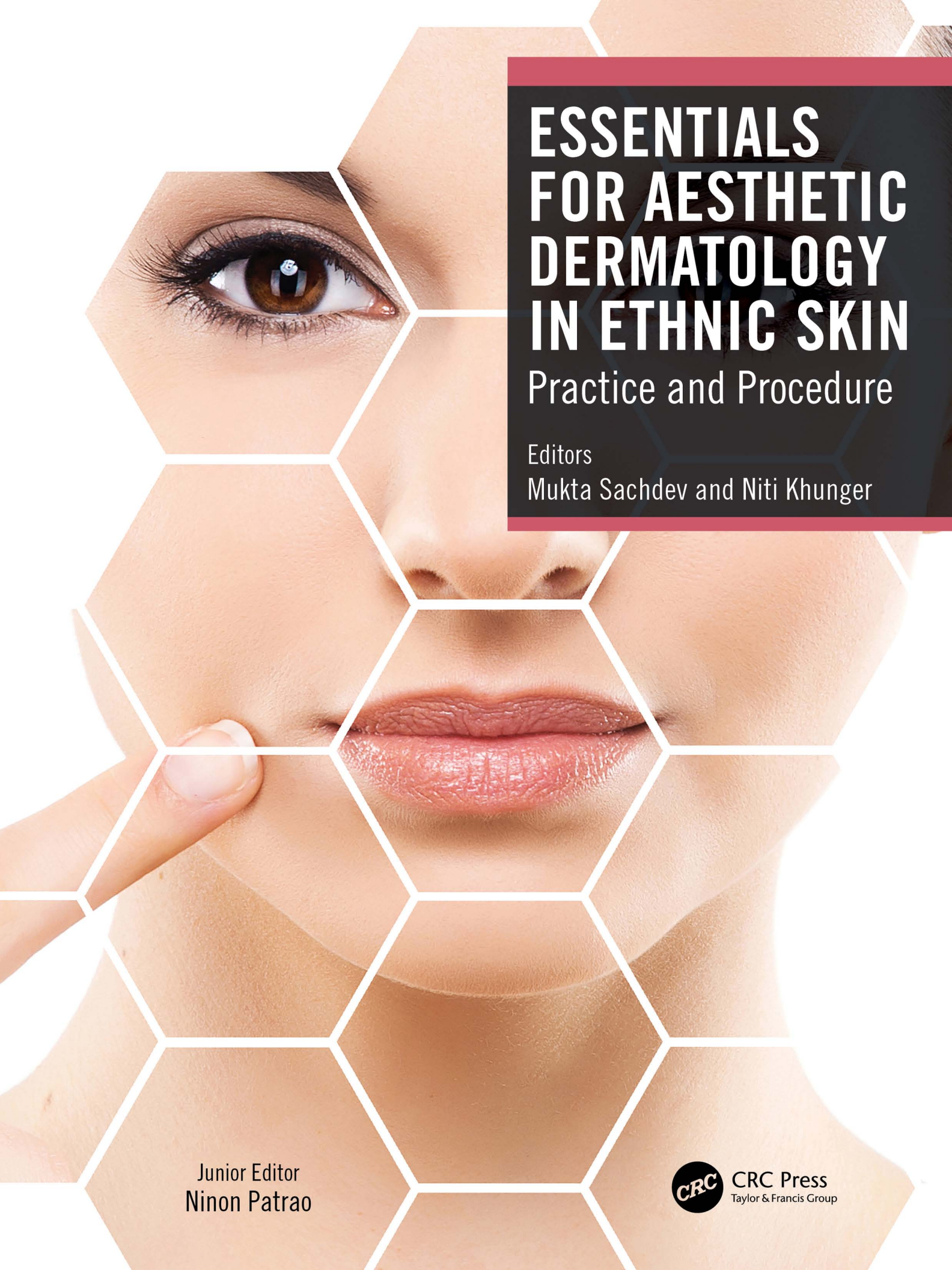

ESSENTIALS FOR AESTHETIC DERMATOLOGY IN ETHNIC SKIN

Practice and Procedure

Editors
Mukta Sachdev and Niti Khunger

Junior Editor
Ninon Patrao

CRC Press
Taylor & Francis Group

Essentials for Aesthetic Dermatology in Ethnic Skin

This book focuses on creating awareness and detailing the nuances of aesthetic dermatology practice in skin of color. It highlights practical considerations in pre-/intra-/post-procedure care with an emphasis on patient selection for aesthetic procedures and the associated challenges involved in real-time practice. It aims to cater to audiences of countries with both high and low populations of dark-skinned patients, as clinicians often have limited experience in treating this group. Numerous topics are explored through case-based discussions and practical tips. This is a practical ready reference manual for a cosmetic dermatologist dealing with darker skin.

Key Features

- Covers the geo-ethnic skin types of Asians, Southeast Asians, Africans, and Hispanics
- Explores the topics through case-based discussions
- Provides comprehensive details about the use of machines on skin of color

Essentials for Aesthetic Dermatology in Ethnic Skin

Practice and Procedure

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I wish to dedicate this book to Dev and Dr. Rani Bhardwaj, my wonderful parents who left us during the pandemic—my source of love, support, and constant inspiration.

My big thank you always to my husband, Rohit, and my lovely boy, Aahan, who support my choices and endeavors with the greatest of enthusiasm, which allows me to constantly grow and aspire to new heights. Thank you always.

Mukta Sachdev

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PART V: PROCEDURES

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I would like to dedicate this to my late parents, both of whom I lost during the pandemic and whose support and encouragement have been my inspiration to achieve and continue to learn.

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Part I
Fundamentals in Understanding Ethnic Skin/Skin of Color

CHAPTER 1: INTRODUCTION

Mukta Sachdev and Niti Khunger

The diversity that we see in the skin landscape today is immense. More than 75% of the global population is people with skin of color. The varying racial, cultural, and ethnic skin backgrounds and the amalgamation and intermixing of individuals across borders have given rise to a diverse milieu of skin types. The field of cosmetic and aesthetic dermatology has expanded considerably over the past decade with the advent of numerous invasive and noninvasive cosmetic procedures. All this has contributed to certain challenges when treating this subset of patients. The aim of our book is to understand pigmented skin and treat it effectively and correctly. Although there is an overlap in the approach for any dermatology patient, irrespective of skin type, emphasis is laid on treating a patient with skin of color. Global experts have shared their valuable clinical expertise, with pearls and pointers to achieve a desirable outcome for both patient and physician.

We hope you enjoy reading!

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CHAPTER 2: ANATOMY

Skin, Hair, Nails

Ninon Patrao

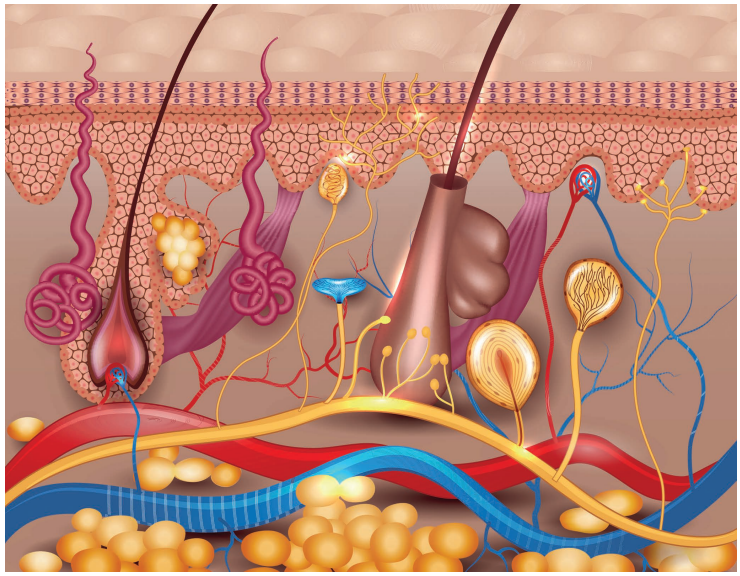

FIGURE 2.1 Human skin.

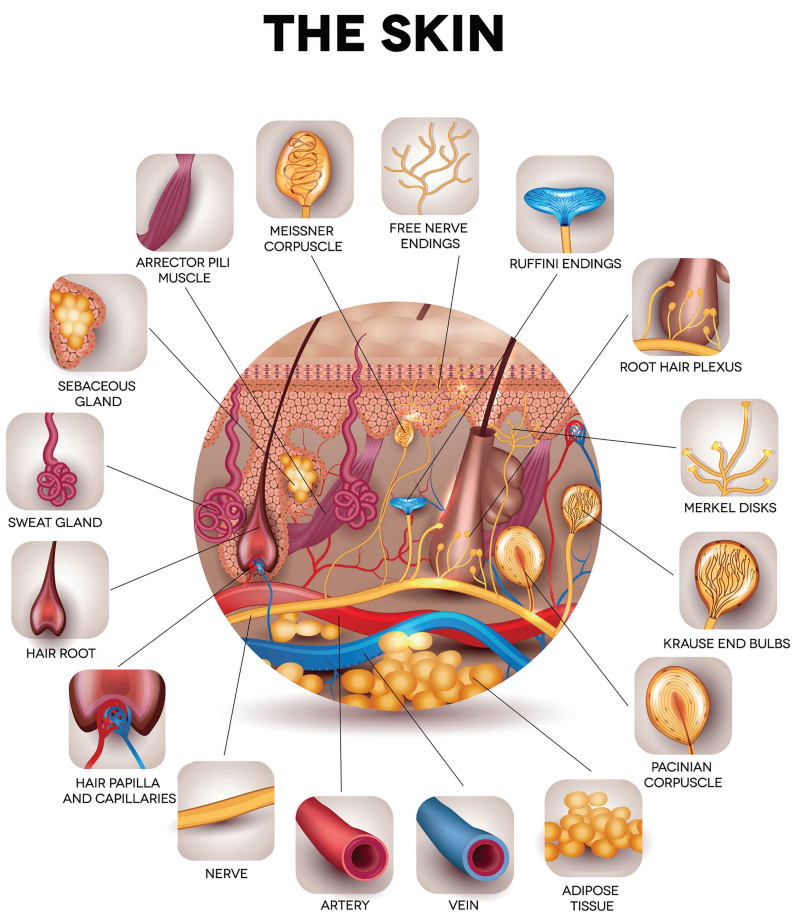

FIGURE 2.2 Structure of the skin.

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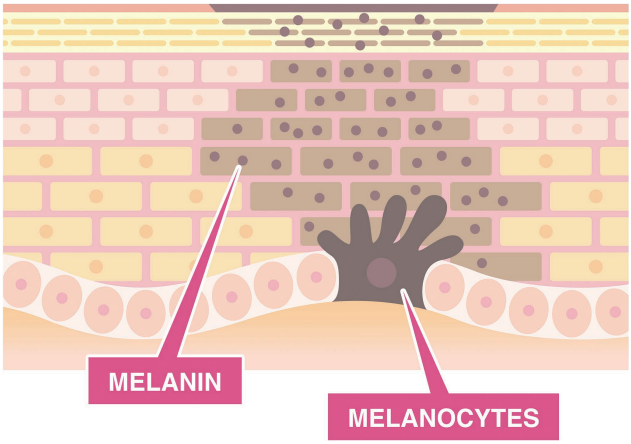

FIGURE 2.3 Melanin and melanocyte.

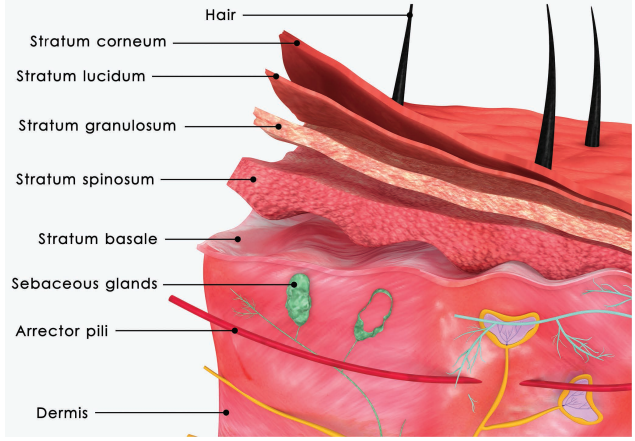

FIGURE 2.4 Layers of the skin.

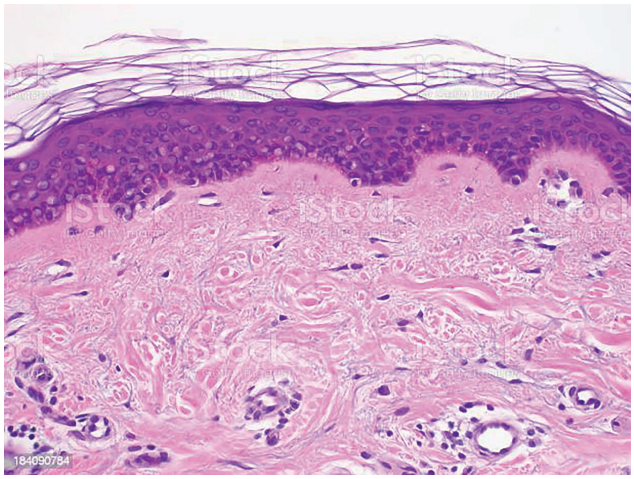

FIGURE 2.5 Histology of the skin.

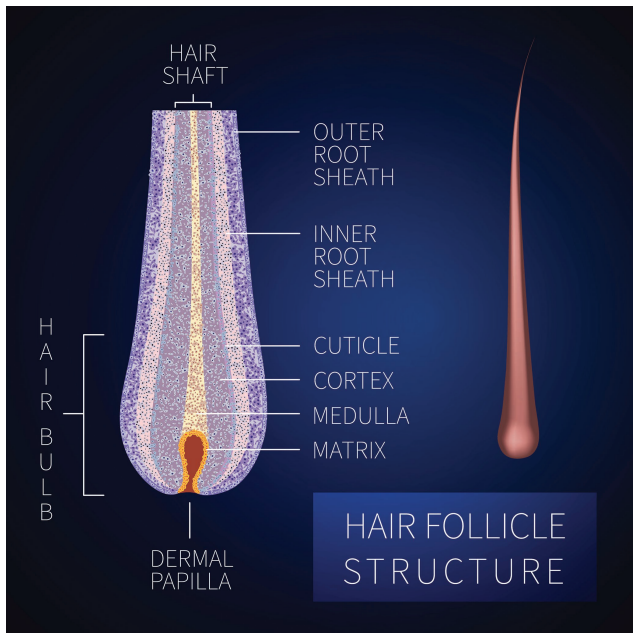

FIGURE 2.6 Structure of the hair follicle.

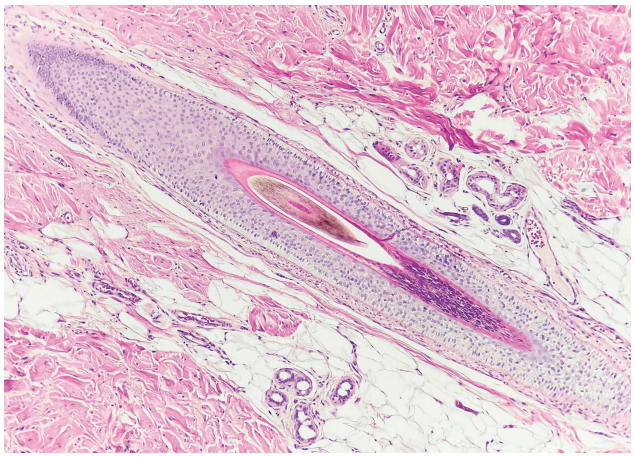

FIGURE 2.7 Histology of the hair follicle.

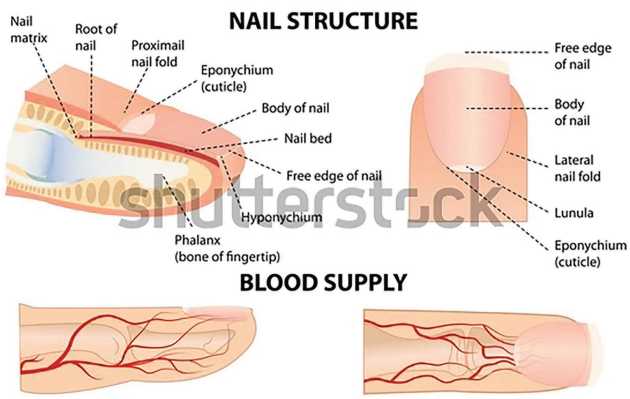

FIGURE 2.8 Structure of the nail.

CHAPTER 3: FACTORS AFFECTING SKIN INTEGRITY

Ninon Patrao

3.1 Introduction

Our skin, as we know, is the largest organ of the body, weighing approximately 8 pounds and comprising a huge surface area of approximately 2 m^2.

It forms an integral interface between the body and its environment, and thus, factors, both internal and external, play a very important role in skin health. Apart from being an organ that has various important functions, its sensitivity and visibility are two crucial aspects that play a significant role in the mind of a patient seeking treatment.

Although there is an interplay of many factors that affect the skin, we have touched upon a few relevant aspects as part of this chapter.

3.2 Microbiome

The skin ecosystem is intricate and complex, and essentially, the biodiversity of the skin microbiome depends both on the local topographic environment, as well that of the macrobiome—that is, one's surroundings and one's interaction with them.[1]

Various skin microorganisms exist as commensals on the skin, but they can sometimes turn pathogenic, depending on an individual's immune status, microbial imbalance, and genetic susceptibility. Certain microenvironments have their distinct microbial communities.

Some of those include sebaceous areas where *Propionibacterium* and *Staphylococcus* species predominate and moist areas where *Corynebacterium* and *Malassezia* species are present.[2]

Apart from these site-specific interactions, one must also recognize the importance of age-related differences, nutrition, medications, household and cosmetic products, ambient temperature, air quality, ventilation, occupation, co-occupancy, domestic pets, and device surfaces, all of which and many more factors have an influence on the colonizing microbiota, and thus the microbial-immune interactions in the skin, which are vital to maintaining healthy tissue homeostasis.

3.3 Endocrine

The human skin has been a target for several hormones, the effects of which have been meticulously described over the years as also their production in the skin and their role in the development and physiological function of skin tissues. Hair follicles and sebaceous glands, for example, are the targets for androgen steroids secreted by the gonads and the adrenal cortex. The circulating androgens dehydroepiandrosterone (DHEA) and androstenedione are converted in the skin through different pathways to testosterone or androstenedione and further into more potent androgen 5α-dihydrotestosterone (5α-DHT).[3]

The ability of the skin to produce hormones and similar substances, along with their ability to metabolize them and synthesize derivatives with systemic activity, have paved the way for the understanding of dermato-endocrinological homeostasis and their pharmacological and therapeutic function. Vitamin D analogs, retinoids, and corticosteroids are a few noteworthy examples of having been used to that effect.

3.4 Climate

3.4.1 Sunlight and Humidity

Exposure to ultraviolet radiation (UV) is associated with both health benefits and risks. On the one hand, it aids in the natural synthesis of vitamin D and endorphins in the skin, and on the other, it is termed as a mutagen with both tumor initiator and promoter properties, in addition to its being a risk factor for other skin disorders such as pigmentary changes. The genetic predisposition of an individual also mediates the sensitivity, color, and malignancy risk, and hence, the effects are multifold and complex.[4]

Extremes in humidity similarly present their own set of troubles, with high humidity being associated with heat rashes and acne eruptions and low humidity leading to a decreased barrier function and thereby making the skin increasingly susceptible to irritants and allergens.[5]

3.4.2 Cold and Dry

The stratum corneum (SC), with its functioning of corneocytes, lipids, natural moisturizing factor, and desquamation, provides important physical blockade against external factors, and its integrity remains very crucial to overall skin health.

The water from the deeper epidermal layers ascends to hydrate the SC and eventually evaporates. It is this loss of epidermal water content that contributes to skin dryness.[6]

The winter weather and dry climatic conditions, along with frequent bathing, add to its severity by sapping moisture.

It is important to keep in mind that the physiological properties of skin vary between races, and even if exposed to a similar external environment, dry skin can be distressing.

Although few studies are being carried out lately to assess the variations in quantifiable parameters across different skin types, such as trans epidermal water loss, water content, ceramide levels, and skin reactivity, an interesting observation among them has been a higher value of these parameters in the Asian skin as opposed to the others.[7] However, more large-scale studies are needed to delve deeper, and efforts are being made to understand these structural and functional nuances.

3.5 Allergens and Irritants

3.5.1 Skin

Although there a variety of allergic skin disorders that one may come across, a basis of understanding the concepts of allergy lies within the realm of atopic dermatitis, mainly because the pathogenesis involves a complex interaction between skin barrier dysfunction and environmental factors, such as allergens and microbes.

An important observation was that the mutation of the skin barrier protein filaggrin is associated with an allergen sensitization and that an altered skin barrier function, caused by several factors, results in the passage of allergens through the skin and to systemic responses. A key factor in such a response is exerted by Langerhans cells, which, via their immunoglobulin E (IgE) receptor, capture the allergens and present them to T cells. When T helper type 2 (Th2) cells are activated, the production of proinflammatory cytokines and chemokines pattern sustains the persistence of inflammation.[8]

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Contact skin lesions involving allergens and irritants are other common inflammatory skin disorders. While allergic contact dermatitis (CD) is a delayed hypersensitivity reaction (type IV) to allergens, irritant CD is a nonspecific skin response to direct chemical skin damage with the release of inflammatory mediators.[9]

3.5.2 Hair

Although the chemical composition of hair remains the same, there are differences in morphological shapes and structural properties across ethnicities. For instance, the cuticular layers, the scalp density, and hair diameter and growth rate are relatively lesser in African ethnicities as compared to those of others.

Moreover, the daily habits and hair care practices owing to societal and cultural norms increase the susceptibility of hair to damage over a period of time as measured intensile properties.

Chemicals used in hair coloring and straightening treatments create breaks in hair shafts resulting in their damage as well those closer to the root. Constant combing and brushing along may cause frictional harm. Thermal styling treatments, such as ironing and blow-drying, can cause hair protein denaturation, dehydration, and cuticular destruction, thus making it very sensitive and highly prone to damage.[10]

As hair ages, there is also a loss of pigment and protein with resultant oxidative damage, and as such, the resilience of an individual's hair to damage is also reduced; consequently, both surface and internal weathering ensue.

3.5.3 Genetic

While there have been different schools of thought on the origin of the human species, genetic variation has been a gradual process. Interbreeding in archaic populations may have hardly existed but with migration over time, this has changed, and today an individual may have attributes from different continental groups.

Thus, we see patterns of variation, and with regard to skin color, there is roughly a 10%variance that occurs within racial and genetic groups and 90%between groups. This poses a challenge to a dermatologist at times because of varied presentation of a skin disorder and how to fine-tune different aspects of treatment to provide the best possible outcome and avoid complications.[11]

Another fascinating concept is that of convergent adaptation, which contributes toward similar skin colors owing to selective pressure. For instance, equatorial populations exhibit a darker skin color so as to prevent skin cancers and photodermatoses.

3.5.4 Cultural Practices

Ethnic differences exist not only with appearances but also with respect to what is viewed by an individual as an acceptable social norm. This can range from the desire to look fair by some ethnicities to preferring a tanned look by others.

Certain cultural practices such as coining, cupping, and moxibustion maybe harmful to the skin, as is the use of traditional hairstyling practices such as hair dyeing and using straightening appliances and products, creams, rollers, and extensions, which can damage the hair, along with the use of hennas and bindis for social occasions, which can cause dyspigmentation over a period of time.[12]

3.5.5 Aging

The aging process involves a myriad of factors that involve photodamage, fat redistribution, bone shifting, and the loss of connective tissue, with also genetic and environmental influences affecting the process. Individuals with darker skin are overall thought to have firmer and smoother skin than individuals with lighter skin of the same age. However, with the intermixing of races, ethnicities, and cultures, the cutaneous effects are varied and dynamic as is the growing desire for a youthful appearance.[13]

3.6 Conclusion

Skin vitality is of the essence in today's world, and with advances in the field of dermatology, factors affecting skin integrity are being studied in greater depth to understand the different facets of micro and macro environments affecting it, which ultimately facilitates skin health, healing, and care.

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CHAPTER 4: GEO-ETHNIC VARIATIONS IN SKIN

Ayushi Khandelwal

4.1 Introduction

The majority of the world's population has skin of color, and Asians comprise more than half of the total population of the earth.[1] Skin conditions occur globally, affecting people of all ethnicities. These conditions may have a genetic factor and may present differently in specific population groups. If population-based differences exist, it is practical to assume that understanding these differences may optimize treatment outcomes. The idea that racial or genetic differences between groups have a relation with health or disease has been supported by sequencing of the human genome and the ongoing international effort to catalog common haplotypes in various populations.[2] With this active research, it is time to examine the complex relation between genetic research and the concepts of race, ethnicity, and ancestry and disease in dermatology.

4.2 The Origin of Humans

Modern humans ventured out of Africa ~100,000 years ago, and they spread across continents into a variety of habitats, from tropical zones to the arctic, and from lowlands to highlands. During migration, selective pressures in local environments (e.g., the cold climate, hypoxia, and endemic pathogens), together with random drift, have resulted in population-specific genetic variants, which further influenced variable phenotypes, such as lactose tolerance, height, immune system, and metabolic efficiency. Skin color variation is one of the most striking examples of human phenotypic diversity. It is dominated by melanin, a pigment located in the base of the epidermis and produced by melanocytes. Melanin has two forms, pheomelanin (yellow-reddish) and eumelanin (black-brown). The former is mainly accumulated in light-complexioned people, while the latter is mostly produced in dark-complexioned people. In addition, the number and size of melanin particles differ among individuals and are even more important than the proportions of the two forms of melanin in the determination of human skin color. Other skin-related factors, such as keratin, also contribute to skin color variation. In global populations, skin color is highly correlated with latitude and, fundamentally, the distribution of ultraviolet (UV) radiation. Populations closer to the equator tend to have dark skin for protection against UV since overexposure to UV may decrease folic acid levels and cause skin cancer. The lighter skin in populations at higher latitudes is the underlying selection to maintain vitamin D photosynthesis, which is a UV-dependent process.

4.3 Differences in Skin Coloration

Pigmentation is the most obvious difference in skin characteristics between different racial groups.[3] This racial variation is dependent on the quantity of melanin, amount of UV exposure, genetics, melanosome content, and type of pigments found in the skin. Four chromophores are responsible for the varying colors found in human skin: hemoglobin, oxyhemoglobin, melanin, and carotenoids. Hemoglobin and oxyhemoglobin contribute to the pinkish color of Caucasian skin by absorbing specific wavelengths of light and allowing red to be reflected back. The various brown shades seen in black and sun-tanned skin are a result of melanin. Carotenes are the source of yellow-orange pigmentation. Other hues are caused by a combination of all the pigments. Melanin is a natural skin pigment that protects the skin from UV damage. It is synthesized in melanocytes and packaged into melanosomes that are found dispersed throughout the epidermis. Melanosomes are found most prominently in the basal layer of the epidermis and serve to protect germinating nuclei of epidermal cells from UV radiation damage. The packaging and arrangement of skin pigments are responsible for the differences in skin pigmentation that serve to protect an individual.

4.4 Racial Differences in Stratum Corneum Structure

Differences in stratum corneum (SC) biology are apparent in different skin types. Black skin contains more corneocyte cell layers than that from Caucasian skin (mean 21.8 vs. mean 16.7 cell layers).[4] Since no significant difference in thickness of the stratum corneum between white people and black people was found, the cell layers in black skin were thought to be more compact, perhaps reflecting greater intercellular cohesion.[5] The desquamation rate was higher in the black subjects. The lipid content of the stratum corneum of black skin was higher than that of white skin. Asians, in general, have the lowest transepidermal water loss (TEWL), highest water content, and highest SC lipid levels. The findings are the opposite for black skin. Black subjects have been reported to have a greater density of *Propionibacterium acnes* compared to white subjects, but the values were not statistically significant.[6] Rebora et al. have also shown increased aerobic bacteria (650% greater) and *Candida albicans* (150% greater) on black skin compared with white skin.[7]

4.5 Racial Differences in Epidermal-Dermal Function

Racial differences in epidermal-dermal structure become especially pronounced during photoaging. Naturally, the darker the skin phenotype, the greater the skin protection against UV irradiation. White subjects exhibit numerous focal areas of atrophy and necrosis.[3] Equally, there is greater dermal damage in the lighter ethnic groups. Skin thickness was increased on the sun-exposed site in all racial groups. However, skin extensibility was the same on both sites for black subjects, whereas both dorsal sites on Hispanic subjects and white subjects showed reduced extensibility.[5] However, the elastic modulus was only increased on the dorsal skin of the Caucasians. Black subjects showed the same elastic recovery on both sites, whereas both Hispanic and white subjects showed reduced recovery and viscoelasticity on the dorsal forearm.[3] These differences are probably due to the greater sun protection capability of black skin. Warrier et al. found that the elastic recovery was 1.5 times greater in black subjects compared with white subjects on the cheeks, with no differences in the legs.[6] Overall, one would expect fewer signs of aging—that is, the maintenance of skin elasticity in darker-skinned individuals. Black

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people are reported to have an intrinsic sun protection factor (SPF) value of approximately.[3]

4.6 Racial Differences in Cutaneous Appendages: Eccrine, Apocrine, and Apoeccrine Sweat Glands

Several papers suggest that there are differences in the number of sweat glands between different racial groups.[3] However, when measuring sweat gland functionality, acclimatization needs to be taken into consideration as this will influence the onset and type of sweating process. Thus, there is probably a greater density of actively sweating glands in the tropics rather than real differences in gland numbers. Differences in electrolyte content may occur where black people do not resorb as much sodium chloride as Caucasians.[8] Apart from this, no other compositional differences are reported, but they are highly likely to occur. There are some very early studies in this area that indicate that black subjects have larger apocrine glands and in greater numbers than Caucasian and Chinese subjects. They can be as much as three times greater in black subjects. There is also a greater proportion of secretion of apocrine fluid by black subjects; secretions were more turbid and had a different odor. The apoeccrine gland is a somewhat forgotten gland that develops at puberty from the eccrine gland. It is present in the axilla, in the perianal regions, and on the face, particularly in the nasal skin. Its fluid does contain some lipids, but it is mainly water and electrolyte. However, it is a much bigger gland and is reported to secrete at ten times the rate of the eccrine gland. Again, these are found in greater numbers in black facial skin compared to white facial skin. In the axilla, these glands are reported to represent up to 45% of the glands present, and they secrete fluid directly on the skin surface, unlike apocrine glands.

4.7 Sebaceous Glands

The sebaceous gland is attached to the hair follicle by a duct, and it produces sebum; a mixture of squalene, cholesterol, and cholesterol esters; wax esters; and triglycerides that are secreted on to the skin surface. On route, the triglycerides can be hydrolyzed to free fatty acids by bacterial lipases. Sebum should not be considered a liquid but a semisolid. Various crystalline lipid domains are present, and these will vary according to composition, which may be due to racial or seasonal variations. For the latter, there is less oleate in sebum in summer compared with winter, for instance. Comparing lipid in hair samples, it has been shown that black subjects have 60–70% more lipid in their hair compared with white subjects. Black subjects also have bigger sebaceous glands, which contribute to the increased sebum secretion. Consistent with these reports, studies by Hillebrand et al. recently reported a greater pore count fraction in African Americans, but the number of pores increases with age in all racial groups.[9] The level of sebum secretion on the forehead was reported to increase during the early decades, peaking in the 30–40s, and then declining. African Americans showed significantly more sebum excretion than East Asians, whereas Hispanics had the lowest. There are few studies on sebum composition and the effect of race. One study examining Caucasians and the Japanese found that, like Caucasians, Japanese subjects have a greater predominance of straight-chain fatty acids in their sebum wax esters than branched-chain fatty acids, but the Japanese had a greater quantity of C16 isobranched-chain fatty acids.[10] Japanese men also appear to have greater sebaceous gland activity compared with Caucasians. Nevertheless, sebum levels decline with age. The incidence of acne is similar across different racial groups, but acne responses appear to show differences between the different racial groups. In response to coal tar, Caucasians develop inflammatory lesions, whereas subjects with Black skin open comedones develop.[9] Thus, in subjects with white skin, the rupture of the follicles occurs, but in black subjects, hyperproliferation and retention of horny cells occur.

4.8 Cutaneous Irritation in Different Racial Groups

As mentioned earlier, differences in SC biology are apparent in different skin types with Asians in general having the lowest TEWL, highest water content, and highest SC lipid levels with the reverse being true for black skin. Due to its enhanced spontaneous desquamation (and probably increased sebum levels), tape stripping revealed a weaker barrier when only using a few strips.[3] However, on further tape stripping, black skin has a stronger barrier presumably due to its increased cohesiveness. This increased cohesivity may also explain the reduced potential to irritate black skin using a variety of chemical stimuli. Asian skin, on the contrary, is reported to be more sensitive to chemical stimuli presumably due to the higher sweat gland density or possibly due to a thinner SC where the number of tape strippings to break the barrier is reported to be less.

4.9 Clinically Relevant Structural and Functional Differences

Structural and functional differences observed among darkly pigmented populations compared with lightly pigmented populations have been reported. Key biological characteristics to consider when performing laser or light-based aesthetic procedures in dark skin types include the following:

1. Increased epidermal melanin
2. Larger melanosomes that are more singly dispersed and widely distributed within epidermal keratinocytes
3. Labile melanocyte responses
4. Reactive fibroblasts

These features, in turn, contribute to differences in the frequency of specific dermatological disorders and the safety of laser or light-based procedures. Increased melanin content, packaging, and epidermal distribution confer greater protection against the deleterious effects of ultraviolet radiation, and therefore, signs of photoaging tend to be less marked and delayed in higher SPT.[11] Labile melanocyte responses contribute to an increased prevalence of pigmentary disorders in nonwhite populations, and as such, the treatment of dyschromia is among the most frequent reasons for which individuals with skin of color visit dermatologists. Of particular relevance to laser or light procedures, the tendency for injury or inflammation to incite alterations in pigment production is associated with a greater risk for post-procedure hyper- or hypopigmentation in individuals with SPT IV–VI. Racial differences exist in the frequency of keloids, with the highest prevalence being observed in populations of African ancestry.[12] This is probably due to genetic factors that contribute to increased fibroblast reactivity among individuals at risk. Therefore, a greater overall risk of keloids and hypertrophic scars associated with