Reprinted from Dermatologic Surgery
Published Ahead of Print, Post-Author Corrections June 1, 2018

Published by Lippincott Williams & Wilkins Printed in U.S.A.

LETTERS AND COMMUNICATIONS

Hybrid Fractional Ablative and Nonablative Laser Resurfacing of Actinic Keratoses

Field treatment of actinic keratoses (AKs) is a therapeutic challenge due to lack of patient tolerability and compliance with traditional treatments. Actinic keratoses are a known risk factor for development of squamous cell carcinoma. Actinic keratoses may be treated with cryosurgery, topical immunomodulators, topical chemotherapy, electrodessication and curettage, and photodynamic therapy. Both cryosurgery and curettage can leave unsightly scars or permanent dyspigmentation. Topical immunomodulators and topical chemotherapy require patient compliance. Photodynamic therapy can be painful and requires strict sunlight avoidance. Laser resurfacing is emerging as a promising therapeutic option for AKs with low recurrence rate after treatment.[1–4] We present a single treatment with a hybrid 1,470-nm diode/2,940-nm Er:YAG fractional laser (Halo; Sciton, Palo Alto, CA) as a novel method to treat AKs off the face.

Methods

Between January 2015 and April 2016, patients of Fitzpatrick skin Type I to IV with clinically identifiable AKs, who had previously failed traditional treatment modalities such as cryosurgery, topical immunomodulators, and topical chemotherapy and who requested an alternative therapy, were offered a single treatment with hybrid 1,470-nm/2,940-nm fractional laser to treat AKs off the face. Patients with active skin cancer in the treatment field or allergy to 7% lidocaine/7% tetracaine anesthetic ointment were excluded. A total of 9 patients (3 men and 6 women) of Fitzpatrick skin Type I to III between the ages of 50 and 75 with a total 358 AKs off the face on 17 sites underwent treatment. The individual sites were as follows: scalp (n = 1), neck (n = 1), chest (n = 3), arms (n = 2), forearms (n = 4), and dorsal hands (n = 6). On obtaining informed consent, each patient received standardized photography of the treatment area and a baseline clinical examination at which time all clinically identifiable AKs were palpated and marked on transparent paper with a surgical marking pen. One hour before the treatment, topical 7% lidocaine/7% tetracaine anesthetic ointment was applied to the treatment area. Laser settings ranged from 1,470 nm (depth 250–400 μm, density 15%–40%) and 2,940 nm (depth 20 μm, density 8%–20%) for a total of 238- to 3,360-J depending on the site (Table 1). Postoperatively, patients were instructed to apply a bland moisturizer, sunscreen of SPF 30, and avoid sun exposure for at least 1 week. These patients were seen in follow-up at 2 to 3 weeks after treatment and 2 to 3 months after treatment. At follow-up visit, a clinical examination, standard photography of the treatment area, and transparency marking of all AKs were performed. Any remaining clinically identifiable AKs were treated with

TABLE 1. Laser Settings

Site	*Area Treated (cm^2)*	*Energy (J)*	*Depth/Density 1,470; 2,940*
Scalp	64.2	761	400, 30; 30, 20
Neck	72	1,793	250, 35; 20, 10
Chest	38–129.2	238–1,395	300–350, 20–40; 20, 10–15
Arms	349.1	2,973	350, 20; 20, 15
Forearms	115.6–601.3	720–1120	350, 15; 20, 15
Bilateral dorsal hands	116.4	512–661	300–350, 15–30; 20–30, 8–20

TABLE 2. Actinic Keratose Clearance

Follow-up	*% Clearance*
2–3 wk	84
2–3 mo	92

cryosurgery at the 2- to 3-month follow-up visit. Actinic keratoses were considered resolved if not palpable and not visible.

Results

At 2 to 3 weeks after treatment 84% of all AKs had resolved. At 2 to 3 months after treatment, 92% of all AKs had resolved (Table 2). The scalp had the highest clearance rate at 96%, followed by the arms 96.2%, neck 95.7%, forearms 94.1%, dorsal hands 88%, and chest 84.2% (Figures 1 and 2). No adverse events were reported. All patients reported overall high satisfaction with the treatment as it was a single treatment with minimal downtime. Of note, the patients also had cosmetic improvement in skin tone and texture.

Limitations

We acknowledge there were only 9 patients included in this case series, and follow-up was limited to 2 to 3 months after treatment. No histologic evaluation was performed. Further studies are needed to optimize treatment settings.

Discussion

Laser resurfacing is a promising therapeutic option for AKs.[1–4] A retrospective case control study of 31 patients who underwent full-face carbon dioxide laser resurfacing for AKs on the face found that 58% of patients remained free of AKs at their longest follow-up visit.[1] A study with 56 patients who compared 5-fluoruracil with Er:YAG laser resurfacing for AKs on the face and scalp found that patients had fewer

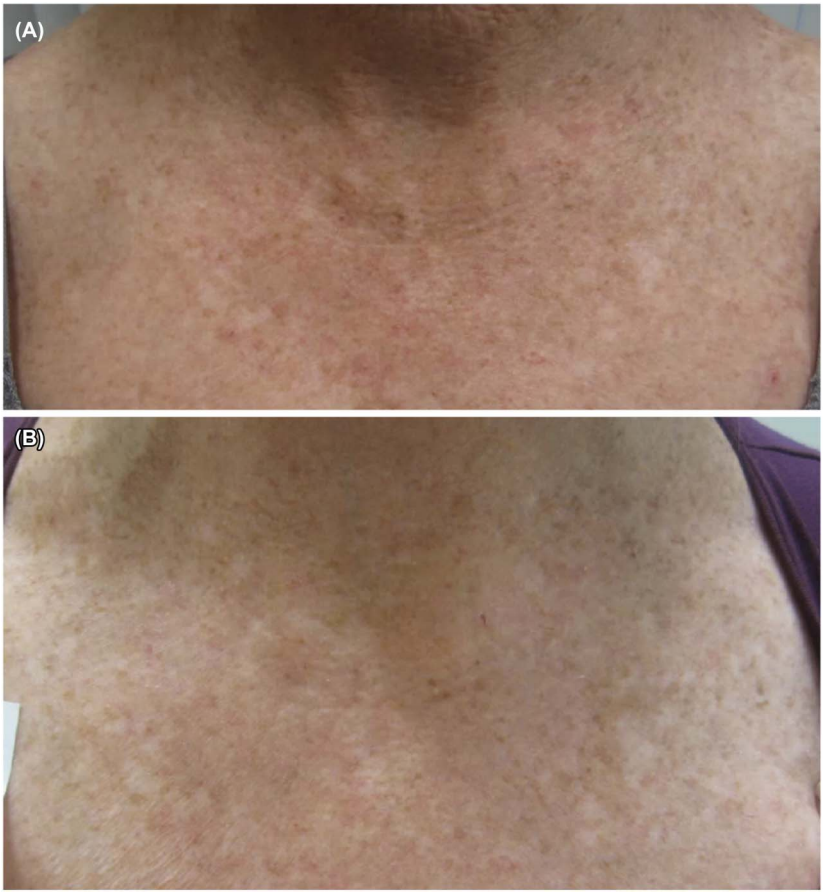

Figure 1. Chest (A) pre-treatment (B) post-treatment.

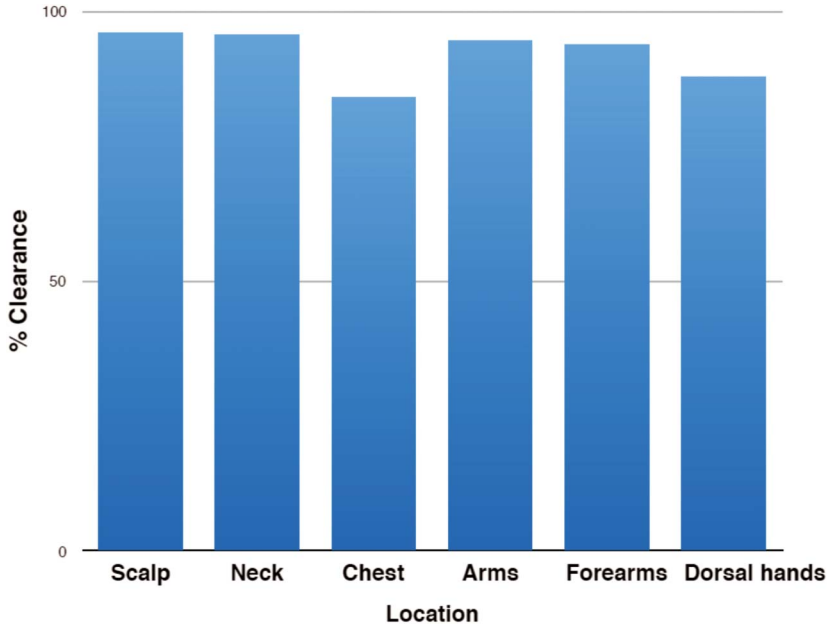

Figure 2. Actinic keratose clearance by location.

recurrent AKs in the laser group at 12-month follow-up.[2] A retrospective chart review of 24 patients who had carbon dioxide or Er:YAG laser resurfacing for facial AKs found that 87% of patients had full AK clearance at 1 year, and 58.3% had no recurrence at 2 years after treatment.[3] Studies showing a high rate of AK clearance with laser resurfacing used ablative resurfacing or multiple nonablative treatments.[1–5] Another study using a 1,927-nm fractional thulium laser for facial AKs on 24 patients had a high clearance rate with a series of 4 treatments.[4] Their clearance rates (91.3% at 1 month and 87.3% at 3 months) were similar to our clearance rates (92% at 2–3 months).[4] Clearance was sustained over a follow-up period of 6 months.[4] The authors of this study hypothesized the fractional thermal injury columns in the epidermis result in removal of ultraviolet-damaged cells with repopulation by healthy follicular-based cells. They found that AK clearance seemed to occur around 1 month after treatment.[4] These results are consistent with we found in our study. Another study showed that damaged keratinocytes undergoing apoptosis may signal surrounding ultraviolet-damaged cells to also undergo apoptosis.[5] This bystander effect, in combination with increased inflammation and immune response after laser resurfacing, may explain the mechanism of action for the high rate of AK clearance we observed with hybrid fractional laser resurfacing. The delivery of an ablative wavelength in addition to a nonablative wavelength seemingly requires fewer treatments over a single nonablative wavelength. We recommend treating settings with a lower fluence because the morphology of AKs is superficial and a high density to facilitate destruction of the entire lesion. Further investigation with longer-term follow-up is needed to optimize treatment parameters and elucidate the mechanism of action of 1,470-nm/2,940-nm hybrid fractional resurfacing for the treatment of AKs. In conclusion, we observed that a single hybrid 1,470-nm/2,940-nm fractional resurfacing treatment is a promising new alternative for the treatment of AKs off the face with good efficacy, patient compliance, and satisfaction.

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A. Ortiz is a member of the scientific advisory boards for Sciton, Inmode, Rodan and Fields, and Allergan. She is on the speakers bureau and receives honorarium from Sciton, Cutera, Inmode, Alastin, and Allergan. The remaining author has indicated no significant interest with commercial supporters.