

Case Studies with Chemical Peeling Agents

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I was asked to discuss chemical peels and my experience with a new enhanced alphahydroxy acid (AHA) peel. I consider AHA peels a category unto themselves in the superficial- to medium-depth peel, as AHAs are the only nontoxic peeling agent that can be neutralized to stop the peeling process at any time. I will begin with a short review of chemical peeling in general. I will then cover the advantages of AHA peels, discuss enhanced AHA peels, and present case studies.

Chemical Peeling

Chemical peeling is the application of a chemical agent to the skin in order to induce controlled destruction of old skin followed by the growth of new skin. Chemical peeling has been utilized in dermatology for over 60 years, with the first peeling agent, trichloroacetic acid (TCA), still being utilized today. Over the past 60 years, great progress has been made. The chemical peeling process and the peeling agents have been refined to minimize potential complications and to further stimulate skin repair.

Chemical peeling destroys and removes old, damaged skin and stimulates new epidermal growth by removing various layers of stratum corneum epidermis and papillary dermis. An ensuing inflammatory reaction further stimulates healing in the deeper layers of the skin. Other mechanisms to achieve this remodeling of skin are laser resurfacing and dermabrasion.

Laser resurfacing and dermabrasion employ essentially the same mechanisms as chemical peeling to stimulate new skin regeneration—ablation of the damaged upper layers of skin to stimulate healing. Depending on which laser is used and the number of passes, laser resurfacing can be compared to superficial, medium, or deep chemical peeling.

Superficial chemical peeling can be used in conjunction with laser resurfacing, pre and post laser, to

enhance the healing process and to minimize post-inflammatory hyperpigmentation. Laser resurfacing can provide dramatic improvement to the skin, but carries a higher risk of complications, a longer healing or "down-time," a higher cost, and can not be used on all skin types.

With the advent of AHA peels, which rejuvenate rather than destroy the skin, virtually any skin type can be treated with minimal risk of complications. With a series of superficial AHA peels (four to six peels at 4 to 6 week intervals), results comparable to a medium-depth peel can be achieved without the "down-time" for potential complications. Significant improvement in rhytides and scarring may take up to 6 months to occur, as new collagen, elastic tissue, and ground substance requires time for deposition. Improvement in skin texture, pigmentation, and acne may be seen after only one peel in less than 1 week. Superficial chemical peels have become the most common form of skin rejuvenation today, as they do not require "down-time," minimize the risk of complications, can be used on virtually any skin type, and are "affordable."

Chemical peeling agents are many and varied. Superficial peeling agents include AHAs, salicylic acid (which has been revived as the "beta peel"), resorcinol, Jessner's solution (14% resorcinol, 14% salicylic acid, 14% lactic acid), and TCA at 10 to 35% concentrations. At present, deeper peeling agents, phenol, and TCA/phenol combinations have generally been replaced by laser resurfacing. Later in this article, I will discuss the AHAs and briefly cover the α -ketopropionic acids, specifically, ethyl pyruvate or pyruvic acid.

Chemical peels are basically classified by their depth of destruction. Very superficial peels mainly involve the stratum corneum, superficial peels reach the epidermis, medium-depth peels get into the papillary dermis, and deep peels penetrate the reticular dermis (high potential for scarring). Dermatologists choose different peeling agents depending on the depth of penetration needed to achieve the desired result, the potential for complications, and the "down-time" acceptable to the patient. Medium-

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FIGURE 1. A 19-year-old female acne patient with very sensitive skin and marked erythema, papules, and comedones (a). The patient in figure 1a after treatment with a polyhydroxy acid cleanser and lotion and a series of three glycolic acid peels starting at 20% and increasing to 35% (b).



FIGURE 2. A side view of the patient in figure 1a before treatment (a). A side view of the patient in figure 1a after treatment (b).

depth peels should not be performed on type III to VI skin types because of risk of dyspigmentation.

Very superficial peeling agents include AHAs, TCA 10% or less, or resorcinol 20 to 30%. Superficial peeling agents include Jessner's solution, glycolic acid enhanced AHA solution, TCA (30 to 50%), or a TCA combination peel. (Note: I almost never use TCA 50% to achieve similar results, I prefer to use glycolic acid 70% for 2 minutes, immediately followed by TCA 25 to 35% to minimize the risk of scarring.)

There are many variables to consider when selecting the best peel for your patient; namely, the peeling agent and its formulation, the concentration of the agent, the patient's skin type, the site to be peeled, the skin preparation prior to and immediately preceding the application of the agent, the application method, the duration of contact, and the patient's lifestyle.

Peeling agent—The chemical chosen and its concentration will determine the depth of the peel and the severity of the reaction. This is the most important variable.

Formulation—This variable is important—very important in AHA peels, which can contain free acids versus buffered or partially neutralized acids. Free acid AHA solutions offer the maximum bioavailability of acid at any given concentration whereas buffered or partially neutralized solutions offer varying concentrations of bioavailable acid, effectively decreasing the “potency” of the concentration. This creates more variability in solutions and a less predictable outcome.

Concentration—This variable is also important, especially for TCA peels. Once a TCA reaction starts, the reaction can not be stopped until it runs its course. Alphahydroxy acid peels are different because they can



FIGURE 3. A 17-year-old female patient with persistent papular and comedonal acne (a). The patient in figure 3a after treatment with one 35% glycolic acid peel, followed by a combined glycolic/mandelic/salicylic acid solution twice daily (b).



FIGURE 4. An Asian male acne patient with marked post-inflammatory hyperpigmentation and scarring (a). The patient in figure 4a after treatment with oral antibiotics, a combined glycolic/mandelic/salicylic acid solution, glycolic acid cleanser, and a series of glycolic acid peels (b).

be neutralized with sodium bicarbonate or diluted with water to stop the reaction at any given time.

Skin type—A medium-depth agent (e.g., TCA) applied to type III or VI skin will cause pigmentation problems. Previously, patients with type V or VI skin did not have the option of chemical peels. The advent of AHA peels, with their ability to be controlled to a superficial level and to be neutralized at any time, enabled patients with darker skin types to safely be treated with chemical peels.

Site—Lower concentrations of the agent or more superficial agents should be utilized in areas of thinner skin (i.e., around the eyes), whereas, in areas of thicker skin (i.e., the back, chest, or the back of the hands), a stronger agent, a longer application duration, or a thicker coat can be used for optimal results.

Skin preparation—Preparation of the skin with keratolytic agents (AHAs, tretinoin, salicylic acid) and

bleaching agents (hydroquinone, kojic acid, azelaic acid) for several weeks to months prior to the peel is important to minimize the risk of dyspigmentation after the peel and to allow the peeling agent to penetrate more uniformly. Also, preparation immediately prior to the peel will affect the depth and uniformity of the peeling agent penetration (acetone, alcohol, or Hibiclens® scrub).

Application method—This variable is important in determining the depth of penetration. Factors such as whether the agent should be painted on, rubbed in, or applied in one or two layers should be considered.

Duration of contact—This variable is related to concentration. Some agents (e.g., TCA) work for a predetermined time; their duration of action is determined by their concentration. Alphahydroxy acids will continue to react until they are neutralized. The duration of AHA contact with the skin will deter-



FIGURE 5. An Asian female acne patient with marked post-inflammatory hyperpigmentation and scarring (a). The patient in figure 5a after treatment with oral antibiotics, a combined glycolic/mandelic/salicylic acid solution, glycolic acid cleanser, and a series of glycolic acid peels (b).

mine the depth of penetration at a given concentration, thus, neutralization is important to stop the reaction at a certain level.

Season/climate—Skin may be more sensitive in drier climates or in the winter, causing it to be more reactive. Hence, lower concentrations of the agent or a shorter contact duration may be necessary. The summer season or sunny, southern climates may require more extensive skin preparation to decrease the skin pigmentation prior to the peel and more compulsive use of sunscreens and post peel care.

The ideal skin preparation is designed to provide the following benefits to enhance the peel:

- Thin the stratum corneum and make it more uniform so that the peeling agent can penetrate more uniformly and produce a uniform peel.
- Enhance epidermal (and dermal) turnover so that the skin healing and new skin formation will occur faster.
- Decrease the amount of pigmentation in the skin to minimize the risk of post-inflammatory hyper/hypopigmentation. Alphahydroxy acids, tretinoin, azelaic acid, bleaching agents, and sunblock usage help decrease pigmentation.
- Make the pH of the skin compatible with the pH of the peeling agent so as to avoid irritation. As preparation for an AHA peel, for instance, an acidic or AHA agent can be used to bring the pH of the skin down closer to normal. Alkaline agents have been shown to disrupt the barrier function of the skin, thus, potentiating the effect of the peel.

Why Use AHA Peels?

Alphahydroxy acids are ideal peeling agents. They offer the following advantages:

- Whereas TCA and salicylic acids are potentially toxic, AHAs are virtually nontoxic.
- Alphahydroxy acids are versatile. They can be used to treat a wide range of dermatologic conditions: acne and rosacea, actinic keratosis, age spots, fine and

coarse rhytides, keratosis pilaris, melasma and other pigmentation problems, and scarring.

- Alphahydroxy acids are tolerated by almost every skin type, including skin that is very sensitive (rosacea, eczema, or psoriasis), and even darker skin (type IV or V). Before AHAs were available, there was not an agent that could be used safely with darker skin. Alphahydroxy acids offer patients with such skin an entirely new therapeutic alternative.
- Alphahydroxy acids provide good control over several peel variables. A variety of concentrations is available, and AHA reactions can be neutralized and stopped in the event that a patient starts having an adverse reaction or sensitivity.
- Contraindications are minimal and relative of AHA peels. Active herpes lesions, recent cosmetic surgery, open wounds, and Accutane® therapy within the past 6 to 12 months are the relative contraindications.
- Complications are minimal. Again, AHA reactions can be stopped. Also, AHAs can be used on nonfacial areas. For approximately the past 8 years, I have not seen any complications from AHA peels.
- Alphahydroxy acids can be combined with other peels, dermabrasion and microdermabrasion, laser resurfacing, topical anti-aging therapy, and other cosmetic procedures (e.g., Botox®, filler substances, cosmetic surgery), and they can be used as pretreatment and post-treatment for laser cosmetic surgery. Alphahydroxy acids can enhance all of these procedures. Also, dermatologists can enhance rapport and gain a patient's trust as a result of using AHAs in controlled, superficial peels prior to performing more extensive procedures.

Alphahydroxy acid peels are also called lunchtime peels, minipeels, and prom peels. The number of peels required by the patient depends on the condition being treated. Patients with acne or melasma may require one or two peels, whereas patients with photoaged, wrinkled,

or extensively dyspigmented skin may require a series of peels. Maintenance of their results may be enhanced with the use of topical AHAs on a daily basis and by returning for "maintenance" peels several times per year.

Patients have minimal "down-time" with AHA peels. Peels may be performed during the day, with the patient returning to work or out to dinner that evening. Makeup may be applied 4 to 6 hours after superficial AHA peels. A discussion of patient expectations and realistic expectations of the peel results are important in selecting the appropriate treatment for your patient. Impatient patients wanting "dramatic" or "overnight" results will not be satisfied with AHA peels. The patient must understand that it may be 6 months before the results are noticeable. Conversely, a patient with a busy schedule may not tolerate 1 to 2 weeks in seclusion while healing from a more extensive procedure and, therefore, may settle for the slower results associated with the AHA peel. I advise my patients that treatment consisting of four to six AHA peels over 4 to 6 months is as effective as a medium-depth TCA peel. I say, "if you don't mind the 'down-time', and you want quick results, it's still going to take you at least 2 weeks, but we can do it with the laser or the medium-depth peel."

Enhanced AHA Peels

The enhanced AHA peel is a stronger combination AHA peel that still allows the ability to control and neutralize the reaction and provide for minimal "down-time". The enhanced peels contain 70% glycolic acid, ethyl pyruvate (converted to pyruvic acid and ethanol in the skin), and acetic acid (similar to vinegar).

Like the traditional AHA peels, the enhanced peels are nontoxic and can be neutralized to reduce irritation. Compared with 70% glycolic acid peels, they produce more erythema, with the deeper dermal effects of the pyruvic acid. Dr. Eugene Van Scott designed enhanced peels to take advantage of the potent peeling power of pyruvic acid. Pyruvic acid is stronger than glycolic acid (pKa, 2.4 vs. 3.8, respectively), achieves deeper dermal penetration, and causes more erythema. The glycolic acid portion promotes stratum corneum dis cohesion and epidermolysis, stimulates the production of collagen, improves elastic fiber quality, and increases glycosaminoglycan production. The acetic acid generates acetate groups in the skin. These groups may serve as substrates for enhanced peeling and regeneration. A drawback of acetic acid is its pungent, vinegary odor, thus limiting it to lower concentrations.

For patients with acne, enhanced AHA peels provide another option. These peels help reduce the potential for scarring and post-inflammatory pigmentation and produce overall improvement in scarring, pigmentation, papules, pustules, and cysts. Enhanced AHA

peels can be combined with traditional acne therapy, including oral and topical antibiotics, topical AHA products, topical retinoids, and benzoyl peroxide agents.

Case Studies

Figures 1a and 2a show a 19-year-old female acne patient with very sensitive skin and marked erythema, papules, and comedones on her cheeks. She was not able to tolerate topical retinoids, benzoyl peroxide, or any topical antibiotics. She had been unresponsive to oral amoxicillin, tetracycline, and minocycline. She was started on a polyhydroxy acid (PHA) cleanser and lotion and 2 weeks later, began a series of three glycolic acid peels starting at 20% and increasing to 35%.

Figures 1b and 2b demonstrate marked improvement in her acne and skin tolerance. Her comedones and papules dramatically improved, as did the erythema. Her skin became much less reactive and had improved barrier function. She was maintained on the PHA cleanser, the PHA lotion, and topical sodium sulfacetamide lotion daily.

Figure 3a shows a 17-year-old female patient with persistent papular and comedonal acne aggravated by sweating and participating in sports. She was to be attending a prom and requested "fast" improvement. (This type of patient gives the AHA peel its nickname of the "prom peel"). She was treated with one 35% glycolic acid peel, which resulted in a marked clearing of her acne. Control of her acne was then maintained with a combined glycolic/mandelic/salicylic acid solution twice daily (Figure 3b). Rapid clearing of comedonal and papular acne can be achieved with the glycolic acid peels to "jump start" the patient's treatment.

Figures 4a and 5a show two Asian patients with severe papular acne with marked post-inflammatory hyperpigmentation and scarring. Both patients were started on oral antibiotics, a combined glycolic/mandelic/salicylic acid solution, and glycolic acid cleanser prior to undergoing a series of glycolic acid peels. Both patients responded with dramatic improvement in their acne and post-inflammatory hyperpigmentation after four to six peels (Figures 4b and 5b). Both patients started with a 20% peel solution and were able to increase the peel solutions to 35%, 50%, and 70%, and eventually, the enhanced peel. It is very important to start slowly and conservatively in peeling darker skin (type III to IV) to avoid inducing additional post-inflammatory hyperpigmentation. The peel must be neutralized at the first signs of erythema and certainly before epidermolysis occurs so as to prevent hyperpigmentation complications. These patients illustrate how chemical peeling can be used safely and effectively in darker skinned individuals for the treatment of acne, scarring, and pigmentation problems.

