being treated. The condition occurs when most of the stem cells in the basal layer are destroyed (Archambeau et al.; Harper et al., 2004). In most cases, healing begins one to two weeks after radiation ends as the basal layer stem cells repopulate.

Various skin care products have been employed in an attempt to prevent and manage radiation-induced skin reactions, including Biafine® (OrthoNeutrogena, Skillman, NJ), Aquaphor® (Beiersdorf, Wilton, CT), Special Care® cream (Bard Medical Division, Covington, GA), Lubriderm® (Pfizer Consumer Healthcare, New York, NY), aloe vera gels, cornstarch, and steroid creams. In a review of the literature since 1996, clinical trials have not consistently demonstrated a significant difference among skin care products in their ability to prevent or manage skin reactions ranging from erythema to dry desquamation (see Table 1).

Skin care protocols for patients receiving radiation vary widely among radiation facilities and even practitioners (Bolderston, 2003). However, one of the recommendations in many facilities is that no skin care products should be applied in the radiation field four hours prior to treatment. Another common recommendation is that commercial deodorants containing aluminum should not be used on the treated side, especially if the axilla is in the field. The Oncology Nursing Society publication Manual for Radiation Oncology Nursing Practice and Education (Bruner, Haas, & Gosselin-Acomb, 2005) provides guidelines for radiation oncology nursing practice. The recommendations given for skin care in patients with breast cancer receiving radiation include avoiding application of perfume, deodorant, powder, and lotion in the treatment field unless the radiation staff suggests a specific product. If a product is recommended, patients are instructed on when to apply it so that it is not present at the time of radiation or they are told to wash it off before treatment (Bruner et al.). The belief is that products may cause a bolus effect on the skin or react with the radiation, resulting in more severe skin reactions.

A review of the literature since 1996 in the United States, Canada, United Kingdom, and Australia revealed no research to support the belief that the presence of skin care products in the treatment field can increase skin reactions. Meegan and Haycocks (1997) noted that some of the practices to manage acute skin reactions originated from the time when external radiation therapy was delivered by orthovoltage equipment. The maximum dose was absorbed by the skin, resulting in severe reactions.

Since the advent and refinement of megavoltage equipment, along with the use of more advanced techniques, the dose to the skin has been greatly reduced (Meegan & Haycocks, 1997). However, many radiation facilities have not changed their practices accordingly.

Two published studies demonstrated that skin reactions are not increased by the use of skin products in the treatment field. Burch, Parker, Vann, and Arazie (1997) employed a phantom model to test the effect of 15 skin care products on surface radiation dose. Products included deodorant in solid, roll-on, and spray formulations; talcum powder; cornstarch; and two different lotions. No significant increase in surface dose (the amount of radiation absorbed by the skin) was detected with normal application of the products. The researchers did not verify their findings in patients. Meegan and Haycocks (1997) compared two groups of women receiving external radiation therapy to the breast. In one group, the women maintained their usual skin care routine, including use of their choice of soap, lotion, powder, and deodorant without restriction. The second group washed the treatment area with warm water only and did not apply products. No statistically significant difference in skin reactions existed between the two groups at the 5% confidence level. Verbal feedback from the patients who were not restricted indicated that they felt more in control of managing their care. The authors noted that, ideally, the two groups should have been studied simultaneously to eliminate seasonal variables, but because of resource limitations, the groups were run consecutively.

When women are diagnosed with breast cancer, they often are faced with overwhelming stress. Healthcare practitioners in the same practice may educate patients differently regarding skin care (Bolderston, 2003). Also, women with breast cancer may make comparisons with others who have been through...
<table>
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<tr>
<th>Study</th>
<th>Purpose</th>
<th>Sample</th>
<th>Design</th>
<th>Instrument or Tool</th>
<th>Results or Conclusions</th>
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<tr>
<td>Berthelet et al., 2004; Canada</td>
<td>Investigate the reliability and validity of the Skin Toxicity Assessment Tool (STAT) to evaluate the objective and subjective manifestations of radiation-induced skin toxicity in patients with breast cancer</td>
<td>27 patients with breast cancer receiving radiation</td>
<td>Pilot study using a pair of independent, blinded observers; the validity and reliability of the STAT tool were tested.</td>
<td>Each patient was assessed weekly during radiation and two weeks after completion using the STAT tool.</td>
<td>The STAT is an easy-to-use, standardized instrument and may be applied to clinical care and research in patients undergoing radiation therapy. Objective and subjective toxicity scores were significantly correlated.</td>
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<td>Wells et al., 2004; United Kingdom</td>
<td>Investigate whether sucralfate or aqueous cream reduced acute skin toxicity during radiotherapy; evaluate the effect of hydrogels and dry dressings on moist desquamation</td>
<td>357 patients receiving radiation to the head and neck, breast, or anorectal area</td>
<td>Randomized clinical trial; patients were instructed to wash using fragrance-free soap; three arms: aqueous cream, sucralfate cream, and no cream from day one of radiation</td>
<td>Modified Radiation Therapy Oncology Group (RTOG) scale, reflectance spectrophotometry, patient diary card, and Dermatology Life Quality Index</td>
<td>No consistent differences were found in the severity of skin reactions or pain levels in each of the three study arms. Risk factors for developing a skin reaction included higher body mass index, concomitant chemotherapy, radiation boost or bolus, and cigarette smoking.</td>
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<td>Bolderston, 2003; Canada</td>
<td>Examine the skin care practices of radiation facilities across Canada</td>
<td>26 radiation therapists from 26 different radiation facilities across Canada</td>
<td>Qualitative, descriptive study</td>
<td>Semistructured telephone survey consisting of 13 items (mix of short answers and yes or no questions)</td>
<td>Skin care protocols varied widely among the facilities and among healthcare practitioners. Lack of communication between disciplines resulted in frustration.</td>
</tr>
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<td>Heggie et al., 2002; Australia</td>
<td>Determine whether topical aloe vera gel is more effective than aqueous cream (Bi-afine®) in reducing skin side effects induced by radiation therapy to the breast; the secondary goal was to identify factors that predict the severity of skin reactions.</td>
<td>225 patients with breast cancer receiving radiation after lumpectomy or partial mastectomy; those requiring treatment of the nodes were excluded.</td>
<td>Phase III randomized, controlled trial; patients were randomized to either topical aloe vera gel or topical aqueous cream to be applied at certain points during and after the completion of radiation therapy to the breast. The nursing staff performed weekly skin assessments.</td>
<td>Registration form, including demographic data, weekly assessment form based on morbidity rating scale designed by Dische et al. (1989) for radiation skin reactions</td>
<td>Aqueous cream was significantly better than aloe in reducing dry desquamation and pain related to treatment. Subjects with D cup or larger breasts had more severe skin reactions, regardless of treatment arm. Aloe vera gel did not significantly reduce radiation-induced skin side effects. Aqueous cream reduced dry desquamation and pain related to radiation treatment.</td>
</tr>
<tr>
<td>Olsen et al., 2001; Florida, United States</td>
<td>Determine whether mild soap and aloe vera gel versus mild soap alone would influence the incidence of skin reactions in patients receiving radiation</td>
<td>73 patients receiving radiation; patients receiving radiation to the brain or for gynecologic cancers were excluded.</td>
<td>Prospective, randomized, blinded clinical trial; skin care began on the first day of treatment. Standard skin care instructions were given to both arms. Patients were instructed to rinse off the gel before treatment each day.</td>
<td>The time to first observed skin change was compared between the two arms using Kaplan and Meier’s (1958) product limit method.</td>
<td>At doses of 2,700 cGy or less, adding aloe had no effect on skin reactions. At higher doses, mean time was five weeks in the soap and aloe arm and three weeks in the soap alone arm. At doses of 2,700 cGy or greater, adding aloe seemed to have a protective effect.</td>
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Table 1. Summary of Research Studies Since 1996 Addressing Skin Care in Patients Receiving Radiation (Continued)

<table>
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<tr>
<th>STUDY</th>
<th>PURPOSE</th>
<th>SAMPLE</th>
<th>DESIGN</th>
<th>INSTRUMENT OR TOOL</th>
<th>RESULTS OR CONCLUSIONS</th>
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<tr>
<td>Roy et al., 2001; Canada</td>
<td>Determine whether washing versus no washing in the treatment area has an effect on skin reactions</td>
<td>99 women with breast cancer treated with radiation</td>
<td>Randomized, controlled trial</td>
<td>RTOG scores, pain, itching, burning</td>
<td>Trend toward worse skin reactions in the nonwashing arm; washing the skin does not increase skin toxicity.</td>
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<tr>
<td>Fisher et al., 2000; Michigan, United States</td>
<td>Compare Biafine with best supportive care (BSC) for efficacy in minimizing or preventing radiation-induced skin reaction in women undergoing breast irradiation; the two top BSC products were aloe vera gel and Aquaphor®.</td>
<td>172 women undergoing breast irradiation</td>
<td>Randomized clinical trial</td>
<td>RTOG Acute Toxicity Scale and the Oncology Nursing Society Radiation Therapy Care Record for Breast Weekly patient satisfaction and Spitzer Quality of Life questionnaires</td>
<td>No difference in skin toxicity existed during radiation between Biafine and BSC in prevention, time to onset, or duration of radiation-induced dermatitis. No difference existed in maximum toxicity by treatment arm or breast size. Large-breasted women had worse skin reactions. Large-breasted women using Biafine were more likely to have no toxicity six weeks following radiation. No difference was reported in quality of life during treatment between the study groups.</td>
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<td>Porock et al., 1998; United Kingdom</td>
<td>Establish risk factors for acute radiation skin reactions</td>
<td>126 women aged 30–78 receiving postlumpectomy radiation for breast cancer</td>
<td>Prospective, descriptive, correlational design with repeated measures; skin reactions were observed and recorded on a weekly basis during the seven weeks of treatment.</td>
<td>The RTOG scoring system for acute reactions and a visual analog scale to measure pain</td>
<td>Predictive factors of severity of skin reaction included weight, breast size, lymph node aspiration, smoking, age, skin cancer, tumor stage, and irradiation dose.</td>
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<td>Burch et al., 1997; Georgia, United States</td>
<td>Establish the effect of various skin care products on the skin dose in the radiation treatment field.</td>
<td>Experimental using phantom model</td>
<td>The effect of 15 skin care products on surface dose were tested using a phantom model.</td>
<td>Surface measurements were made with a Markus chamber.</td>
<td>No significant increase in surface dose was detected with normal application of the products.</td>
</tr>
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<td>Meegan &amp; Haycocks, 1997; Canada</td>
<td>Examine two consecutive groups of women receiving breast irradiation, comparing the effects on skin toxicity between using warm water only in the treatment area and their normal skin care regimens and skin products</td>
<td>156 women with breast cancer treated with radiation</td>
<td>Prospective, quasi-experimental study using consecutive samples compared usual skin care regimens, including patients’ own choice of skin products, to warm water only in treatment area</td>
<td>Four-point skin toxicity scale; data were collected on physical manifestations of acute reactions such as discomfort, use of analgesics, and interference with usual activity.</td>
<td>Statistical analysis using t test showed no difference in skin reactions between the two groups at the 5% confidence level.</td>
</tr>
<tr>
<td>Williams et al., 1996; Minnesota, United States</td>
<td>Determine whether aloe vera gel prevents radiation-induced skin reactions</td>
<td>First study: 194 women receiving breast or chest wall radiation; second study: 108 patients receiving breast or chest wall radiation</td>
<td>Two phase III double-blind and non–double-blind randomized trials</td>
<td>A basic 1–3 scale was used to score the severity of skin reactions at study initiation and weekly. Patients completed questionnaires at study initiation, weekly, and one month following treatment.</td>
<td>Skin dermatitis scores were almost identical in both treatment arms during both studies. A rare contact dermatitis was seen from the gel. The dose and schedule of aloe vera gel did not protect against radiation-induced skin reactions.</td>
</tr>
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</table>
the same treatment. If management of skin care during radiation therapy is not consistent, the confusion and anxiety that patients already may be experiencing can be compounded. In addition, patients are being asked to alter their normal hygiene practices, such as avoiding deodorant use on the treated side. Such action may cause them to feel socially unacceptable at a time when maintaining existing social support and a healthy body image is imperative (Bolderston, Lloyd, Wong, Holden, & Robb-Blenderman, 2005). Research to verify the findings of Burch et al. (1997) and Meegan and Haycocks (1997) would allow women to continue their current practice of using commercial deodorant during treatment.

If women receiving breast irradiation inadvertently apply skin products to the treatment area within four hours of treatment when they were instructed not to, they may be fearful that treatment will be delayed or that they will incur a worse skin reaction as a result. Also, their normal routines would be less disrupted if the timing of application of skin care products was not restricted. The Burch et al. (1997) study showed that normal application of skin care products in the treatment area at any time in relation to radiation will not increase the surface dose enough to cause a bolus effect. Meegan and Haycocks (1997) demonstrated that women who were allowed to use their own products on their usual schedules had no more severe skin reactions than women who washed only with warm water. If further research corroborates that finding, women undergoing treatment would have more control of their own care at a time when loss of control can lead to increased stress and anxiety.

Methods

Procedure

A systematic search of the literature on skin care during radiation published from 1996 to June 2005 was performed using the MEDLINE®, CINAHL®, and PubMed online databases. Key-word searches included the terms radiation, skin reactions, skin care, and breast neoplasms. Reference lists of the research studies found were reviewed, and those publications also were examined. Studies from the United States, Australia, United Kingdom, and Canada were included. Any studies without patients with breast cancer in the sample were excluded. The focus was narrowed to prevention and management of erythema and dry desquamation, excluding management of moist desquamation. Table 1 compares the characteristics of the studies reviewed.

Purpose

Of the 11 studies reviewed, only 1 (Berthelet et al., 2004) was conducted for the purpose of testing a tool to measure skin reactions. The study was included to demonstrate that the Skin Toxicity Assessment Tool (STAT) is the only method of assessment that has been tested for reliability and validity in evaluating radiation-induced skin reactions. The other tools that have been used widely are the Radiation Therapy Oncology Group (RTOG) Acute Toxicity Scale (four-point scale) and the National Cancer Institute’s Common Terminology Criteria Skin Assessment Tool (four-point scale). The latter tools have not been tested for reliability and validity, and they do not include subjective measures such as pain, discomfort, and itching.


Burch et al. (1997) used a phantom model to measure the effect of skin products on surface dose of radiation. The remaining seven studies tested various skin care products or washing methods to determine whether they could prevent or decrease skin reactions. Some included the products’ effects on quality of life and issues such as pain or comfort.

Research Design

Sample sizes in the 11 studies reviewed ranged from 26–357. The studies reviewed included six randomized clinical trials (Fisher et al., 2000; Heggie et al., 2002; Olsen et al., 2001; Roy, Fortin, & Larochelle, 2001; Wells et al., 2004; Williams et al., 1996), one pilot study testing the validity and reliability of a skin assessment tool (Berthelet et al., 2004), a descriptive study (Bolderston, 2003), and a prospective, descriptive, correlational design (Porock et al., 1998). Burch et al. (1997) employed an experimental design, and Meegan and Haycocks (1997) used a quasi-experimental design.

Instruments used included the STAT, RTOG or modified RTOG scale, Dische’s Morbidity Rating Scale, the Oncology Nursing Society’s Radiation Therapy Care Record for patients with breast cancer, a four-point toxicity scale, a basic 1–3 skin assessment scale, and a semistructured telephone survey. Wells et al. (2004) used reflectance spectrophotometry, a patient diary card, and the Dermatology Life Quality Index. Reliability and validity of the skin assessment tools had not been established previously.

Results

Berthelet et al. (2004) concluded that the STAT is reliable and valid in measuring radiation-induced skin toxicity. No consistent difference among skin care products in the prevention of radiation-induced skin toxicity was found in the randomized clinical trials. Fisher et al. (2000), with a sample size of 172, demonstrated no overall difference among Biafine, aloe vera gel, or Aquaphor in prevention of, time to, or duration of skin toxicity. The results of another investigation with a sample size of 225 indicated that Biafine increased comfort and reduced dry desquamation better than aloe vera gel (Heggie et al., 2002). Olsen et al. (2001) concluded that aloe vera gel has a protective effect when the radiation dose exceeds 2,700 cGy. Roy et al. (2001) found that washing the treatment area did not increase skin reactions. Two of the studies reviewed identified patient-related factors that increased skin toxicity (Porock et al., 1998; Wells et al., 2004). In the Bolderston (2003) survey, considerable practice differences were demonstrated among Canadian radiation facilities, along with a lack of interdisciplinary communication and resulting frustration.


Discussion

The studies testing specific products failed to indicate that the severity of radiation-induced skin reactions is influenced by the type of skin care products used on the treated skin. However, using a water-soluble moisturizer seems to increase comfort. Therefore, patients should use a water-soluble moisturizer of their own preference. Bolderston’s (2003) survey results established the need for a more unified approach to skin care while still allowing patients to make choices. This would minimize stress for patients and healthcare providers. Of note, Burch et al. (1997) demonstrated on a phantom model that applying skin care products, including commercial deodorant, had minimal effect on the surface skin dose and postulated that skin reactions would not be increased. Meegan and Haycocks (1997) demonstrated Burch et al.’s results in patients. One drawback was the collection of data from the two groups consecutively rather than simultaneously.

More research is needed in this area to confirm the findings of Burch et al. (1997) and Meegan and Haycocks (1997). Further support of their findings would provide evidence to eliminate the practice of advising patients not to use products less than four hours prior to treatment and to avoid the use of commercial deodorant on the treated side. Patients would be allowed to use their choice of hygiene products, including aluminum-based deodorant. In addition, restriction of the timing of application of the products in relation to treatment may not be necessary. Such changes will give women with breast cancer more control over their own care and minimize disruption to their usual hygiene practices. The resulting mitigation of anxiety and stress at a difficult time is likely to have a positive impact on patients’ quality of life.

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References


