

Facial Photoaging Treated With Salicylic Acid–Enhanced Photodynamic Therapy

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Photoaging refers to skin damage that occurs from chronic exposure to UV radiation. These changes include roughness, sallowness, rhytides, pigmentary changes, erythema, telangiectasias, and sebaceous hyperplasia. Photodynamic therapy (PDT) offers a convenient and effective treatment option for photoaging. Because it acts as a photosensitizer, 5-aminolevulinic acid (5-ALA) is sometimes used as a treatment adjuvant in PDT, rendering the PDT more effective. We describe a new technique of using a 30% salicylic acid peel immediately prior to 5-ALA application in order to enhance penetration of 5-ALA. In our patient, this technique produced significant improvement in the skin, including decreased lentigines and more even skin texture, after just one treatment session. By combining these techniques, we propose that a more effective outcome can be produced with a single treatment session, thereby decreasing the number of treatments needed to produce the desired effect.

Chronic exposure to UV radiation causes characteristic skin changes, including roughness, sallowness, fine and deeper rhytides, pigmentary disturbances, erythema, telangiectasias, and hypertrophy of the sebaceous glands. Photoaging is the term that collectively describes these changes. Patients who are seen in the dermatology office often seek treatments to correct or improve these changes. For the patient seeking a quick and significant result with minimal downtime and few risks, photodynamic therapy (PDT) offers a very practical and effective treatment option. PDT is emerging as an increasingly popular treatment option for a variety of skin conditions, including photoaging, actinic keratoses, rosacea, sebaceous hyperplasia, rhinophyma, superficial basal cell cancers, and acne.¹ Previous studies have shown that

following PDT treatment for photoaging, the greatest improvement is seen in lentigines; slightly less improvement is observed in facial redness and telangiectasias and even less improvement in overall skin tone.² There is also limited improvement in fine lines and wrinkles or pore size. However, the effects of PDT are likely limited by the impeded penetration of 5-aminolevulinic acid (5-ALA) through the stratum corneum.

Superficial chemical peels, such as 30% salicylic acid, remove the stratum corneum and sometimes the epidermis, stimulating epidermal growth.³ Although salicylic acid peels alone work well to decrease facial pigmentation, fine lines, and skin surface roughness, their superficial penetration prevents significant effect on treating skin processes that are deeper in origin. We hypothesized that the use of salicylic acid as a peeling agent immediately prior to PDT would enhance the penetration of 5-ALA into the skin, thereby providing a synergistic effect by the use of these 2 treatments simultaneously. We used this combination, not previously described in the literature to our knowledge, to treat a patient with dermatoheliosis and achieved significant results following a single

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treatment. Our technique and outcome are outlined in this case report.

CASE REPORT

A 55-year-old white woman came to our office for evaluation and treatment of multiple lentigines and skin roughness on her face. She was not on a specific skin care regimen at the time of presentation and sought a quick result in time for an event that was 1 month away. She desired a treatment with minimal downtime. Her medical history was unremarkable. On examination, the patient had Fitzpatrick skin type II with numerous lentigines, fine lines, focal erythema, and telangiectasias, as well as mild sebaceous hyperplasia.

The skin was first washed with a gentle facial cleanser. Acetone was then used to further remove any residual oils or makeup. A 30% salicylic acid peel was applied to the entire face using moderate to firm pressure. A total of 5 passes of gauze saturated with peel solution were performed at intervals of 2 to 3 minutes, and the salicylic acid was left on for 3 minutes after the final pass. After the face was cleansed again, 20% 5-ALA was applied and the patient was sent home with strict sun-avoidance measures. Sixteen hours later, the patient returned to our office for light treatment with a blue light PDT illuminator for 16 minutes and 40 seconds. The patient was counseled regarding the importance of sun avoidance following treatment.

The patient tolerated the procedure well and complained of moderate burning and tingling during the treatment. Postprocedure, she experienced redness and mild edema of her face, mild burning, and, over the course of the first several days after the procedure, desquamation of the skin. Her postoperative course was complicated by an episode of herpes labialis that resolved following treatment with valacyclovir. The patient was seen for follow-up 12 days after her treatment and showed significant improvement of her dermatoheliosis. The most significant improvement was seen in her lentigines and skin texture (Figure).

DISCUSSION

PDT combines the use of topical 5-ALA with a variety of light sources, such as red or blue light, pulsed dye laser, or intense pulsed light. Studies have shown that pretreatment of the skin with 5-ALA enhances the effect of PDT on photoaging.⁴ Topical 5-ALA is metabolized to protoporphyrin IX (PpIX), a photosensitizer, and quantification of induced PpIX is dependent on the dose of applied 5-ALA.⁵ When PpIX is activated by the appropriate visible light, cytotoxic oxygen free radicals are produced. The porphyrins optimally absorb light in the Soret band (360–400 nm) and also have a smaller peak

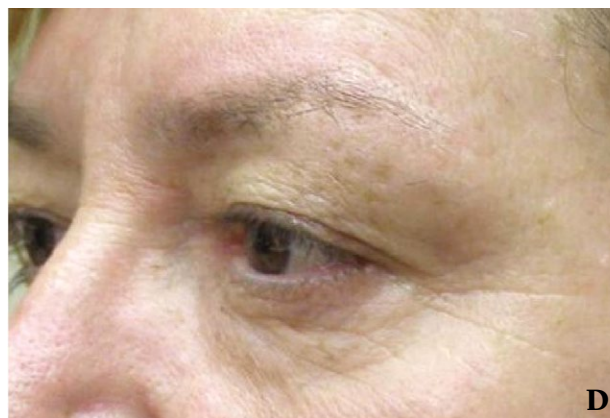
between 500 and 635 nm.⁶ Because of these properties, the blue range of light (417 nm) is optimally absorbed by porphyrins.

The advantages of PDT include its efficacy and relatively short downtime. Additionally, this treatment is not time intensive for the patient; the 5-ALA takes only minutes to apply, and the procedure itself takes less than 20 minutes. PDT carries a lower risk of pigmentary and textural abnormalities than do ablative treatments employed for photoaging. Efficacy, however, is probably somewhat limited by the impedance of the stratum corneum on 5-ALA penetration into the skin: 5-ALA is hydrophilic,⁷ impairing its ability to penetrate the hydrophobic barrier created by the stratum corneum of the skin. In fact, some authors have concluded that the intact corneum is the principal barrier to effective absorption of ALA.^{8,9} Laboratory studies show that tape stripping of the epidermis prior to the application of 5-ALA enhances its penetration into the skin.¹⁰ This is not practical in the clinical setting, but other approaches have been tried to chemically remove the stratum corneum. Forty percent urea cream has been used prior to the application of 5-ALA for the treatment of actinic keratoses, but this approach did not show efficacy over the use of 5-ALA alone.¹¹ We sought to enhance the effect of PDT alone by applying a salicylic acid peel prior to 5-ALA application in order to help the penetration of 5-ALA and obtain a superior cosmetic result. To our knowledge, this is the first case report of such a combination treatment for photoaging.

Our patient underwent a long (16 hours) incubation time with 5-ALA prior to undergoing light treatment with the blue light. Previous studies have shown that short (1 hour) incubation times for PDT are effective in clearing certain skin conditions, such as acne¹² and actinic keratoses.¹³ The impact of salicylic acid on short versus long incubation time has yet to be determined, but it is reasonable to postulate that removal of the stratum corneum may allow for a shorter incubation time because of enhanced penetration of 5-ALA. Additionally, neoplastic lesions, which often have disrupted epithelial barriers, better absorb topically applied 5-ALA and therefore tend to have the strongest response following PDT.

Complications that can occur following PDT include phototoxicity and superficial infections.⁴ Phototoxicity occurs when patients fail to avoid the sun and heed appropriate precautions immediately following treatment. Strict sun avoidance is recommended for 48 hours following the application of 5-ALA. Phototoxicity manifests as well-demarcated erythema and edema at the treated sites. Ice, low-potency topical corticosteroids, and rest will lead to the resolution of symptoms

Figure not available online



Patient before (A, B) and after (C, D) salicylic acid-enhanced photodynamic therapy.

with time. Superficial infections include both viral and bacterial infections. Our patient did experience an episode of herpes labialis following treatment, although this has not been reported with PDT. It would be appropriate to administer prophylactic antiviral therapy prior to treatment in a patient with a history of herpes labialis. Impetigo or superficial bacterial infections may also occur and should be treated with a topical antibiotic ointment such as mupirocin.⁴

We had positive results in our patient without significant discomfort or toxicity following a single treatment with a

30% salicylic acid peel immediately prior to application of 5-ALA for PDT. Controlled studies are needed to confirm our observation, as it is possible that our results could have been achieved with either salicylic acid or PDT alone.

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