The Art of Chemical Peeling

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A resurgence of interest in chemical peeling is currently taking place in the dermatology community for its time-tested efficacy and safety in treating cosmetic and medical concerns at a cost comparison without peer. Like many procedures in dermatology, there is an art to the technique, which is learned through direct hands-on instruction focusing on the pre-peel preparatory regimen, application techniques to obtain the appropriate peel penetrations for different indications, assessment of clinical endpoints, as well as post-operative instructions. Hands-on instruction, and the current state of the field, is available through such societies as the American Society for Dermatology Surgery and the International Peeling Society.

Definition

Chemical peels are generally categorized into superficial, medium and deep peels based on the depth of histologic penetration and injury, which in turn triggers a reproducible wound healing response that yields the clinical benefits observed.(1) Superficial chemical peels cause dyscohesion of epidermal keratinocytes up to the basal layer, but not through the papillary dermis, resulting in superficial exfoliation over 3-7 days. Superficial peels are repeated every 2-6 weeks for approximately 4-6 sessions to address epidermal pathology findings including comedonal acne, epidermal melasma, and an appearance of skin 'dullness.'

Medium depth chemical peels penetrate through the papillary dermis to the upper reticular dermis, and are associated with peeling for approximately 7-10 days. Medium depth peels are an excellent method to treat skin pathology spanning the epidermis (including the basal layer), papillary and upper reticular dermis, including actinic keratosis, lentigo, and sallow skin discoloration/fine wrinkling associated with solar elastosis, and result in normalized epidermal polarity and an increased quality and quantity of collagen and elastin in the papillary dermis Medium depth chemical peels are usually a one-time treatment.(2)

Deep chemical peels are a powerful technique that injure to the level of the mid-reticular dermis, and are a gold standard in the treatment of deep, static rhytids such as those involving the perioral, medial cheek, peri-ocular skin. Due to the depth of injury, deep chemical peels composed principally of phenol and croton oil are associated with a healing period of 7-12 days, and an expected post-procedure erythema lasting approximately 1-3 months. The clinical effect of deep chemical peels are durable up to 10-15 years follow-up and area also a one-time treatment.(3)

Preparatory Regimen

Pre-peel skin preparation is important to optimize outcomes. Using a solution of alcohol and/or acetone to degrease the skin prior to peel application is important to remove excess corneocytes and sebum which may impair peel penetration. Applying a topical retinoid to the entire face over moisturizer (to minimize retinoid irritation) for approximately 1 month prior to

the peel enables even peel penetration. In Fitzpatrick types III and above, topical hydroquinone 4% cream twice daily over moisturizer and strict sun protection approximately 3 weeks before and after the peel may also decrease the risk of post-inflammatory hyperpigmentation. In Fitzpatrick skin phototypes I-II, the preparatory regimen maybe continued to the day of the procedure, whereas for Fitzpatrick phototypes III-VI, the preparatory regimen may be discontinued 7 days before the peel to minimize the risk of post-inflammatory hyperpigmentation as both retinoids and hydroquinone may induce irritant contact dermatitis that may inappropriately and focally enhance peel penetration. For medium and deep peels, infection prophylaxis with acyclovir 400mg TID for herpes simplex virus and cephalexin 500mg QID for Staphylococcus aureus starting on the day of the procedure is warranted.(4)

Post-Procedure Care

Strict sun avoidance and sun protection including zinc oxide-based sunscreens are necessary for the first 2-4 weeks after chemical peeling to minimize the risk of post-inflammatory hyperpigmentation. For superficial peels, a bland emollient is applied three times daily for approximately 1 week or until the peel is complete. For medium depth peels, an occlusive ointment is applied three times daily for the first 3-5 days, and then switched to a bland emollient for patient tolerability (as many find ointments too sticky) until the peel is complete in 7-10 days. For deep peels, dilute vinegar compresses are applied four times daily followed by occlusive ointment until the peel is complete in approximately 7-12 days.

Superficial Peels

Common superficial peels include glycolic acid, salicylic acid, Jessner's solution, retinoic acid, lactic acid, mandelic acid, pyruvic acid and trichloroacetic acid (TCA) 10-35%. The only peels that require neutralization using sodium bicarbonate solution to prevent ongoing skin penetration and injury are glycolic and pyruvic acid. All other peeling solutions cannot further penetrate the skin once they have reached their clinical endpoints. Although a detailed discussion of all these agents is beyond the scope of this article, we will focus on salicylic acid and Jessner's solution for their safety and utility in treating common skin conditions. Salicylic acid is a beta-hydroxy acid available in 20-30% hydroalcoholic vehicle with anti-inflammatory, antimicrobial, and depigmenting properties. It is safe for all phototypes. Salicylic acid is lipophilic and comedolytic, and is thus particularly effective for comedonal acne. After degreasing the skin with alcohol or acetone, application of salicylic acid using gauze or a cotton tipped applicator results in crystallization of the salicylic acid on the skin, resulting in a pseudofrost. The patient may leave the office with this pseudofrost intact, or it may be removed with a dampened cloth. Monthly treatment of comedonal acne using salicylic acid 20-30% may be used to augment traditional acne therapies. Neutralization is unnecessary as crystalized salicylic acid crystals cannot further penetrate the skin. Salicylic acid peels may cause urticaria and angioedema, with known cross-sensitivity to acetylsalicylic acid.(4)

Jessner's solution consists of 14% resorcinol, 14% salicylic acid and 14% lactic acid in 95% ethanol. Modified Jessner's solution consists of 17% salicylic acid, 17% lactice acid and replaces resorcinol with 8% citric acid. Both peels are applied using gauze or a cotton tipped applicator, with the clinical endpoint being patchy reticulate frost with background erythema (and again

represents salicylic acid crystallization) and need to be repeated monthly for 4-6 treatments. Modified Jessner's solution is an ideal peel for melasma and in skin of color as it lacks resorcinol, which may be particularly irritating to skin and associated with increased risk of post-inflammatory hyperpigmentation.(4) A study comparing Jessner's + 20% TCA vs 20% TCA alone in higher Fitzpatrick phototype individuals found Jessmer's+20% TCA more effective in treating melasma, and with no significant difference in post-inflammatory hyperpigmentation.(5)

Medium Depth Peel

There are 3 methods to obtain a medium depth chemical peel, which consist of the initial application of an epidermolytic acid, such as solid CO2 (dry ice), Jessner's solution, or glycolic acid 70% followed by application of TCA 35%. In the solid CO2 (Brody method), a block of dry ice is dipped in a 3:1 solution of acetone:alcohol and applied to the skin for 3 seconds for light lentigines or up to 10 seconds for rolling acne scars or fine wrinkling to enhance TCA penetration. For Jessner's solution (Monheit method) or 70% glycolic acid (Coleman method), the superficial peels are applied to their clinical endpoint: reticulate frost for Jessner's solution or neutralization after 2 minutes for glycolic acid. The solid CO2 + TCA 35% acid peel is associated with the greatest penetration depth of the above peels.(4)

The serial application of an epidermolytic agent followed by TCA 35% allows for safe and predictable injury to the level of the papillary or upper reticular dermis, and is an excellent way to treat confluent actinic keratosis, lentigines and sallow discoloration of the face. Notably, medium depth chemical peels should not be performed off the face or scalp, such as on the neck or elsewhere on the body, because of the risk for scar. The clinical endpoint following the TCA 35% application is a solid white frost with erythema showing through for a lighter peel, and without erythema showing through for a deeper peel. The depth of penetration of the peel may be increased using increased volume of solution or increased pressure of application. It takes approximately 3-5 minutes for the TCA frost to develop completely, consequently one must wait and observe during this period to assess the degree of frost development before applying additional solution to prevent over-coating of TCA. When peeling the face, care must be taken to peel into the hairline, and to approximately 1cm below the mandible to prevent a line of demarcation. Similarly, the neck may be blended with a superficial chemical peel, such as TCA 10-20%, to minimize the contrast between the neck and the face.

Deep Chemical Peels

Deep chemical peels use phenol as a solvent to deliver the active ingredient, croton oil, to the reticular dermis to incite a neutrophilic inflammatory reaction and protein kinase C signaling to induce neocollagensis and elastogenesis for durable improvement of deep static wrinkles. (6) Compared to the historic Baker-Gordon formula (48.5% phenol-2.1% croton oil), the Hetter formulas have allowed clinicians to titrate the concentation of phenol (27.5-33%) and of croton oil (0.1% to 1.1%) to match the clinical indication of fine to coarse wrinkles on thin or thick skin, allowing for superior safety (decreased risk for scar and hypopigmentation) with maintained efficacy.(7) Consequently, the Hetter formulas are emerging as the standard for deep chemical

peeling that compare favorably, or likely exceed, the outcomes obtained with ablative laser resurfacing at a fraction of the overhead cost to the clinician. The clinical endpoint for deep chemical peels is a gray white frost in contrast to the solid white frost, which represents the endpoint for medium depth peels. Deep chemical peels may be performed as either a full-face procedure for patients with diffuse deep facial rhytides, or focally to areas that require the greatest wrinkle improvement. Full-face resurfacing requires cardiac cardiac clearance and intra-operative cardiac monitoring as croton oil has been demonstrated to prolong the QT interval, that may eventuate into torsades de pointes.(8) When performing a full-face deep chemical peel, oral or IV hydration should be used to promote urinary excretion of phenol, and a 10 minutes safety pause should be instituted between facial cosmetic subunits (forehead, temple, right cheek, left cheek, perioral region, and nose) to allow for metabolism and excretion of phenol and croton oil. Thus, a full-face procedure should be performed over the course of 1-2 hours.(9) Many patients, however, present with deep rhytides localized to 1 cosmetic subunit (defined as 1% body surface area approximated by the surface area of the patient's palm without fingers), without deep static wrinkles elsewhere, a common example being deep rhytides limited to the perioral region and lentigines on the remainder of the face. In these cases, a segmental peel may be performed. A segmental peel is defined as a deep chemical peel in the areas of deepest wrinkling, for example the perioral region, and a medium depth peel on the remainder of the face for blending. Published clinical experience has demonstrated that segmental peels may be performed safely without cardiac monitoring.(10) In addition, a novel technique of cosmetic lip augmentation and eversion using phenol-croton peels without injectable fillers has been described.(11) As with medium depth chemical peels, a superficial peel with TCA 10-20% may be applied to the neck to minimize the contrast between the face and the neck.

Complications

Post-inflammatory hyperpigmentation may occur with excessive sun exposure before or after the peel, or as a result of over-penetration. Triple bleaching cream including retinoic acid, topical corticosteroid and hydroquinone formulations are effective in treating this complication, which usually resolves within 3 months. Bacterial infection signaled by pain, or candidal infection signaled by pruritus, require culture and treatment based on sensitivities. Scarring is heralded by areas of persistent erythema or induration, and must be aggressively treated with super-potent topical or intralesional corticosteroids. In addition, avoid medium or deep chemical peels over areas of broad surgical undermining such as blepharoplasty or rhytidectomy for at least six months as the compromised vasculature may be associated with impaired healing.(4, 9)

Conclusion

Chemical peeling is a re-emerging art that compliments the various cosmetic and medical procedures available to dermatologists and can provide powerful clinical results at minimal overhead cost. Hands-on training is necessary to gain experience regarding application techniques, clinical endpoints, and safety signals related to chemical peels and may be obtained through the American Society of Dermatologic Surgery or the International Peeling Society.

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