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Neelam A. Vashi, Stephen A. Wirya, Meyene Inyang & Roopal V. Kundu

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THERAPY IN PRACTICE

Facial Hyperpigmentation in Skin of Color: Special Considerations and Treatment

Neelam A. Vashi[1] · Stephen A. Wirya[1] · Meyene Inyang[2] · Roopal V. Kundu[3]

Abstract Differences in cutaneous diseases in people of color call for nuanced evaluation and management. One of the most common dermatological complaints from patients with skin of color is dyspigmentation, particularly hyperpigmentation. The challenge for clinicians is to establish correct diagnoses along with consistently successful treatments to meet the needs of the increasingly diverse population served. This review focuses on facial hyperpigmentation and outlines the most common skin disorders and treatment options.

Key Points

Facial hyperpigmentation is a common skin condition that more commonly affects persons with skin of color.

Sun-protective measures are the mainstay of both prevention and treatment.

Treatment modalities include (1) topical lightening agents, (2) chemical peels and oral agents, and (3) laser therapy as the first-, second-, and third-line treatments, respectively.

Any type of procedural treatment should be used with caution given the increased risk of scarring and dyspigmentation in the skin of color population.

1 Introduction

The color of skin is partially determined by normal biological processes that dictate the type, amount, and distribution of melanin in the skin [1]. The production of melanin is triggered by α-melanocyte-stimulating hormone (α-MSH) and adrenocorticotropic hormone activation of the melanocortin-1 receptor. Melanin pigment is derived from a chemical reaction involving tyrosine that is metabolized into either eumelanin (brown–black) or pheomelanin (yellow–red). Melanin production occurs in the melanocyte and is transferred to keratinocytes in the epidermis and hair matrix [1]. Hyperpigmentation occurs because of a change in melanin production and/or its distribution.

✉ Roopal V. Kundu
rkundu@nm.org

[1] Department of Dermatology, Boston University School of Medicine, Boston, MA, USA

[2] Howard University College of Medicine, Washington, DC, USA

[3] Department of Dermatology, Northwestern University Feinberg School of Medicine, 676 N. St. Clair Street, Suite 1600, Chicago, IL 60611, USA

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In contrast with lighter skin tones, skin of color (traditionally characterized as Fitzpatrick skin phototypes III–VI) has more eumelanin and more efficient transfer of melanin to keratinocytes. Darker skin types are more prone to pigmentary alterations, making dyschromia a very common dermatologic complaint [2, 3].

Although hyperpigmentation is typically not harmful, it can cause deleterious emotional and psychological impact on the health-related quality of life of affected individuals [4, 5]. Special considerations when evaluating individuals with skin of color with facial hyperpigmentation can improve both cutaneous disease and quality of life.

2 Common Hyperpigmentation Disorders

Disorders of facial hyperpigmentation can be difficult to diagnose. The more common etiologies are reviewed in Table 1.

2.1 Melasma

2.1.1 Epidemiology, Risk factors, Pathology, Etiology

Melasma is characterized by hyperpigmented macules or patches on the face, most commonly with increased or normal levels of melanocytes and an increased number of melanosomes [6]. The condition is more commonly seen in women of reproductive age, especially in those with darker skin originating from East and Southeast Asia or Latin America [7].

The most commonly cited causes of melasma include sun exposure, combined oral contraceptive use, and pregnancy [8, 9]. As over 30% of individuals with melasma have family members with the condition, genetic factors are likely contributory; however, the specific genetic pathway(s) remain unclear [6, 10]. It is thought that the main pathway in the pathophysiology of melasma likely involves increased production of α-MSH. Ultraviolet radiation from the sun triggers melanocytic activity and is the most important modifiable risk factor for melasma [8]. High levels of estrogen and progesterone may stimulate melanogenesis, causing the condition to be more common in pregnant women, post-menopausal women receiving only progesterone, and men treated for prostate cancer with hormonal therapy [11]. Estrogen increases pigment production by triggering increased expression of melanocortin type 1 receptors and the *PDZK1* gene, a factor involved in tyrosinase transcription [8]. One possible connection between hypermelanosis and estrogen suggests that melanocytes have estrogen receptors that become hyperactive [12].

2.1.2 Clinical Features

Melasma often presents as bilateral and symmetric reticulated tan, light to dark brown, or grayish-brown hyperpigmented macules and patches in sun-exposed areas, especially the face, with typical categorizations into centrofacial, malar, and mandibular regions (Fig. 1) [8]. The most common locations are over the cheeks, forehead, and upper lip [7].

2.1.3 Diagnosis and Histopathology

Diagnosis of melasma is most often clinical (Table 2). The differential diagnosis includes ephelides, lentigines, exogenous ochronosis, and PIH [8]. Darker skin tones may make it difficult to distinguish between melasma and natural pigmentary demarcation lines [8].

Melasma can be classified as epidermal, dermal, mixed, and inapparent/indeterminate, which is more commonly seen in darker skin types. A Wood's lamp can be used to aid in diagnosis and guide prognosis. The epidermal type shows enhanced lesional pigmentation with a Wood's lamp, whereas the dermal type does not [7]. Wood's light examination can also be useful in examining disease extent because it can elucidate subclinical disease that is not visible on routine clinical exam alone. A dermatoscope can also be used as a diagnostic aid, visualizing a pseudo-rete pattern in epidermal melasma versus granules that are more representative of dermal melasma.

Histopathology reveals increased melanin deposition in all layers of the epidermis (with or without the presence of melanophages), epidermal hyperpigmentation, hypertrophied melanocytes in normal quantities, and increased melanosomes [13]. The majority of melasma lesions contain a significant increase in solar elastosis (83 vs. 29% in non-lesional skin) and mast cells compared with normal skin [14, 15].

2.1.4 Treatments

While no single treatment eradicates melasma or prevents recurrence, there are options for minimizing the dyspigmentation. Standard therapy approaches consist of sun avoidance and use of agents that inhibit melanin synthesis, inhibit melanosome formation or transfer, and alter melanosome degradation.

Sun-protective measures should be utilized on a daily basis, as melasma is photo-exacerbated. These include avoidance of intense sun exposure, use of wide-brimmed hats, sunglasses, and the regular and daily use of sunscreens. Sunscreens should be broad spectrum—a minimum of SPF 30—and reapplied regularly. Tinted sunscreens with iron oxide additionally block visible light,

Table 1 Distinguishing features for more common etiologies of facial hyperpigmentation

Etiology	Affected group	Clinical features	Pathology	Associations
Melasma	Hispanic, Asian, African adults	Bilateral and symmetric reticulated hyperpigmented patches mainly on forehead, cheeks, upper lips; can rarely be extrafacial	Increased epidermal pigmentation with solar elastosis; some also show disruption of the basal layer, blood vessel proliferation, and mast cell proliferation [13]	UV light exposure, pregnancy, oral contraception/hormonal treatment [9]
Post-inflammatory hyperpigmentation	Skin of color population; e.g., Hispanics, Asians, Africans	Hyperpigmented macules/patches on previous site(s) of inflammation and/or injury	Increased epidermal pigmentation with variable amount of perivascular lymphohistiocytic infiltrate and presence of melanophages in the dermis	Previous inflammatory processes; e.g., acne, insect bites, folliculitis, atopic dermatitis
Maturational hyperpigmentation	4–5th decade of Fitzpatrick skin types IV–V	Hyperpigmented patches with unclear borders that eventually fade into normal skin affecting sun-exposed areas, including the lateral aspects of the face and dorsal hands and feet	Mild to moderate proliferation of melanocytes with some reports of papillomatous epidermal proliferation	Associated with chronic sun exposure and possibly obesity and diabetes
Hori's nevi	Adult Asian females [76]	Clusters of brown, brown to gray, gray, or bluish macules, most commonly involving the bilateral malar region, followed by the forehead, upper eyelids, temples, and root and ala nasi [76, 77]	Melanocytes dispersed in the upper and mid dermis with noticeable perivascular distribution [13, 75, 76, 79]	Sun exposure, pregnancy, hormonal, stress, trauma, and chronic atopic dermatitis
Dermatosis Papulosa Nigra	Adults with darker skin tones, especially those of African descent	Multiple 1- to 5-mm dark papules on the face, neck, and upper back, some with sessile, pedunculated, or confluent characteristics	Acanthosis, papillomatosis, and hyperpigmentation of the epidermis; fewer horn cysts and pseudocysts than seborrheic keratoses [67]	Mutation in FGFR3 and PIK3CA
Lentigines	Adults with lighter skin tones, e.g., Caucasian and lighter skinned Asian populations	Numerous brown to dark-brown macules on sun-exposed areas	Epidermal hyperplasia with increased number of melanocytes and basal layer pigmentation [96]	UV light exposure
Ephelides	Children of Caucasian or Asian descent	Well demarcated 1- to 3-mm light to medium-brown macules on sun-exposed areas of the face, upper trunk, and dorsal upper extremities; increased intensity in summer with fading in winter	Increased epidermal pigmentation without increase in melanocyte counts	UV light exposure, variants of *MC1R* gene mutation
Periorbital melanosis	Adults with darker skin tones; women more than men	Brown to dark-brown pigmentation concentrated around the bilateral orbital skin and eyelids, sometimes extending to the upper nose and glabella	Increased amount of melanin in the papillary dermis with moderate dilation of blood vessels in the reticular dermis; presence of pigment-containing macrophages in the dermis	Multifactorial etiology, including genetics, post-inflammatory hyperpigmentation, periorbital edema, excess vascularity, shadowing, and tear trough formation [45]
Exogenous ochronosis	Individuals with prolonged use of hydroquinone	Bluish, brown, and/or black mottled macules in areas where topical lightening agents have been applied	Yellow–brown banana-shaped deposits in the dermis	Prolonged use of topical hydroquinone

Table 1 continued

Etiology	Affected group	Clinical features	Pathology	Associations
Acanthosis nigricans	Most commonly Native American adults followed by African, Hispanic, and Caucasian populations [57]	Symmetric hyperpigmentation with velvety thickening of the skin affecting flexural areas of the body, but can also involve the umbilicus, groin, inframammary folds, face (hollows of the cheeks), and perioral and perianal surfaces [59]	Hyperkeratosis and papillomatosis of the epidermis with finger-like projections of the dermal papillae; minimal to no acanthosis of epidermis	Congenital (AD with variable penetrance), obesity, diabetes, syndromic, malignancy, and drug induced
Lichen planus pigmentosus	Individuals with darkly pigmented skin, Fitzpatrick skin types III–V [102]	Asymptomatic, hyperpigmented (dark-brown, gray, or black) macules/patches on sun-exposed areas; may also involve intertriginous areas in the inversus type [102]	Epidermal atrophy with dyskeratotic keratinocytes and colloid bodies, basal cell vacuolization, and superficial dermal melanophages	Other typical lesions of lichen planus may be present elsewhere on the body
Erythema dyschromicum perstans	Young adults of Hispanic and Asian origin	Gray, bluish or brown (ash-like) macules and/or patches on the trunk, extremities, and face; may have an erythematous border that fades over time [115]	Increased epidermal pigment, vacuolar basal cell degeneration with pigment incontinence, dermal melanophages, and perivascular lymphohistiocytic infiltration	Unknown

AD autosomal dominant, *FGFR3* fibroblast growth factor receptor 3, *PIK3CA* phosphatidylinositol 3-kinase, *UV* ultraviolet

Table 2 Classification and distribution of melasma

Melasma	Clinical presentation
Classification	
Epidermal (70%)	Brown, well-defined margins
Dermal (10–15%)	Gray-brown, poorly defined margins
Mixed (epidermal-dermal) (20%)	Melanin in epidermis and dermis
Indeterminate	Difficult to classify, especially in dark skin
Distribution	
Centrofacial (65%)	Cheeks, forehead, upper lip, nose, chin
Malar (20%)	Cheeks and nose
Mandibular (15%)	Ramus of mandible
Extrafacial (Rare)	Arm, forearm, neck, sternum, back

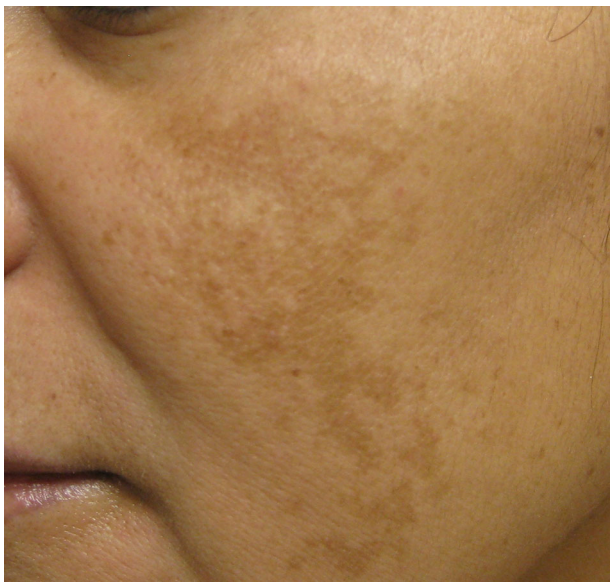

Fig. 1 Melasma: hyperpigmented patch with irregular borders on left cheek

which has recently been shown to be associated with melasma [16, 17]. Cosmetic camouflage in the form of tinted moisturizers and sunscreens and make-up can cover melasma.

Treatment consists of lightening agents that tend to be most effective for epidermal disease. Hydroquinone, a tyrosinase inhibitor, is the most common agent in lightening formulations [18, 19]. Hydroquinone in 2–4% formulations has been used as monotherapy for skin lightening. The course of treatment often lasts 10–12 weeks, with application to the hyperpigmented areas only to prevent lightening of the surrounding normal skin, also known as halo hypopigmentation. With long-term use or at high concentrations, hydroquinone can cause permanent dyspigmentation, including exogenous ochronosis,

and therefore should only be used for short time periods with physician monitoring.

Combination therapy with hydroquinone, a retinoid, and a topical steroid is considered the most effective topical treatment [19]. The original Kligman's formula of 4% hydroquinone, 0.05% tretinoin, and 0.01% fluocinolone acetonide has shown effective results [18]. Corticosteroids decrease melanocyte function, resulting in reduced pigment, with non-fluorinated formulations being the safest [20, 21].

In settings of adverse reactions or intolerability to hydroquinone, 1–4% kojic acid, also a tyrosinase inhibitor, can serve as a substitute [18]. Azelaic acid, a melanocyte-specific cytotoxic compound, can also be substituted or used adjunctively in 15–20% concentrations, with efficacy reported to be similar to that of hydroquinone [22, 23]. Many other topical lightening agents have been used, including ascorbic acid, retinoids as monotherapy, soy, arbutin, licorice, niacinamide, and N-acetyl glucosamine.

Other treatment modalities include chemical peels, energy devices, and oral agents. Chemical peels may be used as monotherapy, adjunctive therapy, and/or maintenance treatment. Chemical peeling agents can broadly be differentiated into groups including alpha-hydroxy acids, beta hydroxy acids, trichloroacetic acid (TCA), retinoic acid, phenol, and combination products, such as Jessner's solution. A moderate result can be achieved safely with serial sessions of chemical peels using glycolic acid, salicylic acid, and/or TCA. In darker skin, TCA peels achieve results faster but with more side effects than glycolic peels. In general, Fitzpatrick types IV–VI should avoid using medium to deep peels, which can cause additional dyschromia. Laser treatments produce short-term benefit and sometimes unpredictable results [24]. The more successful laser treatments include Q-switched (QS), low-fluence QS neodymium-doped yttrium aluminum garnet (Nd:YAG), fractional, and combination lasers, but they are typically only used as third- or fourth-line treatments given their high costs, high rates of recurrence, and potential for side effects, including further pigmentary alteration [18, 25]. Oral adjunctive agents include tranexamic acid, an antifibrinolytic that decreases melanogenesis in melanocytes, which may be utilized in recalcitrant disease [26–28].

Overall, treatments are less successful in people with dark skin/hair, family history of melasma, long-standing disease, concomitant ochronosis, or mixed- and dermal-type melasma. Any type of procedure may lead to post-inflammatory hyperpigmentation (PIH) from the procedure itself. Therefore, given the higher risk of PIH and scarring in dark-skinned individuals, procedures should be performed with caution.

2.2 Post-Inflammatory Hyperpigmentation

2.2.1 Epidemiology, Risk factors, Pathology, Etiology

PIH is a hypermelanosis that can occur after injury or inflammatory periods to the skin. It is one of the most common dermatological complaints among darker skinned individuals [29]. The most common causes of PIH are acne vulgaris, atopic dermatitis, impetigo, insect bites, pseudofolliculitis barbae, and contact dermatitis (Fig. 2) [29].

2.2.2 Clinical Features

PIH will appear as macules or patches in the areas of previous or ongoing inflammation. Epidermal PIH will appear tan to dark brown, whereas dermal PIH appears blue-gray. Epidermal PIH often fades over months to years on its own, and dermal PIH often takes years to resolve or may be permanent [29].

2.2.3 Diagnosis and Histopathology

The underlying cause of PIH is inflammation leading to excess melanin production and/or abnormal placement of melanin. Inflammatory mediators such as leukotrienes, prostaglandins, and interleukins are thought to stimulate melanocyte activity. In epidermal PIH, melanin production and melanin transfer to keratinocytes is increased, whereas, in dermal PIH, melanin leaks out into the dermis through defects in the basal layer. This dermal melanin typically has a blue-gray appearance [29]. Diagnosis is often made clinically, but histopathologic exam can be performed for diagnosis confirmation and prognostic value in difficult

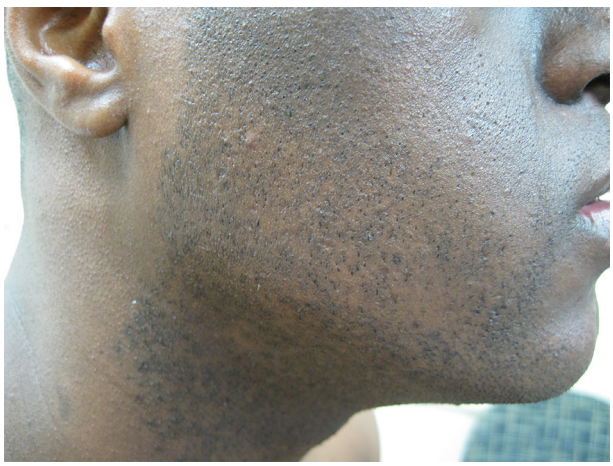

Fig. 2 Post-inflammatory hyperpigmentation: coalescing hyperpigmented macules on the beard area secondary to pseudofolliculitis barbae

cases and will show increased melanin content in keratinocytes along with dermal melanophages.

2.2.4 Treatments

Treatment begins with the prevention and control of inflammation. Therapeutic regimens are similar to those for melasma. First-line treatments consist of photo-protective measures and lightening agents, including hydroquinone, retinoids, glycolic acid, kojic acid, azelaic acid, and triple combination cream [30–33]. Any treatment leading to skin irritation should be stopped to prevent further PIH. Similar to melasma, epidermal-type PIH responds well to topical lightening agents, whereas dermal-type PIH does not. The combination of 4% hydroquinone, 0.05% tretinoin, and 0.01% fluocinolone acetonide has been successful in the treatment of PIH with minimal irritation [29]. Alternatively, mequinol, a compound similar to hydroquinone [34], may be substituted for hydroquinone; comparable results have been reported [35]. A combination of 2% topical tranexamic acid (which prevents ultraviolet [UV]-induced pigmentation) and 2% niacinamide (which inhibits melanosome transfer) showed significant skin lightening and minimal side effects after 8 weeks of treatment [36]. Adjuvant treatments include chemical peels such as those described for melasma. Laser and light therapies are not typically used for PIH given the risks of further adverse events; however, energy devices employing longer wavelengths and cooling mechanisms are viable options. Great care and caution should be taken with energy-based devices and procedures given the high risk of adverse events in the skin of color population.

2.3 Maturational Hyperpigmentation

2.3.1 Epidemiology, Risk factors, Pathogenesis, Etiology

Maturational hyperpigmentation is a descriptive term that refers to the darkening of sun-exposed skin. This condition is acquired and develops in the 4th–5th decade in skin types V and VI [1]. Pathogenesis is currently unclear, but an association with chronic sun exposure is likely and an association with obesity and diabetes is possible [1, 37, 38].

2.3.2 Clinical Features

Maturational hyperpigmentation presents on sun-exposed areas, most commonly the lateral aspects of the face and dorsal hands and feet. It presents as hyperpigmented patches with ill-defined borders that blend into normal skin [37].

2.3.3 Diagnosis and Histopathology

Diagnosis is made clinically. Histopathology shows mild to moderate melanocytic proliferation and some papillomatous epidermal proliferation has been reported [1].

2.3.4 Treatments

The first-line treatment for this condition is prevention with the proper use of broad-spectrum sunscreen. Topical lightening agents containing hydroquinone and adjunctive chemical peels can also be useful [37, 39].

2.4 Periorbital Melanosis

2.4.1 Epidemiology, Risk factors, Pathology, Etiology

Periorbital melanosis, also known as idiopathic cutaneous hyperchromia of the orbital region or—commonly—as ‘dark circles’, is a skin disorder that appears in those with darker skin pigmentation. The discoloration can be distressing to patients, who may complain of a prematurely aged appearance.

Etiology for periorbital melanosis or hyperpigmentation is multifactorial; contributing factors include constitutional pigmentation, PIH, edema, subcutaneous vascularity, increased skin laxity, and prominent tear trough formation [40, 41]. This condition can be inherited in an autosomal dominant pattern where the excess pigment is an extension of pigmentary demarcation lines, also called Futcher’s lines or Voigt’s lines, on the face [6, 42]. People of color, middle-aged individuals, and women are most commonly affected [43].

2.4.2 Clinical Features

Medium to deep brown hyperpigmentation around the bilateral orbital skin and eyelid is seen, sometimes extending to the upper nose and glabella [6, 43]. The discoloration may be present on the upper or lower or both eyelids [43].

2.4.3 Diagnosis and Histopathology

The diagnosis is made clinically and classified according to etiology. The most common differential diagnosis includes PIH due to atopic dermatitis, irritant contact dermatitis, or allergic contact dermatitis.

2.4.4 Treatments

There is no standard treatment for periocular melanosis, and regimens are based upon etiologic factors. Photo-

protection with sunglasses, hats, and sunscreen is important. Several therapies have been used for periorbital melanosis with varying efficacy, including topical lightening agents, growth factor serums, antioxidants, soft-tissue fillers, autologous fat transplant, chemical peels, and QS lasers [44, 45].

2.5 Exogenous Ochronosis

2.5.1 Epidemiology, Risk factors, Pathology, Etiology

Exogenous ochronosis (EO) is a rare dermatosis that has been associated with the prolonged use of skin-lightening products, most commonly those containing hydroquinone and also resorcinol, phenol, mercury, and/or picric acid [6, 46, 47]. EO is most commonly seen among the indigenous Black population in African countries and is thought to be due to localized homogentisic acid collecting within the dermis [29].

2.5.2 Clinical Features

Typical features include an erythematous pinkish hue to the skin over photo-exposed areas, most commonly the malar cheeks, forehead, temples, and periorbital regions (Fig. 3). These areas may be stippled with caviar-like black macules or micropapules in areas of EO involvement.

2.5.3 Diagnosis and Histopathology

Diagnosis of this condition is made by stringent history taking and clinical observation and is typically confirmed by histopathologic findings [48]. Dermoscopy shows scattered blue-gray structures that obliterate follicular openings [49]. Histopathologic findings show the presence of banana-shaped yellow–brown bodies and pigmentary incontinence as well as solar elastosis with the occasional presence of colloid milium and granulomas [49]. Early lesions may show basophilia of the collagen fibers in the upper dermis, homogenization of collagen bundles, and altered elastic fibers resembling solar elastosis [50].

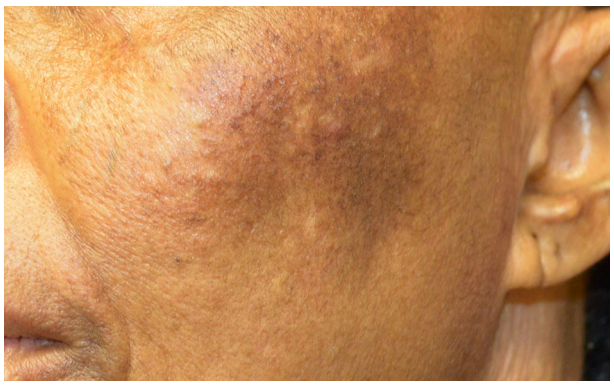

Fig. 3 Exogenous ochronosis: hyperpigmented patch surmounted with small *dark-brown* to *black* macules and surrounding *pink* hue on the left malar cheek

2.5.4 Treatments

The first line of treatment is stopping the offending medication. Multiple reports involving the use of topical retinoic acid, topical corticosteroids, 50% TCA peels, and cryotherapy have not shown significant or consistent improvement [48]. Ablative methods such as erbium-doped YAG and carbon dioxide lasers combined with dermabrasion have yielded promising results [48, 51]. Other modalities involve longer wavelength lasers, as they are able to penetrate deeper and possibly reach the dermal deposits. These other modalities involve QS ruby (694 nm), QS alexandrite (755 nm), and QS Nd:YAG (1064 nm) lasers [48, 52–54], with one study reporting good results after combining an ablative carbon dioxide laser with an Nd:YAG laser [55].

2.6 Acanthosis Nigricans

2.6.1 Epidemiology, Risk factors, Pathogenesis, Etiology

Acanthosis nigricans (AN) was first reported by Unna and Pollitzer in 1890. The name is derived from *acantho*, which is Greek for 'thorn', and *nigricans*, which is Latin for 'becoming dark' [56]. Prevalence varies greatly according to age, race, type, and associated factors. Native Americans have been found to be more prone to this condition, followed by Africans, Hispanics, and Caucasians [57]. AN has been divided into benign, obesity-associated, syndromic, malignant, acral, unilateral, drug-induced, and mixed types [58].

2.6.2 Clinical Features

AN generally presents with bilateral hyperpigmented symmetric velvety thickening of the skin. It can present at any part of the body but is classically found in the axillae, posterior neck folds, and flexor surfaces of the upper and lower extremities. It can also be seen in the umbilicus, groin, inframammary folds, face, and perioral and perianal surfaces [58, 59]. Lesions on the face are typically noted in the hollows of the cheeks (Fig. 4). Clinically, minimal hyperpigmentation, associated pruritus, and presence on mucosal surfaces is more common in malignancy type AN [41].

2.6.3 Diagnosis and Histopathology

Diagnosis is typically made clinically. Histological findings show hyperkeratosis and papillomatosis of the

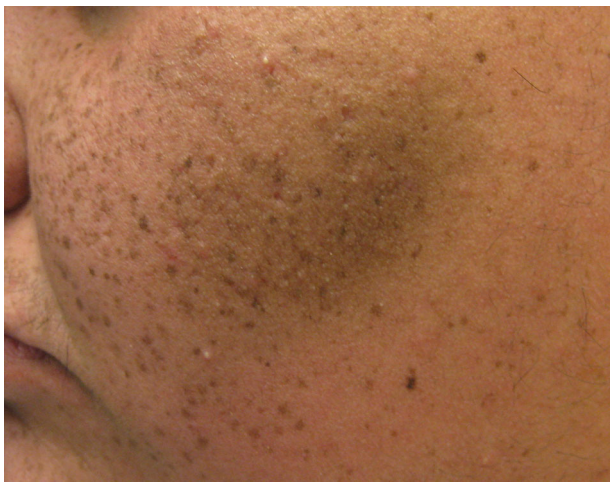

Fig. 4 Acanthosis nigricans: hyperpigmented patch in hollow of the left cheek

epidermis with finger-like projections of the dermal papillae. Parakeratosis can be found in mucosal AN [41, 57, 60].

2.6.4 Treatments

Treatment of AN is typically based on treating the underlying etiology. Other treatment options include oral and topical retinoids, keratolytic agents such as ammonium lactate, calcipotriol, chemical peels, and long-pulsed alexandrite lasers [57, 61–63].

2.7 Dermatosis Papulosa Nigra

2.7.1 Epidemiology, Risk factors, Pathology, Etiology

Dermatosis papulosa nigra (DPN) is a common benign condition affecting 35–77% of individuals of African descent [64] but can also present in other races with darker skin tones [65–67]. They are considered to represent a variant of seborrheic keratosis but tend to present at a comparatively younger age. It can uncommonly be found in children [68, 69].

Pathogenesis is currently unknown, but there may be a genetic component as many patients report a family history. Recent studies have found a mutation in FGFR3 (fibroblast growth factor receptor 3) and PIK3CA (phosphatidylinositol 3-kinase), which are also found in seborrheic keratoses and its other variant, stucco keratoses [67].

2.7.2 Clinical Features

DPN presents as multiple dark papules most commonly on the face, neck, and upper back, sometimes showing sessile, pedunculated, or confluent characteristics (Fig. 5). Lesions

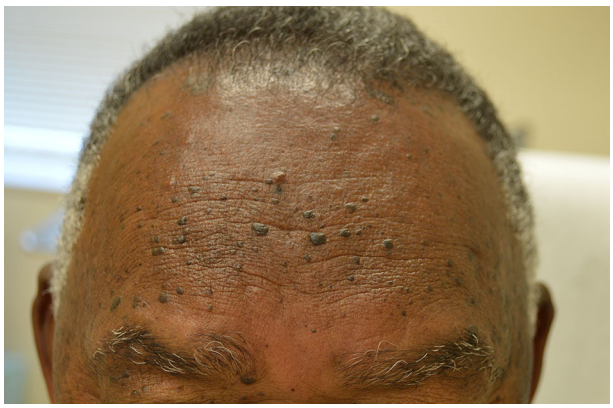

Fig. 5 Dermatosis papulosa nigra: multiple 1- to 3-mm brown discrete papules over the forehead

usually measure between 1 and 5 mm but can be larger [64].

2.7.3 Diagnosis and Histopathology

Diagnosis is made clinically. A biopsy can be conducted to differentiate this condition from viral warts or epidermal nevi. Histology is similar to that for seborrheic keratosis, which shows acanthosis, papillomatosis, and basal layer pigmentation, but with fewer horn cysts and pseudocysts [67].

2.7.4 Treatments

DPN is a benign condition, and treatments are pursued for cosmetic purposes. Common treatment options include electrodesiccation and curettage, cryotherapy, and snip removal using scissors if lesions are pedunculated. In dark-skinned patients, electrodessication is preferred using low settings of 0.4–0.8 watts on a standard hyfrecator with a pointed tip. Further reports suggest using long pulsed 1064-nm Nd:YAG, 532-nm diode laser, 595-nm pulsed-dye laser, fractionated photo thermolysis 1550 nm, potassium-titanyl-phosphate (KTP), and carbon dioxide ablative lasers [66, 70–74].

2.8 Hori Nevi

2.8.1 Epidemiology, Risk factors, Pathology, Etiology

Hori nevi were first described by Hori et al. [75] in 1984 as acquired bilateral nevus of Ota-like macules (ABNOM). Also termed nevus fusco-caeruleus zygomaticus and acquired circumscribed dermal facial melanocytoses [76], this condition is commonly found in adult Asian females aged 20–70 years, and one study suggests individuals of Chinese descent are at greater risk [76, 77]. Pathogenesis is largely unknown, but reports suggest the following two-stage process [75–78]:

1. Ectopic placement of inactive poorly melanized dermal melanocytes at birth or soon after.
2. Activation of these melanocytes in response to different factors such as sun exposure, pregnancy, hormones, stress, trauma, and/or chronic atopic dermatitis.

2.8.2 Clinical Features

Hori nevi present as brown, brown to gray, gray, or bluish clusters of macules, most commonly involving the bilateral malar region, followed by the forehead, upper eyelids, temples, and root and ala nasi [75, 77]. Hori nevi also present during adolescence and do not involve mucosal surfaces. This presentation is often compared to nevus of Ota, which presents at birth or soon after and unilaterally affects the first and second trigeminal nerve areas along with mucosal surfaces.

2.8.3 Diagnosis and Histopathology

Diagnosis is often made clinically. Pathology is rarely required but may be used to differentiate the condition from nevus of Ota, melasma, lentigines, and ephelides. Hori nevi present with melanocytes dispersed in the upper and mid-dermis, in contrast to nevus of Ota, in which melanocytes are dispersed throughout the upper and lower dermis [75, 76, 79]. Furthermore, perivascular distribution of melanocytes is more noticeable in Hori nevi [76, 79].

2.8.4 Treatments

Hori nevi are benign lesions and do not need treatment other than for cosmetic purposes. Although many treatment modalities have been tried, the most successful means of removal include the use of QS lasers; in individuals with skin of color, use of the longer wavelength Nd:YAG is safest [80–86].

2.9 Ephelides

2.9.1 Epidemiology, Risk factors, Pathology, Etiology

Ephelides, or freckles, are very common pigmentation findings in those with lighter skin color, mainly Caucasian patients but also Asian individuals with lighter and medium skin tones [87, 88]. Ephelides may present as early as 5 years of age and can fade over time. They are more visible during summer and less during winter months, which leads to the idea that ephelides may represent a type of solar lentigo [89]. Variants of *MC1R* genes play a role in the development of ephelides [87, 90].

2.9.2 Clinical Features

Ephelides present as well demarcated 1- to 3-mm light- or medium-brown macules on sun-exposed areas of the face, upper trunk, and dorsal upper extremities.

2.9.3 Diagnosis and Histopathology

Diagnosis is made clinically. Histopathologically, ephelides present with a normal epidermis and increase in melanocytic activity without an increase in melanocyte counts.

2.9.4 Treatments

Ephelides are a benign condition and require no treatment. Sun-protective measures should be taken to prevent worsening. Topical treatments such as depigmenting agents, a combination of alpha-hydroxy-acids and antioxidants, 70% TCA peel, and 80% phenol peels have been reported to be effective [65, 91, 92]. Lasers and light devices such as intense pulsed light, QS lasers, and fractionated carbon dioxide lasers are also efficacious [93–95].

2.10 Lentigines

2.10.1 Epidemiology, Risk factors, Pathology, Etiology

Lentigines are a very common benign condition that affects an older population. Around 90% of the White population aged over 60 years are affected, but this condition may also occur in Asian populations and other ethnicities [65]. The appearance of lentigines comes from sun-related UV radiation, which induces epidermal hyperplasia as well as the proliferation and activity of melanocytes [96].

2.10.2 Clinical Features

Lentigines present on sun-exposed areas of the face, upper trunk, and upper extremities. They present as numerous brown to dark-brown macules measuring a few millimeters to around 2 cm in diameter [65].

2.10.3 Diagnosis and Histopathology

Diagnosis is made clinically, with or without the addition of tangential lighting or dermoscopy. Histopathology can rule out lentigo maligna and may show epidermal hyperplasia with increased number of melanocytes and basal layer pigmentation [96].

2.10.4 Treatments

Treatment of lentigines is unnecessary other than for cosmetic purposes. Therapeutic options include depigmenting agents, retinoic acid, cryotherapy, intense pulsed light therapy, and laser therapy with QS lasers [97].

2.11 Lichen Planus Pigmentosus

2.11.1 Epidemiology, Risk factors, Pathology, Etiology

Lichen planus pigmentosus (LPP) is a variant of lichen planus that occurs most often in Fitzpatrick types III–V. Although the exact pathophysiology of LPP is unknown, some studies point to the associated use of cosmetic fragrances, hair dyes, and certain oils (e.g., mustard oil), serving as potential photosensitizers [6, 65]. Most recently, associations between LPP and frontal fibrosing alopecia (FFA) have been reported, highlighting the need for examination of both the skin and the hair [98–100].

2.11.2 Clinical Features

Patients present with an asymptomatic diffuse and bilateral distribution of hyperpigmented dark-brown to gray macules and patches in sun-exposed areas, such as the forehead, temples, and neck [65]. It can also be seen on the trunk, especially in flexural skin. LPP can be distinguished from erythema dyschromicum perstans (EDP), described below, by the lack of an erythematous border and the presence of mucosal lesions; however, some feel that these entities fall along a clinical spectrum [6].

2.11.3 Diagnosis and Histopathology

LPP is often biopsied to aid in diagnosis, confirming the location of melanin and presence of inflammation. Histologically, there is epidermal atrophy with dyskeratotic keratinocytes and colloid bodies, basal cell vacuolization, and superficial dermal melanophages [101, 102].

2.11.4 Treatments

Lichen planus pigmentosus is difficult to treat given its resistant nature; however, it can improve spontaneously after several months [103, 104]. Limited data exist on the successful treatment of LPP. Several treatment methods have been reported to be successful, but they have required months to achieve satisfactory results. One study reported good results with the use of tacrolimus ointment, taking 8 weeks to visualize improvement [105]. Other studies have reported good results combining tacrolimus ointment with dapsone [106]. Low-fluence QS Nd:YAG lasers have also been reported to be efficacious with and without tacrolimus [107, 108]. Oral treatment using low-dose oral isotretinoin has also been reported to be efficacious [109].

2.12 Erythema Dyschromicum Perstans

2.12.1 Epidemiology, Risk factors, Pathology, Etiology

EDP, also known as ashy dermatosis of Ramirez or erythema chronicum figuratum melanodermicum, is a rare dermatosis histologically similar to but distinct from LPP [110]. The exact etiology is unknown; however, there is a genetic link between the development of EDP in Mexican Mestizo and human leukocyte antigen (HLA)-DR4 [111]. Furthermore, EDP most often presents in Latino and Asian adults [112]. Case reports suggest associations with toxins (ammonium nitrite, cobalt, radiocontrast, and pesticides), drugs (ethambutol, penicillin, benzodiazepines, chlorothalonil), whipworm infection, and HIV [6, 113, 114].

2.12.2 Clinical Features

Early lesions are localized erythematous, asymptomatic macules, and patches with raised borders; late lesions are brown or gray in color [6, 115]. Lesions are typically symmetric in nature and gradually enlarge over time. They are predominantly distributed over the trunk but may also affect the face, neck, and extremities (Fig. 6) [6]. Lesions are not found on mucosal surfaces [19]. Differential diagnosis may include secondary syphilis, LPP, or lichenoid drug reaction.

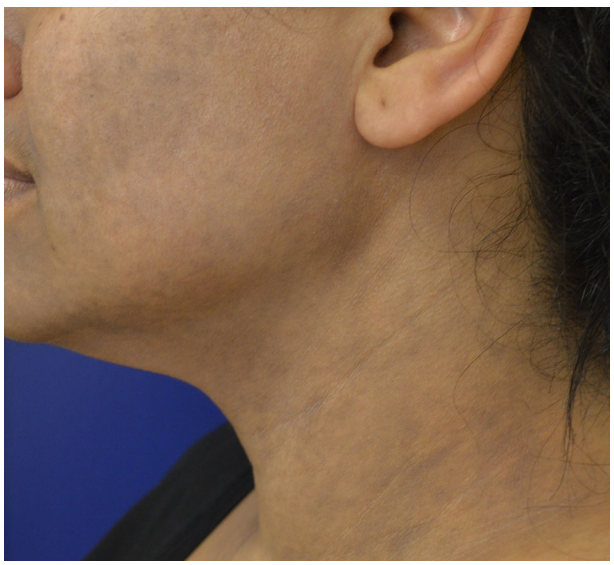

Fig. 6 Erythema dyschromicum perstans: multiple, ill-defined, *gray-brown* macules and patches on the cheek and neck

Table 3 Distinguishing features for rarer etiologies of facial hyperpigmentation

Etiology	Affected group	Clinical features	Pathology	Associations
Idiopathic eruptive macular pigmentation	Children and adults	Asymptomatic brown macules, mainly on face, neck, proximal extremities, and trunk [121]	Basal layer pigmentation with occasional dermal melanophages, some specimens show papillomatosis [122, 123]	Unknown
Post chikungunya pigmentation	All ages	Hyperpigmented macules mainly on the nose but can also appear similar to melasma, periorbital melanosis, or with irregular and flagellate patterns on the trunk, extremities, abdomen, and palms [124, 125]	Increased intra-epidermal melanin in basal and supra-basal areas [125]; others also report presence of pigmentary incontinence and melanophages [124]	Chikungunya infection from *Aedes* mosquitoes or congenital transmission [126]
Erythrose Peribuccale Pigmentaire de BROCQ	Mostly adult women	Red-brown pigmentation involving the perioral area and extending to the nasolabial sulcus [127]	Hyperkeratotic epidermis with dilated follicular openings with some plugging and presence of *Demodex folliculorum*; presence of melanophages in the papillary dermis [128]	UV radiation, fragrances, cosmetics, *Demodex folliculorum* [128]; AD inheritance with incomplete penetrance [129]
Erythromelanosis follicularis faciei et colli	Mostly adult men	Red-brown pigmentation on lateral face/pre-auricular areas, sometimes extending to the neck area [130]	Hyperkeratotic epidermis with some follicular plugging; enlarged sebaceous glands with dilatation of superficial blood vessels [127]	Unknown; possible AR inheritance [127]
Poikiloderma of Civatte	Older than 4th decade	On sun-exposed areas: combination of telangiectasia, hyperpigmentation, hypopigmentation, and depigmentation along with atrophy	Thinning of the epidermis with effacement of rete ridges. Upper dermis shows band-like inflammatory infiltrate with pigment incontinence and dilated blood vessels [131]	Cumulative sun exposure, hormonal factors, aging process, photodynamic substances, also possible AD inheritance with variable penetrance [132, 133]
Actinic lichen planus	Adults of Middle east and Asian origin [134]	On sun-exposed areas; non-pruritic bluish-brown patches/papules/annular plaques; patch-type lesions may resemble melasma [135]	Similar to other forms of lichen planus: hyperkeratosis with wedge-shaped hypergranulosis, saw-toothed rete ridges, basal cell vacuolization; in dermis: lichenoid inflammatory infiltrate and dermal melanophages	Precipitated by UV exposure, higher occurrence during spring or summer [135]
Riehl's melanosis	More common in darker skin types [6]	Brown/black patches on the face, especially forehead, zygomatic and temporal areas; darker pigmentation laterally; sometimes with scale [136]	Follicular plugging, basal cell vacuolization with numerous melanophages and variable inflammatory infiltrate; dilated blood vessels are often seen [136]	Contact dermatitis to cosmetics, fragrances, and plants [6]
Nevus of Ota	Mostly Asian females	Blue-gray large unilateral pigmentation on the face following trigeminal nerve distribution; may also involve oral mucosa/sclera; can be bilateral [137]	Numerous melanocytes diffusely distributed throughout upper and lower dermis [137]	Genetic factors [6], some familial cases [138, 139]. Rare association with melanoma [140–142]

AD autosomal dominant, *AR* autosomal recessive, *UV* ultraviolet

2.12.3 Diagnosis and Histopathology

Diagnosis is often confirmed with histological examination. Histology will show increased epidermal pigment, vacuolar basal cell degeneration with pigment incontinence, dermal melanophages, and perivascular lymphohistiocytic infiltration. In contrast to the dermal pigmentation seen in LPP, that of EDP is deeper within the dermis, producing the blue-gray color of the lesion [102].

2.12.4 Treatments

There is no standard treatment for EDP. It has been reported to self-resolve in 50% of pre-pubertal patients but is more recalcitrant in adults [112, 114, 116]. Current treatment modalities focus on stopping active inflammation using topical and/or systemic corticosteroids, usually in addition to hydroquinone and tretinoin. Inconsistent cosmetic results have been achieved with oral dapsone [117]. Oral clofazimine, an inflammatory and immunomodulatory, showed marked improvement in 66–87% of cases at 3 months [118, 119]. Application of 0.1% tacrolimus ointment for 2–3 weeks has also achieved success in lightening the lesions [117]. Narrowband UV-B phototherapy decreases the production of immune cells and cytokines and has been used to treat EDP [114, 120]. Other treatments for EDP include antibiotics (e.g., doxycycline), griseofulvin, isoniazid, antimalarials, and keratolytic agents [65].

3 Less Common Disorders of Facial Hyperpigmentation

Less common disorders of facial hyperpigmentation are reviewed in Table 3.

4 Conclusion

Facial hyperpigmentation is a condition that more commonly affects individuals with skin of color. Hyperpigmentation, specifically occurring on the facial areas, can have deleterious effects on quality of life. Diagnosis can be difficult, and histopathologic findings are not so readily attained given the highly visible area of involvement. Wood's light examination has utility in diagnosis and assessing disease severity. In addition, dermoscopy is becoming a more utilized non-invasive diagnostic tool. Unfortunately, current treatment protocols are typically not curative and have limited efficacy. Sun-protective measures are the mainstay of both prevention and treatment, whereas a multitude of other modalities, including both non-invasive and invasive techniques, can be used depending on the etiology of dyspigmentation.

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