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Mitigating Radiodermatitis in Ultra-Hypofractionated Breast Radiotherapy: Objective Assessment of a Dermoprotective Bra by Laser Doppler Imaging

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Objective:
To evaluate the effect of a dermoprotective bra on the progression of acute radiodermatitis induced by radiotherapy, using as an objective biomarker a quantitative skin perfusion index obtained by Laser Doppler imaging.
Materials and methods:
Forty-seven patients with breast cancer treated with ultra-hypofractionated radiotherapy (total dose 26 Gy delivered in five fractions of 5.2 Gy) were included. According to the bra worn during RT, patients were assigned to two groups: dermoprotective bra, seamless and made of viscose/chitin fiber with ionic silver (n = 21), and conventional bra (n = 26). Skin toxicity was assessed clinically with the CTCAE scale and objectively by skin perfusion measured with Laser Doppler Imaging.
The upper-outer region of the irradiated breast and the contralateral breast (internal control) were scanned to obtain mean perfusion. A Microcirculation Index (MCI) was defined as the relative difference in mean perfusion between the treated and contralateral breast. Measurements were performed at four time points: pre-RT, mid-treatment, at RT completion and at one month. Receipt of chemotherapy was also recorded.
Statistical analysis was performed using a general linear model for repeated measures, including main effects of time, bra type and chemotherapy, and their interactions. Post-hoc comparisons were adjusted by the Bonferroni method.
Results:
By CTCAE scale, at RT completion 90.5% of the dermoprotective-bra group remained Grade 0 and 9.5% had mild erythema (Grade 1). In the conventional-bra group, 65.4% were Grade 0 and 34.6% Grade 1.
Objective analysis using the MCI showed significant differences: at the end of RT the conventional-bra group exhibited a significantly higher MCI than the dermoprotective-bra group ($p = 0.037$). At 30 days, the dermoprotective-bra group showed a trend toward lower MCI, close to statistical significance ($p = 0.065$), suggesting faster microvascular recovery. Analysis of chemotherapy effect indicated that, among patients who did not receive chemotherapy, those who did not use the dermoprotective bra had a significantly greater increase in MCI at RT completion ($p = 0.017$).
Conclusion:
Use of the dermoprotective bra during breast radiotherapy reduces the incidence and severity of acute radiodermatitis and moderates the acute increase in skin perfusion at treatment completion ($p = 0.037$), with a tendency to accelerate microvascular recovery at one month ($p = 0.065$). Furthermore, it attenuates the adverse vascular effect observed in patients receiving RT alone ($p = 0.017$). These findings support the relevance of the dermoprotective bra's design and composition and warrant consideration of its clinical implementation.

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