Chapter 13

Chemical Peels in Dark Skin 13

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The author has no financial interest in any of the products or equipment mentioned in this chapter.

Contents

13.1 Definition

Dark skin is a commonly used phrase to describe people of color. Other terms used to describe darker skin types include ethnic skin, brown skin, and pigmented skin. The unifying feature represented is pigmented skin (i.e., shades of tan, olive, brown, and black). Such individuals are often classified as Fitzpatrick's skin types IV through VI. These individuals represent many of the faces of North America, South America, Africa, the Caribbean, Asia, Malaysia, and Australia.

13.2 Epidemiology

In the year 2000, the US Census Bureau estimated that the total resident US population included 33 million Hispanic Americans (12%), 34 million African Americans (13%), 11 million Asians and Pacific Islanders (4%) and 2 million Native Americans, Eskimos, and Aleuts (1%). Statistical projections suggest continuing major growth of the non-white US population, with Hispanics having the most significant growth rate [1]. People of color comprise a substantial percentage of the global population. They include Africans, Hispanics, Pacific Islanders, Asians, East Indians, Aleuts, Eskimos, Middle Easterners, Caribbeans, Arabs, and Malaysians.

13.3 Morphologic and Physiologic Skin Differences in Dark Skin

A myriad of morphologic and physiologic features define pigmented skin. Although there are no quantitative differences in melanocytes amongst various racial/ethnic groups, the melanocytes of darker skin, in particular black skin, produce more epidermal melanin. Melanosomes are often large and singly dispersed within melanocytes and keratinocytes [2, 3, 4]. Melanosomes are distributed throughout the epidermis in black skin, whereas in whites, they are limited to the basal and lower malphigian layer of the epidermis. Melanosomes in whites and Asians are smaller and often aggregated and membrane bound, whereas in black skin, they are most often singly dispersed within

melanocytes and keratinocytes. Dark skin (i.e., black skin) has more stage IV melanosomes. The transmission of ultraviolet radiation (UVA and UVB) through white and black skin has been assessed [5]. On average, five times as much ultraviolet light reaches the upper dermis of whites than in blacks. Differences in transmission between the stratum corneum of blacks and whites are less striking. The increased epidermal melanin content of black skin serves as a significant filter for blocking ultraviolet light transmission. In addition, other reported differences include increased stratum corneum cell layers, increased desquamation, increased lipid content, decreased ceramide content, and increased recovery time after tape stripping [6].

Dark skin demonstrates significantly greater intrinsic photoprotection because of the increased content of epidermal melanin. Clinical photodamage, actinic keratoses, rhytides, and skin malignancies are less common problems in deeply pigmented skin. However, darker skin types are frequently plagued with dyschromias because of the labile responses of cutaneous melanocytes [7]. In a survey of 2000 black patients seeking dermatologic care in a private practice in Washington, DC, the third most commonly cited skin disorders following acne and eczema was pigmentary problems other than vitiligo [8]. Of these patients, the majority had a diagnosis of post-inflammatory hyperpigmentation, followed in frequency by melasma. In a survey of 100 women of color assessing issues of cosmetic concerns for darker skin types, the most commonly cited problems were dark spots or blotchy skin, texturally rough skin, and increased sensitivity to topical products [9]. Patients surveyed also complained of oily skin. Wrinkles and photodamage were significantly less frequent issues of cosmetic concern when the data was compared with an age-matched Caucasian population of 141 women.

13.4 Peeling Indications in Dark Skin

Peel indications differ between light and dark skin. Key indications in Fitzpatrick's skin types I–III include photodamage, rhytides, acne, scarring and the dyschromias characterized by hyperpigmentation. In contrast, survey data suggest that key indications in darker skin types include disorders of hyperpigmentation such as melasma and post-inflammatory hyperpigmentation, acne, pseudofolliculitis barbae, textural changes, oily skin, wrinkles, and photodamage.

Despite major concerns regarding peel complications such as post-inflammatory hyperpigmentation, hypopigmentation and scarring in darker racial-ethnic groups, recent studies suggest that peeling procedures, particularly superficial procedures, can be performed safely in darker racial-ethnic groups [10]. These peels induce epidermal and papillary dermal wounding (Fig. 13.1).

13.5 Peel Selection

Chemical peeling agents are classified as superficial, medium-depth, or deep peels [11]. Superficial peels target the stratum corneum to the papillary dermis (Fig. 13.1). They include glycolic acid, salicylic acid, Jessner's solution, tretinoin, and TCA in concentrations of 10–30%. Medium-depth peels penetrate to the upper reticular dermis and include TCA (35–50%) combination glycolic acid 70%/TCA 35%, Jessner's/TCA 35% and phenol 88%. Deep chemical peels utilize the Baker-Gordon formula and penetrate to the midreticular dermis. Analysis of morphologic, physiologic, and clinical data (see Introduction) suggests that the benefits of chemical peeling in dark skin can be maximally achieved utilizing superficial peels while simultaneously minimizing risks.

Grimes [12] compared the histologic alterations induced by a variety of chemical peels in 17 patients with skin types IV–VI, including glycolic acid 70%, salicylic acid 30%, Jessner's solution, and 25 and 30% trichloroacetic acid (TCA). Peels were applied to 4 × 4 cm areas of the back and 2 × 2 cm post auricular sites. Biopsies were performed at 24 h (Fig. 13.2a–d). Glycolic acid induced the most significant stratum corneum necrosis. Compared with the other tested peels, salicylic acid and Jessner's peels caused mild lymphohistiocytic dermal infil-

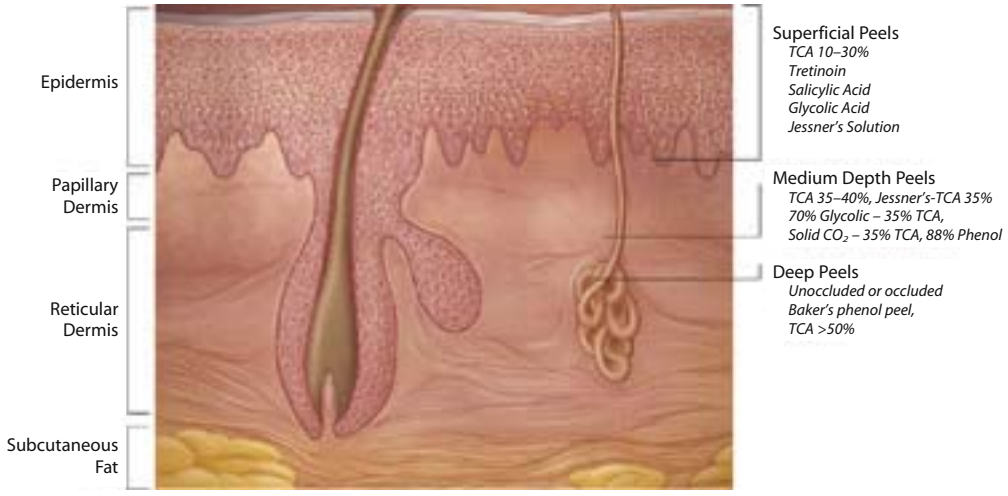


Fig. 13.1. Illustration of the depth of wounding caused by peeling agents

trates. The most severe damage was induced by 25 and 30% TCA, which caused deep epidermal necrosis and dense papillary dermal lymphohistiocytic infiltrates. TCA test sites developed post-inflammatory hyperpigmentation. These findings corroborate our clinical experience using these agents. In general, glycolic, salicylic acid, and Jessner's peels induce a lower frequency of post-peeling complications compared with 25 and 30% superficial TCA peels.

13.6 Peeling Preparation

Despite some general predictable outcomes, there is tremendous variability in the reactivity and responses to chemical peels. Even superficial chemical peeling can cause hyperpigmentation and scarring in susceptible individuals. Therefore, the author always performs the initial peel with the lowest concentration of the

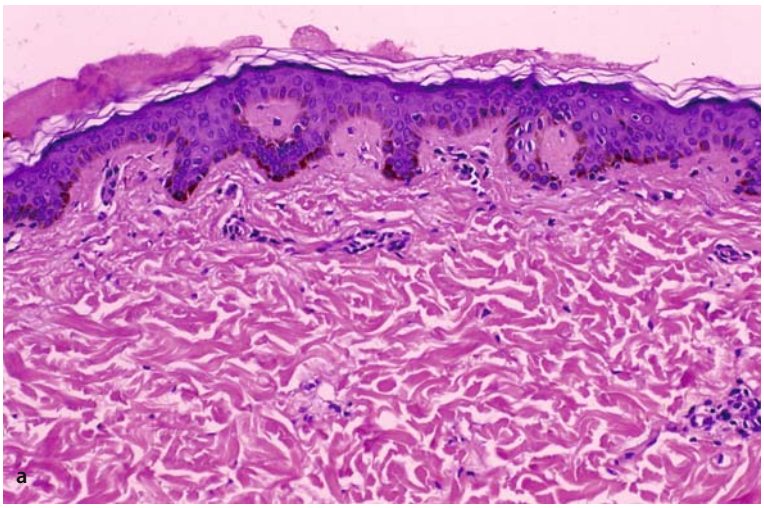
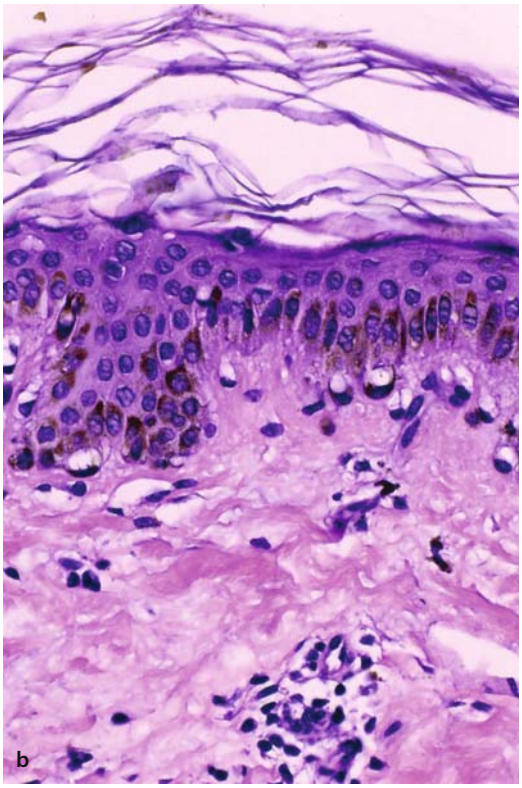
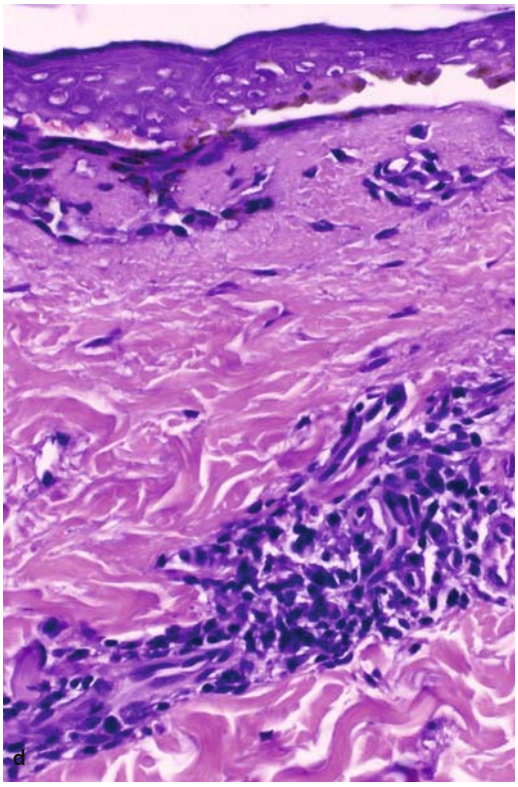


Fig. 13.2a–d. Hematoxylin/eosin stains of biopsies of back skin taken 24 h post-chemical peeling. **a** Glycolic acid peel 70%. Note stratum corneum necrosis





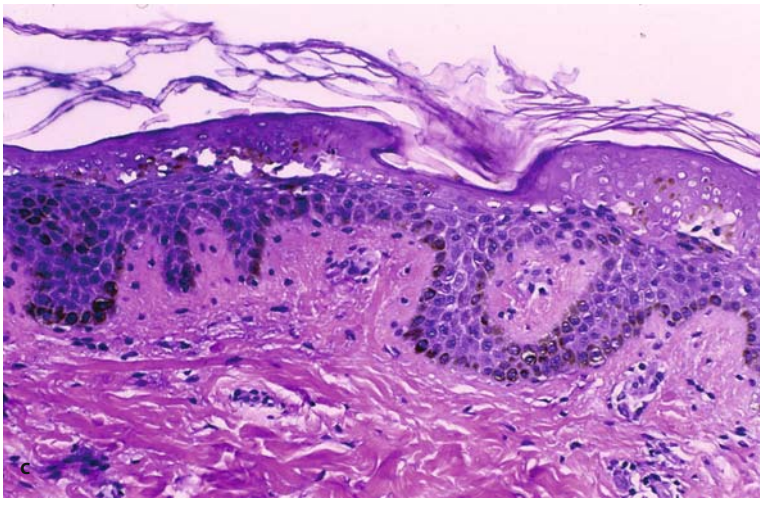


Fig. 13.2b–d. Hematoxylin/eosin stains of biopsies of back skin taken 24 h post-chemical peeling. **b** Salicylic acid 30%. Note mild lymphohistiocytic infiltrate. **c** Twenty-five percent TCA induced mid-epidermal wounding/separation. **d** Thirty percent TCA peel caused deep epidermal separation

peeling agent to assess the patient's sensitivity and reactivity. The author's standard protocol involves initial pretreatment for 2–4 weeks with 4% hydroquinone formulations. Higher strength formulations (5–10%) can be compounded for recalcitrant hyperpigmentation. Azelaic acid or kojic acid formulations are used if patients are experiencing irritation or hypersensitivity to hydroquinone. Tretinoin, tazarotene and retinol are often used to treat acne, hyperpigmentation or photodamage in darker skin types. However, these agents should be discontinued 1–2 weeks prior to peeling to avoid post-peel complications in dark skin. Retinoids increase epidermal turnover and they increase the depth of the peeling agent. This may be a desired effect in skin types I–III; however, in dark skin increasing the depth of the peel may result in excessive erythema, crusting, desquamation, and post-inflammatory hyperpigmentation. Topical bleaching agents, which do not contain retinoids, lower strength alpha hydroxy acids, polyhydroxy acids, and beta-hydroxy acids can be continued up to 1 or 2 days prior to peeling. These are less aggressive agents compared with retinoids. Superficial peels are performed at 2- to 4-week intervals and a series of three to six are routinely performed.

13.7 Peeling Techniques

The author has observed cases of postinflammatory hyperpigmentation even with low concentrations of superficial peeling agents. Hence, cautious titration is appropriate in darker skin types. Glycolic acid peels are titrated from 20–35%, 50%, and finally 70%. Similar titration methods are used for salicylic acid and TCA. Salicylic acid peels should be titrated from 20 to 30%. Despite the use of higher concentrations of TCA in some studies [12, 13], it is best to initiate TCA peeling in dark skin with low concentrations (i.e., 10–15%). Post-peel care includes the use of bland cleansers and emollients until irritation and peeling subsides. The patient then resumes the use of topical skin care products and bleaching agents. Post-peel reactions such as excessive erythema, desquamation, and irritation are treated with low- to high-potency topical steroids. Clearing usually occurs in 5–7 days.

13.8 Superficial Peeling Agents

13.8.1 Glycolic Acid

Glycolic acid, an alpha-hydroxy acid (AHA), has become the most widely used organic carboxylic acid for skin peeling. Glycolic acid formulations include buffered, partially neutralized, and esterified products. Concentrations for peeling range from 20 to 70%. Several published studies have assessed the efficacy of glycolic acid peels in darker-skinned racial-ethnic groups. A series of ten Asian women with melasma and fine wrinkles were treated with 2% hydroquinone and 10% glycolic acid applied to both sides of the face [13]. A series of 20–70% glycolic peels were performed on one side for comparison. Greater improvement with minimal side effects was noted on the side treated with the series of glycolic acid peels. Forty Asian patients with moderate to moderately severe acne were treated with a series of 35–70% glycolic acid peels [14]. The investigators noted significant improvement in skin texture and acne. Side effects were reported in 5.6% of patients.

Nineteen black patients with post-inflammatory hyperpigmentation were treated with glycolic acid peeling [15]. The control group was treated with 2% hydroquinone/10% glycolic acid twice a day and tretinoin 0.05% at bedtime, whereas the active peel group received the same topical regimen plus a series of six serial glycolic acid peels. Although not statistically significant, greater improvement was noted in the chemical peel group.

The safety and efficacy of a series of glycolic acid facial peels were investigated in 25 Indian women with melasma [16]. Patients were treated with 50% glycolic acid peels monthly for 3 months. Improvement was noted in 91% of patients with maximal clearing occurring in patients classified with epidermal melasma. Side effects were observed in one patient who developed brow hyperpigmentation.

In a separate study, the combination of glycolic acid peels with a topical regimen for the

treatment of melasma was assessed in a series of dark-skinned patients with melasma [17]. The authors compared the efficacy of serial glycolic acid peeling with a series of 3–30% glycolic peels and 3–40% peels in combination with a modified Kligman bleaching regimen (hydroquinone 5%, hydrocortisone acetate 1% and tretinoin 0.05%) to the use of the modified Kligman formulation alone. Forty women were included in each group. Both groups showed a statistically significant improvement in the Melasma Area Severity Index (MASI) score at 21 weeks. However, maximal improvement occurred in the group treated with the series of glycolic acid peels in combination with the topical bleaching regimen.

Glycolic acid peels are well tolerated in darker skinned racial-ethnic groups (Figs. 13.3a, b and 13.4a, b). Side effects are substantially minimized when concentrations are gradually titrated from the lower concentrations of 20–35% to the full-strength 70% peel. Glycolic acid peels are most advantageous when treating darker skin types with sensitive skin.

13.8.2 Salicylic Acid

Salicylic acid has been formulated in a hydroethanolic vehicle at concentrations of 20 and 30% for use as a superficial peeling agent [18]. It is a lipophilic agent that produces desquamation of the upper lipophilic layers of the stratum corneum. Grimes [19] treated 25 patients with skin types V and VI with salicylic acid peels. Conditions treated included acne vulgaris, post-inflammatory hyperpigmentation, oily skin, with textural changes, and melasma. Patients were pretreated for 2 weeks with hydroquinone 4%, followed by a series of two 20% and three 30% salicylic acid peels. Peels were performed biweekly. Moderate to significant improvement was observed in 88% of the patients treated. Minimal to mild side effects occurred in 16%. Three patients experienced hyperpigmentation that resolved in 7–14 days. Thirty-five Korean patients with facial acne were treated biweekly for 12 weeks with 30% salicylic acid peels [20]. Both inflammatory and non-inflammatory lesions were significantly improved. In general, the peel was well tolerated with few side effects.

The author has observed enhanced improvement of oily skin, enlarged pores, and acne vulgaris with the use of salicylic acid peels compared with glycolic acid peels. Possible mechanisms for this observation include salicylic acid's effect on lipid solubility and microcomedone formation.

13.8.3 Jessner's Solution

Jessner's solution contains 14% resorcinol, 14% salicylic acid and 14% lactic acid. Jessner's solution has been used alone for superficial peeling, or in combination with TCA 35% to achieve a medium-depth peel. Increasing the number of coats applied to the treated area increases the depth and reaction induced by the Jessner's peel. These peels are well tolerated with minimal side effects in the author's practice. As with glycolic acid and salicylic acid peels, Jessner's peels are most commonly used as adjunctive therapy for moderate to severe facial dyschromias, acne, oily skin, texturally rough skin, fine wrinkles, and pseudofolliculitis barbae.

Lawrence et al. [21] compared the efficacy of Jessner's solution and 70% glycolic acid in a split-face study of 16 patients. Of the total group, five were skin type IV, three were skin type V, and one was skin type VI. There was no statistically significant difference in improvement between the two groups. The investigator did not report an increased frequency of side effects in patients of skin types IV–VI.

13.8.4 Tretinoin Peeling

Tretinoin 1% has also been used as a chemical peeling agent [22, 23]. The efficacy of tretinoin peels was compared with glycolic acid peels in the treatment of melasma in dark skinned patients [23]. In a split face study of ten Indian women, 1% tretinoin was applied to one half of the face, while 70% glycolic acid was applied to the opposite side. Peels were performed weekly. Significant improvement occurred on both sides as assessed by photographs and a Modi-

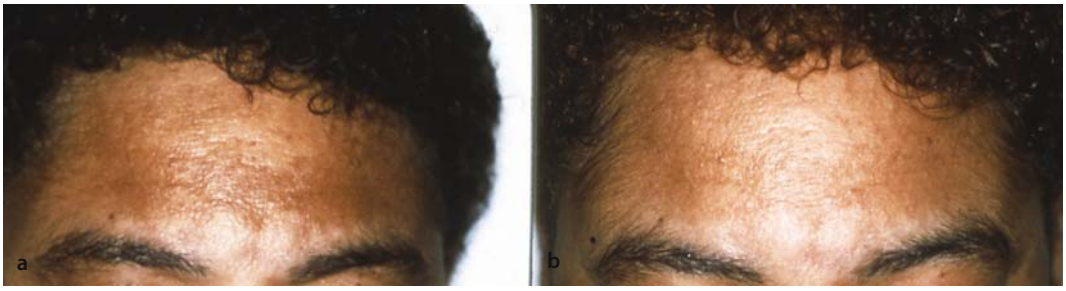


Fig. 13.3. a Forehead post-inflammatory hyperpigmentation. **b** Significant improvement in forehead hyperpigmentation following a series of glycolic acid 20–50% peels

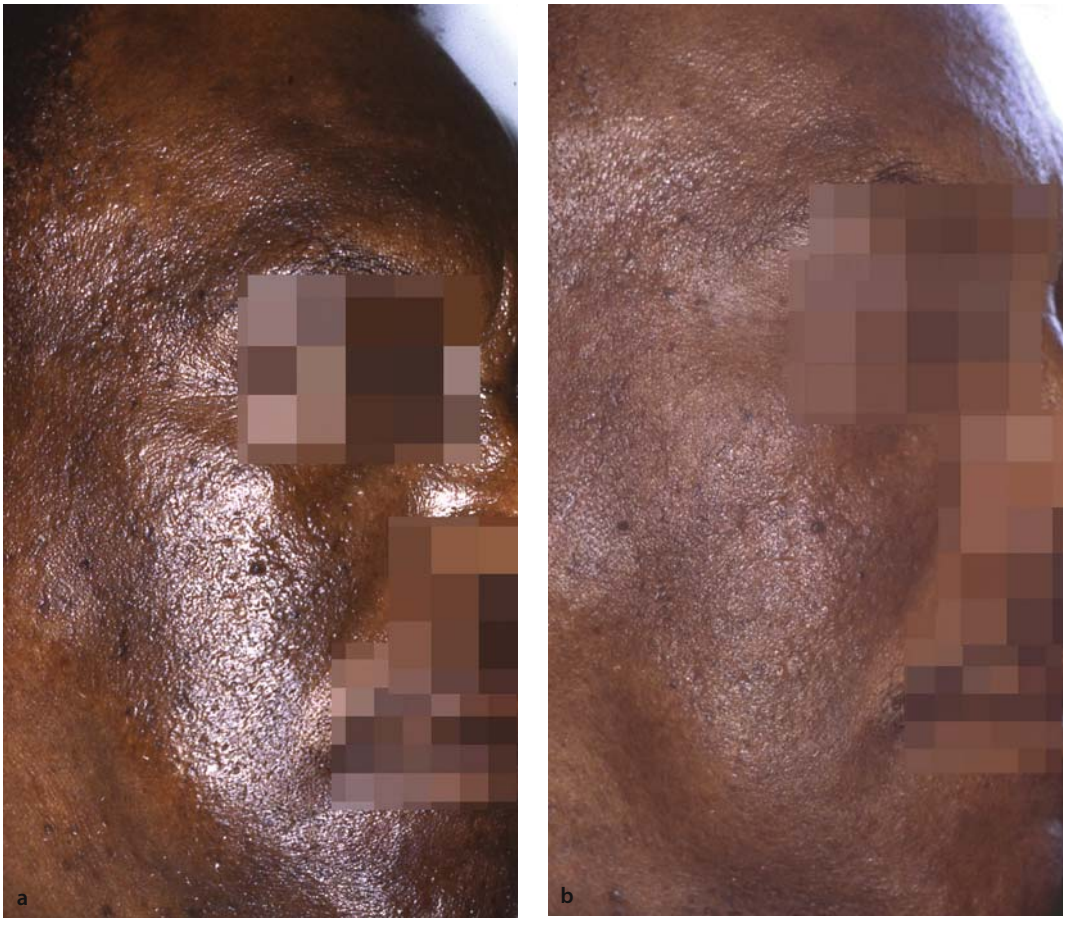


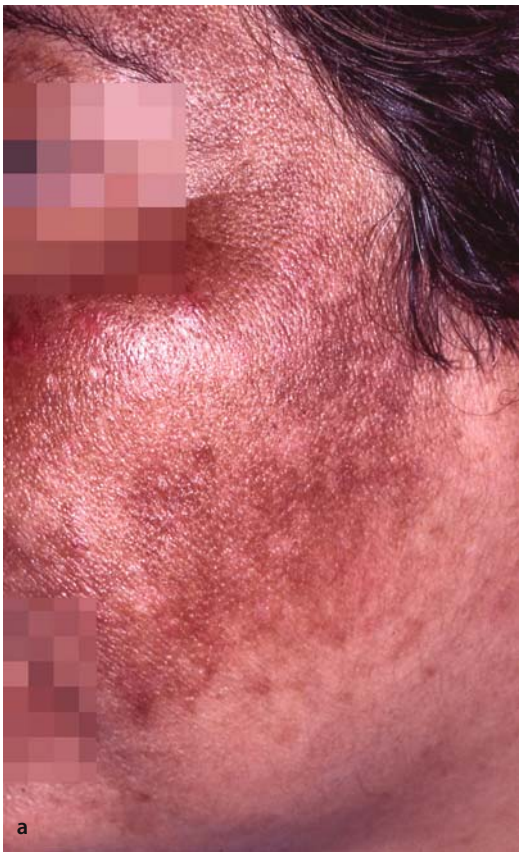
Fig. 13.4a, b. Significant improvement after a series of five glycolic acid 20–70% peels

fied Melasma Area and Severity Index Score. However, there were no significant differences between the tretinoin peeled side and the glycolic acid treated areas. Side effects despite the weekly frequency of peel applications were minimal throughout the 12-week study.

13.8.5 Trichloroacetic Acid

TCA peels were first described by Roberts in 1926. Many consider TCA the gold standard by which other peels are measured. Concentrations of 10–30% are used for superficial peeling. TCA precipitates epidermal proteins, causing sloughing and necrosis of the treated area. The extent of damage is concentration dependent. In contrast to glycolic acid, Jessner's solution, and salicylic acid, there is a substantially smaller window of safety when TCA peels are applied to skin types IV–VI. The frequency of post-peel hyperpigmentation is significantly more common in dark skin. Therefore, the author only uses TCA peels in patients recalcitrant to glycolic acid, salicylic acid, or Jessner's peels (Fig. 13.5a, b). TCA peels are cautiously used in darker-skinned patients. Indications include wrinkles, photodamage, stubborn pigmentation, and scarring.

In a histometric, immunohistochemical and ultrastructural study, TCA peeling in concentrations of 10, 20 and 30% were compared with dermabrasion in nine dark-skinned patients (Fitzpatrick's IV and V) with photodamage [24]. Both procedures induced increasing amounts of types I and III collagen. However,



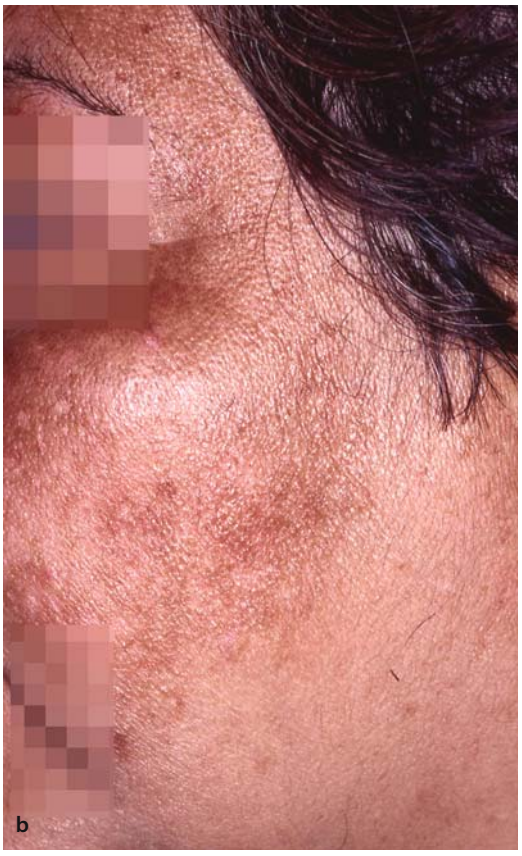


Fig. 13.5a, b. Moderate improvement in melasma after a series of two 15% TCA peels plus hydroquinone 6%

the most prominent changes were observed in the group treated with dermabrasion.

There is minimal published data on the use of combination peeling protocols in deeply pigmented skin (Fitzpatrick skin types IV–VI). The author has reported the efficacy of combination peeling with salicylic acid 20 and 30% in combination with 10% TCA for recalcitrant melasma patients. This peeling regimen was well tolerated with minimal side effects in darker racial ethnic groups (see Salicylic acid/TCA peel section).

13.8.6 Medium and Deep Peels

Medium and deep peels utilize TCA concentrations of 30–40% or greater or phenol combinations. Medium-depth peels also utilize glycolic acid 70% or Jessner's solution in combination with 35% TCA. Combination medium-depth peels are often used to treat moderate to severe photodamage. Fifteen Middle Eastern patients with atrophic or pitted acne scars were treated with a combination of Jessner's solution and 35% TCA peeling [11]. All patients were of light brown to dark brown complexion. Six percent had excellent improvement, 53% had moderate improvement and mild improvement was noted in 27%. Nine patients (73.4%) developed transient post-inflammatory hyperpigmentation which resolved after 3 months. Patients with light brown complexions did not develop hyperpigmentation. In the author's experience, aggressive peels of this nature have a substantially greater likelihood of inducing persistent hyperpigmentation and hypopigmentation in darker skin types.

Clinicians should be acutely aware that deeper peels carry substantial risks of inducing scarring and hypopigmentation in darker-skinned racial-ethnic groups (Fig. 13.6).

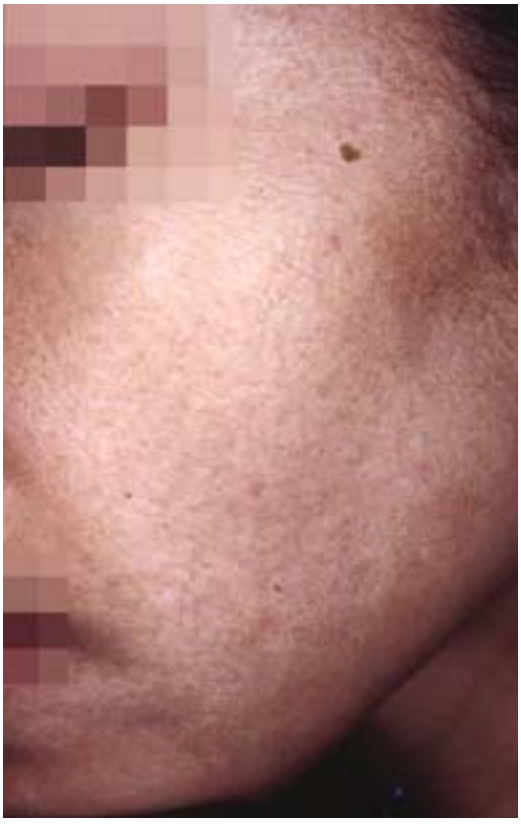


Fig. 13.6. Post-peel persistent hypopigmentation following a 35% TCA peel

13.9 Summary

In contrast to the previous decade, chemical peels are commonly performed in darker racial-ethnic groups, individuals comprising skin types IV–VI (Asians, Hispanics, Blacks, and Native Americans). Serial superficial glycolic acid, salicylic acid, Jessner's solution, and TCA peels (when appropriate) offer substantial benefits for post-inflammatory hyperpigmentation, melasma, acne, pseudofolliculitis barbae, oily skin, and texturally rough skin. When selecting a peeling agent, the benefits of the procedure should always substantially outweigh any associated risks or complications. Superficial peels with appropriate titration of concentrations are generally safe and efficacious for darker-skinned patients. However, given the labile nature of melanocytes of darker complexioned individuals, medium-depth and deep peels are more likely to induce substantial complications and side effects.

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