Chapter

1

Basics and Introduction

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BASICS

This overview of pigmentary disorders is based on three fundamental concepts which are elucidated in the following pages. We will first focus on the role of melanocytes in the color of the skin. This is followed by an overview of various types of colors that can be visualized for numerous different skin diosrders without specifically being related to the melanocyte. At the end, we give an overview of the common pigmentation disorders both hyper and hypo.

Needless to say, it must be appreciated that no amount of manipulation by fairness creams can alter the basic nature of the skin in Indians nor can it affect in any way the melanocytes. This message should be conveyed to patients at the outset.

MELANOCYTES AND COLOR

Melanin, synthesized by melanocytes, provides some defence against ultraviolet radiation (UVR) as well as gives color to skin and hair. Skin color and ease of tanning are important determinants of the risk of skin cancer.

- **Melanocytes** are dendritic cells that migrate from the neural crest to the epidermis and hair follicles in the third month of fetal development.
- Melanocytes are interspersed amongst the basal keratinocytes in the epidermis. Melanocyte stem cells are found in the bulge region of hair follicles from where they migrate to the hair bulb.
- Melanocytes synthesize both brown/black eumelanin and red/yellow pheomelanin from tyrosine.
- Melanin is passed in packages (melanosomes) along dendritic processes into keratinocytes (Fig. 1.1) where melanosomes sit in a cap or 'parasol' over the upper sun-exposed side of the keratinocyte nucleus. Each melanocyte links to a number of keratinocytes, forming an epidermal melanin unit. Melanin provides protection by absorbing visible light and UVR.
- UVR induces tanning by stimulating oxidation of pre-existing melanin, by triggering the synthesis of new melanin, and by changing the distribution of melanosomes.
- Melanin is the main determinant of the color of skin and hair. The color depends on the number, size, and distribution of melanosomes within keratinocytes and

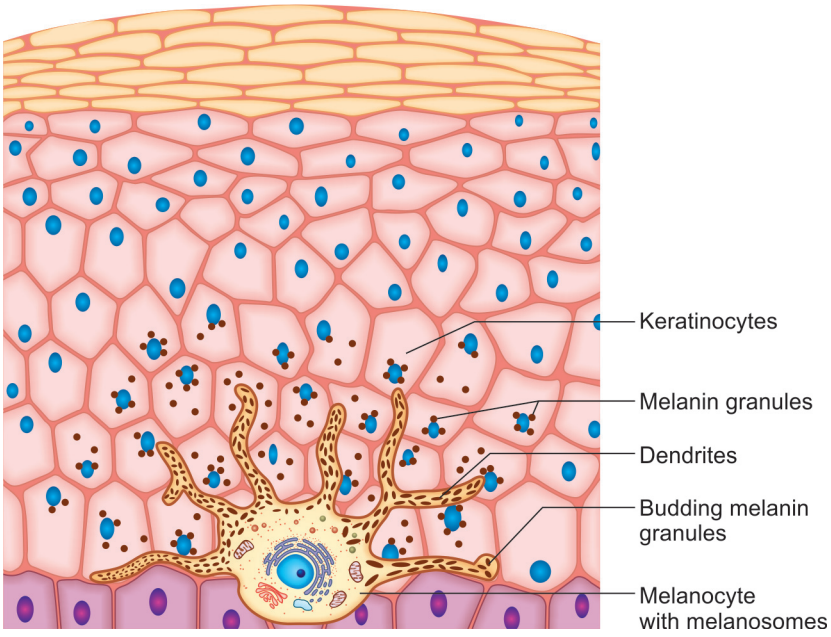


Fig. 1.1: An artist's depiction of the epidermis with the melanocyte which has dendritic processes that help in dispersing melanin to the keratinocytes

the type of melanin, rather than the number of melanocytes. Darkly pigmented skin has similar numbers of melanocytes as lightly pigmented skin, but more and slightly differently packaged melanin (melanosomes) within keratinocytes.

- The melanosomes in white skin are small and tend to be aggregated within the keratinocyte whereas in darker skin melanosomes are larger and distributed as singlets.
- Skin color is not uniform. Normal variation in pigment also called pigmentary demarcation lines must be differentiated from acquired pigmentation (Box 1.1). Dorsal skin surfaces are more pigmented

Box 1.1: Pigmentary demarcation lines (Voigt-Futcher lines)

Type A	Vertical line on the lateral aspect of the upper arm that may extend into the pectoral region (commonest).
Type B	Curved line on back of the thigh (posteromedial) that extends from the perineum to the popliteal fossa and occasionally the ankle.
Type C	Vertical or curved hypopigmented band on the mid-chest (contains two parallel lines).
Type D	Vertical line on the posteromedial area of the spine.
Type E	Bilateral hypopigmented streaks, bands, or patches on the upper chest in the zone between the mid-third of the clavicle and the periareolar skin.
Facial patterns, which appear around puberty, have been described in the Indian subpopulation:	
Type F	V-shaped hyperpigmented lines between the malar prominence and the temple.
Type G	W-shaped hyperpigmented lines between the malar prominence and the temple.
Type H	Linear bands of hyperpigmentation from the angle of the mouth to the lateral aspects of the chin.

than ventral surfaces. Lines of demarcation between darker dorsal and paler ventral surfaces are apparent in about 20% of people with dark skin. The lines, which are symmetrical and bilateral, are present from infancy and have no clinical significance.

- Darkly pigmented skin has better epidermal barrier function than lightly pigmented skin.

INTRODUCTION

COLOR AND SKIN DISORDERS

Most skin disorders have a distinctive color to them. Though we will largely discuss disorders with alteration in pigment cells (melanocytes), it is a good idea to give an overview of the various colors that can be seen in skin disorders. These are listed in Table 1.1. Disorders of melanin pigmentation can be divided into hypermelanosis and hypomelanosis. Hypermelanosis is characterized by increased amount of melanin in the skin. Excess melanin in epidermis gives a brownish hyperpigmentation whereas in the dermis it produces a blue or slate-gray appearance. Hypomelanosis is characterized by a lack of pigment in the skin that leads to white or lighter skin as compared to the normal color. Depigmentation refers to loss of pre-existing pigment from the skin. The commonly used term 'leukoderma' denotes white skin that can be congenital or acquired.

Table 1.1: Overview of causes of various colored lesions in dermatology

Color		*Common causes*	
	Endogenous		*Exogenous*
Red/purple	Erythrocytes Inflammation Vessels	Hemangioma (Fig. 1.2)	Tattoo
Black	Melanin Inflammation Vessel occlusion Necrosis	Vessel necrosis (Fig. 1.3)	Tattoo Poison Ivy Tick
Blue	Melanin Vessels	Venous malformation (Fig. 1.4)	Drug Heavy metals Tattoo pigment
Yellow	Lipid CT disease Deposition Keratin	Xanthoma (Fig. 1.5a to c)	Drug
Brown	Melanin Hemosiderin Celullar proliferation (dermatofibroma)	Melasma (Fig. 1.6)	Drug
White	Decreased melanin Vasospasm Deposition (calcium) Keratin Scar	Scar (Fig. 1.7)	Tattoo

CT: Connective tissue

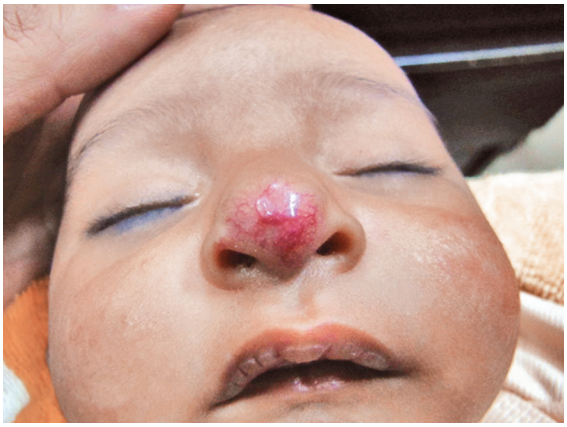


Fig. 1.2: Red nodule: Hemangioma

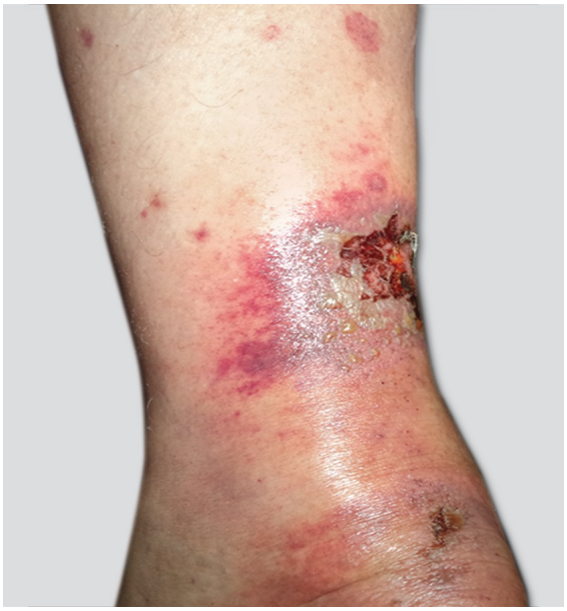


Fig. 1.3: Vessel necrosis in a case of occlusion with vasculitis

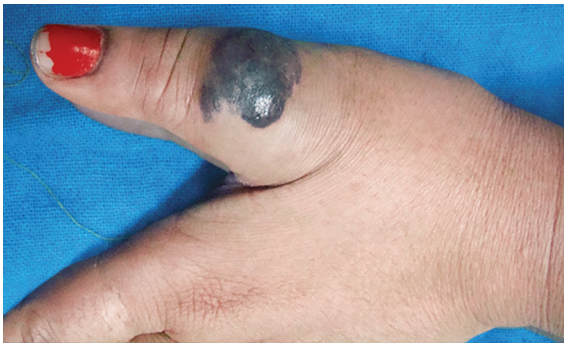


Fig. 1.4: Venous malformation

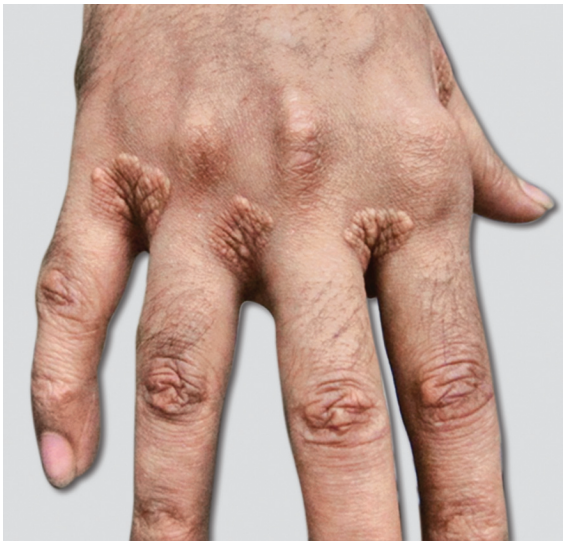


Fig. 1.5a: Striate xanthoma (type III hyperlipoproteinemia)

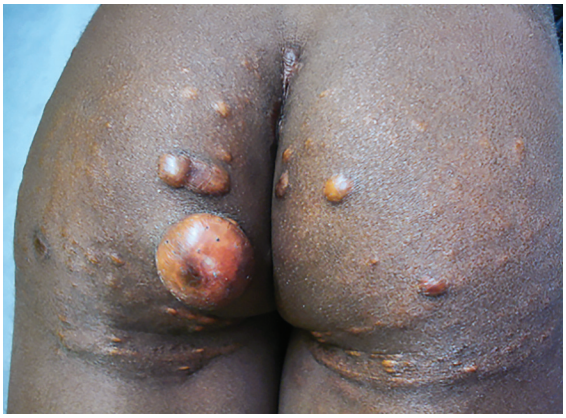


Fig. 1.5b: Tuberous xanthoma

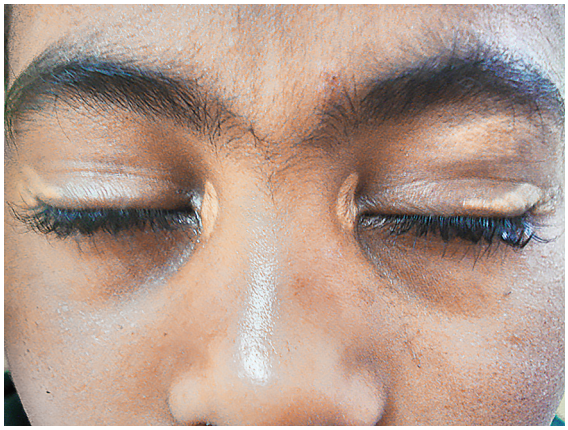


Fig. 1.5c: Xanthelasma

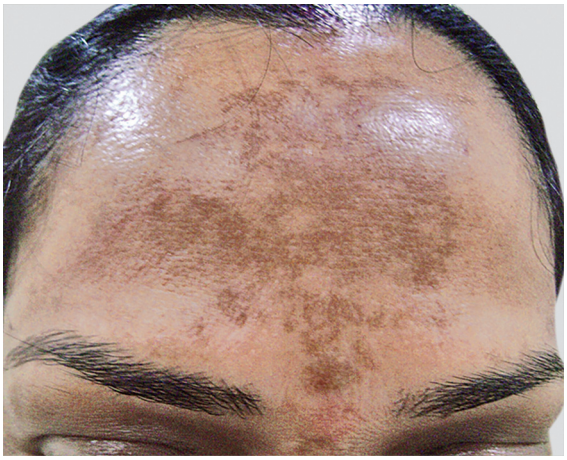


Fig. 1.6: Melasma

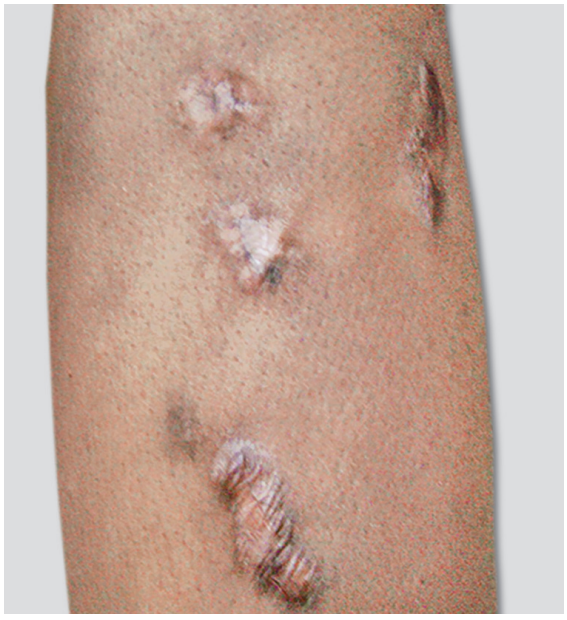


Fig. 1.7: Scar following traumatic injury

Change in Skin Color (Pigment Cell)

The commonest cause of change in color is due to a previous inflammation. This is known as post-inflammatory hyperpigmentation. Though we will be largely restricting ourselves to the change in melanin and melanocytes, it is important to take an overview of the various causes. The details of common disorders will follow in subsequent Chapters.

Acquired Hyperpigmentation

Strictly speaking, hyperpigmentation means brown skin, but this list encompasses colors ranging from brown to blue or gray.

a. **Common**

- Normal racial variation or sun tan.
- *Stasis dermatitis*: The pigment is a mixture of melanin and hemosiderin.
- *Melasma* (*usually facial*): Brown color caused by melanin (Fig. 1.6).
- Post-inflammatory hyperpigmentation, particularly in dark skin.

  Common after acne, lichenoid eruptions such as lichen planus (LP) or cutaneous lupus erythematosus (LE) and contact dermatitis (Fig. 1.8a). Lichenoid eruptions subside with a grayish tinge as the pigment is deep in the dermis (Fig. 1.8b).
- 10% of normal people have one or two café au lait spots/macules (CALM) (Fig. 1.9).
- *Erythema ab igne*: Repeated local heating of the skin from a hot water bottle or fire causes localized fixed reticulate pigmentation.
- *Phytophotodermatitis*: Linear streaks of brown pigmentation are preceded by erythema and sometimes blisters.

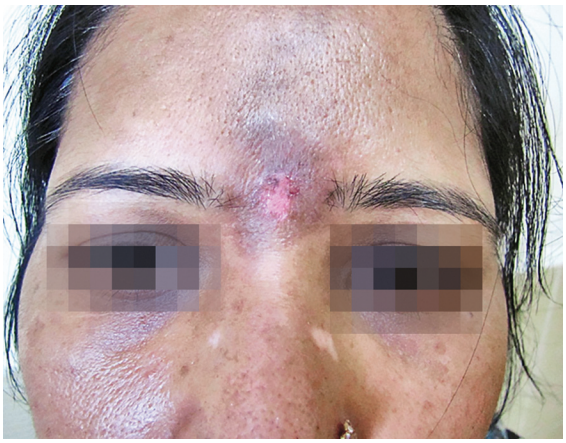


Fig. 1.8a: Contact dermatitis—due to the allergy to the sticking chemical of bindi

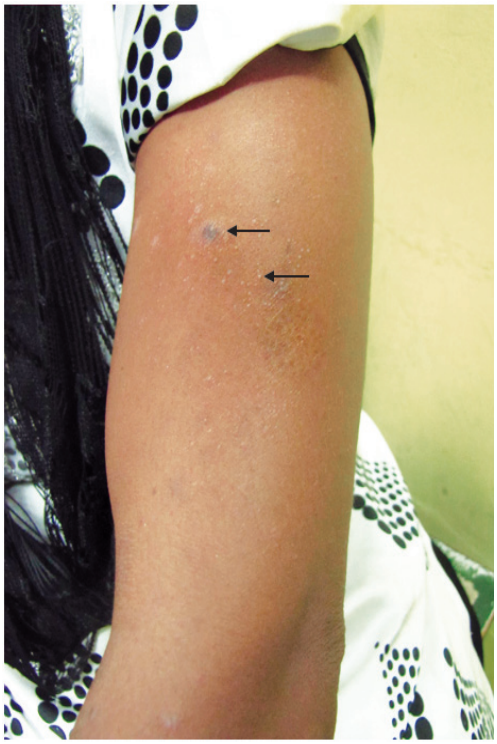


Fig. 1.8b: Lichenoid eruption

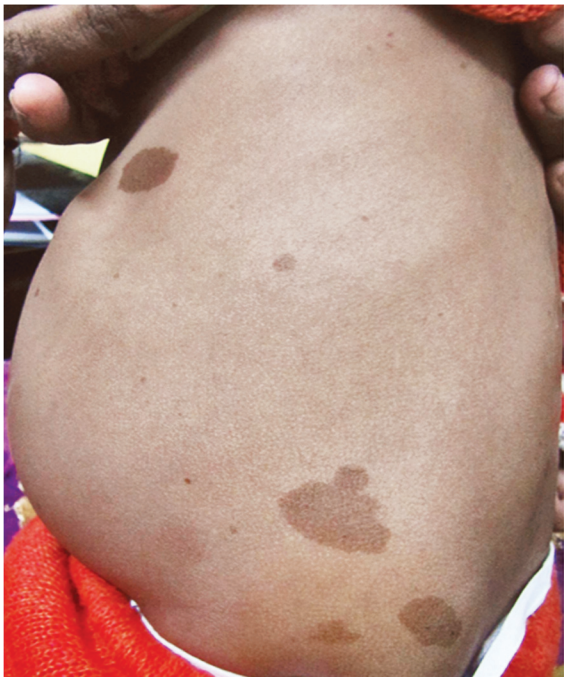


Fig. 1.9: CALM. Here the patient has multiple CALM. It is advisable to look for a systemic cause

- *Dermatitis neglecta:* Occasionally, patients avoid touching a patch of skin. The unwashed skin builds up brown scale.
- Drugs, including minocycline, antimalarials (Fig. 1.10), amiodarone, and heavy metals, may give the skin a bluish grey tinge.
- *Amyloidosis:* Rippled pigmentation (Fig. 1.11).

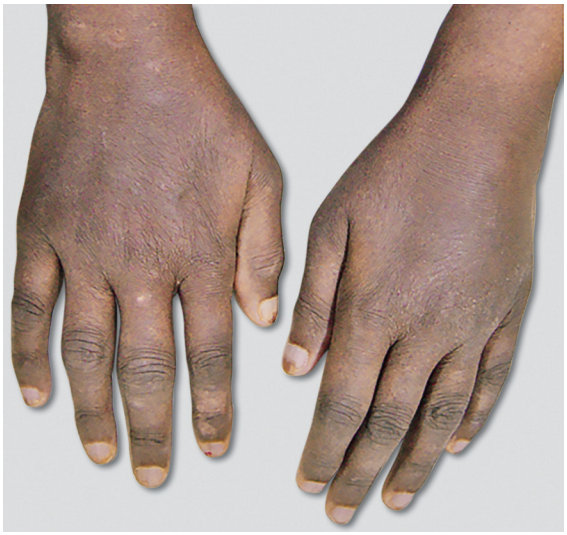


Fig. 1.10: Drug-induced pigmentation: This patient was on HCQS (hydroxychloroquine sulfate) for 6 months

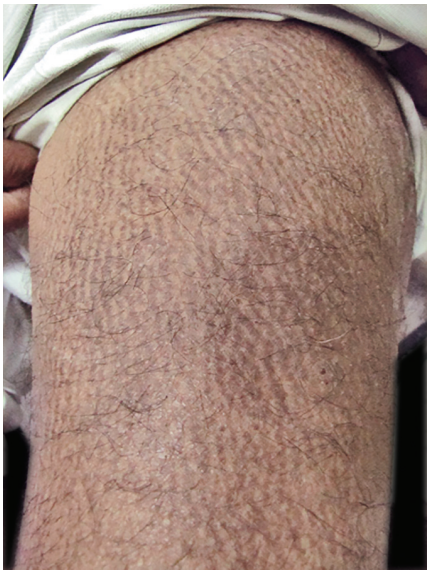
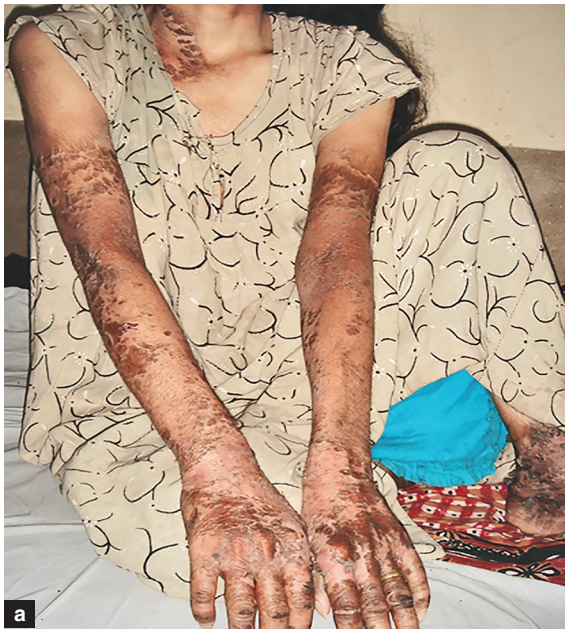


Fig. 1.11: Amyloidosis: Rippled pigmentation

b. **Less common**

- Neuropathic itch or chronic rubbing.
- Malabsorption, pellagra (Fig. 1.12).
- Cutaneous systemic sclerosis and sclerodermoid chronic graft versus host disease (GVHD). The skin is thickened, often with perifollicular hypopigmentation.



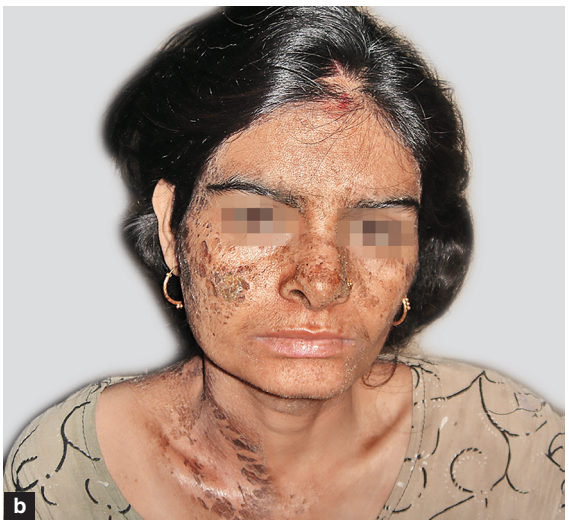


Fig. 1.12a and b: Pellagra: Scaly pigmented plaques on exposed sites

Fig. 1.13: Freckles in a fair-skinned patient

- Pseudo-ochronosis secondary to hydroquinone in skin-lightening creams (may also cause confetti-like loss of pigment). It is also called as exogenous ochronosis.
- Primary biliary cirrhosis, hemochromatosis.

c. **Rare**

- *Café au lait spots* (*CALM*): Multiple CALMs are seen in neurofibromatosis, McCune-Albright syndrome, multiple mucosal neuromas syndrome.
- Widespread freckling (Fig. 1.13) in children may be associated with xeroderma pigmentosum (XP), multiple lentigines syndrome, Carney complex, and Peutz-Jeghers syndrome.
- *Generalized pigmentation:* Adrenal insufficiency, Nelson syndrome, ectopic adrenocorticotropic hormone (ACTH)—producing tumors, POEMS syndrome in plasma cell disorders.
- *Alkaptonuria:* Blue black pigment of helices of the ear and sclerae.

Hypopigmentation and Depigmentation

Hypopigmented skin: Loss of pigment is partial. The tone of the skin is creamy, rather than absolutely white. Depigmented skin is

white and fluoresces bright white under Wood's light, e.g. vitiligo, though this is rarely required in our skin type.

a. **Common**

- *Pityriasis alba:* Hypopigmented cheeks in children. Subtle scale may be present (Fig. 1.14).
- *Pityriasis versicolor:* Scaly in the active phase, but macular post-inflammatory hypopigmentation may persist for months, until melanocytes are stimulated by sun exposure (Fig. 1.15).
- *Idiopathic guttate hypomelanosis:* Pale macules on sun-damaged forearms of adults.
- *Progressive macular hypomelanosis:* Common in young AfroCaribbean adults. Progressive symmetrical hypopigmentation in midline of the trunk.
- *Post-inflammatory hypopigmentation:* Most often in dark skin. Causes—psoriasis, discoid lupus erythematosus (DLE) (Fig. 1.16), sarcoidosis, leprosy, pinta, and kwashiorkor.
- *Vitiligo:* Smooth depigmented macules or patches (Fig. 1.17).
- *Halo nevus:* Seen in children or young adults, a ring of white skin appears around a melanocytic nevus. The brown 'mole' gradually turns pink and

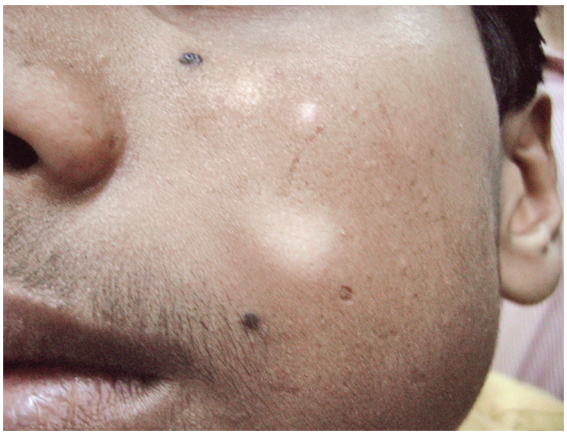


Fig. 1.14: Pityriasis alba

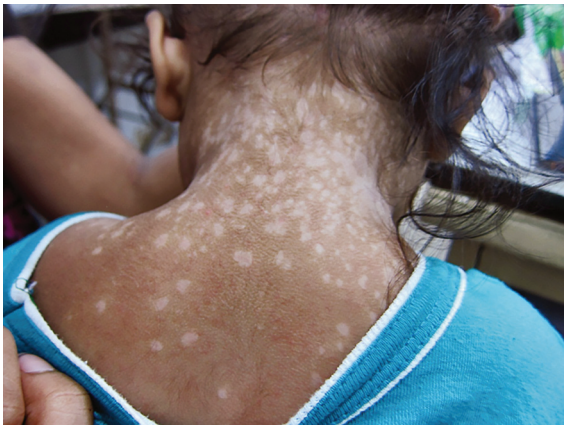


Fig. 1.15: Macular post-inflammatory hypopigmentation consequent to P versicolor

Fig. 1.16: DLE: Discoid plaques of DLE heal with pigmentary loss and can be mistaken for vitiligo

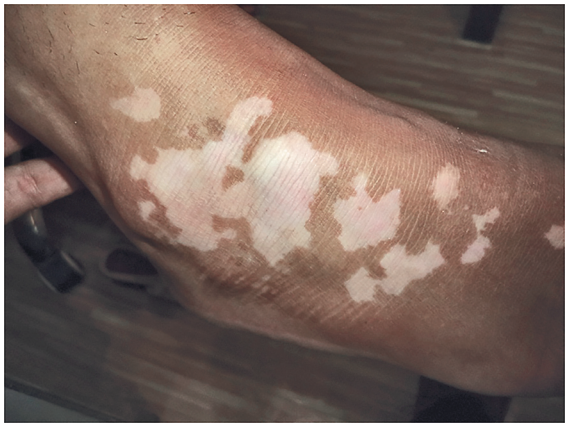


Fig. 1.17: Vitiligo

eventually disappears, leaving a depigmented macule (Fig. 1.18).
- Scars (may also be hyperpigmented).
- *Atrophie blanche:* Pale scar with a rim of telangiectasia. Seen over the leg in venous disease.
- *Post-injection:* Perilymphatic depigmentation consequent to injection of steroids within joints or ganglion is a common and reversible phenomenon (Fig. 1.19).

b. **Less common**
- Contact leukoderma after exposure to chemicals, e.g. aromatic or aliphatic derivatives of phenols or catechols, hydroquinone in skin-lightening creams, betel leaves, fentanyl patches.
- *Secondary syphilis:* Hypopigmented macules superimposed on hyperpigmented, reticulate patches (syphilitic leucomelanoderma) seen over neck, chest, and back. Usually occurs six months after primary disease.
- *Tuberous sclerosis:* Oval or confetti- like hypopigmentation.
- *Cutaneous lupus erythematosus (LE):* Hypo- and hyperpigmentation.
- *Morphea or cutaneous scleroderma:* Perifollicular hypopigmentation in thickened skin. May also be hyperpigmentation.
- Chronic GVHD (also hyperpigmentation).
- *Antiphospholipid syndrome:* Porcelain white scars with telangiectatic rim (like atrophie blanche).
- *Chronic arsenic ingestion:* 'Raindrop' hypopigmentation.
- *Extragenital lichen sclerosus:* Crinkly, shiny white papules with follicular plugging. Look for genital disease.
- *Nevus depigmentosus:* Localized hypopigmented skin with discrete, regular, or serrated margins. Stable appearance.
- *Nevus anemicus:* Jagged outline, caused by vasoconstriction
- Cutaneous T cell lymphoma (Fig. 1.20).

c. **Rare**
- Malignant atrophic papulosis (Degos disease). Erythematous papules evolve into porcelain white scars with a rim of telangiectasia. Linked to fatal vascular occlusion in the gastrointestinal tract (GIT) or central nervous system (CNS). Differentiate from antiphospholipid syndrome.
- *Pigmentary mosaicism:* Swirling hypopigmented patches (Fig. 1.21).

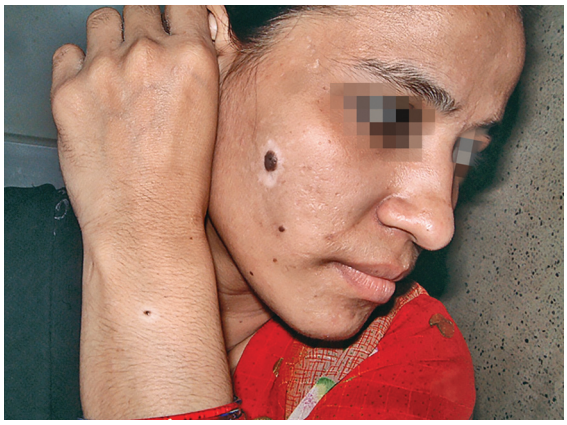


Fig. 1.18: Halo nevus

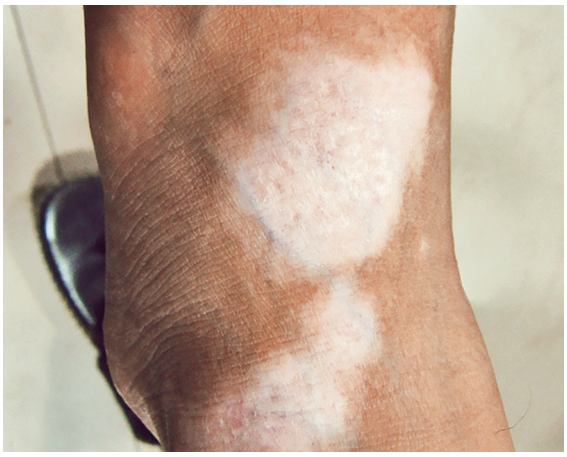


Fig. 1.19: Post-steroid pigmentary loss. Commonly seen due to extravasation of steroid while injecting intralesionally

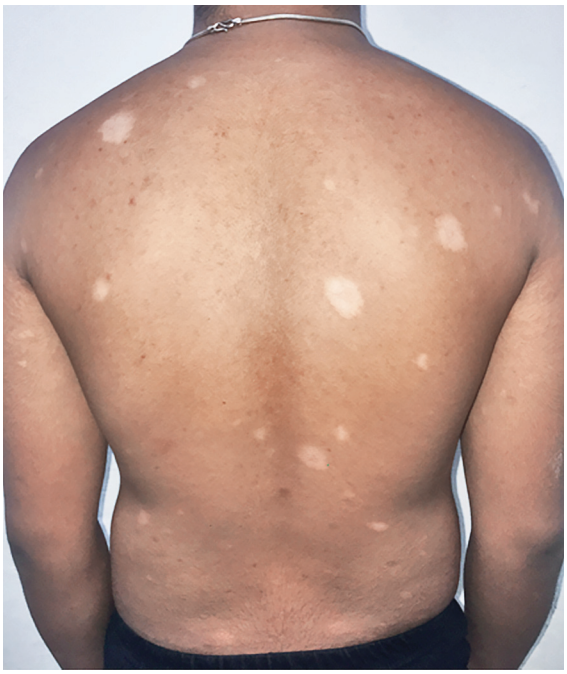


Fig. 1.20: A child with hypopigmented macules over the trunk. Biopsy showed changes suggestive of mycosis fungoides

- Focal dermal hypoplasia of Goltz.
- *Albinism:* Total body depigmentation, light blue iris, nystagmus.
- Waardenburg syndrome (a form of piebaldism). Autosomal dominant (AD) inheritance. Symmetrical patches of hypopigmentation on the face, scalp, back, and proximal extremities, with a stripe of normal-colored skin down the center of the back. Also white forelock, neurosensory deafness, widening of the bridge of the nose, and heterochromia of the iris.
- *Incontinentia pigmenti*: Linear atrophic hypopigmented scars along Blaschko's lines that represent post-inflammatory scarring (Fig. 1.22).

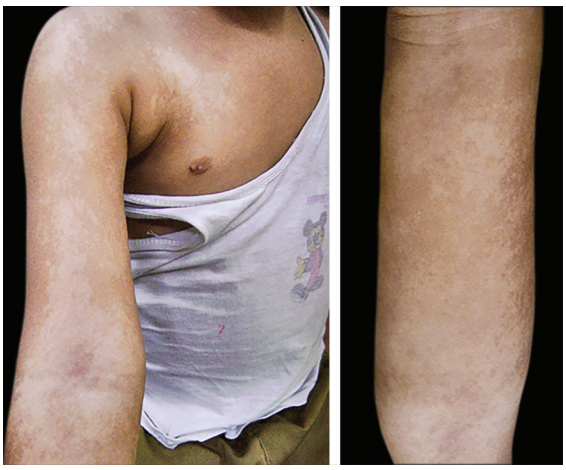


Fig. 1.21: Nevoid hypomelanosis

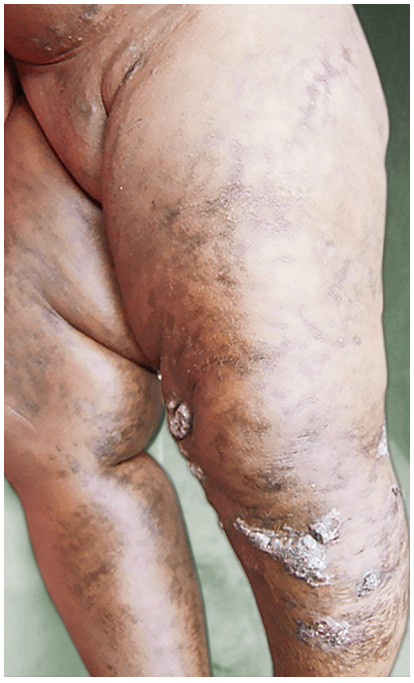


Fig. 1.22: Incontinentia pigmenti