Skin cancer in patients treated with photobiomodulation for alopecia: a retrospective chart review

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To the Editor:

Photobiomodulation (PBM) was cleared by the Food and Drug Administration (FDA) in 2007 for androgenetic alopecia (AGA). These devices contain laser diodes that produce monochromatic, highly coherent light (650-678nm) and/or light emitting diodes [1]. Minimal side effects have been reported with these devices including erythema, pruritus, and tingling [2]. Herein, we report no identifiable increased risk of skin cancer when used in alopecia patients within one academic health center.

A retrospective chart review was performed using electronic medical record data from an academic dermatology clinic (January 1, 2007 to December 31, 2017). Records were identified using PBM search terms and all FDA cleared devices including: photobiomodulation, low-level laser therapy, and hair laser. Records were filtered to include diagnoses: AGA, female/male pattern hair loss (FPHL/MPHL), alopecia areata (AA), telogen effluvium (TE), frontal fibrosing alopecia (FFA), lichen planopilaris (LPP), and central centrifugal cicatricial alopecia (CCCA). Subjects using PBM in at least two encounters were included. Charts were manually reviewed for the development of skin cancer on the scalp or forehead. Estimated treatment number, immunosuppressive medications, history of solid organ transplant, HIV status, and prior phototherapy were recorded.

Six hundred and thirty-eight patients met initial screening criteria. Of these, 204 met inclusion criteria (192F, 12M, age range 16-90, mean age 52.8 years), (**Table 1**). The most common alopecia diagnosis was AGA (**Table 1**). Treatment time ranged from 0-96 months (mean 26.4). Two cutaneous malignancies developed on or near the scalp during the treatment

Table 1. *Summary of patient characteristics and duration of treatment in patients using photobiomodulation devices.*

Variable	No. (%) (N=204)
Patient characteristics	
Age, mean (range), years	52.8 (16-90)
Female	192 (94.1)
Alopecia Diagnoses	
Androgenetic alopecia	58 (28.4)
Non-scarring alopecia	47 (23)
Telogen effluvium	31 (15.2)
Multifactorial	20 (9.8)
Lichen planopilaris	18 (8.8)
Frontal fibrosing alopecia	10 (4.9)
Alopecia areata	9 (4.4)
Female pattern hair loss	6 (2.9)
Central centrifugal cicatricial alopecia	2 (0.98)
Chemotherapy induced hair loss	1 (0.49)
Scalp psoriasis	1 (0.49)
Seborrheic dermatitis-related alopecia	1 (0.49)
Duration of Treatment	
Mean (range), months	26.4 (0-96)

Table 2. *Summary of non-melanoma skin malignancies after starting photobiomodulation.*

Variable	No. (N=2)
Location	
Forehead	1
Scalp	1
Latency (months)	12.5-60
Alopecia diagnosis	
LPP/AGA	1
FFA	1
Patient characteristics	
Mean age at start of therapy (years)	53.5
Female	1

AGA, androgenetic alopecia; FFA, frontal fibrosing alopecia; LPP, lichen planopilaris.

period (**Table 2**). One was a non-melanoma skin cancer on the forehead of a female with FFA 12.5 months after starting PBM. The second was a basal cell carcinoma on the scalp of a male with LPP/AGA 60 months after starting PBM. Neither had documented use of immunosuppressive medications, history of solid organ transplantation, HIV, or ultraviolet phototherapy.

This preliminary data does not suggest that PBM results in increased rates of skin cancer over the time period examined. This aligns with a literature review revealing just one reported skin cancer arising in PBM treatment sites for alopecia that was not attributed to device use [3]. The use of a control group comprising patients diagnosed with alopecia with no exposure to PBM should be considered in future studies.

Potential conflicts of interest

The University of Minnesota has received equipment gifts from HairMax, Theradome, Capillus, LaserCap, and iGrow for research. In addition, a gift from Revian Red for an unrelated study was received.

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