

Photoaging in Skin of Color

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Cutaneous aging is a multifactorial process that encompasses both intrinsic and extrinsic factors in all skin types. Many patients, regardless of their nationality, location, or race, experience the desire to age gracefully; however, the clinical features of skin aging differ by race and ethnicity, and therefore cosmetic concerns among these groups also tend to vary.

Biologic Differences

Although all races and ethnicities are susceptible to photoaging,¹ the increased epidermal melanin in Fitzpatrick skin types IV to VI provides a natural photoprotective effect, leading to photoaging that is delayed or less pronounced in this population. The average minimal erythema dose in darkly pigmented skin is reported to be 15 to 33 times greater than white skin with variation depending on skin tone.^{2,3} The melanin pigment in black skin acts as a neutral density filter that reduces all wavelengths of light equally. In a 1979 study, Kaidbey et al⁴ used cadaver skin to compare the transmission of UV radiation in black and white skin. A mean protective factor against UVB rays of 13.4 was observed in black skin versus 3.4 in white skin, and a mean rate of UVB transmission into the dermis of 5.7% was evaluated in black skin versus 29.4% in white skin.⁴ In a more recent study, the incidence of UV-induced apoptosis was shown to be greater in darker skin than lighter skin, which suggests that photodamaged cells can be removed more efficiently in darkly pigmented skin.⁵ Montagna and Carlisle⁶ compared punch biopsies from the malar eminences of black women to white women and found a greater amount of solar elastosis in white skin. Del Bino et al⁷ conducted a study assessing the relationship between skin color and response to UV exposure using 42 ex vivo skin samples classified from light to dark that were analyzed based on colorimetric

parameters and individual typology angle (ITA) values. A biologically efficient dose was determined for each sample by quantifying sunburn cells after exposure to increasing doses of solar-simulated UV radiation. Biologic markers that were UV induced such as DNA damage, apoptosis, and p53 accumulation also were analyzed. A statistically significant correlation was reported between ITA and the biologically efficient dose as well as between ITA and DNA damage ($P < .001$ for both). In light, intermediate, and tanned skin samples, the DNA lesions were distributed throughout the epidermis and the uppermost dermal cells; in brown and dark skin samples, the DNA lesions were confined to the suprabasal epidermal layers. These results indicated a progressive decrease in sensitivity to UV exposure with increasing pigmentation. This susceptibility was thought to be predictive of individual proneness to develop damaging effects of chronic sun exposure, photoaging, and skin cancer, in which pigmentation can have a natural protective role.⁷

Racial/Ethnic Differences in Photoaging

Common features of photoaging in skin of color include fine wrinkles, pigmentary alterations, skin laxity, and textural changes. Rawlings⁸ reviewed the effects of photoaging due to sun exposure and reported that although all participants were prone to the process of photoaging regardless of race, white individuals experienced earlier onset as well as more prominent wrinkles and skin laxity than other skin types. Darker phototypes tend to have more associated mottled hyperpigmentation and uneven skin tones.⁸ As a result of minimized photoaging, signs of intrinsic aging, such as volume loss, can become highlighted.

Photoaging in African American and Hispanic Skin

Published studies on photoaging in blacks have been limited to African Americans. In this group, photoaging primarily appears in lighter phototypes and may not appear until late in the fifth or sixth decades of life.⁹ Histologic preservation of epidermal and dermal components has been demonstrated in sun-exposed African Americans in contrast to sun-exposed white skin.¹⁰ Features of photoaging in African Americans can include fine

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wrinkles, mottled pigmentation, and formation of dermatosis papulosa nigra (DPN). African Americans also demonstrate signs of laxity with aging, which is mainly situated in the deeper muscular layers of the face with sagging of malar fat pads toward the nasolabial folds.¹¹ Grimes et al¹² also reported that hyperpigmentation and uneven skin tone are a greater concern in black skin compared to white skin.

Hispanics/Latinos represent the largest ethnic group in the United States, which is continuing to grow.¹³ Sanchez¹⁴ published a study showing that photoaging was the third most common dermatologic diagnosis in 1000 Hispanic dermatology patients, accounting for 16.8% of visits. Facial wrinkling in lighter-skinned Hispanics typically occurs at the same age as white individuals. In one study, investigators in Central America evaluated the treatment of photoaging effects in Hispanics, primarily focusing on improvement in fine wrinkles, dilated pores, and thickened and oily skin as end points for successful photorejuvenation.¹⁵ The Hispanic/Latino population encompasses the full range of skin phototypes, with lighter-pigmented Hispanics exhibiting photoaging signs similar to white individuals and darker-skinned Hispanics showing photoaging signs similar to African Americans and other populations of African descent.¹⁶

Photoaging in Asian Skin

In the Asian population, much attention is directed toward the effects, prevention, and treatment of photoaging; therefore, much of the research on photoaging in patients with skin of color has involved patients of Asian descent. Characteristic features of photoaging in the Asian population have been well described. The effects are attributed not only to inherent genetic differences but also cultural practices; however, many features of photoaging in Asian skin can be seen in similar phototypes. The clinical features of photoaging in east and southeast Asians are largely isolated pigmentary changes. In the photoaged skin of Asians, pigmentary changes dominate over acquired rhytides. These changes include actinic lentigines, pigmented seborrheic keratoses, and mottled hyperpigmentation. Facial melasma induced by solar UV exposure is more common in this group than whites. It should be considered a form of actinic dyspigmentation and therefore a contributor to photoaging.¹⁷

Differences in the clinical manifestations of photoaging may be augmented by different cultural habits related to sun exposure as well as the biologic defenses of the skin. Korean, Japanese, and Chinese subpopulations traditionally avoid direct sunlight by wearing long-sleeved clothing, carrying umbrellas, or seeking shade.

The increased melanin, thicker stratum corneum, and presence of epidermal proteins such as urocanic acid create a darker phototype in Asian skin, which also provides natural photoaging protection.¹⁸ The primary difference between white and Asian skin can be attributed to melanocytic function. Because Asian skin is more highly pigmented, its acute and chronic cutaneous responses to UV irradiation differ from white skin. In individuals from Singapore, Indonesia, or Malaysia, changes in pigmentation seem to be a more important feature in prematurely aged skin rather than wrinkling. Skin wrinkling in these populations is not readily apparent until approximately 50 years of age, and the degree of wrinkling is not as marked as white skin.¹⁹ Chung²⁰ developed a 7-grade photographic scale to assess rhytides related to photoaging in Korean skin, paralleling the efforts of Griffiths et al²¹ and Larnier et al²² who developed photographic scales to evaluate the characteristic features of photoaging in white females. Chung²⁰ suggested that this scale also could be applied to Japanese and Chinese populations. These systems are important epidemiologic assays to correctly standardize evaluations of potential treatments in clinical studies. Compared to the white population, Chung²⁰ documented that Asians have coarser, thicker, and deeper rhytides, concentrated on the forehead as well as the periocular and perioral areas. A genetics-based hypothesis involving wrinkle-associated genes or single-nucleotide polymorphism in certain genes, such as collagen, elastin, or matrix metalloproteinase genes, have been proposed for these differences,²⁰ but no scientific evidence has been established to date.

Smoking

Smoking has been associated with premature photoaging and rhytide formation predominantly in white skin and less often in skin of color.²³ Overall, pronounced facial wrinkling is remarkably more common in smokers than nonsmokers. Kadunce et al²⁴ found that white individuals who smoked 450 pack-years were 2.3 to 4.7 times more likely to develop facial wrinkles than nonsmokers. The effects of smoking and sun exposure on wrinkling in white skin also were found to be synergistic.²⁴ Chung et al¹⁷ studied the effects of smoking in the darker brown phototypes of Korean skin and found that the odds ratio of wrinkling associated with 30 and 50 pack-years was 2.8 and 5.5, respectively, after controlling for age, gender, and sun exposure. The combined effects of sun exposure and smoking were synergistic and presented a risk for wrinkling that increased 11-fold compared to nonsmokers in a less sun-exposed group.¹⁷ Yin et al²⁵ reported a 22-fold increase in more severe skin wrinkling in

Japanese participants who smoked 430 pack-years and were exposed to the sun for more than 2 hours per day compared to those who never smoked and had lower sun exposure levels (approximately 2 hours/day) at the same age. These studies implicate cigarette smoking as an independent risk factor for the development of rhytides in Asians, which acts synergistically with the effects of aging and sun exposure in this population. These studies have not been performed in other populations of skin of color, such as Hispanics and Latinos, but would be of interest.

Pigmentary Changes

Mottled pigmentation and pigmented lesions on sun-exposed skin are common responses to chronic UV exposure in the skin of color population. In Koreans, patterns of pigmentary change have been shown to be dependent on gender.²⁶ For instance, the appearance of lentiginos increases with age and is more common in women, whereas the incidence of seborrheic keratosis also increases with age but is more common in men. For Korean skin, Chung²⁰ reported that the number of melanocytes in sun-exposed facial skin is greater than the unexposed skin of the buttocks. In Koreans, the number of melanocytes decreases with age in sun-protected skin of the buttocks, which is similar to white individuals.²⁷ Gilchrist et al²⁸ found that the density of dopa-positive melanocytes was roughly 2 times higher in the sun-exposed skin of white individuals than unexposed skin in whites at all ages. In Koreans, dopa activity and the number of melanocytes in photoaged facial skin was found to be higher with age.²⁰ Melanin pigment was shown to decrease with age on the unexposed skin of the buttocks and localize in the basal cell layer. In sun-exposed skin, the presence of melanin pigment increased with age and extended to the upper spinous layer beyond the basal cell layer.²⁸

Melasma

Although melasma is not always associated with photoaging, it can be an indicator of chronic UV damage in the skin of color population, such as Latinos and Asians. Melasma is characterized by irregular, brown, hyperpigmented patches that are typically located on the forehead, cheeks, nose, chin, and upper lip. It is more commonly seen in women and patients with darker skin tones, particularly those of African American, Hispanic, and Asian descent. Melasma is a result of the excess deposition of melanin in the skin and can be classified into 3 types—epidermal, dermal, and mixed—corresponding to whether the increased pigment is localized to the epidermis, dermis, or a combination of both. A fourth type of melasma

has been described in individuals with Fitzpatrick skin type VI and is defined as indeterminate melasma.²⁹ The most inciting and promoting factor in melasma is proposed to be UV exposure. The condition is more common in patients with darker skin types living in areas of intense radiation.³⁰ Melanocytes in skin affected with melasma have been shown to be highly dendritic, exhibit rapid increase in DNA synthesis with sun exposure, and multiply rapidly. Sun exposure was the most frequently reported triggering or aggravating factor in a study of 197 Tunisian patients with melasma.³¹

Facial Seborrheic Keratoses and DPN

Flat seborrheic keratoses are common indicators of photoaging in Asian skin. Kwon et al³² studied the frequency of seborrheic keratoses in relation to age and level of sun exposure in Korean males (N=303). The mean overall prevalence of seborrheic keratosis in all participants (age range, 40–70 years) was 88.1%. The study showed an age-associated increase in incidence, as the mean overall prevalence rose from 78.9% at 40 years of age to 93.9% at 50 years of age and then again to 98.7% in participants 60 years or older. The overall prevalence of seborrheic keratoses on exposed areas of the skin, such as the face, neck, and dorsal hands, was 80.5%, whereas the prevalence in partly exposed areas was 60.4%. There also was a statistically significant increase in the prevalence of seborrheic keratoses in exposed areas by decade ($P<.01$). This study found that exposure to sunlight for 6 hours or more per day over the course of a lifetime was associated with a 2.28-fold increased risk for seborrheic keratoses compared to those with exposure of 3 hours or less.³²

Dermatosis papulosa nigra is a common manifestation of facial skin aging in individuals with black skin. Lesions are brown, 1- to 3-mm, keratotic papules that are either flat or pedunculated and are a common cosmetic concern in this population. Although the pathogenesis for the formation of DPN is not completely understood, Niang et al³³ proposed that UV irradiation is a potential pathogenic factor, as the lesions were limited to sun-exposed areas in the African population of Senegal.

Summary

Aging is universal and the desire to halt the aging process spans all races and ethnicities. Although darker skin types naturally have increased protection against UV radiation, they are still susceptible to photoaging and variations in clinical manifestations can be observed in different races, ethnicities, and phototypes. An understanding of racial/ethnic variations in photoaging can aid dermatologists in addressing common cosmetic concerns across a wide

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spectrum of skin types. As in light-skinned phototypes, sun protection and sun avoidance practices are important measures in preventing the deleterious effects of UV radiation in darker skin phototypes and should be included in the management of cutaneous aging concerns in this patient population.

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