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Avoiding antiperspirants during breast radiation therapy: Myth or sound advice?

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Avoiding antiperspirants during breast radiation therapy: Myth or sound advice?

SUMMARY:

Breast cancer patients are typically advised to avoid antiperspirants for fear of increasing radiation dermatitis in the axilla. We hypothesized that antiperspirants would have minimal effect on skin dose. We found no difference in surface dose +/- antiperspirants using 6MV photons at gantry angles of 0°/30°/60°/90° regardless of aluminum concentration.

INTRODUCTION:

Antiperspirants/deodorants are used by >90% of adults in the USA [1, 2], and multiple studies demonstrate antiperspirants improve quality-of-life [2-4]. Antiperspirants have traditionally been proscribed during breast radiation for fear of increasing axillary dermatitis through a bolus effect or electron scatter from aluminum in antiperspirants.

Several clinical trials investigated this traditional practice, and none reported significantly increased skin toxicity associated with aluminum-containing antiperspirants [5, 6] or aluminum-free deodorants [7, 8]. These studies did not quantify axillary erythema using photo-analysis and instead relied upon the CTCAE and RTOG dermatitis grading scales which define grade 2 dermatitis so broadly that a clinically meaningful effect (*e.g.* pain, pruritus, or desquamation) may not be captured [9, 10].

The only dosimetric study quantifying antiperspirant effect on surface dose was published 20 years ago using older dosimeters measuring surface dose for *en face* beams with greater skin-sparing properties than typical tangent beams and did not assess dose as a function of gantry angle [11]. No prior studies have investigated the dosimetric effect of extra-strength antiperspirants having a higher aluminum content.

Despite this older literature suggesting that antiperspirants could be safely used during breast radiation, we hypothesized that the tradition of avoiding antiperspirants remains widespread. We also hypothesized that applying antiperspirants before treatment would have negligible effect on surface dose measured with modern dosimetric techniques regardless of the aluminum concentration or gantry angle of the tangent beams.

METHODS:

We conducted online, anonymous international surveys of patients and providers using OncoLink (www.OncoLink.org) to determine current practice regarding antiperspirants during breast radiation. Patients completed a 24-question survey about skin care and radiation therapy. Providers completed a separate 18-question survey on the topic. Responses were collected between January 2015 and March 2017. Differences in responses with respect to baseline characteristics were assessed using the Chi-square test for categorical variables and the Mann-Whitney test for continuous variables. P-values <0.05 were considered significant.

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We measured surface dose in a tissue-equivalent phantom using optically stimulated luminescent dosimeters (OSLDs) (NanoDot, Landauer, Glenwood, IL) with or without two commercially available, aluminum-containing roll-on antiperspirants of different concentrations. The standard antiperspirant contained 15% aluminum zirconium tetrachlorohydrex glycine. The extra-strength antiperspirant contained 25% of this compound. Initially, we measured surface dose with or without standard antiperspirant. Eight roll-on applications of this antiperspirant were applied to a 5×5 cm paper square to ensure a thick coating. A control square of equal size had no antiperspirant. OSLDs were placed under the center of each square. 6 MV photons delivered 200 MU to both targets at 100 cm SSD for multiple sequential gantry angles (0°, 30°, 60°, and 90°) using a TrueBeam linear accelerator (Varian Medical Systems, Palo Alto, CA). The OSLDs were replaced after each fraction. The same experiment was repeated with extra-strength antiperspirant. OSLDs were processed according to standard protocol [12].

RESULTS:

A total of 241 patients and providers completed the surveys. There were 133 patients who participated in the OncoLink patient survey. Of these, 92 received breast radiation therapy for breast cancer. Seventy-three of 92 surveyed breast cancer patients (79%) said they were advised to avoid antiperspirants before radiation by their healthcare providers (Table 1). Thirty-eight of 43 patients (88%) treated at academic centers were advised to avoid antiperspirants vs. 35 of 49 patients (71%) treated at private practice centers (p=0.045). Thirty-five of 42 patients (83%) who indicated that their radiation oncologist was the primary provider managing their skin side-effects were advised to avoid antiperspirants compared to 38 of 50 patients (76%) whose skin care was managed primarily by nurses. There were no significant differences in patient responses about antiperspirant recommendations based on primary provider managing their radiation dermatitis (physician vs. nurse), the time duration since completion of breast radiotherapy, patient age, education level, or patient ethnicity (p>0.05 for all). For the 53 of 92 patients (58%) who reported "moderate" or "severe" skin erythema in the survey, 81% reported that they were advised to avoid antiperspirants.

108 providers participated in the separate healthcare provider survey. 105 of 108 providers reported that they have been directly involved in managing radiation dermatitis for their patients and were included in the analysis (Supplemental Table 1). Of these 105 providers, 52 were physicians (50%) and 53 were nurses (50%). Eighty-six of 105 providers (82%) routinely advise their patients to avoid antiperspirants during breast radiotherapy. Of the 86 providers recommending against antiperspirants, reasons cited were electron scatter from metals in 71%, bolus effect in 63%, and "routine clinical practice" in 55%.

Ninety of 105 providers identified as radiation oncology healthcare providers, with 50 radiation oncologists and 40 radiation oncology nurses. 75 of 90 radiation oncology providers (84%) routinely advised their breast cancer patients not to use antiperspirant during breast radiotherapy. 39 of 50 radiation oncologists (78%) vs. 37 of 40 radiation oncology nurses (93%) offered this advice (p=0.059). Of the 32 providers who practice in the academic setting, 28 of 32 (88%) recommended against antiperspirant use, which included 13 of 14 physicians (93%) and 16 of 18 nurses (89%). Of the 58 surveyed private practice providers, 47 of 58 (81%) advise against

antiperspirant use, including 26 of 36 physicians (72%) and 21 of 22 nurses (95%). There was no significant differences in provider responses based on academic versus private practice, physicians vs. nurses, physicians at academic centers vs. private practice physicians, or nurses at academic centers vs. nurses at private practice centers ($p>0.05$ for all).

OSLD measurements showed no difference in surface dose with or without antiperspirants at gantry angles of 0°, 30°, 60°, or 90° regardless of aluminum concentration (Table 2). The largest absolute difference of 7 cGy (5%) for a beam angle of 60° was within the OSLD margin-of-error.

DISCUSSION:

Whether women should avoid antiperspirants before breast radiation has been controversial. Several randomized trials reported no significantly increased physician or patient-reported skin toxicity with non-aluminum deodorants or aluminum-containing antiperspirants [5-8]. Despite these studies, 82% of clinicians in our survey cling to traditional proscriptions against antiperspirants during radiation. A comparable number of patients (79%) reported that they had received this advice from their healthcare providers. The enduring popularity of this recommendation, even in the face of reports questioning the tradition's rationale, negatively impacts patients' quality-of-life. A survey reported that 64% of women abstaining from deodorants expressed concern about body odor with 19% expressing "a lot of concern" [4]. In the absence of a deleterious dosimetric impact from antiperspirants, there is no justification for prohibiting their use since these products can improve many women's quality-of-life.

In our opinion, there are shortcomings in the available studies on axillary antiperspirant use during breast radiation that may have inhibited providers from liberalizing antiperspirant use. The one prior dosimetry study did not explore the effect of commonly used extra-strength antiperspirants with higher aluminum content, the impact of thickly applied antiperspirant, or the effect of gantry angle on surface dose. We assessed surface dose using both extra-strength and standard-strength antiperspirants. We also applied the antiperspirant immediately before radiation in a thicker layer than most patients would use. We tested not only the surface dose of *en face* beams as in the 1997 study [11] but also assessed surface dose at multiple gantry angles since patients receiving breast radiation are treated with tangent fields. Even in the extreme case of extra-strength antiperspirant copiously applied just prior to radiation, we found no difference in the surface dose related to antiperspirant use.

Our dosimetric study provides quantitative assessment of surface dose at different gantry angles and lends necessary credence to the results of older clinical trials reporting no increased skin toxicity with antiperspirants since those trials were limited by the inherent difficulties of assessing skin toxicity using the overly broad CTCAE grading system. CTCAE grade 2 dermatitis is so broadly defined that it could mask potentially meaningful differences in toxicity by grouping together asymptomatic women with moderate erythema with women having significant pain and pruritus from severe erythema and focal moist desquamation. This grading system is acknowledged by experts as a major limitation in any trial assessing dermatitis as an endpoint [9, 10]. Our quantitative dosimetric analysis reinforces the conclusions of the toxicity studies that antiperspirant use is acceptable during breast radiation.

There are several limitations to this study. The size of the survey population (n=200) is relatively modest and the results were obtained over a 2 year period using a sample of convenience approach, so the results may not accurately reflect current practice. The results of the survey do, however, confirm the results of the only other patient survey on this issue by Graham et al. published in 2009 in which 67% of patients in the UK reported that they were advised to avoid antiperspirants by their providers [4]. While the Graham study was larger, it was conducted before the publication of the randomized trials assessing antiperspirant use and does not reflect the impact of those trials, if any, on current clinical practice [5-8], especially in the US. Our study fulfills an important role in assessing the effect of those trials on current clinical practice and raises the possibility that the recommendation to avoid antiperspirants is at least as widespread now as it was in 2009 before the publication of the first randomized trials. Our survey of healthcare providers, which was not performed in the Graham study, is the largest and only provider survey on this issue and lends additional credence to the results of the patient survey, as the percentage of providers recommending against antiperspirants (82%) was virtually identical to the number of patients who reported receiving that advice (79%). In addition, a survey of >100 healthcare providers may be more indicative of current practice than the comparably-sized patient survey as each provider presumably offers their recommendations on antiperspirant use to many breast cancer patients. We would argue that our survey, while smaller than the Graham study, is a better reflection of current practice because it is more modern and also surveyed healthcare providers. While the size of our survey population does not allow us to conclude with certainty about the exact prevalence of this recommendation in general practice, the results do strongly suggest that the recommendation to avoid antiperspirants remains popular. Another key limitation of the study is that our assessment of antiperspirant effects was limited to a dosimetric study of the impact of antiperspirants on the surface dose. We did not investigate whether chemical irritants in the antiperspirant were contributing to skin toxicity, although presumably such an effect would have been reported in the randomized clinical trials, and there was no significantly increased skin toxicity in the antiperspirant group either from chemical irritants or other factors (e.g. bolus effect or electron scatter).

CONCLUSIONS:

While our study did not assess the direct skin toxicity from chemical irritants in antiperspirant, it is the first dosimetric analysis of the effect of aluminum-containing antiperspirants on surface dose as a function of different gantry angles and aluminum concentrations. Our findings show no significant difference in skin dose using antiperspirants regardless of gantry angle or aluminum concentration. Survey results suggest that the traditional recommendation to avoid antiperspirants during breast radiation remains widespread in spite of the publication of several randomized trials that showed no increased toxicity with the use of antiperspirant. We conclude that the use of currently available antiperspirants during breast radiation can be liberalized to improve patient quality-of-life without risking increased axillary dermatitis.

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Our work on antiperspirants is in conjunction with our current efforts to investigate the effects of skin creams (topical moisturizers as well as silver sulfadiazine) on surface dose using both dosimetric analysis and animal models [13].

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Table 1: Results of the online survey of breast cancer patients undergoing breast RT

Patient Survey (n=92)	
Variable	
Median age (range)	58 (18-78)
Gender	
Male	1 (1%)
Female	91 (99%)
Ethnicity	
Caucasian	78 (85%)
African-American	6 (7%)
Latino	4 (4%)
Asian	2 (2%)
Mixed race	2 (2%)
Education	
High school diploma	11 (12%)
Some college	16 (17%)
College degree	41 (45%)
Graduate school	24 (26%)
Radiation treatment center	
Academic center	43 (47%)
Community practice	49 (53%)
Time since RT	
Currently on treatment	10 (11%)
RT completed in last 6 months	20 (22%)
RT completed in last 7 - 24 months	18 (20%)
RT completed >24 months ago	44 (48%)
Main provider managing RT dermatitis	
Physician	42 (46%)
Nurse	50 (54%)
Did the patient report skin peeling?	
Yes	39 (42%)
No	53 (58%)
Did the patient report skin erythema?	
None	0 (0%)
"Mild"	39 (42%)
"Moderate"	26 (28%)
"Severe"	27 (29%)
Advised to avoid antiperspirants during breast RT?	
Yes	73 (79%)
No	19 (21%)

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Table 2: Surface dose measured using OSLDs in the presence or absence of standard antiperspirant and extra-strength antiperspirant

Gantry Angle	Dose (cGy) with standard antiperspirant	Dose(cGy) without standard antiperspirant	Dose (cGy) with extra-strength antiperspirant	Dose (cGy) without-extra strength antiperspirant
0°	89	89	84	84
30°	92	99	94	92
60°	136	129	131	126
90°	157	152	155	157

Supplemental Table 1: Results of the online survey of breast cancer providers

Provider Survey (n=105)	
Variable	
Provider Role	
Physician	52 (50%)
Nurse	53 (50%)
Radiation oncology provider	
Yes	90 (86%)
No	15 (14%)
Practice setting	
Academic center	40 (38%)
Community practice	65 (62%)
Routinely advise patients to avoid antiperspirants during breast RT?	
Yes	86 (82%)
No	19 (18%)
Reasons cited to avoid antiperspirant use during breast RT	
Electron scatter from metals	61 (71%)
Bolus effect	54 (63%)
Routine clinical practice	47 (55%)