Chemical Peels for Darker Skin Types

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KEYWORDS
- Chemical peel
- Acne scars
- Postinflammatory hyperpigmentation
- Chemabrasion
- Multimodal treatment

This article focuses on chemical peels for darker skin types. All races comprise a range of Fitzpatrick skin color types (Table 1\(^1\)): light skin types III and IV in African Americans, Asians, Middle Easterners, and Latinos and dark skin type IV in whites. With the focus on Fitzgerald skin types IV to VI, the article discusses chemical peels, providing current information on types of peels, detailed techniques, preoperative and postoperative care, complications, hazards, and nuances of management. When evaluating a patient for a skin-resurfacing procedure, it is often inaccurately assumed that race and ethnicity equate with skin color. This rainbow of skin tones within any race erodes the notion that all nonwhites are dark skinned, or that all whites are light skinned.

In addition to the wide intraracial variation in skin color, the global population is becoming increasingly mixed. Although categorization of race and ethnicity is useful in demographic or socioeconomic evaluation, it has poor predictive value for skin-resurfacing outcomes. The American melting pot (the result of migration, wars, and inter-race relationships) shows why classification systems based on original geographic distributions have become archaic. Although the scientific literature is sparse on this topic, clinicians practicing aesthetic facial surgery and medicine should be aware of the nuances of evaluating and managing patients across the spectrum of Fitzpatrick skin types. This awareness is accentuated by the results of the 2000 US Census, which showed that Latinos are the fastest increasing minority in the United States and Filipino Americans are the fastest increasing group of Asian Americans.

International census reports illustrate similar observations. Mixed race (2 or more races in the heritage) and darker skin types (IV–VI) constitute most of the global population and one-third of the US population.\(^2\) Terms like mestizo, mulato, trigueno, moreno, pardo, Chindian, and Eurasian reflect how widespread and varied the mixed race has become all around the world. Celebrities like Alicia Keys (African American, Irish, Italian) and President Barak Obama (English, Cherokee, Irish, Kenyan, Scottish) reflect this phenomenon.

HISTOLOGY AND FUNCTION

Skin types and races have key differences other than tone. The darker tone is caused by a higher melanin content within keratinocytes (the number of melanocytes is the same as in lighter skin).\(^3\) Dark skin contains eumelanin, a highly cross-linked dark brown to black pigment. Melanin is synthesized in melanosomes in a pathway controlled by the enzyme tyrosinase. The skin of blacks has a high content of large, singly dispersed melanosomes (stage IV) within melanocytes and keratinocytes.\(^4\)–\(^6\) In contrast, pale white skin has few melanosomes in the epidermis. However, the skin of darker-skinned whites, on sun exposure, can temporarily produce melanosomes similar to black skin.\(^7\) Likewise, blacks

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Table 1
Fitzpatrick skin classification

<table>
<thead>
<tr>
<th>Type</th>
<th>Color</th>
<th>Reaction to Sun Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Very white or freckled</td>
<td>Always burn</td>
</tr>
<tr>
<td>II</td>
<td>White</td>
<td>Usually burn</td>
</tr>
<tr>
<td>III</td>
<td>White to olive</td>
<td>Sometimes burn</td>
</tr>
<tr>
<td>IV</td>
<td>Brown</td>
<td>Rarely burn</td>
</tr>
<tr>
<td>V</td>
<td>Dark brown</td>
<td>Very rarely burn</td>
</tr>
<tr>
<td>VI</td>
<td>Black</td>
<td>Never burn</td>
</tr>
</tbody>
</table>

Data from Fitzpatrick TB. The validity and practicality of sun-reactive skin types I through VI. Arch Dermatol 1988;124(6):869-71.

with a lighter complexion have a combination of large dispersed and smaller aggregated melanosomes like whites. In Asians, skin that has not been exposed to sun has aggregated melanosomes like whites, whereas areas that have been exposed to the sun have predominantly dispersed melanosomes. These similarities and differences suggest significant intraracial and inter-racial variation in pigmentation. Recent work suggests that the activity of the protease-activated receptor-2 correlates with skin color and may influence ethnic skin color phenotypes.

The stratum corneum in skin of color has more layers and more phospholipids than white skin. The dermis tends to be thicker because of the increased number and size of fibroblasts. Because of the photoprotective nature of melanin, aging in dark-skinned individuals is associated with soft tissue and gravitational changes rather than wrinkles. Whereas whites and Asians undergo significant epidermal changes with photodamage, blacks have only marginal changes. Fibroblasts, elastic fibers, mast cells, blood vessels, hair follicles, and other dermal structures also differ in quantity and function between races.

Melanocytes are labile in darker skin, resulting in a high incidence of dyschromia, such as post-inflammatory hyperpigmentation (PIH) following injury or cutaneous surgery. Similarly, melasma is more prevalent in blacks, Hispanics, and Asians, and is attributed to hormonal factors, ultraviolet (UV) and infrared radiation exposure, and lability of melanocytes.

INDICATIONS, NUANCES, AND HAZARDS FOR CHEMICAL PEELING IN SKIN TYPES IV TO VI

Individuals with darker skin typically request correction of conditions such as PIH, melasma, acne vulgaris and scarring, textural changes (fine wrinkles), lentigines, dermatosis papulosa nigra, and seborrheic keratosis (SK). Diagnostic mistakes commonly occur in the initial evaluation of patients of dark skin. Brown lesions are lumped together as pigmented instead of hyperkeratotic-like (eg, SK). This misclassification leads to ineffective ablative treatments that may actually worsen the complexion, whether these peels are from light sources or chemicals. Chung and colleagues assessed Korean patients and found that pigmentedary changes are common features of photoaging in Asians, with SK being the major pigmentary lesion in men and lentigo in women. Physicians therefore need to individualize their treatments to different types of lesions. For example, careful electrocautery of individual SK lesions is not only more effective than chemical or laser ablation, it is also safer (associated with lower risk of PIH). Long-pulsed 532-nm neodymium:yttrium-aluminum-garnet laser treatment was similarly found to be more effective and have a lower incidence of PIH for lentigines in darker-skinned patients than other modalities. Intense pulsed light has also been studied extensively in Asians for the treatment of lentigines and freckles but would be ineffective in patients with a misdiagnosis of SK. The novel use of modified phenol formulas for spot peels of lentigines (eg, with Hetter VL) had been routinely practiced for years by 1 of the authors (PPR) (Fig. 1). Benign dermal tumors, such as syringomas, must be

Fig. 1. Lentigines on the cheek of a Latina woman with skin type IV to V. (A) Before treatment; (B) with spot treatment with Hetter VL (medium depth) showing frost; (C) 1 month after treatment with normal skin tones.
identified and treated with techniques that cause less PIH and scarring, such as fine-needle tipped electrosurgery.\textsuperscript{16} A common mistake is to treat with only 1 modality (eg, chemical peel), and then respond with a stronger peel when the results are unsatisfactory. Melasma and acne scar management are good examples. Melasma is a dysfunction of the pigmentary system, and cannot be cured with any type of peel \textsuperscript{17}; it is commonly worsened by unimodal aggressive peels. These conditions require a multimodal approach. For melasma, prescription creams are recommended that address the existing melanophages, the lability of the melanocytes, the synthesis of melanin, and that promote attempts to increase cellular turnover. Protective measures require blocking of UV-B, UV-A, and infrared (heat) radiation, using physical sunblocks (oxides), cooling measures, and protective clothing and hats. The significance of inflammation as a cofactor in melasma is documented by the effectiveness of applying 0.01\% fluocinolone cream twice a day, along with sun and heat protection, in achieving notable improvement (Fig. 2). All resurfacing modalities should be superficial, so as to minimize the risk of PIH or hypopigmentation,\textsuperscript{2} because even superficial peels can cause PIH (Fig. 3) if the patient is retinized. Another common condition, macular PIH, is better treated with intralesional injections of dilute triamcinolone (2 mg/mL) or fluocinolone rather than with peels.

Acne scars are categorized as ice-pick, box scar, rolling scar, atrophic, or hypertrophic types.\textsuperscript{18} In pigmented skin, correction of ice-pick scars, for example, is better accomplished with precise intralesional injury, which results in negligible PIH.\textsuperscript{19} This is achieved with chemical reconstruction of skin scars (CROSS) using a pointed toothpick or paintbrush to apply the acid (Fig. 4).\textsuperscript{19,20} Shallow lesions (eg, box scars) respond to more superficial peels. Rolling scars (eg, atrophic scars with adhesions) require subcision and possible dermal fillers. Hypertrophic scars require treatment with intralesional steroids, occlusion, and pulsed-dye laser therapy.

When performing an ablative procedure on skin of color, deeper ablation, greater thermal effect, and greater inflammation of the injury all increase the risk of PIH.\textsuperscript{21} One of the authors (PPR) has performed more than 40,000 chemical peels in a Southern California city 10 miles north of Tijuana, Mexico, where more than 50\% of the population is of Hispanic, black, Filipino, or mixed race. In this referral center for correction of acne scars, superficial, medium, and deep chemical peels are frequently combined in the same patient. For example, a stronger solution can be applied for individual ice-pick scars using the CROSS method, medium-depth peels are useful for scarred sebaceous areas, and superficial agents can be used on thinner skin overlaying bony prominences (Fig. 5).

As noted by Grimes, retinoids, hydroquinones (HQ), steroids, azelaic acid, and antioxidants (alone or in combinations) are used in the treatment of PIH.\textsuperscript{2} When used for 2 to 6 weeks before a peel, these agents provide benefit. However, when PIH occurs as a complication of other treatments, it is usually more responsive to conservative measures (within 2–3 months) (see section on Complications).\textsuperscript{22} Correction of PIH is easier than correction of melasma in the same patient.

**TYPES OF CHEMICAL PEELS AND FORMULAS**

Each chemical formula or component has specific effects, and can be categorized by the depth of the peel or by the mechanism of the action. Superficial peels target the stratum corneum to the papillary dermis (100 \mu m); medium peels penetrate to the
upper reticular dermis (200 μm); and deep peels penetrate to the midreticular dermis (400 μm) (Table 2). Variables such as pH, concentration, quantity applied, and concomitant use (and duration) of other chemicals modify wounding ability. In general, peels consist of α-hydroxy acids (AHA), β-hydroxy acids (BHA), trichloroacetic acid (TCA), tretinoin, or various phenolic compounds (HQ, resorcinol, and carbolic acid).

**AHA Peels**

AHA peels, particularly glycolic acid (GA) peels, function by promoting epidermolysis (corneocyte detachment), dispersing basal cell melanin, thinning the epidermis, and increasing collagen synthesis in the dermis. Unbuffered GA with a low pH has the potential to induce greater epidermal and dermal damage. GA peels are available in concentrations ranging from 20% to 99%.

**BHA Peels**

BHA peels, particularly salicylic acid (SA) peels, are lipophilic compounds that remove intercellular lipids that are covalently linked to the cornified envelope surrounding the epithelial cells. Studies have shown that BHA peels activate basal cells...
and underlying fibroblasts without directlywounding the dermis or causing inflammation. They also have anti-inflammatory and antimicrobial properties. The common formulations have concentrations of 20% and 30% in ethanol.

**Jessner Peel**

Jessner peel is a keratolytic, which combines SA (14 g), resorcinol (14 g), and lactic acid 85% (14 g) mixed in ethanol for a final volume of 100 mL. Lactic acid is an AHA that causes epidermolysis. Resorcinol is structurally similar to phenol, and disrupts the weak hydrogen bonds of keratin.

**TCA**

TCA is a protein denaturant that precipitates epidermal proteins, causing sloughing and necrosis, and dermal inflammation. These processes appear as white frosting (coagulation of epidermal keratinocyte proteins) on the skin surface. Common applications combine an AHA, a BHA, or a Jessner peel, followed by TCA. The Blue Peel (Obagi Medical Products, Long Beach, CA, USA) contains a blue-dye indicator that helps the physician recognize the depth of the peel penetration (Fig. 6). The recommended strength of TCA is 20% to 35%. TCA is formulated commercially or in the office as a weight-volume preparation from 10% to 100%. This versatile peel can be used to achieve superficial, medium, or deep peels, depending on the skin conditioning, the strength of the acid, and the number of coats applied. Multiple studies in the past 40 years have shown that TCA can be safely used in nonwhite dark skin types (Fig. 7). Safe use of TCA requires longer preconditioning of the skin, use of the lowest effective strength of TCA, and strategies for dealing with any occurrences of PIH. As shown in the Korean study by Lee and Kim, applying TCA in a smaller area, for example inside an ice-pick scar, significantly reduces the risk of PIH and facilitates correction of PIH when it occurs.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Types of peels by depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peel Type</td>
<td>Depth (μm)</td>
</tr>
<tr>
<td>Superficial</td>
<td>100</td>
</tr>
<tr>
<td>Medium</td>
<td>200</td>
</tr>
<tr>
<td>Deep</td>
<td>≥400</td>
</tr>
</tbody>
</table>
Fig. 6. Blue Peel applied to the level of the (A) papillary dermis and (B) immediate reticular dermis.

**Phenol**

Phenol formulas typically consist of 88% phenol (carbolic acid), croton oil, hexachlorophene, olive oil, or distilled water (Table 3). Phenol disrupts sulfide bonds, resulting in keratolysis and protein coagulation. Phenol is also melanotoxic. Hexachlorophene is an antiseptic with surfactant properties, which allows a more uniform penetration by decreasing surface tension. Croton oil is a vesicant (and therefore epidermolytic) that greatly enhances the absorption of phenol. Olive oil is added to slow the cutaneous absorption rate of these agents to reduce any systemic toxicity. Commonly used phenol formulas (Fig. 8) include Hetter VL (Fig. 9), Hetter all around, Stone (Fig. 10), Exoderm, and Baker-Gordon.

Fig. 7. Asian woman with skin type III treated for acne scars. (A) Before treatment with a Blue Peel; (B) post peel showing normal skin tones and good scar correction.
Table 3
Phenol formulas

<table>
<thead>
<tr>
<th>Formula</th>
<th>Croton Oil Content (%)</th>
<th>Phenol Content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hetter VL</td>
<td>0.1</td>
<td>30</td>
</tr>
<tr>
<td>neck/eylid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stone-2</td>
<td>0.2</td>
<td>60</td>
</tr>
<tr>
<td>(Stone 100/Grade II)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hetter all around</td>
<td>0.4</td>
<td>35</td>
</tr>
<tr>
<td>Hetter</td>
<td>0.7</td>
<td>50</td>
</tr>
<tr>
<td>(range 0.1%–1.0%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exoderm-Lift</td>
<td>0.6–0.7</td>
<td>64</td>
</tr>
<tr>
<td>Baker-Gordon</td>
<td>2.1</td>
<td>50</td>
</tr>
</tbody>
</table>

*Some commercially available formulas contain additional ingredients.*

Phenol peels have the potential to cause cardiotoxicity and renal toxicity. Patients should be hydrated during the peripeel period and monitored for cardiac arrhythmias. To avoid these side effects, the peels should be administered slowly in a subunit approach. Typically, peel administration should span 60 to 90 minutes.

**Tretinoin Peels**

Tretinoin is the acid form of vitamin A, also known as all-trans retinoic acid. A tretinoin peel (1%–5%) produces effects that are similar to commercially available creams, resulting in increased epidermal thickness, decreased stratum corneum, and decreased melanin content (Fig. 11).

Vi Peel

The Vi Peel (a variation of the ApothePeel) is a pre-mixed formula containing TCA (10%–12% in alcohol), phenol (10%–12%), SA (10%–12%), and tretinoin (0.4%) (see Fig. 11). The home regimen consists of 2 nightly applications of a pad containing tretinoin oil and vitamin C.

Nomelan Fenol kh (SeSDERMA)

This peel contains TCA, phenol, HQ, kojic acid, GA, α-arbutin, ascorbic acid, SA, phytic acid, mandelic acid, and retinoic acid mixed in an alcohol base. The mixture is applied for 3 to 5 minutes, followed by application of a 10% retinol/1% retinyl propionate cream for 6 to 8 hours. The home regimen consists of 10% vitamin C/5% niacinamide and a cream with 15% lactic acid, 4% retinol, and 1% retinyl propionate.

Melanage Peel

The Melanage Peel (a commercial version of the Krulig Amelan Peel) comes as a kit (Fig. 12) that includes a 1% tretinoin solution, a powder formulation of HQ, which is freshly mixed with 10% azelaic acid, 10% lactic acid, and 10% phytic acid, and applied as a mask. Physicians can make up to a 14% HQ peel, which is left for up to 8 hours on the skin (Fig. 13). The home regimen consists of freshly mixed cream of 4% HQ and 0.75% tretinoin with an optional 0.7% hydrocortisone for possible irritation. The key features of this peel are that it is weakly acidic, noncorrosive, minimally inflammatory, and causes no protein precipitation; it is designed for dark skin types with melasma or PIH (Fig. 14). It can be performed once yearly, with the option of a series of 3 to 4 minipeels during the year.

**INDICATIONS AND APPLICATION TECHNIQUES**

All patients require a full personal, family, and medical history. Special consideration should be focused on history of cutaneous malignancy, history of acne scarring or PIH, herpes simplex outbreaks, and use of isotretinoin in the last 12 months. Performing a chemical peel on a patient on isotretinoin, or within 6 months of discontinuation of isotretinoin, is contraindicated, and the skin must have regained its normal sebaceous activity.

Patients preparing to have a phenol-based peel require a full laboratory work-up, including hepatic, renal, and cardiac testing. During the initial evaluation, the physician should assess parameters that can help predict healing, such as the presence of a suntan, the level of exercise.
(or other temperature-increasing activities), use of make-up, tendency to heal with PIH, parents’ skin color, and available downtime. Guidance for peel selection is shown in Table 4.

**Preconditioning the Skin**

To reduce the risk of PIH and to improve the efficacy of the peel outcome, preparation of the skin for chemical peels requires preconditioning of the skin\(^{30,31}\) for 2 to 12 weeks (Table 5). Topical agents are used to help reduce the seborrhea and thin the epidermis. These products allow rapid penetration of the peel, accelerate re-epithelialization and wound healing, and decrease the risk of PIH caused by the bleaching effect that results from dispersion of melanin granules. Bacterial infections and flares of herpes simplex must be prevented during healing with the use of antibacterial and antiviral prophylaxis. In contrast with laser ablation, the status of the skin on the day of the peel is critical. If the skin is dry, has an abrasion, or is retinized, the peel will be much stronger than expected, which can be an advantage (in patients with thick, sebaceous, scarred skin) or detrimental (in patients with melasma or PIH, especially over thin skin).

The Obagi Nu-Derm (or the similar Dermesse line), Triluma (or EpiQuin with 0.01% fluocinolone cream for the more sensitive skin), or a glycolic-HQ combination cream (Lustra) is used for 2 to 12 weeks before the peel. Treating acne before the peel gives better cosmetic results and may require the use of retinoid creams, acne surgery, and isotretinoin pills. The peel should be delayed until the patient has discontinued

**Fig. 9.** Latina woman with skin type IV to V treated to correct lower eyelid wrinkling. (A) Before upper blepharoplasty and 2 Hetter VL phenol peels; (B) postoperative appearance with normal skin tones and good color match between cosmetic units.

**Fig. 10.** Korean American woman with skin type IV treated for acne scars. (A) Before full-face Stone phenol and 1 regional touch-up; (B) 2.5 years after the first peel.
isotretinoin for 6 months or until the skin has regained its normal sebaceous activity and thus its healing capacity.

**Complications**

Many of the same complications that can affect patients with lighter skin types can occur in patients with darker skin types, including herpes simplex infection, bacterial infection, prolonged erythema, contact dermatitis, scarring, PIH, and hypopigmentation. The early recognition and management of these complications is essential for a successful resolution.

PIH remains the most common complication in patients with darker skin types and occurs with most types of peels, especially deep ones (Fig. 15). Regional deep peels on dark skin types outside a cosmetic unit should be avoided because of this risk (Fig. 16). PIH generally develops when the pink stage begins to fade. In addition to the use of sunblocks (eg, Colore Science products) and heat avoidance, the early use of class V or VI steroid creams (eg, 0.01% fluocinolone twice a day) can be effective in reversing the first signs of PIH. As the redness fades, the use of the steroid cream can be discontinued and replaced with barrier-repair creams (CeraVe, Cetaphil). If the pigmentation progresses, the use of HQ alone or in combination with a glycolic cream (eg, Lustra) or a retinol (eg, Epigluin) can be used twice a day or at bedtime depending on the level of irritation. Tretinoin is not recommended, as it can irritate the skin and worsen the PIH in sunny or hot conditions. Persistent redness, either from the peel or from the creams, should not be allowed to continue untreated.

**Postpeel Regimen**

With most superficial peels, the postoperative care is simple: wash and lubricate with a gentle, soap-free product (eg, CeraVe, Cetaphil) twice a day and avoid irritating the skin with sun, sweat, or acidic creams. Medium-depth peels require some analgesia and antiinflammatory therapy. Burning sensations are treated with white vinegar.
Fig. 14. Latina woman with skin type IV to V with melasma. (A, B) Before Melanage Peel, followed by an additional bleaching skin care regimen for 2 months; (C, D) 28 days post peel.

(1 tablespoon in 1 cup of water) compresses twice to 4 times daily and application of ointment (eg, Aquaphor) until the skin peels and recovers a strong epithelial layer (usually 5–7 days). Finally, soothing gentle barrier-repair cream systems (eg, aloe vera hydrocortisone balm [Topix]) are used.

Deeper peels heal better with the bismuth subgallate powder (Fig. 17) mask than with an open-wound system such as that used for medium-depth peels. Once the skin has re-epithelialized following a deep peel, the regimen of Cetaphil plus sunblocks is used.
### Table 4
Peel selection

<table>
<thead>
<tr>
<th>Indication</th>
<th>Peel</th>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIH, melasma</td>
<td>SA 20%–30% (series of 3–6 peels)</td>
<td>Low cost, safe, good for acne-prone patients, somewhat effective</td>
</tr>
<tr>
<td></td>
<td>GA buffered (series of 3–6 peels)</td>
<td>Low cost, safe, good for dry skin types, somewhat effective</td>
</tr>
<tr>
<td></td>
<td>Vi Peel (series of 1–3 peels)</td>
<td>Brand name, safe, good for all skin types, more effective</td>
</tr>
<tr>
<td></td>
<td>Melanage Peel (1–2 peels per year)</td>
<td>Brand name, safe, good for all skin types, most effective</td>
</tr>
<tr>
<td>Acne scars (box and ice-pick scars)</td>
<td>CROSS with 30% TCA plus a full-face Jessner or Vi Peel</td>
<td>Good for scars of mild severity, little downtime</td>
</tr>
<tr>
<td></td>
<td>CROSS with Stone phenol chemabrasion + Jessner (full-face) or Vi Peel</td>
<td>Good for more severe scars, little downtime</td>
</tr>
<tr>
<td></td>
<td>Stone phenol (full-face) 2-day chemabrasion (with 1 regional touch-up) Obagi Blue Peel Jessner + 20%–35% TCA</td>
<td>Good for more severe scars, 10–14 days of downtime, must avoid sun exposure for 1–3 months</td>
</tr>
<tr>
<td>Photoaging</td>
<td>Jessner Vi Peel GA series SA series SA + 15% TCA Jessner + 15% TCA GA unbuffered (35%–70%)</td>
<td>For mild cases</td>
</tr>
<tr>
<td></td>
<td>Stone phenol 2-day chemabrasion Obagi Blue Peel Jessner + 20%–35% TCA Jessner + 20%–35% TCA</td>
<td>For moderate cases</td>
</tr>
</tbody>
</table>

**GA PEEL TECHNIQUE**

Multiple studies in dark-skinned patients have confirmed the efficacy of a series of GA peels (every 2 weeks for 3 to 6 times) to help improve PIH and melasma, as measured by the melasma area severity index score in all skin types and races, especially when combined with topical regimens. The topical regimens vary from a modified Kligman formula (5% HQ, 1% hydrocortisone).

### Table 5
Preconditioning treatments

<table>
<thead>
<tr>
<th>Indication</th>
<th>Drug and Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antiviral</td>
<td>Famciclovir (500 mg twice a day), valacyclovir (500 mg twice a day), or acyclovir (400 mg twice a day) for 7–10 days starting 1–2 days before peel</td>
</tr>
<tr>
<td>Prevention of PIH and enhanced peel quality</td>
<td>Retinoid creams applied for up to 12 weeks for medium-depth peels to be restarted after skin peeling and irritation subsides; discontinue 1–2 days before peel if photodamage is evident and 1–2 weeks before peel if treating melasma or PIH</td>
</tr>
<tr>
<td>If weather is sunny or patient is sensitive to retinoids, use of a glycolic cream for 2–4 weeks is suggested</td>
<td>Retinoid and glycolic creams can be used with 2%–8% HQ at bedtime</td>
</tr>
<tr>
<td>Pre-existing PIH</td>
<td>Fluocinolone cream (0.01%–0.025%) twice a day for 2–12 weeks</td>
</tr>
<tr>
<td>PIH, acne scars</td>
<td>Tazarotene cream (0.05%) at bedtime</td>
</tr>
<tr>
<td>UV radiation protection</td>
<td>Physical sunblocks, eg, zinc or titanium oxide creams, ColoreScience or mineral make-up, visors</td>
</tr>
</tbody>
</table>

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*Including Epiquin, Triluma, Obagi Nu-Derm, or Dermesse systems.*
cream, 0.05% tretinoin), to a mixture of an AHA with HQ mixture (especially in Asian patients), such as 2% HQ with a 10% GA twice daily and 0.05% tretinoin cream at bedtime. Retinoids must be discontinued at least 2 days before the peel.

Before starting a series of GA peels, the status of the skin should be assessed for dry, scaly, oily, open sores that may have been acidified from using GA/tretinoin creams. Required materials include a fan, a small cup with 10 mL of 10% sodium bicarbonate, another small cup with 3 to 4 mL of the GA peel (usually 70% buffered), Q-tips, gauze (for drying the peel), and a stopwatch. The GA peel is stopped with sodium bicarbonate; this can be done at 2 minutes, 10 minutes, or once an end point is reached. End points such as pink edema (mildest), perifollicular edema, and vesiculation (the maximum safe end point, which can lead to crustling and possible PIH) are most easily assessed using a magnifier visor. The next peel in the series is chosen based on the results of the previous peel. Grimes recommends free, unbuffered GA (pH 0.6–1.7) as a solo agent for medium-depth peels in pigmented skin because of a lower incidence of PIH than with other peels at that depth. However, erosive blisters can occur with the use of unbuffered GA (especially in the central porous face regions) and can cause scarring.

SA PEEL TECHNIQUE

This is an inexpensive, simple, and safe peel to perform on pigmented skin with acne, PIH, or melasma. A 20% or 30% formulation is applied after thoroughly cleansing the area to be treated. One of the authors (PPR) routinely applies it on patients receiving low-dose isotretinoin (0.25–0.5 mg/kg) to accelerate the correction of active acne lesions or PIH. Each layer is applied with regular Q-tips from a plastic cup holding about 5 mL of solution. A white pseudofrost precipitate forms immediately, which can be wiped off. Two to three coats are usually applied; however, if there is burning, 1 coat is sufficient. This solution can be washed off after 5 minutes or left on for several hours to achieve a more drying effect. When it is washed off, a bland moisturizing cream should be applied and continued for 2 days. In studies conducted in African American, Hispanic, and Asian patients, only mild or transient side effects (peeling, redness) and no cases of PIH were observed. Garg and colleagues compared GA with an SA-mandelic combination to treat acne, scars, and PIH, and showed that although both

Fig. 16. Example of peel-induced PIH in a Japanese woman with skin type IV who was treated for acne. (A) Before a regional Exoderm peel; (B) 3 weeks post peel with PIH and redness; (C) 7 months post peel after treatment with retinoids, HQ, and steroid creams.
peels worked well, the SA-mandelic peel was superior overall. This result was attributed to the lipophilic and comedolytic superiority of SA to GA. Salicylism has never been seen by 1 of the authors (PPR) and has been reported only rarely.40

**JESSNER ACID PEEL TECHNIQUE**

In contrast with the opinions of others,2 one of the authors (PPR) has performed thousands of Jessner peels on skin types IV to VI (Fig. 18); many of those patients were also being treated with low-dose isotretinoin but to do so safely requires the use of the Obagi Skin Classification guide (Table 6). For example, the solution should be applied on the more sebaceous or thicker regions of the face (sparing the thin skin overlying bony prominences and the porous creases or just barely covering them with a light amount). As with most peels, the face is first thoroughly cleansed and degreased, and the Jessner solution is placed in a small disposable plastic cup (5.0–7.5 mL). Two regular Q-tips with wooden handles are used for easier application. A portable personal fan is offered. To best avoid PIH, only 1 coat is applied (producing a slight whitish precipitate), which achieves slight drying of acne lesions. If the clinical endpoint is the improvement of acne scars or to prepare the skin for application of TCA, a deeper peel is needed, which can be accomplished by the application of multiple coats or by leaving the single application until a patchy, slightly white frost is achieved. Jessner solution can be used also for truncal acne with or without scars with PIH by using a larger (obstetrics and gynecology type) Q-tip or 2-inch x 2-inch gauze. Neutralization is not required, but one of the authors (PPR) has used 10% sodium bicarbonate successfully for this purpose. He has also used the original Retin-A 0.05% solution to calm the burning and to enhance the peel, allowing this oil to remain on the face overnight. As noted previously, dry, retinized skin that receives multiple coats of Jessner solution can reach the upper reticular dermis and cause a medium-depth injury (see Fig. 3).

**TCA PEEL TECHNIQUE**

According to the procedure described by Monheit,42 Jessner solution is applied first to achieve a 1+ frost followed by application of 20% to 35% TCA (Fig. 19). The Blue Peel, which uses 20% to 30% TCA, has a color-sensitive reaction to indicate the depth of the peel. The procedure

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Fig. 17. Bismuth subgallate powder.

Fig. 18. Latina woman treated for recalcitrant melasma. (A) Before Jessner peels and triple bleach formula (retinol, HQ, fluocinolone); (B) follow-up with noticeable improvement requiring sun and heat protection and nightly skin-care regimen.
Table 6
Obagi skin classification

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Key Features and Considerations for Peels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Hypopigmentation versus hyperpigmentation</td>
</tr>
<tr>
<td>Oiliness</td>
<td>Based on time when T-zone is oily: by 10 AM = very oily; by 12:00 PM = normal</td>
</tr>
<tr>
<td>Thickness</td>
<td>Determined by pinching the nasolabial fold: thin = lighter procedures; medium = all procedures; thick = dermabrasion, chemical peels</td>
</tr>
<tr>
<td>Laxity</td>
<td>Separate skin versus muscle laxity</td>
</tr>
<tr>
<td>Fragility</td>
<td>Procedures should be restricted to the papillary dermis for fragile skin; correlates with scarring</td>
</tr>
</tbody>
</table>

Data from Obagi Z. Obagi skin health restoration and rejuvenation. New York: Springer; 1999.41

Used by Grimes² includes a superficial peel with 20% to 30% SA followed by 15% TCA for resistant melasma or mild photodamage in all skin types. If the goal is a superficial peel, a thin coat should be applied so that little or no frost appears, regardless of the combination of peels used. To achieve a medium-depth peel to the papillary dermis, 20% to 30% TCA is applied, with the goal of producing an organized white sheet with a pink background. When the peel reaches the deepest safest level (the immediate reticular dermis) the pink background gradually diminishes (because of the coagulation of blood vessels) and the sheet appears pure white.⁴¹

Fig. 19. Latina woman with skin type III to IV treated for acne scars. (A) Before treatment with Jessner solution plus 35% TCA; (B) 10 years after peel, using a skin-care regimen and HQ.
Sedation and analgesia are usually necessary with TCA peels. The area is thoroughly cleansed with hexachlorophene, alcohol, and acetone. If using Jessner solution, only 1 to 2 coats are applied to achieve a blotchy frosting. A 2-inch x 2-inch gauze is then dipped into a plastic or stainless-steel cup containing the TCA solution and squeezed dry before the application. The solution is then applied laterally, then slowly to the central area, and lastly to the periocular and periorbital regions. The solution should be left on for 2 to 5 minutes for complete frost formation; overcoating with more TCA should be avoided. The peel is then feathered into the hairline and the neckline just below the mandibular border. Several immediate postoperative maneuvers can be used to reduce burning, such as an ice-water compress, 10% sodium bicarbonate rinse, cold aloe vera lotion, a Zimmer cooler, or topical lidocaine ointment. Depending on the depth of the peel, exfoliation with some redness to intense redness, edema, blistering, and crusting starting within 24 hours will be observed. A 20-mg intramuscular dose of triamcinolone is useful to reduce swelling.

The standard regimen used by one of the authors (AMK) is as follows: Aquaphor is used up to day 5 or so and the skin is washed with dilute vinegar in water 4 times per day. Cetaphil lotion and cleanser (Gалderma Laboratories, Fort Worth, TX, USA) are used for the next 5 days. Healing typically takes 7 to 10 days. A class II steroid cream administered twice daily is a consideration for dark-skinned patients, beginning as soon as the skin is re-epithelialized and is no longer tender. A 2% HQ cream can also be started after the second week, together with chemical-free sunblocks.

**MODIFIED PHENOL PEEL TECHNIQUE**

Research over the last 11 years has clearly distinguished the early Baker-Gordon phenol peel from the newer and much safer modified versions that are based on lower concentrations of croton oil. A series of articles by Hetter in 2000-2006 characterized the active ingredients and established a major role for croton oil in peels. In those studies, nonwhites received peels safely with the lower-strength phenol formulas. Studies by Stone in 1998 and in 2001 delineated the active ingredients and refined the technique of application for the modified phenols. The Fintsi Exoderm-Lift peel has been performed in skin type IV without producing an alabaster-white hypopigmentation, but rather a pseudohypopigmentation (the color of skin that has not been exposed to sun). In a 2004 publication by one of the authors (PPR) describing his technique for chemabrasion, 44% of the 72 patients were Latinos, Afro-Caribbean, or Asian. Since then, he has treated 250 such patients, and has monitored the incidence of late-onset dyschromias. There have been no cases of depigmentation or persistent PIH using this technique (Figs. 20 and 21). As expected, darker skin types have 2 different skin tones between the face and neck, with the peeled facial skin being lighter than the tanned neck with an appearance similar to the skin that has not been exposed to sun. Some patients have been able to tan almost normally. One of the authors (PPR) has used the Exoderm-Lift and Stone (Grade II) formulas (Fig. 22), which demonstrated equivalency in the clinical and histologic studies. The stronger Hetter formulas have been used and

![Fig. 20. An Afro-Caribbean woman with skin type VI treated with a full-face Stone phenol peel for acne scars without hypopigmentation or hyperpigmentation. (A) Patient before peel; (B) almost 3 years post peel showing lighter but normal skin tone.](image-url)
shown to be equally as effective as Stone. PRR has used the 2-day phenol chemabrasion technique described later with reliable results for 6 years (Fig. 23).

THE 2-DAY PHENOL CHEMabrasion Technique FOR ACNE SCARS

As noted earlier, the best results on acne scars (because they are of different types) usually require a combination of subcision, dermal fillers, lasers, and repeated peels. If laxity or volume deficiency accompanies deep facial wrinkling, then dermal or periosteal fillers along with cosmetic surgery are also necessary to achieve optimal results, although this is less common in darker skin types. Also, full-face phenol peels are not always necessary and, as already noted, combining deeper and lighter peels can result in sufficient improvement without the risk of dyschromias or prolonged downtime.

Patient Evaluation

If the skin type is a dark VI (black) and the neck is also dark, then a full-face phenol peel is contraindicated because of the probability of discordant tones, unless the patient agrees to strict avoidance of sun and the chronic use of skin lighteners on the neck. Types IV and V, and even a light VI, have been peeled with acceptable concordance of skin tone between face and neck. For the patient with dark skin type VI, performing 2-day chemabrasion only on individual ice-pick or box scars with the Stone formula or CROSS with 30% TCA is a safer and effective option. Subcision can be performed weeks before, during, and after

Fig. 21. Latina woman with skin type V treated for acne scars and melasma. (A) Before 2-day Stone phenol; (B) 10 days post peel with severe discordance between pink face and dark neck; (C) 1 year post peel, showing some PIH on forehead but overall improvement in scars and normal face-to-neck color match.

Fig. 22. Latina woman with skin type IV treated for acne scars and photoaging. (A) Before full-face Stone phenol; (B) 6 months post peel; (C) 3 years post peel.
the peel (for rolling scars) and a medium peel performed on the rest of the face or neck with TCA or with fractionated CO₂ laser ablation (Fig. 24). Test spots and lighter peels are suggested before doing a full face. Photographic documentation should be obtained with direct lighting and shadows. A supportive family member should be recruited and trained on pre- and postoperative care along with the patient.

Preconditioning

As noted, preconditioning of the skin with creams and treatment of acne is required to improve the efficacy of the peel, reduce the risk of PIH, and promote healing.

Anesthesia and Monitoring

Intravenous (IV) access with either oral (diazepam, triazolam, hydromorphone, or fentanyl oral transmucosal) or IV conscious sedation (midazolam, fentanyl, propofol, ketamine) is necessary. The use of facial nerve blocks is effective at reducing the need for systemic medication. The use of epinephrine has been avoided or minimized in these blocks to reduce the risk of arrhythmias. Clonidine (1–2 mg) orally used as a preoperative medication also reduces this risk. General anesthesia is not recommended because of respiratory and pH issues. The PO₂ must be kept at more than 90% throughout the procedure, and sinus tachycardia must be brief and minimized. The patient is discharged home with diazepam, hydromorphone, and triazolam with IV access still in place, with the trained family member assisting.

Day 1

Ringer lactate (1–2 L) is infused for 2 hours. The face is thoroughly cleansed and degreased as described earlier. For a full-face peel (Fig. 25), preformulated Stone formula (Delasco, Council Bluffs, IA, USA) is applied with regular Q-tips, which are rolled against the edge of the stainless-steel cup to remove excess fluid. The formula is applied to 5 anatomic areas (forehead, 2 cheeks, perioral and chin, and peri orbital and nose), spending 10 to 15 minutes per area so that the peel application takes approximately 60 minutes. Ice-pick scars receive an additional peel application with a fine paintbrush to ensure complete wetting of the lesion. A complete, organized frost has to be achieved in each area, and a yellowish edematous
Fig. 24. Korean woman with skin type IV treated for acne scars. (A) Before treatment with subcision, CROSS with 2-day Stone phenol peel followed immediately by 30 W fractionated CO₂ therapy (2 sessions); (B) postoperative shadow photograph showing improvement in acne scars.

appearance indicating epidermolysis is noted after 15 to 30 minutes. The face is completely taped (except the upper lids) with 1-inch to 2-inch strips of waterproof Hy-Tape (Hy-Tape International, Patterson, NY, USA) (Fig. 25C) and covered with a surgical face net. The patient is discharged with a trained family member or nurse. Patients can only drink fluids through a straw or poured

Fig. 25. Korean man with skin type IV treated for acne scars. (A) Before treatment with subcision and Stone phenol chemabrasion; (B) 10 days post peel fully re-epithelialized; (C) following application of the peel, the patient's face is covered with Hy-Tape on day 1; (D) tape is removed on day 2, revealing the coagulum of necrotic epidermis and upper reticular dermis; (E) the coagulum is debrided with a tongue depressor or large curette; (F) the bismuth subgallate powder mask is applied on day 7 and removed on day 9.
into the mouth through a long-tipped water bottle for the next 8 days.

For regional acne scars, the authors suggest applying Stone 100 phenol only on ice-pick and box scars, using a fine paintbrush to deliver it directly into the scars, whereas the rest of the face is then peeled with a lighter acid or with fractional CO₂ ablative resurfacing. Subcision can also be performed at this visit (see Fig. 24).

**Day 2**
The patient is usually groggy but pain free on returning to the clinic. The Hy-Tape is easily removed (Fig. 25D). Additional sedation and analgesia are sometimes given if the condition is severe and aggressive abrasion is expected. The necrotic coagulum is debrided using a tongue blade or a large Fox curette (Fig. 25E). Ice-pick scars and box scars (or deep wrinkles) are debrided using 1- to 2-mm chalazion-type curettes, achieving punctate bleeding inside the scars, thus ensuring de-epithelialization of these types of lesions. The goal is to create a true open wound within the lesions to induce secondary healing and wound closure. An antibiotic, antiinflammatory powder, bismuth subgallate (Delsasco or Spectrum Pharmaceuticals, Irvine, CA, USA) is applied to the entire face (except the upper lid) (Fig. 25F) and the patient is sent home. This mask dries out and stays in place for the next 7 to 8 days. The authors call it the protective "green cocoon."

**Days 3 to 8**
The patient is restricted to home and should not shower until the mask is removed. On approximately the eighth day, the mask separates because the skin has re-epithelialized. Vaseline is applied all over the mask, allowed to soak in, and left overnight. The mask is gently removed the next morning by applying more Vaseline (while showering), under the slowly separating mask. Gentle creams or Aquaphor ointment (Eucerin, Beiersdorf AG, Hamburg, Germany) are then used until the skin is no longer tender or red. Nearly all patients are 99% re-epithelialized by day 9. There has been no incidence of infections following this procedure in the authors' clinic.

**Touch-up**
Two or three months after the peel has healed, a regional or lesional peel can be repeated, even in skin types IV to VI. These lighter skin types can tolerate a regional peel (Fig. 26). The intent is to recreate an open wound inside the ice-pick scars, adding new collagen to the inside of these scars so they eventually fill in almost completely.

**Fig. 26**. Latino man with skin type IV treated for acne scars. (A) Before Stone phenol 2-day chemabrasion; (B) after a full-face peel and a regional touch-up phenol peel.
Postoperative care
With all peels, the immediate postoperative procedure is similar. Cool compresses (water or dilute white vinegar) or oral analgesics should be used for pain. A bland moisturizer should be applied and the skin should be washed with a soapless cleanser (CeraVe, Cetaphil). Sweating should be avoided until redness subsides and sunscreens applied once the skin has re-epithelialized (powder make-up is an option for coverage). Deeper-peeled areas should be treated with Aquaphor. Previous skin conditioning can be re-initiated once skin is no longer sensitive, red, and peeling. Fluocinolone 0.01% cream is started when reaction is stronger, PIH is noted, or when persistent redness is observed.

SUMMARY

Chemical peels to correct dyschromias, acne scars, and other conditions are recommended in patients with darker skin. Peel selection is determined by the depth of the peel required and the mechanism of action of the peel. Peels are commonly used in combinations, as a series, or as a component of a multimodal approach with laser ablation, electrocautery, surgery, dermal fillers, and neurotoxins to correct multiple defects. Care must be taken to reduce the risk of peel-associated PIH. Preconditioning is required for all peels and a rigorous postoperative maintenance regimen ensures long-term satisfaction.

Long-term care and commitment are required from patients who have had peels. Patients may expect peels to control or shrink pores in a lasting manner, but this does not happen. Patients, particularly those with large pores or acne active, need to control the oiliness of their skin by the use of cleansers and drying agents such as medications that are typically used to treat acne. Lifestyle changes may also be required, including avoidance of sun and the reduction of exercise-induced heat (eg, swimming rather than running). These measures will help to ensure patients’ lifelong satisfaction with their appearance following a chemical peel.

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REFERENCES