Efficacious and Safe Cosmetic Procedures in Skin of Color

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The number of cosmetic procedures being performed on persons with skin of color is increasing; therefore, an understanding of the indications and factors affecting the successful use of such procedures in this population is essential. This paper reviews experiences with the most commonly performed procedures including chemical peeling, microdermabrasion, botulinum toxin injections, and dermal fillers. The available evidence suggests that most of the aforementioned are as effective in persons with skin of color as in white individuals and that, provided attention is paid to patient selection and appropriate indications, they can be considered safe in most persons with skin of color.

The use of minimally invasive cosmetic procedures in people with skin of color is increasing.[1] Data from the United States show that the proportion of such procedures performed in ethnic minorities increased from approximately 15% in 2000 to 22% in 2007,[2] and this trend is likely to continue. Indeed, it is anticipated that by the year 2050 people with skin of color will constitute at least 50% of the US population. These individuals already make up the majority of the global population and include Asians, East Indians, Malaysians, Africans, African Americans, Native Americans, and Hispanics. These ethnicities are classified as Fitzpatrick skin types V and VI.

From a historical perspective, many physicians have been reluctant to perform cosmetic surgical procedures in persons with skin of color, partly because such groups have a tendency to develop dyschromias, hypertrophic scars, and keloids following cutaneous injury.[3,4] This concept has changed significantly in the last 10 years. This article will review structural and physiological differences and common cosmetic procedures performed in skin of color including chemical peels, microdermabrasion, botulinum toxin injections, and soft tissue fillers.

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STRUCTURAL AND PHYSIOLOGICAL DIFFERENCES

When considering cosmetic procedures in persons with skin of color, dermatologists should be cognizant of the special structural and physiological differences in the skin of such individuals. These differences can significantly impact cosmetic and surgical outcomes.

Key differences in the structure and function of skin of color are included in Table 1. Deeply pigmented skin has the highest content of epidermal melanin. However, there are no differences in the number of melanocytes between different ethnic groups. Given the increased content of epidermal melanin, the mean UV protective factor for black skin is 13.14 as compared with 3.4 for white skin.[5]

The melanocytes of darker skinned individuals show labile, exaggerated responses to cutaneous surgery. A major consequence of this phenomenon is the high frequency of dyschromias such as postinflammatory hyperpigmentation (PIH) and melasma. In addition, in deeply pigmented skin, fibroblasts are reported to be large and numerous.[6] This is often associated with a thicker dermis in darker skin types.

Current data suggest that there are substantial differences in aging in skin of color as compared with

TABLE 1

Morphologic and Physiologic Differences in Skin of Color

Increased stratum corneum layers
Increased stratum corneum lipids
Increased epidermal melanin
Low epidermal vitamin D production
Nonaggregated melanosomes in keratinocytes
Thick compact dermis
Numerous large fibroblasts
Numerous dilated superficial blood vessels
Variable data transepidermal water loss, capacitance, sebum production, sodium lauryl sulfate irritation

TABLE 2

Advantages and Disadvantages of Skin of Color

Advantages
Enhanced photoprotection
Decreased frequency of skin cancer
Photoaging minimized
Disadvantages
Hyperpigmentation
Hypopigmentation
Hypertrophic scars and keloids
Alopecia

lighter skinned individuals. Common signs of aging in lighter skinned individuals result from photodamage as evidenced by wrinkles, skin laxity, dyschromia, and textural alterations. These changes begin to appear as early as the second and third decade. The photoprotective effects of melanin in skin of color retard the common telltale signs of aging including crow's-feet and periorbital wrinkles. Hence, changes from photoaging are often minimized in darker skin types. Instead, soft tissue and gravitational changes may dominate cutaneous aging.

The major advantage of skin of color is the low incidence of skin cancer and photodamage given the photoprotective effects of melanin. In contrast, the disadvantages include the common incidence of dyschromias, hypertrophic scars, and keloids (Table 2).

Cosmetic surgeons must be cognizant of these differences in order to provide optimal patient care, patient satisfaction, and enhanced quality of life.

INDICATIONS FOR COSMETIC PROCEDURES IN SKIN OF COLOR

All ethnic groups desire to maintain a healthy, youthful appearance of their skin. However, given the inherent differences in the structure and function of the skin of darker versus lighter skin types, indications for cosmetic procedures may vary considerably.

Cosmetic issues of concern for skin of color include disorders of pigmentation, particularly hyperpigmentation; texturally rough skin; acne vulgaris; oily skin; enlarged pores; laxity; hirsutism; pseudofolliculitis barbae; and to a lesser degree, wrinkles.[7,8] Treatment of wrinkles, nasolabial lines, and facial volume loss have increased in popularity in the last 3 to 5 years.

CHEMICAL PEELS

Superficial or medium-depth peeling has an important place in the management of conditions, such as melasma, PIH, photoaging, acne vulgaris, acne scarring, oily skin, textural changes, and wrinkling.[4] Despite the routine use of such procedures, there is a dearth of published data regarding the use of peeling agents in darker skinned (Fitzpatrick skin types IV–VI) individuals. However, our current evidence suggests that, with appropriate attention to patient selection and peeling technique, such procedures offer substantial efficacy and high levels of patient satisfaction in people with skin of color. Examples of peeling agents used in skin of color are shown in Table 3. In general, optimal outcomes are achieved with superficial peels while minimizing complications.

Glycolic Acid Peels

The majority of studies using chemical peels in patients with skin of color have involved the use of glycolic acid peels, alone or in combination with topical preparations.[9-15] Glycolic acid can produce both superficial and deeper peeling, depending on the strength used, with concentrations of 30% to 70% normally used in dermatologic practice. Glycolic acid peels have been shown to be effective in the treatment of acne in skin of color.[9] In a study of 40 Asian patients, treatment with 4 glycolic acid 35% or 50% peels, combined with glycolic acid 15% at-home preparations, resulted in resolution of acne lesions and rejuvenation of skin texture in

TABLE 3

Peeling Agents Used in Skin of Color

Superficial Peels
TCA 10%–30%
Tretinoin
Salicylic acid
Glycolic acid
Jessner solution
Medium-Depth Peels
TCA 35%–40%, Jessner–TCA 35%
Glycolic 70%–TCA 35%
Solid CO_2–TCA 35%, Phenol 88%

Abbreviation: TCA, trichloroacetic acid

all patients.[9] Adverse effects occurred in only 5.6% of patients (Figure 1).

Several studies have investigated the use of glycolic acid peels in the treatment of melasma in people with skin of color.[10-15] In one study, 40 Indian patients (Fitzpatrick skin types III and IV) with moderate to severe melasma were randomized to receive topical therapy with the Kligman formula (hydroquinone [HQ] 5%, tretinoin 0.05%, hydrocortisone acetate 1%), alone or with 6 glycolic acid 30% to 40% peels at 3-week intervals.[12] Efficacy was assessed by means of the Melasma Area and Severity Index (MASI). Both groups showed significant ($P<.001$) reductions in MASI scores at 21 weeks; however, patients receiving glycolic acid peels in addition to topical therapy showed significantly ($P=.01$) greater decreases at both 12 and 21 weeks than those receiving the topical regimen alone. One patient receiving glycolic acid developed PIH, and 2 developed persistent erythema; however, none of these adverse effects warranted discontinuation of therapy. Thus, in this study, glycolic acid peels in addition to topical therapy resulted in greater and faster improvement than topical therapy alone. By contrast, in a study of 21 Hispanic women (Fitzpatrick skin types IV and V) with melasma, combination therapy with glycolic acid 20% to 30% every 2 weeks for 8 weeks, in addition to topical therapy with HQ 4% and sunscreen, did not result in a further improvement in MASI scores as compared with topical therapy alone.[13]

Figure 1. Patient before (A) and after 2 glycolic acid 35% peels (B).

In a further study, 10 Indian patients (Fitzpatrick skin types III–V) with moderate to severe melasma received 12 weekly peels with glycolic acid 70% and tretinoin 1% in an open, left-right comparison.[14] Both treatments produced significant reductions in MASI scores throughout the study, with no significant difference between the two. Adverse events were more common with glycolic acid than with tretinoin peels. One patient developed PIH, which resolved following treatment with hydrocortisone 1%, and 3 patients developed erythema, superficial desquamation, and burning.

Nineteen black patients with PIH were treated with HQ 2% and glycolic acid 10% twice daily and tretinoin 0.05% at bedtime, whereas the active peel group received the same topical regimen plus a series of 6 serial glycolic acid peels. Although not statistically significant, greater improvement was noted in the chemical peel group.[16]

The author has used glycolic acid peels routinely in darker ethnic groups, with minimal complications. To minimize complications, retinoids should be discontinued 1 to 2 weeks prior to peeling. Excessive peeling and exfoliation can result in PIH.

Tretinoin Peels

Several studies have assessed the efficacy of tretinoin peels for improvement of fine lines, wrinkles, sallowness, and the dyschromia of photoaging. In one study, 15 patients were treated twice weekly with concentrations ranging from 1% to 5%. The authors reported improvement in skin texture and overall appearance.[17]

Tretinoin peels were compared with glycolic acid peels in a split-face study in 10 Indian women with moderate to severe melasma. Tretinoin was as effective as glycolic acid and less irritating in treating melasma. This was consistent with the results of an uncontrolled trial involving 15 women with Fitzpatrick skin types I to IV, who received 5 sessions of tretinoin 1% to 5% peeling at 2- to 3-day intervals.[17]

Salicylic Acid Peels

Salicylic acid is one of the oldest chemical peels, its use having first been described by the German

dermatologist Paul Gerson Unna in 1882.[18] The efficacy and safety of this agent in patients with skin of color was evaluated by Grimes[4] in a study involving 25 patients with Fitzpatrick skin types V and VI. Nine patients had acne, 5 had PIH, 6 had melasma, and 5 had rough, oily skin with enlarged pores. All patients were treated with HQ 4% for 2 weeks before undergoing a series of 5 salicylic acid peels 20% or 30% at 2-week intervals. Efficacy was assessed with biweekly photographs. Moderate to significant improvement occurred in 22 patients (88%), and the remainder showed mild improvement. All patients with PIH, and 66% of those with melasma, showed moderate or significant improvement. Mild adverse events occurred in 4 patients (16%). One patient experienced temporary crusting and hyperpigmentation, and 3 had transient dryness and hyperpigmentation, all of which resolved within 14 days. The low incidence and transient nature of hyperpigmentation in this study was attributed to the use of HQ pretreatment (Figure 2).

Twenty-five Korean patients with facial acne were treated with biweekly salicylic acid 30% peels for 12 weeks. Both inflammatory and noninflammatory lesions were significantly improved. In general, the peel was well tolerated with few side effects.[19]

Jessner Solution

Jessner solution is an ethanolic solution of resorcinol, salicylic acid, and lactic acid. The efficacy of this agent has been shown to be comparable with glycolic acid 70% in a study involving 16 melasma patients, 9 of whom were Fitzpatrick skin types IV to VI.[11] However, the resorcinol component may cause depigmentation in individuals with Fitzpatrick skin types V or VI.[20]

Figure Not Available Online

Figure 2. Patient with acne and postinflammatory hyperpigmentation before (A) and after a series of 5 salicylic acid peels (B).

Lactic Acid Peels

Preparations of lactic acid alone also have been used as chemical peels. In one study, 30 patients with melasma, 29 of whom had Fitzpatrick skin types IV and V, were treated with lactic acid 92% on one side of the face and Jessner solution on the other side every 3 weeks until the desired result was achieved.[21] All patients showed significant improvements as judged by MASI scores with both treatments. No adverse effects were observed during 6 months' follow-up.

Trichloroacetic Acid Peels

Trichloroacetic acid (TCA) peels produce superficial peeling at concentrations of 10% to 35%,[22] which is usually sufficient in skin of color. Higher concentrations (35%–50%) produce medium-depth peeling, but such concentrations are associated with an increased risk for PIH and scarring in individuals with Fitzpatrick skin types IV to VI.[20,23]

The efficacy and tolerability of 35% TCA peels in dark skinned individuals was assessed in a study involving 15 patients with acne who received up to 3 peels with Jessner solution followed by TCA.[24] All except one patient showed some degree of improvement. However, transient PIH occurred in 9 patients (60%), and was preceded by erythema of more than 1 month's duration in 2 patients. All patients were free from hyperpigmentation 3 months after treatment.

In an attempt to reduce the risk for complications resulting from high-strength TCA peels, Chun et al[25] have evaluated a focal application technique in which the peel is applied only to the affected area. Their study involved 106 patients with Fitzpatrick skin types IV and V and benign hyperpigmented lesions. Patients with seborrheic keratoses received TCA 65%, those with solar lentigines or freckles received TCA 50% to 65%, and those with melasma received TCA 10% to 50%. The proportion of patients showing a good response to treatment ranged from 55% in patients with melasma to 86% in those with solar lentigines, and these response rates were associated with high degrees of patient satisfaction, ranging from 70% to 91%, respectively. There were no significant complications in this group of patients. Only 2 patients (1.8%) experienced transient PIH and this resolved within 4 weeks with local HQ treatment.

A further study has evaluated the use of TCA 10% to 30% peels following priming with either HQ 2% or tretinoin 0.025% in 50 patients with melasma, 92% of whom were Fitzpatrick skin types IV and V.[26] Fair or good responses were achieved in 76% to 80% of patients in both groups. Erythema occurred in 40% of HQ-treated patients and 48% of tretinoin-treated patients. In

addition, 8% of patients receiving tretinoin experienced PIH, whereas patients treated with HQ did not develop this complication.

In the author's experience, TCA peels in concentrations of 15% and higher should be used with extreme care and caution in darker skin types due to the increased likelihood of developing PIH.

MICRODERMABRASION

Microdermabrasion is a superficial skin resurfacing procedure in which the stratum corneum is partially or completely removed by light abrasion to correct or improve skin imperfections. The technique involves the use of aluminum oxide crystals or other abrasive substances that are deposited onto the face under pressure, with the resulting debris removed by suction.[27] Methods of microdermabrasion include mechanical abrasion from jets of aluminum oxide or zinc oxide crystals and other fine organic particles or wands with a roughened surface. Some newer machines include more than one method. Aluminum oxide is the most commonly used abrasive in microdermabrasion. It is a relatively chemically inert abrasive that typically does not cause allergic skin reactions, such as eczema or itching. Other crystals can also be used for microdermabrasion and these include sodium chloride, sodium bicarbonate, and magnesium oxide crystals.[28] Generally, these alternative particles are not as abrasive as aluminum oxide. Instead of crystals, some newer techniques use diamond-tipped devices that abrade the skin. Indications for this procedure include acne, acne scars, hyperpigmentation, striae, photodamage, and texturally rough skin (Figure 3).

Despite the popularity of microdermabrasion, there is indeed a dearth of well-designed studies documenting the short- and long-term efficacy of microdermabrasion.

Figure Not Available Online

Figure 3. Patient with melasma before (A) and after a series of 4 microdermabrasion treatments (B).

In general, trials with this technique have involved small numbers of patients and used diverse treatment protocols.[29] There are few studies with microdermabrasion used specifically in patients with skin of color. In an early study, 41 Asian patients underwent an average of 9 microdermabrasion sessions for the treatment of scarring.[30] Good or excellent results were obtained in all patients, and no cases of severe PIH were observed. More recently, Hexsel et al[31] studied 6 Brazilian patients (Fitzpatrick skin types II and III) who underwent 3 retinoid acid 5% peels, alone or following microdermabrasion, for photoaging. Pretreatment and posttreatment photographs revealed that both treatments produced improvements in skin appearance, pigmentation, and texture, and patients who underwent microdermabrasion before peeling reported higher levels of satisfaction with their treatment than those who underwent chemical peeling alone. However, the combined treatment was associated with a mild burning sensation after application of the peel.

Microdermabrasion is a relatively painless and safe procedure. The patient perceives immediate improvement in tone, skin texture, and pigmentation. It is extremely well tolerated in all skin types including individuals with Fitzpatrick skin types V and VI. Albeit well tolerated in most patients, complications can occur. The most common complications include mild erythema, exfoliation, and PIH. Streaking, petechiae, and purpura have been reported with aggressive microdermabrasion.

BOTULINUM TOXIN

Injection of botulinum neurotoxin type A (BoNTA) is the most common cosmetic procedure performed in the United States, with over 3 million patients receiving treatments in 2007.[2] The increasing use of BoNTA has been accompanied by an increased use of other treatments, such as dermal fillers. Together, BoNTA and hyaluronic acid (HA) fillers account for approximately 54% of nonsurgical aesthetic procedures in the United States.[32]

Treatment with BoNTA has been shown to be effective for dynamic wrinkles, regardless of a patient's age, gender, or ethnicity. However, patients with darker skin have facial features that impact the use of BoNTA. Dark skinned patients tend to have fewer facial wrinkles than fair skinned patients of the same age, and dynamic wrinkles in these individuals are predominantly found in the upper face.[33] Conversely, perioral injections of BoNTA are rarely needed in dark skinned individuals because wrinkling in this area is uncommon and usually occurs late in life.[33]

Injections with BoNTA are effective and well tolerated in persons with skin of color,[34] and there appear to be no significant differences in the response to BoNTA

injections in people with skin of color as compared with other groups. A recent study assessed the degree and duration of efficacy of 20 U and 30 U of BoNTA for the treatment of glabellar lines in African American women with Fitzpatrick skin types V and VI. Women aged 18 to 65 years with a glabellar rhytide score greater than or equal to 2 at maximum frown on an investigator-rated, 4-point facial wrinkle scale (0=none, 3=severe) were eligible for this study. Patients were randomly assigned to receive either a total of 20 U or 30 U of BoNTA in the glabellar region. Evaluations were conducted at baseline and days 30, 60, 90, and 120 postinjection. The percentage of responders at maximum frown did not differ significantly between the 2 groups. Although not statistically significant, the effect lasted somewhat longer in the subjects receiving the 30 U dose. Adverse events were mild, transient, and did not differ between the groups. These results further suggest that doses of 20 U and 30 U of BoNTA demonstrate efficacy and safety in African American women with Fitzpatrick skin types V and VI.

DERMAL FILLERS

The popularity of injectable fillers in people with skin of color is increasing substantially in cosmetic practices in the United States and globally. The most frequently used products include HA products, calcium hydroxylapatite, collagen, poly-L-lactic acid, and autologous fat. Patients with darker skin, particularly African Americans, tend to manifest aging in the deeper muscular layers of the face. This is characterized by medial movement of the malar fat pads, nasolabial and melomental lines, laxity, and gravitational effects in the midface and lower face.

Given these features, key indications for injectable filling agents include nasolabial lines, jowls and sagging cheeks, marionette lines, perioral rhytides, and glabellar lines. Many African American women have naturally voluminous lips. Hence, they opt for lip augmentation substantially less often as compared with white women.

Injection techniques include linear threading, serial puncture, fanning, and cross-hatching. Since darker skin has a propensity to develop PIH, the treating physician should attempt to minimize the number of injections necessary to achieve optimal correction.

Grimes and Few[35] assessed the efficacy and safety of a variety of filling substances for correction of nasolabial folds and marionette lines in 65 African Americans. Their mean age was 52 years; 61 were female and 5 were male. Injected fillers included bovine collagen (25), HA (20), human collagen (15), and avian HA (5). Of the subjects, 60% achieved excellent correction and 40% had moderate correction. Four patients experienced PIH at the injection site, which resolved with topical steroids and HQ 4%. None experienced hypertrophic scars or keloids at the injection site. Preliminary data from the Vitiligo and Pigmentation Institute of Southern California in African Americans show persistence of HA fillers beyond one year in many patients.

A multicenter, double-blind randomized trial evaluated the efficacy and safety of the HA-based family of products as compared with bovine collagen in white and nonwhite subjects. A total of 420 patients completed the 24-week, split-face study. Of that group, 26% were nonwhite including 11% African American; 12% Hispanic; 2% Asian; and 1% other. One of 3 HA fillers was injected in one fold, and bovine collagen was injected in the opposite fold. Compared with bovine collagen, the HA products resulted in significantly longer-lasting results. At 24 weeks, all of the HA fillers had nasolabial scores of mild, which was significantly less than bovine collagen. Efficacy was similar in white and nonwhite individuals. Safety and tolerability was assessed in detail for both groups. No patients experienced hypertrophic scars or keloids. In addition, the nonwhite subjects did not show a higher incidence of PIH.[35,36]

An open-label, randomized study assessed the efficacy and safety of 3 low-concentration HA fillers in 160 patients for correction of nasolabial folds. These products provided clinically significant wrinkle correction through 24 weeks. There were no cases of keloids or hypertrophic scars. Three patients developed mild PIH.

In another study, 150 subjects with Fitzpatrick skin types V and VI were treated with HA. Fifteen percent of the patients developed mild to moderate pigmentation changes that resolved within 12 weeks and there were no keloidal scars.[37]

Data from the Vitiligo and Pigmentation Institute of Southern California suggest that fillers are efficacious in people with skin of color, with minimal complications except occasional PIH at the injection site (Figure 4). This complication usually clears spontaneously; however, it is also amenable to treatment with HQ bleaching agents.

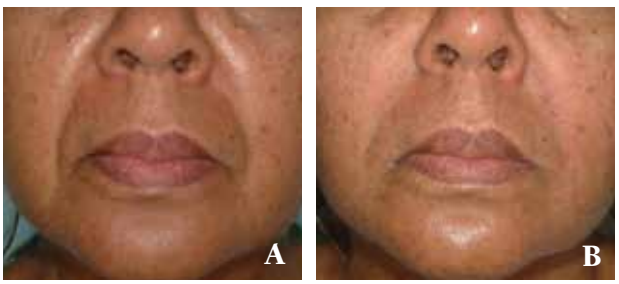

Figure 4. Patient before (A) and after nasolabial correction with 2 syringes of calcium hydroxylapatite (B).

CONCLUSION

As the number of cosmetic procedures performed in persons with skin of color increases, so does the importance of a thorough understanding of the indications for, and potential risks associated with, such procedures. Current evidence shows that procedures such as chemical peels, microdermabrasion, BoNTA injections, and dermal fillers are as effective in persons with skin of color as in lighter skinned patients. Moreover, provided attention is paid to appropriate indication and patient selection, these procedures can be considered safe in persons with skin of color.

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