Evaluating the Effects of Aluminum-Containing and Non-Aluminum Containing Deodorants on Axillary Skin Toxicity During Radiation Therapy for Breast Cancer: A 3-Armed Randomized Controlled Trial

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Summary
This 3-armed randomized controlled trial of 333 patients receiving fractionated postoperative radiation therapy for breast cancer compared the effects of aluminum-containing deodorant to those of non—aluminum-containing deodorant on axillary skin toxicity in 2 experimental

Purpose: Deodorant use during radiation therapy for breast cancer has been controversial as there are concerns deodorant use may exacerbate axillary skin toxicity. The present study prospectively determined the use of both aluminum-containing and non aluminum containing deodorants on axillary skin toxicity during conventionally fractionated postoperative radiation therapy for breast cancer.

Methods and Materials: This 3-arm randomized controlled study was conducted at a single center, tertiary cancer hospital between March 2011 and April 2013. Participants were randomized to 1 of 2 experimental groups (aluminum-containing deodorant and soap or non—aluminum containing deodorant and soap) or a control group (soap). A total of 333 participants were randomized. Generalized estimating equations were used to estimate and compare the odds of experiencing high levels of sweating and skin toxicity in each of the deodorant groups to the odds in the control group.

Received Apr 11, 2014, and in revised form Jun 17, 2014. Accepted for publication Jun 20, 2014.

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This study was supported by a University of Western Australia Cancer and Palliative Care Research and Evaluation Unit (CaPCREU) grant, a Sir Charles Gairdner Group research grant, and the Western Australian Nurses and Midwives Charitable Trust. The cleansing bar (QV Bar), deodorant (QV Naked Deodorant), and antiperspirant (QV Naked Anti-perspirant deodorant) were kindly supplied by Ego Pharmaceuticals, Australia. We thank Michelle Sin, Susan Richards, Jane Devine, Shannon Rabe, and Judy Pinto for their assistance with the study.
groups and a control group. Results demonstrated that participants in the deodorant groups did not report significantly different ratings for axillary pain, itch, or burning than the control group. In addition, the aluminum-containing deodorant group experienced significantly less sweating than the control group.

Introduction

Skin reactions are common during and after postoperative breast radiation therapy and can result in discomfort, pruritus, and pain (1), all of which can interfere with quality of life (2, 3). The use of deodorants during radiation therapy has been controversial, as there are concerns deodorant may exacerbate skin toxicity (3, 4). Suggested mechanisms for increased radiation toxicity include the deposition of aluminum salts that might affect surface radiation dose, a bolus effect from the product on the skin, and chemical or mechanical irritation (5). Although a phantom study did not show any large effects on surface doses from the normal application of 15 different topical products, some with and some without high atomic number components, (6) concerns remained.

In the past, proscription against use of antiperspirants or deodorants has been standard practice during postoperative radiation therapy. Women have been advised not to wear deodorant (7, 8) and to use only water and a mild soap to cleanse underarm during radiation therapy (2, 4, 9). However, many women feel uncomfortable with this (1), especially as a conventionally fractionated course of radiation therapy can last 7 weeks. A recent study surveyed 414 women, finding 64% were worried about body odor during radiation therapy treatment for breast cancer. This study also suggested that not using deodorant during radiation therapy can make women feel socially uncomfortable at a time when social support and a healthy body image are central to their well being (8).

Three randomized trials addressing skin toxicity during breast radiation therapy with non–aluminum containing deodorants were published prior to our study (1, 7, 10). The results of another randomized trial that studied the use of aluminum-containing deodorants were published recently, while our study was being conducted (5). Each of these studies concluded skin reactions were not significantly worsened by deodorant use.

In the 3 trials that specified the radiation therapy schedules (1, 5, 7), these were hypofractionated treatments, which might be expected from calculations of equivalent doses to have less early normal tissue effects. A number of clinical studies have reported lower rates of skin toxicity with hypofractionated courses than with conventional fractionation (11, 12, 13). Deodorant use might be more of a problem for patients treated with conventionally fractionated breast radiation therapy. A recent meta-analysis of the 4 randomized trials found the pooled relative risk did not identify an association between skin toxicity and deodorant use, despite the most recent study (5) favoring the control (14). Even assuming the results of trials using hypofractionated treatments are generally applicable, it is not clear that the results of trials using either non–aluminum containing or aluminum-containing deodorants can be combined in a meta-analysis.

We undertook a 3-arm randomized study comparing axillary skin toxicity with both aluminum-containing and non–aluminum containing deodorants compared to no deodorant use during conventionally fractionated postoperative radiation therapy for breast cancer. The study evaluated a range of endpoints including objective measurements of axilla sweating, skin toxicity, pain, itch and burning. Quality of life was assessed with a validated questionnaire.

Results: Radiation characteristics were similar across all groups. Patients in the deodorant groups did not report significantly different ratings for axillary pain, itch, or burning compared with the control group. Patients in the aluminum-containing deodorant group experienced significantly less sweating than the control; the odds of their sweating being barely tolerable and frequently or always interfering with their daily activities was decreased by 85% (odds ratio, 0.15; 95% confidence interval, 0.03-0.91).

Conclusions: We found no evidence that the use of either aluminum-containing or non–aluminum containing deodorant adversely effects axillary skin reaction during conventionally fractionated radiation therapy for breast cancer. Our analysis also suggests patients in the aluminum-containing deodorant arm had significantly less sweating without increased symptoms of axillary radiation skin toxicity. These results add to the evidence that the prescription of deodorants during radiation therapy for breast cancer is now questionable. © 2014 Elsevier Inc.
multidisciplinary management of breast cancer. The study was performed from March 2011 to April 2013.

Recruitment

Female patients 18 years or older with breast cancer scheduled to undergo 2-, 3-, or 4- field breast radiation were invited to participate in the study. Patients were excluded if they were: having concomitant chemotherapy; having hypofractionated radiation therapy; had intraoperative radiation therapy; had previous ipsilateral breast or chest wall radiation therapy; had a tumor with skin involvement; were pregnant or lactating; had a known allergy or hypersensitivity to deodorant; or hyperhidrosis.

Patients were recruited by the nurse performing their radiation therapy planning visit approximately 6 weeks before their radiation therapy was due to commence. Both verbal and written explanations of the study were used to aid recruitment and ensure patients understood why the study was important and what the study involved. Once verbal consent was gained, a consent form was signed and a copy given to the patient for their own record. The study was approved by the SCGH institutional ethics committee.

Radiation details

Breast radiation therapy was identical to the department’s usual practice. The intention was to treat the breast at risk and underlying chest wall. Beam energy was typically 6 MV, although mixed energy treatments (6 MV and 18 MV) were occasionally used to treat larger breasts. Wedges (physical or virtual “enhanced dynamic wedges”) were used in almost all of the patients to provide a homogenous dose. Multileaf collimators were used when necessary. The breast treatment volume was treated to the prescribed dose plus 7% or minus 5%. With 3- or 4-field treatments (ie, where, in addition to the 2 tangential breast fields, there was a third matching anterior supraclavicular field, with or without a fourth posterior axillary boost field), the supraclavicular region may have been treated with >107% of the prescribed dose. Radiation therapy was delivered daily, from Monday through Friday. Electronic portal imaging was used.

Randomization

Patients were randomly assigned using a third party internet-based program to 1 of 3 arms: water and soap; non–aluminum containing deodorant with water and soap; or an aluminum-containing deodorant with water and soap. Soap was provided to all participants to ensure all treatment groups were treated equally apart from the intervention. The soap was low irritant (pH 6, free from fragrance, color, lanolin, and propylene glycol). The aluminum-containing deodorant contained aluminum zirconium tetrachlorohydrex glycine at 20%, which is equivalent to 32.5% to 35.5% free aluminum.

The trial was double blinded, with both the patient and the assessor (research nurse) performing the skin assessment blinded to the aluminum-containing and non-aluminum-containing deodorants. Both deodorants were the same shape and size, had a white and opaque covering, and were non-perfumed. All participants were asked to use the soap when they were washing themselves, and those randomized to deodorant were asked to use it daily or as they required.

Procedures

The ipsilateral axilla of the breast or chest wall being treated was assessed weekly by the research nurse by using the Radiation Therapy Oncology Group (RTOG) Acute Skin Toxicity Scale (15, 16). If patients experienced grade ≥3 radiation dermatitis, they were asked to cease using deodorant.

Underarm sweating on the side on which patients were receiving their radiation therapy was assessed weekly by the research nurse by using the Hyperhidrosis Disease Severity Scale (HDSS), a validated and reliable instrument used in studies of hyperhidrosis (17). Weekly assessment of axillary itch, pain, and burning sensation on the side where patients were receiving radiation therapy was also performed. Patients were asked to place a cross on a 10-cm line to indicate where their experience of the symptom fell on a continuum from none to extreme.

Quality of life was evaluated during the first and last week of radiation therapy treatment, using the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire C30 scale (EORTC QLQ-C30) (18). This scale was specifically designed to measure cancer patients’ physical, psychological, and social functions (19). It incorporates 9 multifunctional scales: 5 functional scales (physical, role, cognitive, emotional, and social); 3 symptom scales (fatigue, pain, and nausea and vomiting); and a global health and quality of life scale. Other information collected for statistical analysis included details of radiation therapy received, age, smoking status, brassiere cup size, and height and weight (to calculate body mass index [BMI]).

One month after their final radiation therapy treatment, women were telephoned at home and asked to complete an in-house designed questionnaire to assess compliance with their allocated treatment group, the use of any other skin treatments on the axillary area being treated and whether they wanted a summary of the study findings.

Sample size

When our study was in the design phase no similar adequately powered studies had been published which could be used to guide our sample size calculation (7, 10). We planned a study of independent groups with 1 control per 2 cases (aluminum-containing and
non—aluminum containing deodorant) that would detect a difference in proportions of 20% assuming that 32% would experience skin reactions (RTOG grade ≥2) in the control group (20).

To reject the null hypothesis of equal skin reaction rates for deodorant users and control subjects with 80% power in a 2-armed trial required a sample size of 94 subjects in each group. As this was a 3-armed randomized controlled trial, we needed to multiply this number by 1.3 to maintain power (21). Therefore, we estimated we would need 111 subjects in each group (a total of n = 333) to detect a 20% change in proportions.

Statistical analysis

Data were analyzed in SPSS (IBM Corp., Armonk, NY) for Windows (version 21.0; Microsoft, Redmond, WA), and significance was set at 5%. The χ² test was used to compare physical and radiation treatment characteristics and final skin assessment among the 3 groups. Kruskal-Wallis tests were used to determine whether there were significant differences between the groups’ ordinal responses to the baseline survey and their changes between responses to the baseline and final surveys.

Linear mixed models were used to estimate the change in the rating scale compared with the control group for each of the skin condition characteristics of axillary itch, pain, and burning, with subsequent adjustment for smoking status, brassiere cup size, BMI, age, number of fractions, and week of radiation therapy.

Generalized estimating equations were used to estimate and compare the odds of experiencing high levels of sweating and skin toxicity in each of the deodorant groups to the odds in the control group, with subsequent adjustment for smoking status, brassiere cup size, BMI, age, number of fractions, and week of radiation therapy.

The 4-point rating for sweating was converted to a binary variable with ratings of 1 (never noticeable) and 2 (tolerable but sometimes interferes), classed as “low,” and ratings of 3 (barely tolerable frequently interferes) and 4 (barely tolerable and always interferes), classed as “high.”

For statistical analysis the 5-point rating for skin toxicity was converted, so RTOG grades 0 and 1 were classed as “low,” whereas RTOG grades 2 and higher were classed as “high” (there were no grade 4 reactions).

Results

Over 24 months, a total of 572 patients were approached, and 333 (58%) were recruited (Fig. 1). The most frequent reason for not participating in the study was that the women did not routinely use deodorant (61% [145 of 239]). Thirty-one participants withdrew in the period between recruitment at their radiation therapy planning visit and the first day of radiation therapy (an average of 6 weeks’ duration). Reasons for withdrawal prior to commencing radiation therapy included: delayed or postponed radiation therapy (45% [14 of 31]); being psychologically overwhelmed by their breast cancer diagnosis (32% [10 of 31]); and deciding not to participate for other reasons (23% [7 of 31]).

Two patients in the control arm withdrew from the study, 1 at week 2, stating she did not want to use deodorant, and another at week 3 who did not want to continue with the study.

Seven patients withdrew from the aluminum-containing deodorant arm: 2 at week 2 (1 patient canceled her treatment, and another developed widespread itch); 1 at week 3 (she...
disliked the deodorant); 1 at week 4 (the deodorant marked her clothes); 2 at week 5 (with an RTOG grade 2 skin reaction); and 1 patient at week 6 (with an RTOG grade 2 skin reaction).

Eight patients withdrew from the non–aluminum containing deodorant arm, 1 at week 1 (with rash over her entire torso); 2 at week 3 (1 patient disliked using the deodorant, and another canceled her radiation therapy treatment); 4 at week 5 (1 patient developed widespread itch, 1 patient disliked using the deodorant, and 2 patients experienced an RTOG grade 2 reaction); and 1 at week 6 (she disliked using the deodorant).

Patients’ baseline characteristics are summarized in Table 1. Patients in the non–aluminum containing group were more likely to smoke than those in the other groups (P = .002). Patients’ ages ranged from 31 to 88 years and did not differ significantly among groups (P = .226). Overall, 33.9% of the women were classified as obese (BMI > 30); this was similar among the groups.

Radiation characteristics were similar across all groups (Table 2). The number of patients experiencing “high” RTOG toxicity increased with each week of radiation therapy. No patients experienced grade ≥2 RTOG skin toxicity in the first 2 weeks of radiation therapy. At 4 weeks, a minority experienced grade ≥2 RTOG skin toxicity: 4.3% of 94 aluminum-containing deodorant users, 5.5% of 91 non–aluminum containing deodorant users, and 4.9% of 103 controls. However, of those still receiving radiation therapy at 7 weeks, 66.7% of 12 aluminum-containing deodorant users, 80% of 10 non–aluminum containing deodorant users, and 58.8% of 17 controls experienced grade ≥2 RTOG skin toxicity. The peak axillary RTOG skin toxicity for each group is summarized in Table 3. Analysis found no association between deodorant use and RTOG skin toxicity (P = .59).

Patients in the deodorant groups did not report significantly different ratings for axillary pain, itch, or burning compared with the control group. The mean change in the rating scale (a 10-cm continuum from none to extreme) for itch in the aluminum-containing deodorant group was 0.02 cm higher than that of the control, but this was not significant because the 95% confidence interval (CI; −0.14 to 0.18) included zero. Patients in the aluminum-containing deodorant group experienced significantly less sweating than the control; the odds of their sweating being barely

### Table 1: Patient baseline characteristics

<table>
<thead>
<tr>
<th>Factor</th>
<th>Aluminum-containing deodorant (n=98)</th>
<th>Non–aluminum containing deodorant (n=98)</th>
<th>Control (n=106)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age, yr (range)</td>
<td>53.5 (33-75)</td>
<td>56.5 (37-88)</td>
<td>57.0 (31-82)</td>
<td>.226*</td>
</tr>
<tr>
<td>Median height, cm (range)</td>
<td>164.5 (150-185)</td>
<td>163 (141-179)</td>
<td>163 (146-182)</td>
<td>.67*</td>
</tr>
<tr>
<td>Median weight, kg (range)</td>
<td>72.75 (45-150)</td>
<td>73.5 (44-132)</td>
<td>74.05 (50-170)</td>
<td>.47*</td>
</tr>
<tr>
<td>Body mass index &gt;30</td>
<td>28 (28.6%)</td>
<td>35 (35.7%)</td>
<td>40 (37.7%)</td>
<td>.41†</td>
</tr>
<tr>
<td>Brassiere cup size</td>
<td></td>
<td></td>
<td></td>
<td>.20†</td>
</tr>
</tbody>
</table>

* P value from analysis of variance test.
† P value from χ² test.

### Table 2: Radiation characteristics

<table>
<thead>
<tr>
<th>Factor</th>
<th>Aluminum-containing deodorant (n=98)</th>
<th>Non–aluminum containing deodorant (n=98)</th>
<th>Control (n=106)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tangent radiation therapy schedules</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45 Gy in 25 fr</td>
<td>4 (4.1%)</td>
<td>9 (9.2%)</td>
<td>6 (5.7%)</td>
<td>.177*</td>
</tr>
<tr>
<td>50 Gy in 25 fr</td>
<td>52 (53.1%)</td>
<td>43 (43.9%)</td>
<td>41 (38.7%)</td>
<td></td>
</tr>
<tr>
<td>50.4 Gy in 28 fr</td>
<td>42 (42.9%)</td>
<td>46 (46.9%)</td>
<td>59 (55.7%)</td>
<td></td>
</tr>
<tr>
<td>No. of fields</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>69 (70.4%)</td>
<td>71 (72.4%)</td>
<td>79 (74.5%)</td>
<td>.93*</td>
</tr>
<tr>
<td>3</td>
<td>2 (2.0%)</td>
<td>3 (3.1%)</td>
<td>3 (2.8%)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>27 (27.6%)</td>
<td>24 (24.5%)</td>
<td>24 (22.6%)</td>
<td></td>
</tr>
<tr>
<td>No. receiving tumor bed boosts</td>
<td>55 (56.1%)</td>
<td>44 (44.9%)</td>
<td>53 (50%)</td>
<td>.29*</td>
</tr>
<tr>
<td>Not receiving boosts</td>
<td>43 (43.9%)</td>
<td>54 (55.1%)</td>
<td>53 (50%)</td>
<td></td>
</tr>
</tbody>
</table>

* P value from χ² test.

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Table 3: Peak Radiation Therapy Oncology Group axillary skin toxicity

<table>
<thead>
<tr>
<th>RTOG*</th>
<th>Aluminum-containing deodorant n=95</th>
<th>Non-aluminum-containing deodorant n=95</th>
<th>Control n=101</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 (0%)</td>
<td>3 (3.2%)</td>
<td>1 (1.0%)</td>
</tr>
<tr>
<td>1</td>
<td>31 (32.6%)</td>
<td>25 (26.3%)</td>
<td>33 (32.6%)</td>
</tr>
<tr>
<td>2</td>
<td>59 (62.1%)</td>
<td>63 (66.3%)</td>
<td>63 (62.4%)</td>
</tr>
<tr>
<td>3</td>
<td>5 (5.3%)</td>
<td>4 (4.2%)</td>
<td>4 (4.0%)</td>
</tr>
<tr>
<td>4</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

Data for 3 aluminum-containing deodorant, 3 non-aluminum-containing deodorant, and 5 control group participants were either missing or participants had withdrawn from the study.

* Grade 0 = no change to skin; 1 = follicular, faint or dull erythema, epilation, dry desquamation and or deceased sweating; 2 = tender bright erythema, patchy moist desquamation, and or moderate edema; 3 = confluent, moist desquamation other than skin folds, pitting edema; 4 = ulceration, hemorrhage, and necrosis.

Table 4: Model coefficients and odds ratios with 95% confidence intervals for intergroup comparisons of skin condition characteristics

<table>
<thead>
<tr>
<th>Skin characteristic</th>
<th>Aluminum-containing deodorant</th>
<th>Non-aluminum-containing deodorant</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in rating scale coefficients</td>
<td>0.12 (−0.12, 0.36)</td>
<td>0.04 (−0.20, 0.28)</td>
<td>.74</td>
</tr>
<tr>
<td>Adjusted change in rating scale</td>
<td>0.08 (−0.17, 0.32)</td>
<td>0.10 (−0.15, 0.34)</td>
<td>.43</td>
</tr>
<tr>
<td>Itch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in rating scale coefficients</td>
<td>0.02 (−0.14, 0.18)</td>
<td>0.06 (−0.10, 0.23)</td>
<td>.46</td>
</tr>
<tr>
<td>Adjusted change in rating scale</td>
<td>−0.04 (−0.21, 0.13)</td>
<td>0.06 (−0.11, 0.23)</td>
<td>.50</td>
</tr>
<tr>
<td>Burning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in rating scale coefficients</td>
<td>−0.03 (−0.22, 0.15)</td>
<td>−0.02 (−0.20, 0.16)</td>
<td>.79</td>
</tr>
<tr>
<td>Adjusted change in rating scale</td>
<td>0.02 (−0.21, 0.16)</td>
<td>−0.01 (−0.20, 0.18)</td>
<td>.94</td>
</tr>
<tr>
<td>Sweating*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in odds</td>
<td>0.21 (0.04, 1.19)</td>
<td>0.08</td>
<td>.81</td>
</tr>
<tr>
<td>Adjusted change in odds</td>
<td>0.15 (0.03, 0.91)</td>
<td>0.04</td>
<td>.45</td>
</tr>
<tr>
<td>Skin toxicity†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in odds</td>
<td>0.81 (0.55, 1.21)</td>
<td>0.92 (0.61, 1.37)</td>
<td>.45</td>
</tr>
<tr>
<td>Adjusted change in odds</td>
<td>0.81 (0.44, 1.49)</td>
<td>1.08 (0.57, 2.04)</td>
<td>.81</td>
</tr>
</tbody>
</table>

Change in rating scale for pain, itch, and burning was assessed in centimeters and model coefficients given to these characteristics.

* Sweating was assessed using the Hyperhidrosis Disease Severity Scale.

† Skin toxicity was assessed using Radiation Therapy Oncology Group acute skin toxicity scale skin rating. Adjustments were made for smoking status, brassiere cup size, body mass index, age, number of radiation fractions received, and week of radiation therapy.

Discussion

This was a large randomized study involving over 300 women with a comprehensive range of relevant endpoints. We found no evidence that the use of either aluminum-containing or non–aluminum containing deodorant adversely affected axillary skin reaction during conventionally fractionated radiation therapy for breast cancer. Our analysis also suggests patients in the aluminum-containing deodorant arm had significantly less sweating without increased symptoms of early radiation skin toxicity.

To our knowledge, no randomized controlled trial to assess the effect of using either aluminum-containing or non–aluminum containing deodorant on underarm skin reaction during a course of radiation therapy for breast cancer has been performed. We believe the results from this study will enable clinicians to use evidence to inform women about management of their underarm body odor during radiation therapy for breast cancer, as the evidence for the proscription of deodorants during radiation therapy for breast cancer is now questionable.

The 3 previous randomized controlled trials that specified their radiation therapy schedules (1, 5, 7) used hypofractionated regimens that would be expected to cause fewer early normal tissue effects (depending on assumptions regarding the kinetics of normal tissue cell repopulation). That is, axillary reactions may be expected to be worse for conventionally fractionated patients than hypo-fractionated patients, therefore deodorants might be potentially more of a problem for this group. Consistent with this, our study demonstrated higher rates of acute skin radiation toxicity than others (1, 7). This makes our study important for treatments using conventional fractionation.

Those randomized to the aluminum-containing deodorant were more likely to smoke than the other 2
groups (Table 1). Previous research (22) has found an association between smoking during radiation therapy for breast cancer and increased risk of skin reaction. However, this would have made reactions more likely, favoring worse reactions in this group, so it does not affect and may indeed strengthen the study’s conclusion. We suggest smoking cessation programs should be considered for women receiving postoperative radiation therapy for breast cancer who continue to smoke, for this and other reasons.

A strength of the current study was that reported compliance with deodorant use was high, an overwhelming majority (98%) of those randomized to the deodorant group reported using it every day of their radiation therapy treatment.

Study limitations

The study had some limitations that might reduce the generalizability of our findings. We used one brand of deodorant that was selected because it was suitable for sensitive skin. The results may not apply to all available deodorants. Most of our sample was Caucasian and effects might be different for different races. Forty two percent of the women eligible for the study declined to participate, many reporting they did not use deodorant. This was not unexpected, as it had been experienced by other studies (5, 8). Anecdotally, many of these women had ceased using deodorant since their diagnosis of breast cancer, concerned that deodorant use had contributed to their cancer.

Finally, we did not assess the amount of axillae treated for individual patients, although this can vary significantly (eg, due to patient shoulder movement restriction or radiation treatment technique). Instead we relied on the randomized study design to balance this between treatment groups.

Conclusions

We found no evidence that deodorant use adversely affected skin reaction during conventionally fractionated radiation therapy for breast cancer. This agrees with the findings of other large randomized controlled trials examining deodorant use with hypofractionated radiation treatments (5, 10). This information will assist clinicians to use evidence to inform women about underarm skin management during the time they are receiving radiation therapy for breast cancer.

References