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Vikram K. Mahajan and Sanjeev Handa

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Abstract

About 15–20% of all consultations in clinical practice worldwide is for dermatological conditions, while a significant number do not seek medical consultation for self-limiting nature of disorder or self-treatment. However, skin diseases have a great impact on cosmetic, physical, psychological, or social well-being of an individual affecting quality of life significantly. An accurate and early diagnosis is of paramount importance for a holistic management. Dermatologic diagnosis is usually a two-step

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approach with an advantage of visibility of skin lesions. These approaches include (1) history taking, physical examination, and clinical investigations and (2) interpretation of information gathered in terms of functional, structural, and pathological disorder.

Keywords

Skin · Dermatologic diagnosis · Dermatology · Medical history · Clinical examination · Skin biopsy · History taking · Physical examination · Mucocutaneous examination · Primary skin lesion · Secondary skin lesion · Macule · Patch · Papule · Nodule · Plaque · Vesicle · Bulla · Blister · Pustule · Abscess · Carbuncle · Cyst · Scale · Desquamation · Crust · Erosion · Ulcer · Fissure · Excoriation · Sinus · Scar · Keloid · Atrophy · Lichenification · Wheal · Angioedema · Burrow · Comedo · Telangiectasia · Erythema · Purpura · Petechia · Ecchymosis · Livedo reticularis · Poikiloderma · Target lesion · Bull's-eye lesion · Cockade · Cutaneous horn · Sclerosis · Scale · Collarette scale · Pityriasisiform scale · Ichthyotic scale · Micaceous scale · Mica-like silvery scale · Furfuraceous scale · Crack-like scale · Gritty scale · Exfoliative scale · Zosteriform · Corymbiform · Koebner's phenomenon · Isomorphic phenomenon · Sporotrichoid pattern · Circle of Hebra · Magnifying lens · Wood's lamp · Dermatoscope · Dermoscopic examination · Epiluminescence microscopy · Trichoscope · Trichoscopy · Videodermatoscopy · Scoring system · Wallace rule of nine · Psoriasis Area Severity Index score · PASI score · Melasma area severity index · MASI · Vitiligo area severity index · VASI · Vitiligo disease activity score · VIDA score · Scoring atopic dermatitis · SCORAD · Urticaria activity score · UAS · Score for toxic epidermal necrolysis · SCORTEN · Clinical sign · Auspitz's sign · Grattage test · Dermographism · Darier's sign · Pseudo-Darier's sign · Fitzpatrick's sign · Buttonhole's sign · Crowe's sign · Carpet tack sign · Tin-tack sign · Nikolsky's sign · Pseudo-Nikolsky's sign · bulla-spread sign · Asboe-Hansen sign · Indirect Nikolsky sign · Nikolsky II sign · Deck-chair sign · Dory-flop sign · Matchbox sign · Heliotrope sign · Gottron's sign · Holster sign · Shawl sign · Groove sign of Greenblatt · Forchheimer's sign · Leser-Trelat sign · Pathergy phenomenon · Examination of nail · Ingram's sign · Nail dystrophy · Nail pitting · Beau's lines · Koilonychia · Leukonychia · Melanonychia · Onycholysis · Nail clubbing · Pterygium unguis · Lindsay's half and half nails · Shuster's sign · Examination of hair · Trichogram · Hair pluck test · Phototrichogram · TrichoScan · Follicle · Clinical side lab test · Bedside lab test · Potassium hydroxide mount · KOH mount · Wet mount · Tzanck test · Giemsa staining ·

Slit-skin smear · Ziehl-Neelsen staining · Epicutaneous test · Provocation test · Patch test · Photopatch test · Skin prick test · Puncture test · Scratch test · Pathergy test · Acetowhite test · Skin biopsy · Punch biopsy · Excision biopsy · Incisional biopsy · Wedge biopsy · Shave biopsy · Saucerization · Snick biopsy · Clip biopsy · Skin surface biopsy · Curette biopsy

1 Introduction

The skin is the largest organ of the human body, measuring about 2.12 m^2 in extent and 4.2 kg in weight, and mirrors physical and psychological well-being of an individual. Nearly 15–20% of all consultations in clinical practice worldwide are for dermatological conditions, while 70% of people in developing countries suffer a skin disease at some time in their lives. However, most patients do not seek medical consultation because of self-limiting nature of disease or self-treatment. Because of the visual nature of skin lesions, whether trivial or persistent and localized or extensive, skin diseases significantly have a great impact on cosmetic, physical, psychological, or social well-being affecting quality of life. Thus, a holistic approach both for physical and psychological aspects remains the most important aspect of accurate and early diagnosis and efficient management of dermatological disorders (Coulson et al. 2016; Garg et al. 2008; Pasricha and Khaitan 2005).

2 Overview for Dermatologic Diagnosis

In general, a patient is usually evaluated in two steps for making a diagnosis, including (1) observation by history taking, physical examination, and clinical investigations and (2) interpretation of information gathered in terms of functional, structural, and pathological disorder. Unlike other specialties, dermatology has the advantage that the diseases are visible leading to instant diagnosis in a large number of cases just by direct inspection.

Clinically, dermatological disorders can be categorized into three groups: (1) disorders such as chronic plaque psoriasis, dermatophytosis, scabies, and atopic dermatitis presenting with characteristic morphology and distribution leading to specific clinical diagnosis; (2) disorders such as erythema multiforme and erythema nodosum having a characteristic clinical pattern and usually variable underlying causes; and (3) dermatoses such as lichen planus and urticaria having variable presentations and underlying causes. However, there can be variations in clinical manifestations depending upon genetic, racial, geographic, and environmental differences. It is also essential to appraise the extent and

severity of disease; predisposing, precipitating, aggravating, and relieving factors; complications; and response to treatments received. A detailed medical history and astute clinical examination remain imperative for diagnosis and efficient management of any disease, whereas skin biopsy and other investigative workup are useful adjuvant in arriving at an accurate diagnosis (Coulson et al. 2016; Garg et al. 2008; Pasricha and Khaitan 2005).

3 History Taking and Physical Examination

It is important to take a detailed history of the skin complaints and every other systemic symptom (Table 1) and examine the patient in entirety. The patient may present with subjective symptoms such as itching, pain or abnormal sensation, or objective symptoms like a skin rash. The history of present illness is usually directed toward onset of skin lesions, associated symptoms, their evolution, and past episodes (Coulson et al. 2016; Garg et al. 2008; Pasricha and Khaitan 2005).

3.1 Mucocutaneous Examination

Mucocutaneous examination includes examination of the skin, hair, nails, and all mucous membranes for lesions. Oral cavity, palms, soles, scalp, and body folds are examined specifically. Palpation of peripheral nerves, checking for sensory-motor deficit, and examination of genitalia may be needed specifically for patients suspected to have leprosy or sexually transmitted diseases. The patient may be required to undress and remove all makeup before clinical examination; thus, making the patient comfortable and ensuring privacy/confidentiality is important. As a rule, skin lesions should be studied for their morphology (size, shape, texture, solidness or hollowness, color, margin, surface, and secondary changes), distribution, configuration, and arrangement to reach a diagnosis (Tables 2, 3, 4, and 5).

Skin lesions in many dermatoses have characteristic morphology (primary skin lesions) (Figs. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15) and may get modified from scratching, erosions, ulceration, or other factors (secondary skin lesions) (Figs. 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, and 29). Morphology of some skin lesions is also

Table 1 General outline for history taking and examination in dermatology (Coulson et al. 2016; Garg et al. 2008; Pasricha and Khaitan 2005)

Chief or present complaint and treatment(s)	Duration, continuity, or intermittency Site of onset for initial and subsequent lesions and their distribution Symptoms such as itching, pain, burning, sensory-motor loss, etc. Signs such as blistering, pigmentation, scaling, etc. Evolution (improvement, worsening, or appearance of new lesions) Triggers-factors affecting initiation, aggravation, or remission Diurnal variation of symptoms Past episodes (if positive history for past episode, similar or different presentation) Investigations, treatments, and their effects done for the present condition
Past medical history	Past or concurrent illnesses such as diabetes mellitus, hypertension, chronic infections like tuberculosis, allergies, idiosyncratic reactions, drug intolerance, etc. Other skin diseases Therapies
Personal and social history, occupation, hobbies, and spare time activities	Sleeping habits, diet, alcohol consumption, smoking, recreational drugs Intake of vitamins and other supplements, laxatives, painkillers or other treatments, cosmetics, etc. Exposure to chemicals (epoxy resins, chromates, nickel, etc.), cement, and weeds (farming and gardening) Hobbies Travels
Sexual practices (optional)	In patients with sexually transmitted diseases, it is needed
Menstrual/obstetric history in women	Menstrual irregularities Bad obstetric history
Family history	Similar diseases Other diseases such as asthma, hay fever, diabetes, melanoma, psoriasis, vitiligo, genetic disorders, etc. Consanguinity of parents
Physical examination	General appearance including obesity/built, height, weight, mental and physical orientation, etc. Vitals including pulse and respiratory rates, temperature, blood pressure, paleness, icterus, cyanosis, lymphadenopathy, pedal edema, etc. Mucocutaneous examination as general (skin, hair, nails, mucosal membranes, etc.) Specific examination of mucocutaneous lesions in relation to dermatologic complaint

Table 2 Morphologic classification of primary skin lesions (Coulson et al. 2016; Mahajan and Ranjan 2015; Garg et al. 2008; Pasricha and Khaitan 2005)

Term	Clinical feature	Example
Macule	Flat, circumscribed, non-palpable alteration in skin color without depression or alteration in skin texture or scaling within the lesion ≤1 cm in diameter Well-defined or ill-defined in margin Circular, oval, or irregular in shape Hypo-, hyper-, or depigmented in pigmentation Pink, red, violet, gray, or black in color A macule >1–2 cm in diameter is better called as “large macule” and a macule >2 cm in diameter as “area”	Nevus anemicus (hypopigmented), freckles and melasma (hyperpigmented), and vitiligo (depigmented)
Patch	No consensus upon definition A macule >1 cm often described as patch A proposed definition: “a circumscribed, non-elevated, and flat skin lesion having obvious altered skin texture or fine scaling with or without changes in skin color” Well-defined, ill-defined, regular, or irregular in margin Erythematous, hypo- or hyperpigmented	Mycosis fungoides (patch stage), digitate dermatosis, borderline tuberculoid hypopigmented patch of leprosy, and pityriasis alba
Papule	A circumscribed solid palpable elevation ≤0.5 cm in diameter Papules sized 1–2 mm defined as micropapules Smooth, rough, or irregular in surface Dome-shaped, flat-topped, acuminate, umbilicated, pedunculated, and filiform in morphology	Lichen nitidus (micropapules), molluscum contagiosum (smooth surface, dome-shaped, and umbilicated), verruca vulgaris and seborrheic keratosis (rough surface), lichen planus (flat-topped), acne (acuminate), and acrochordons (pedunculated), warts (filiform)
Nodule	A solid palpable lesion >0.5 cm in diameter The absolute size probably not very important The depth differentiating a nodule from a papule Elevated above surface or palpable in dermis or subcutis Elevation due to epidermal hyperplasia, inflammatory cells’ infiltration, or deposits within the dermis	Neurofibroma, lipoma, metastases, erythema nodosum, and nodular leprosy
Plaque	An elevated plateau-like area of the skin Surface area greater than the height ≥1 cm or more in diameter Plaque sized >2 cm labeled as “large plaque” May be formed by the extension or coalescence of either papules or nodules Elevation due to epidermal edema, hyperplasia and/or inflammatory cells’ infiltration, or deposits within the dermis	Psoriasis, discoid eczema, lichen simplex chronicus, lichen planus, xanthoma, mycosis fungoides (plaque stage), and leprosy
Vesicle	An elevated fluid-filled lesion ≤0.5 cm in size Arise from the cleavage at either intraepidermal or subepidermal level Clear, serous, turbid, or hemorrhagic in content depending on its pathology	Herpes simplex, herpes zoster, varicella, pompholyx, and dermatitis herpetiformis
Bulla or blister	An elevated fluid-filled lesion ≥0.5 cm in size Arise from the cleavage at either intraepidermal or subepidermal level Clear, serous, turbid, or hemorrhagic in content depending on its pathology	Pemphigus, bullous pemphigoid, friction blister, diabetic bullae, and epidermolysis bullosa
Pustule	A visible accumulation of free pus May occur on normal skin or within a pilosebaceous follicle or a sweat duct Associated with bacterial or other infections Can be sterile	Pustular psoriasis, acute generalized exanthematous pustulosis, subcorneal pustular dermatoses, bacterial folliculitis, and inflammatory acne
Abscess	An infection of hair follicle and localized accumulation of pus deep in the dermis or subcutis Visible as fluctuant nodule with inflammation (erythematous, painful, warm, and tender) Inflammation of surrounding skin Due to staphylococcal and/or streptococcal infections	Pilonidal abscess

(continued)

Table 2 (continued)

Term	Clinical feature	Example
Carbuncle	Deep infection (as abscess) of a group of contiguous follicles Intense inflammation of surrounding and underlying tissues Pus discharging from multiple follicular orifices Necrosis of intervening skin leaving yellow necrotic slough surmounting a crateriform nodule	Diabetic carbuncle
Cyst	A closed cavity or sac (normal or abnormal) of variable size Having an epithelial, endothelial, or membranous lining Containing fluid or semisolid material	Sebaceous cyst, epidermoid cyst, and milium

specific to the relevant disorder (specific skin lesions) (Figs. 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, and 45). Further descriptions have been summarized in Table 6 and can be seen in Figs. 46, 47, 48, 49, 50, 51, and 52 (Coulson et al. 2016; Garg et al. 2008; Pasricha and Khaitan 2005).

3.2 Skin Examination Tools

Commonly used skin examination tools and their application have been summarized in Table 7 and been shown in Figs. 53, 54, and 55.

3.2.1 Diascope

A diascope is a clean microscopic glass slide for bedside use to highlight the actual morphology of a skin lesion particularly with vascular component. The glass slide pressed against the lesion causes blanching and delineates its actual morphology (Table 8).

3.2.2 Wood's Lamp

Wood's light, invisible, long-wave UV radiation (365 nm) filtered through 9% nickel oxide with barium silicate is used to induce fluorescence in dermatoses. Wood's lamp has a wide variety of clinical applications (Table 9). The skin should be well cleansed before examination as topical ointments, exudates, cosmetics, and soap may also fluoresce. The lamp should be on for at least a minute to attain optimum intensity, and the light source should be 4–5 in. from the lesion for best results.

3.2.3 Dermatoscope

Dermatoscope uses high-magnification skin surface microscopy by illumination of a lesion with different light sources. Different varieties of them are available (Fig. 55). Dermoscopic examination or epiluminescence microscopy is a noninvasive method that allows *in vivo* evaluation of colors, microstructures of the epidermis, dermoepidermal junction, and papillary dermis for diagnosis and to differentiate simulators (Table 10). Linkage fluids are applied to the

lesion to prevent reflection of light incident on dry, scaly skin to improve the visibility of subsurface features.

3.2.4 Trichoscope

Trichoscope is a special digital camera equipped with a close-up microscopy attachment to visualize hair and scalp at $\times 20$ to $\times 120$ magnifications. A usual handheld dermatoscope of $\times 10$ magnification can serve the same purpose. The number of hairs is assessed, and hair shaft diameter and relevant trichologic parameters are then measured using the software. Trichoscopy (videodermatoscopy) is a simple, quick, less invasive, semiquantitative, and superior method to the trichogram (Gallikar and Trüeb 2012; Rudnicka et al. 2008) for identifying common scalp dermatoses and hair loss (Table 11).

4 Scoring System

The methods used for evaluation of dermatological diseases are mostly subjective and associated with observer's bias and may lead to discrepancy in results which may not be reproducible due to interobserver variations. Following are some commonly used and uniformly accepted scoring systems in dermatology.

4.1 Wallace Rule of Nine

An area of skin equal to the palm of one hand represents approximately 1% of the total body surface area (BSA). Wallace rule of nine is used frequently to measure involved BSA to estimate extent and severity in widespread dermatoses (Fig. 56).

4.2 Psoriasis Area Severity Index Score (PASI Score)

PASI score is commonly used for assessment of extent and severity of psoriasis despite limitation of interobserver variability. It is calculated combining the assessments of

Table 3 Morphologic classification of secondary skin lesions (Coulson et al. 2016; Garg et al. 2008; Pasricha and Khaitan 2005)

Term	Clinical feature	Example
Scale	A visible exfoliation of flakes of stratum corneum Occurring from accumulation of stratum corneum due to increased proliferation and/or delayed desquamation A perceptible accumulation or shedding of scales called as “desquamation” May accompany or follow many inflammatory disorders Morphologic appearance of scales providing clues for clinical diagnosis	Psoriasis (micaceous scale), seborrheic dermatitis (petaloid scale), pityriasis versicolor (brawny powdery scale), ichthyosis (fish skin-like scales), tinea (leading scale), erythema annulare centrifugum (trailing scale), and pityriasis rosea (peripheral collarette of scale and central scale)
Crust	Consisting of dried exudates (serum, pus, or blood) Color variation according to nature of exudates providing clues for clinical diagnosis	Honey-yellow crusts (impetigo contagiosa), turbid yellow-green crust (purulent lesions), and reddish black crust (hemorrhagic lesions)
Erosion	Raw, moist lesion left from a complete or partial loss of the epidermis or mucosal epithelium Commonly following a blister Healing without scarring	Pemphigus, Stevens-Johnson syndrome, and toxic epidermal necrolysis
Ulcer	Forms from breach and destruction of the skin (epidermis, dermis with basal layer, and adnexal structures) or mucosa Superficial or deep in nature Produced by sloughing of necrotic tissue Healing with scarring Overhanging or punched out in margin	Stasis ulcer, ecthyma, pyoderma gangrenosum, neuropathic ulcer, tubercular ulcer, and syphilitic gumma
Fissure	A linear, triangular crack in the skin/mucosa Occurring from excessive tension or decreased elasticity of the involved tissue Can be superficial or deep Deep fissures being painful Commonly seen over palms and soles due to thick stratum corneum	Palmoplantar psoriasis, keratodermas, and chronic irritant contact dermatitis
Excoriation	Superficial loss of skin substance produced by scratching May be linear or sharply circumscribed and sometimes deep Associated with pruritic conditions including systemic diseases	Prurigo, atopic dermatitis, insect bites, neurotic excoriation, acne excoriée, uremic pruritus, and diabetic pruritus
Sinus	A tract connecting a deep cavity to the surface of the skin Pus and epithelial debris as contents of the deep cavity, draining to the surface from the sinus	Scrofuloderma and mycetoma
Scar	Replacement by fibrous tissue of another tissue destroyed by injury or disease (ulcer) Thinning and wrinkling of the epidermis and destruction of the skin adnexa like hair An atrophic scar being thin and wrinkled A hypertrophic scar being elevated, with excessive growth of fibrous tissue	Acne scar and post-burn scar
Keloid	Replacement by fibrous tissue of another tissue destroyed by injury or disease (ulcer) Unlike hypertrophic scar, extension beyond its original margin	Acne keloidalis nuchae
Atrophy	Loss of cutaneous mass due to diminution in size of any of the components of skin (epidermis, dermis, or subcutis) Loss of skin markings Fine wrinkling and increased translucency in epidermal atrophy	Lichen sclerosus et atrophicus, poikiloderma, healed lepromatous leprosy, old age, atrophoderma, progeria/acrogeria, and focal dermal hypoplasia
Lichenification	Thickening of the epidermis, accentuated skin markings, and hyperpigmentation Due to repeated and prolonged rubbing and/or scratching	Lichen simplex chronicus and lichenified chronic (atopic) dermatitis

Table 4 Morphologic classification of specific skin lesions (Coulson et al. 2016; Garg et al. 2008; Pasricha and Khaitan 2005)

Term	Clinical feature	Example
Wheal	An erythematous, elevated pruritic lesion of variable size and shape Transient, lasting for 48–72 h (evanescent) Due to edema of the dermis Often surrounded by a red axon mediated flare	Urticaria
Angioedema	Urticular edema/swelling of dermo-hypodermis tissue having loose dermal tissue, e.g., lips, eyelids, and scrotum Nonpruritic Often accompanying urticaria	Angioedema
Burrow	A small tunnel-like linear lesion Housing a metazoal parasite visualized as tiny black dot at one end Observed commonly over palms/soles in infants/young children and occasionally over genitalia in adults	Scabies
Comedo	Dilated pilosebaceous orifice plugged with inspissated keratin and sebum Basic lesion of acne vulgaris “Open comedo (black head)” with black plug “Closed comedo (white head)” with whitish keratin plug	Acne vulgaris and nevus comedonicus
Telangiectasia	Permanent dilatation of small blood vessels in the superficial dermis Seen as fine, bright, non-pulsatile vessels Mat-like, punctate or linear (angioectasias), or in a net-like pattern	Rosacea, systemic sclerosis, other collagen vascular disorders, accompanying cutaneous atrophy in topical corticosteroid abuse
Erythema	“Redness of the skin” blanches on pressure Due to vascular congestion or increased skin perfusion	Rosacea, viral exanthem, and systemic lupus erythematosus
Purpura, petechia, and ecchymosis	Non-blanching non-palpable, reddish to purple lesions sized 0.3–1 cm Petechiae being 1–2 mm in size Ecchymosis being >1 cm in size Due to extravasation of red blood cells in the dermis due to clotting/bleeding disorders or vasculitis Purpuric lesions of vasculitis being palpable	Clotting and bleeding disorders, thrombocytopenia, scurvy, senile purpura/ecchymosis, disseminated intravascular coagulation, and Henoch-Schönlein purpura (vasculitis)
Livedo reticularis	Purplish mottled reticulated and lace-like vascular pattern Due to abnormal blood flow and decreased oxygenation of the skin Physiologic or from systemic cause	Primary or idiopathic livedo reticularis, secondary livedo reticularis (due to collagen vascular disorders, polyarteritis nodosa, antiphospholipid syndrome, polycythemia, lymphoma, adverse effects of amantadine, bromocriptine, etc.), cutis marmorata (physiological form in infants from exposure to cold), livedo racemosa (generalized and persistent), and livedoid vasculitis
Poikiloderma	A dappled appearance of skin from combination of atrophy, telangiectasias, and pigment changes	Rothmund-Thomson syndrome, xeroderma pigmentosa, poikiloderma vasculare atrophicans, and mycosis fungoides
Target lesion (Bull's-eye lesion or a cockade)	Target-like lesion <3 cm diameter Three zones including central zone of dusky erythema, purpura or blister, a middle paler zone of edema, and an outer rim of erythema	Erythema multiforme
Cutaneous horn	A conical mass of cornified cells arising over an abnormally differentiating epidermis	Benign (seborrheic keratosis and actinic keratosis) and malignant (squamous cell carcinoma)
Sclerosis	A diffuse or circumscribed induration of the dermis and subcutaneous tissues Epidermal atrophy Hidebound, board-like, immobile, and difficult to pinch skin	Scleroderma, pseudoscleroderma, scleredema adultorum, and scleredema neonatorum

Table 5 Different morphologies of scale (Coulson et al. 2016; Garg et al. 2008; Pasricha and Khaitan 2005)

Morphology	Possible diagnosis
Collarette scale or pityriasisiform scale defined as a fine peripherally attached and centrally detached scale at the edge of an inflammatory lesion	Pityriasis rosea
Ichthyotic scale defined as large and polygonal scale giving fish-like skin appearance	Ichthyosis vulgaris
Micaceous scale defined as mica-like silvery scale	Psoriasis
Furfuraceous scale defined as fine and loosely adherent scale	Pityriasis versicolor
Crack-like scale giving appearance of dry cracked skin	Eczema craquelé
Lamellar scale defined as thin, large scale attached in the middle and loose at margins	Lamellar ichthyosis
Gritty scale defined as densely adherent scale with sandpaper texture	Actinic keratosis
Exfoliative scale defined as peeled-off scale from epidermis in fine scales or sheets	Exfoliative dermatitis
Seborrheic scale defined as thick, greasy/waxy, yellowish, or brownish scale	Seborrheic dermatitis



Fig. 1 Depigmented macules in vitiligo. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 2 Hyperpigmented macules of freckles. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 3 Multiple papules and nodules of varied sizes, sessile and pedunculated. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 4 A large pedunculated acrochordon (skin tag). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

psoriasis-induced erythema, scaling, and skin thickness, each weighed according to the size of the affected area (Table 12) (Fredriksson and Pettersson 1978). Percentage reduction in baseline PASI score is the primary measure for satisfactory treatment outcome in any clinical drug trial or psoriasis management. PASI 75 means 75% reduction in baseline score and is currently considered satisfactory, while PASI 90 and 100 are desirable (Manalo et al. 2015).

4.3 Melasma Area Severity Index (MASI)

MASI is mainly used in research for measuring severity of melasma before and after treatment (Kimbrough-Green et al. 1994) (Fig. 57).

4.4 Scoring for Vitiligo

Currently, vitiligo area severity index (VASI) and vitiligo disease activity (VIDA) score (Tables 13 and 14) are the two scoring systems used to assess severity and disease



Fig. 5 Smooth-surfaced and umbilicated papules of molluscum contagiosum over forehead (Arrow indicating inflamed lesion). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

activity in vitiligo (Hamzavi et al. 2004; Njoo et al. 1999). Both have limitation of interobserver variations.

4.5 Scoring Atopic Dermatitis (SCORAD)

SCORAD (Table 15) is a commonly used scoring system to standardize the assessment of severity and interpret therapeutic outcome in atopic dermatitis despite interobserver variability (Stalder et al. 1993).

4.6 Urticaria Activity Score (UAS)

UAS is a patient-reported measure specific for chronic spontaneous urticaria. It comprises sum of the wheal number score and the itch severity score (Table 16). The UAS7 is the sum of the average daily UAS over 7 days (Hollis et al. 2018; Zuberbier et al. 2014). Its main utility is for controlled clinical/therapeutic trials and in daily clinical practice for urticaria activity/severity despite being a subjective tool.

4.7 Score for Toxic Epidermal Necrolysis (SCORTEN)

SCORTEN is commonly used to assess severity and prognosis in patients with toxic epidermal necrolysis (TEN). Seven independent risk factors are evaluated assigning one point to each variable within the first 24 h of hospitalization. The value of the total number of points determines the predicted mortality in a given TEN patient with good to excellent accuracy (Table 17).



Fig. 6 Micropapules in lichen nitidus seen over elbow and forearm; grouped and linear patterns due to Koebner's isomorphic phenomenon (arrows). (Taken by Prof. Vikram K. Mahajan, Department of

Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 7 Erythematous elevated indurated scaly plaque of psoriasis. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 8 Erythematous patch of borderline tuberculoid leprosy with non-palpable changes in texture. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 9 Hypopigmented patch of pityriasis alba with non-palpable changes in texture. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 10 Multiple vesicles over dorsal foot with characteristic oblong shape and clear serous content in hand foot and mouth disease. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 11 Multiple polymorphic maculopapular vesicles over back with clear serous and few with characteristic central umbilication in varicella. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 12 A bulla over dorsal foot with clear serous content. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

triangular lunula is a feature of nail patella syndrome, while red lunulae may occur in cardiac failure, chronic obstructive pulmonary disease, liver cirrhosis, psoriasis, CO poisoning, or local disturbances of blood flow (Baran et al. 2010) (Table 19) (Figs. 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, and 93).

5 Important Bedside Clinical Sign

Diagnosis in dermatology mostly relies on careful observation of important morphological and physical features often described as “clinical signs.” Many dermatological signs, appearing de novo or elicited by clinician, reflect clinical and diagnostic aspects of various dermatoses and/or underlying disorders (Coulson et al. 2016; Madke and Nayak 2012; Garg et al. 2008). They may sometimes be the only and early diagnostic clue for a disorder that is yet evolving (Table 18). Their knowledge and elicitation become imperative to further improve clinical acumen (Figs. 45, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, and 76).

5.1 Examination of Nail

Nails are examined for normal arrangement of nail unit and any abnormality of nail plate, nail bed, hyponychium, lunula, cuticle, nail folds, and terminal interphalangeal joints. A

5.2 Examination of Hair

Hairs are visually examined for:

- **Growth and distribution:** overgrowth (such as hirsutism or hypertrichosis) or undergrowth
- **Hair loss:** such as alopecia areata, tinea capitis, anagen effluvium, telogen effluvium, androgenetic alopecia, or cicatricial alopecia
- **Color:** such as canitis or premature graying
- **Texture:** such as hair shaft abnormalities
- **Extraneous body:** such as nit, hair cast, scale, or piedra

Apart from visual examination and trichoscopy, trichogram (hair pluck test) and phototrichogram are other



Fig. 13 A pustule from inflammatory acne. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

useful hair examination methods particularly in patients with hair loss (Gupta and Mysore 2016).

5.2.1 Trichogram (Hair Pluck Test)

Trichogram or hair pluck test is performed on hairs that are unwashed or untreated cosmetically for 4–5 days prior. At least 50–100 hairs are plucked from frontal and occipital regions with the help of tightly closing epilation forceps by sudden and adequate pull along the direction of hair growth. The plucked hairs are mounted on a glass slide side by side in a mounting medium, covered with a glass cover slip, and examined under a light microscope for trichology parameters (Table 20). Hair roots are quantified based on their hair cycle-specific morphology. “Unit area trichogram” means proportion of various types of hair counted after epilating all hair in small marked out area (30mm^2). Trichogram is a less invasive but painful and less preferred procedure than other noninvasive and painless methods (Coulson et al. 2016; Kharkar 2012) (Figs. 94 and 95).

5.2.2 Phototrichogram

Phototrichogram is a noninvasive method for qualitative and quantitative assessment of the hair growth cycle by a close-up



Fig. 14 A large cyst with inflammatory content. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

photograph of a defined scalp area. Trichologic parameters including hair density, hair shaft diameter, and proportions of different hair types are analyzed using special digital photograph analyzing software such as TrichoScan® and Folliscope® (Blume-Peytavi et al. 2008).

TrichoScan

Stages and evaluation of findings of TrichoScan have been summarized in Table 21 (Figs. 96 and 97).

Folliscope

Folliscope is a recent automated digital phototrichogram system having a small handheld high-definition microscopic camera connected to a computer that visualizes the hair and automatically measures various trichologic parameters (Lee et al. 2012). The disease course and response to therapy in a patient can also be assessed by comparing the values of different trichologic parameters with baseline measurements. The method has advantage of no plucking or clipping of hair and can be used on a dry scalp obviating the need for linkage fluid or hair dye.



Fig. 15 Multiple milia with no inflammation. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 16 An abscess over back topped with multiple pustules akin to carbuncle. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 17 Large adherent polygonal scales in ichthyosis with a fish skin-like appearance as a characteristic sign. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

6 Clinical Side Lab Test

In some of the cases, the confirmation of clinical diagnosis is aided by clinical side lab tests or bedside lab tests which are cheap, are time-saving, and require no elaborate instruments.

6.1 Potassium Hydroxide Mount (KOH Mount) and Wet Mount

Skin scrapings are obtained from active margins of lesions, intertriginous skin, roof of the vesicular lesions, clippings from affected nail, hair shaft, and underlying skin. KOH wet mount is prepared (Tables 22 and 23) and examined



Fig. 18 Loose mica-like silvery scales characteristic for plaques psoriasis. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

microscopically for any fungal elements (Fig. 98). False-negative or false-positive results may be from artifacts like lipid droplets (creams or ointments), KOH crystals, textile fibers, etc. (Coulson et al. 2016; Pasricha and Khaitan 2005).

Wet mounts are prepared in a similar manner but using a drop of normal saline or mineral oil instead of KOH to demonstrate viable ectoparasites identified from their characteristic morphology and movements (Fig. 99) (Coulson et al. 2016; Pasricha and Khaitan 2005).

6.2 Tzanck Test

Tzanck test involves Giemsa staining of smears prepared from clinical samples obtained by scraping skin lesions (Table 24) to demonstrate acantholytic or Tzanck cells (Fig. 100), syncytial giant cells (Fig. 101), and Leishman-Donovan bodies (Fig. 102) and for a wide range of other



Fig. 19 Honey-colored, stuck-on crusts in impetigo contagiosa, an infective dermatosis from *Streptococcus hemolyticus*, *Staphylococcus aureus*, or both, common in children. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

dermatological conditions (Table 25) (Coulson et al. 2016; Gupta and Singh 2005; Roucco and Roucco 1999).

6.3 Gram's Staining

Smears are prepared from clinical samples and stained with Gram's stain (Table 26) for identification of Gram-positive (such as *Staphylococcus* and *Streptococcus* species) or Gram-negative bacilli and cocci (such as *Neisseria gonorrhoeae*), clue cells in bacterial vaginosis (Gram-positive bacilli-laden epithelial cells in vaginal smears) in infected samples such as tissue smears, sputum, pus, or genital discharge (Coico 2005) (Figs. 103, 104, and 105).

6.4 Slit-Skin Smear and Ziehl-Neelsen Staining

Slit-skin smear is performed in leprosy to demonstrate *Mycobacterium leprae* (Fig. 106) with 100% specificity when positive and has short turnaround time. Table 27 lists its necessary material. It should be performed in all cases suspected of leprosy at the time of presentation, release from treatment, or relapse (Table 28). Slit-skin smear is a gold standard for other diagnostic methods because of 100%



Fig. 20 Erosions in pemphigus with black hemorrhagic crusts. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

specificity. However, its sensitivity depends upon the expertise of the laboratory technician and is as low as 10–50% especially in paucibacillary cases. Nevertheless, a negative smear by itself will not exclude leprosy. Smears are prepared from tissue scraping obtained from earlobe or skin lesion(s), air-dried and heat-fixed by passing 2–3 times over a spirit flame. The smears are flooded with freshly prepared and preheated (not boiling) carbol fuchsin or by holding the flame underneath the slide until vapors arise, left for 10 min, and gently washed under tap water. Sulfuric acid (5%) or 1% acid alcohol is used to decolorize for 10 min and counterstained with 1% methylene blue and air-dried before microscopic examination for intensely red-stained lepra bacilli against blue background (Mahajan 2013; Report of the International Leprosy Association Technical Forum 2002; Jopling and McDougall 2000; WHO Expert Committee on leprosy 1988).



Fig. 21 Large ulcer over dorsal foot from tissue sloughing. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

Total number of the bacilli measured using Ridley's logarithmic scale and bacteriological index and percentage of solid-staining bacilli or morphological index are calculated in this method (Table 29) (Mahajan 2013; Jopling and McDougall 2000; WHO Expert Committee on leprosy 1988).

6.5 Epicutaneous Test

Epicutaneous test is an *in vivo* skin test to verify if a person is allergic to certain substances and what allergens trigger a reaction. The test provokes an allergic reaction (provocation test) depending upon immunological mechanisms involved for clinical presentation. However, their results need careful interpretation in clinical relevance (ASCIA Skin Prick Testing Working Party 2016; Johansen et al. 2015; Rietschel and Fowler 2008; Liang 2002).



Fig. 22 Deep fissures of skin in psoriasis. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

Patch test, as an epicutaneous test, is used in patients suspected of having contact dermatitis (T cell-mediated delayed hypersensitivity) to determine whether a specific contactant or contact allergen causes allergic contact dermatitis. Photopatch test is used in patients suspected of photocontact dermatitis. Skin prick, puncture, or scratch test detects specific IgE-mediated (immediate hypersensitivity) reaction to food or an inhalant antigen (ASCIA Skin Prick Testing Working Party 2016; Johansen et al. 2015; Rietschel and Fowler 2008; Liang 2002).

6.5.1 Patch Test and Photopatch Test

The patch testing is commonly performed by Finn chamber method (Fig. 107) using patch test series approved by the International Contact Dermatitis Research Group (ICDRG) or other similar bodies. The Finn chambers are aluminum discs of 9 mm internal diameter and 0.7 mm depth mounted on micropore tape with a distance of 2 cm from the center of



Fig. 23 Erosions over shin from scratching. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

each other. These units are covered with nonsticking release paper for ready use.

The patches are applied on the upper back avoiding midline and scapula after cleansing thoroughly with ethanol without rubbing. The area selected is non-hairy and free of any skin lesions.

The patch test is left in place for 48 h (2 days and 2 nights), and the patient is instructed to avoid various activities lest the patch comes off (Table 30).

For photopatch testing, two sets of patch test units are applied in a similar manner and kept covered with a radiopaque sheet. After 48 h, one set of patches is removed, and test sites are exposed to 5–10 J/cm² of UVA. After irradiation, the other set of patches are also removed, and both the sites are then covered again with the opaque sheet. The patient is asked to come after another 48 h for reading.

Reading of patch test is made at the second day (48 h), the third day (72 h), and sometimes the seventh day. The patches are removed after 48 h, and the patient is instructed to avoid



Fig. 24 Multiple sinuses over back draining purulent material in a case of nodocardial mycetoma. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 25 Scar with atrophy and no hair growth after healing of a deep ulcer. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 26 Keloid showing tendency to extend beyond its original margins unlike hypertrophic scar; atrophy and prominent vessels appeared from intralesional triamcinolone injection. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 27 Skin atrophy showing fine wrinkling from epidermal atrophy in old age. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

scratching. Reading is made after half 1/2–1 h for the skin to regain its normal contour and nonspecific skin irritation to subside.

Test sites are examined for signs of dermatitis, and results are graded (Table 31) according to the ICDRG criteria (Johansen et al. 2015; Rietschel and Fowler 2008). In photo-patch test, photo-aggravated reactions are interpreted as contact allergy with photo-aggravation, while photo-augmented reactions signify both contact and photocontact allergy.



Fig. 28 Skin atrophy showing fine wrinkling from epidermal atrophy due to leprosy. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 29 Lichenification of skin over ankle in lichen simplex chronicus. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 30 Wheals as characteristic and specific lesions of urticaria. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

Positive patch test results are interpreted for their past or present relevance (Table 32) based on the history and exposure to the antigens (Johansen et al. 2015; Rietschel and Fowler 2008; Bourke et al. 2001). The significance of results remains “unknown” if there is no evidence of relevance even after extensive investigations.

Further readings at 72 and 96 h post irradiation are made to enable detection of crescendo or decrescendo scoring patterns suggesting allergic and non-allergic mechanisms, respectively (Bruynezeel et al. 2004).

Adverse effects, if any, such as reaction to adhesive tape, discomfort, and development of itching, flare up of clinical dermatitis, angry back phenomenon, active sensitization, and alteration in pigment at test site may occur.

6.5.2 Skin Prick Test (Puncture or Scratch Test)

Skin prick test, also known as puncture or scratch test, is used for identifying allergens responsible for triggering symptoms in IgE-mediated allergic diseases such as hay fever and allergy to food allergy, latex, pet dander, dust, pollen, dust mites, drug, and bee and wasp venom (ASCIA Skin Prick



Fig. 31 Angioedema involving periorbital tissue in a patient with urticaria. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 32 Burrows over sole of an infant (arrows) are specific for scabies. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 33 Open (blackhead) comedones over forehead. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 34 Closed (whitehead) comedones. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

Testing Working Party 2016). It is usually performed over the inner forearm, and 3 or 4 or as many as 25 allergens placed at least 2 cm apart can be tested simultaneously. A few drops of the purified allergen/test solution are placed on the skin, and a prick, puncture, or scratch is made by a sharp needle (Table 33).

Wheal formation at the site of prick over allergen within 20–30 min is compared with control for interpretation of positive results (Fig. 108). A positive skin prick test does



Fig. 35 Diffuse erythema blanched on diascopy. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 36 Senile ecchymosis over forearm, age-related and occurring from minor trauma due to increased skin and vascular fragility. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 37 Purpura and petechiae over legs. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 38 Telangiectasia (angioectasias). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 39 Multiple mat-like telangiectasias over palm in systemic sclerosis. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 40 Primary livedo reticularis. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 41 Poikiloderma in xeroderma pigmentosum. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 42 Poikiloderma in poikiloderma vasculare atrophicans. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 43 Target or bull's eye-like lesions in erythema multiforme. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 45 Sclerosis of skin in systemic sclerosis; smooth wrinkle-free tight skin, pinched nose, thin lips, and inability to retract the lower eyelid (Ingram's sign) indicating sclerosis of facial skin. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 44 Cutaneous horn arising on actinic keratosis. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

Table 6 Description of dermatologic lesions (Coulson et al. 2016; Garg et al. 2008; Pasricha and Khaitan 2005)

Number of lesions	Described as single, multiple, several, numerous, etc.
Combination of lesions	Described as maculopapular (e.g., rosacea), papuloplaques or papulonodular (e.g., leprosy), papulosquamous (e.g., psoriasis and lichen planus), papulovesicular (e.g., eczema), papulopustular (e.g., pustular psoriasis), etc.
Color of skin and of lesions	Described as erythematous (e.g., exanthema), blanched (nevus anemicus), purplish (e.g., lichen planus), yellowish (e.g., xanthoma), etc.
Shape of lesions	Described as dome-shaped, flat-topped, umbilicated, acuminate, pedunculated or sessile, verrucous, etc.
Arrangement of lesions	Described as discrete, confluent, randomized, annular arcuate/arciform, linear, grouped, discoid, reticulate, gyrate, dermatomal, serpiginous/circinate, etc.
Distribution of lesions	Described as generalized, localized, scattered/disseminated, widespread, bilateral symmetrical (endogenous cause) or asymmetrical (exogenous cause), acral, or truncal. Additionally, described as localization over face, extensors, flexors, body folds, or sun-exposed area (e.g., photosensitive dermatoses) or along Blaschko's (or cleavage) lines
Borders/margins	Described as distinct, ill-defined, regular, irregular, coalescing/confluent, polycyclic, serpiginous, etc.
Zosteriform	Described as grouped and arranged in a dermatome
Corymbiform	Described as grouped arrangement with a central cluster of lesions beyond which are scattered individual lesions
Unpatterned grouped lesions	Described as grouping of lesions not following any specific pattern
Spared body areas	Described as body areas bereft of lesions such as sparing of covered skin in photosensitivity and island of sparing in pityriasis rubra pilaris
Features on palpation	Including depth, mobility, consistency (soft, fluctuant, or infiltrated), adhesion of scales or crust (loose or adherent), temperature, tenderness, etc.
Arrangement of lesions over sites of trauma (Koebner's or isomorphic phenomenon)	Appearance of morphologically similar new skin lesions of an already existing dermatosis arranged over sites of trauma in non-infective dermatoses
Pseudo-Koebner's phenomenon	Described as autoinoculation of virus in verruca plana
Blaschkoid pattern	Described as skin lesions distributed along Blaschko's lines



Fig. 46 Annular and arcuate lesions in tinea corporis. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 47 Zosteriform pattern showing grouped vesicular lesions in a dermatomal distribution in herpes zoster. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 48 Sporotrichoid pattern showing noduloulcerative lesions in linear distribution over forearm along lymphatics occurring in lymphocutaneous sporotrichosis. (Taken by Prof. Vikram K. Mahajan,

Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

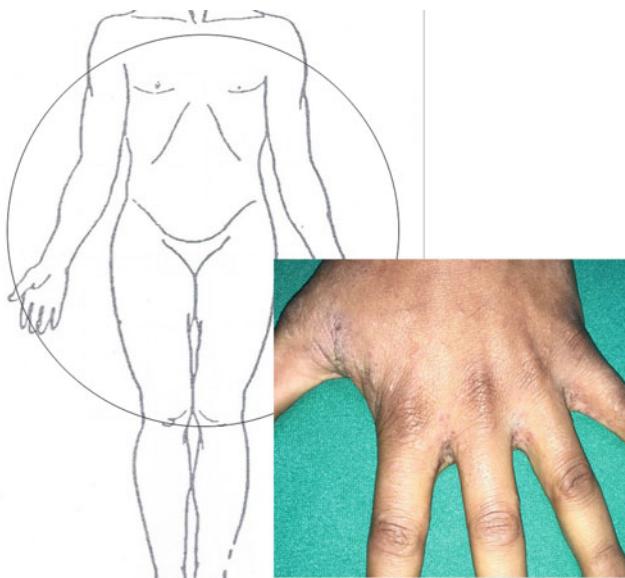


Fig. 49 Circle of Hebra representing the main sites including finger web spaces, ulnar border of wrists, ulnar border of forearm, elbow, axillae, nipple, umbilicus, genitalia, and thighs in scabies. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 50 Corymbiform pattern of arrangement of skin lesions in verruca vulgaris. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 51 Blaschkoid pattern; pigmentary changes along Blaschkko's lines in incontinentia pigmenti. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 52 Blaschkoid pattern; lichen planus along Blaschkko's lines (Blaschkoid lichen planus). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

Table 7 Commonly used skin examination tools and their application in diagnosis (Coulson et al. 2016; Galliker and Trüb 2012; Nischal and Khopkar 2012; Rudnicka et al. 2008; Pasricha and Khaitan 2005; Gupta and Singhi 2004; William et al. 1994)

Examination tool	Diagnostic use	Remarks and characteristics
Light source Natural light Focused light (torch)	To illuminate skin lesions while examining them	Natural light is ideal Oblique lighting provides better visualization
Magnifying lens 4x or 10x magnification	To magnify subtle morphological changes or other features	Essential for dermatological examination to magnify subtle morphological features/changes
Diascope	A clean microscopic glass slide pressed against the lesions to highlight the actual morphology by blanching the lesions	Diascopy is noninvasive method used to identify the origin of erythema such as vascular (vascular nevi), hemorrhagic (petechiae or purpura), or inflammation Blanching of inflammatory erythema reveals actual morphology (e.g., granulomatous)
Wood's lamp	A handheld device equipped with light source emitting black light/UV light 365 nm to examine skin lesions that illuminate	Wood's lamp is noninvasive method used to induce fluorescence in dermatoses Wood's lamp is best used in dark room
Dermatoscope	Using high-magnification skin surface microscopy by illumination of a lesion with different light sources	A noninvasive method that allows <i>in vivo</i> evaluation of colors, microstructures of the epidermis, dermoepidermal junction, and papillary dermis
Trichoscope	Special digital camera equipped with a close-up microscopy attachment to visualize hair and scalp at $\times 20$ to $\times 120$ magnifications	Assessment of number of hairs Measurement of hair shaft diameter and relevant trichologic parameters using the software

not predict the nature of the allergic symptoms. It may indicate a clinically true allergy but that may be irrelevant. A negative skin prick test result can occur even in the presence of true IgE-mediated allergy. It is generally not a useful diagnostic test for atopic dermatitis, chronic urticaria/angioedema, food intolerance, dermatitis herpetiformis, or other nonspecific rashes.

Fig. 53 Commonly used skin examination tools: (1) hand lens of 4x or 10x magnification, (2) focus light source (torch), (3) disposable glove, (4) glass cover slips, (5) pins (for checking pain sensations), (6) cotton wisp (for checking fine touch), (7) glass slides (for diascopy), (8) spirit swabs (for cleaning and wetting the lesion), (9) glass test tubes (for checking thermal sensation), and (10) measuring tape. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

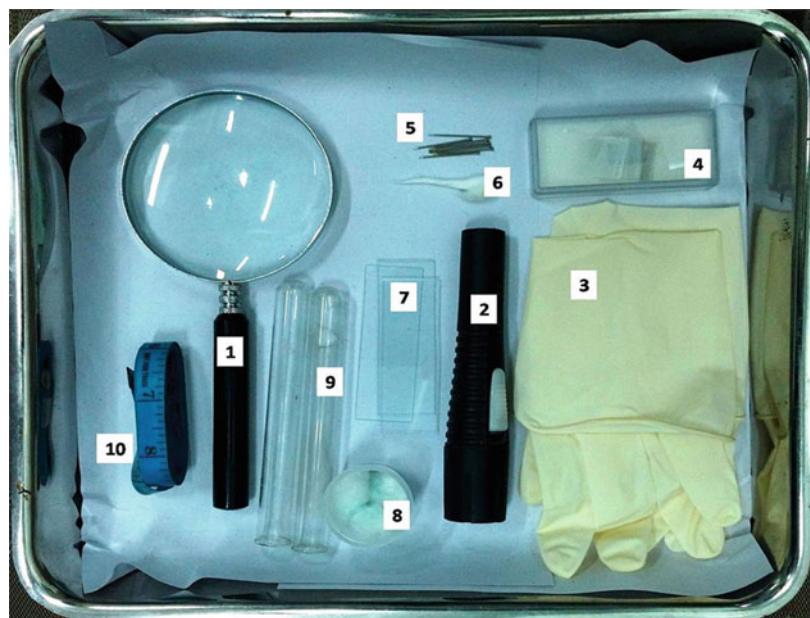
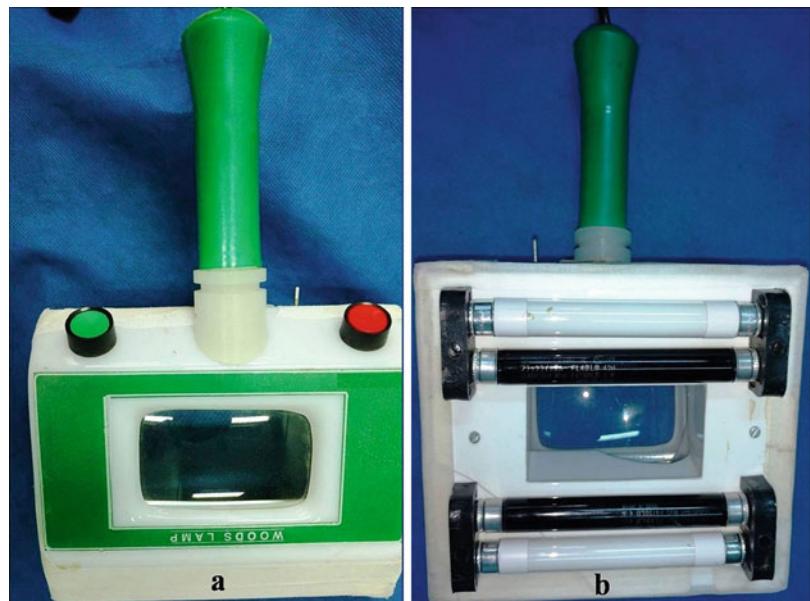


Fig. 54 Wood's lamp; a handheld device equipped with light source emitting UV light 365 nm to examine skin lesions that illuminate skin in darkened room. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



6.6 Pathergy Test

In pathergy test, an inflammatory reaction is induced by a skin prick with a sterile intradermal 20G needle over the lower lip or flexor forearm or by intradermal injection of normal saline, and results are read after 48 h (Sequeira and Daryani 2011). A papule, pustule, or ulcer with an erythematous rim (pathergy reaction) (Fig. 75) develops in positive pathergy test. It is one of the major criteria for diagnosis of Behçet's disease, but it can be positive in other disorders (Table 34) or healthy individuals (International Study Group for Behcet's Disease 1990).

The intensity of pathergy reaction depends upon disease activity and type of needle used for skin prick. However, a negative reaction does not exclude Behçet's disease.

6.7 Acetowhite Test

Acetowhite test is used to detect unapparent subclinical genital warts on the uterine cervix or penis. Gauze soaked in vinegar or freshly prepared acetic acid (3–5%) is applied for about 3–5 min over normal-looking skin/mucosa to be examined for warts. The epithelium is then examined for change of



Fig. 55 Commonly used dermatoscopes, (1, 2, and 5) small dermatoscopes with option for USB connectivity, (3) dermatoscope attachment allowing iPhone to be used as dermatoscope, and (4) a high-resolution dermatoscope with triple light source (normal,

polarizing, and ultraviolet light) with option for connectivity with computer and a TV monitor. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

Table 8 Some important application of diascope in diagnosing dermatoses (Coulson et al. 2016; Garg et al. 2008; Pasricha and Khaitan 2005)

Dermatosis	Finding
Petechiae/purpura	Non-blanching vascular lesions
Nevus achromicus	Non-blanching hypopigmented macule
Nevus anemicus	Blanching hypopigmented macule
Spider nevus	Application of mild pressure causes compression of radiating arterioles, and blood flow can be visualized in the feeding vessel
Lupus vulgaris and cutaneous sarcoidosis	Apple jelly nodules

color from pink to white with or without raised margins. Warts become acetowhite due to reversible coagulation or precipitation of the cellular proteins particularly in areas of increased nuclear activity and DNA content exhibiting most striking color change with or without raised margins touching the squamocolumnar junction.

The clinical application of this test for early detection of intraepithelial cervical neoplasia appears promising in cervical cancer screening program at primary health-care services (Sankaranarayanan et al. 2003).

6.8 Skin Biopsy

Histologic examination of a tissue is the essential basic and most informative diagnostic procedure indicated for various dermatological and systemic conditions (Table 35),

Table 9 Some important applications of Wood's lamp in diagnosing dermatoses (Coulson et al. 2016; Garg et al. 2008; Gupta and Singhi 2004)

Dermatosis	Finding
Erythrasma caused by <i>Corynebacterium minutissimum</i>	Coral red fluorescence (due to porphyrins)
<i>Pseudomonas pyocyannea</i> infection	Yellow-green fluorescence (due to pyocyanin)
Pityriasis versicolor caused by <i>Malassezia furfur</i> (<i>Pityrosporon</i> species)	Yellow fluorescence
Tinea capitis caused by <i>Microsporum (M.) audouinii</i> , <i>M. canis</i> , <i>M. distortum</i> , <i>M. gypseum</i> , <i>M. nanum</i> , or <i>Trichophyton schoenleinii</i>	Brilliant green or pale green fluorescence in <i>Trichophyton</i> infection
Porphyrins in blood, urine, stool, or teeth	Coral pink fluorescence
Scabies	Fluorescein solution filling the burrows
Scales, ointments, dried soaps, threads of fibers, and scars	Give false-positive fluorescence

Table 10 Some important applications of dermatoscope in diagnosing dermatoses

Dermatosis	Finding
Basal cell carcinoma	Arborizing blood vessels
Bowen's disease	Glomerulus blood vessels
Squamous cell carcinoma	Pinpoint dotted vessels
Collagen vascular disorders	Accentuated tortuous, dilated capillary loops in proximal nail folds
Hair transplant surgery	Estimation of follicular density in donor area
Monitor adverse effects of topical corticosteroids	Skin atrophy and telangiectasia

Table 11 Some important applications of trichoscope in diagnosing hair disorders (Galliker and Trüeb 2012; Miteva and Tosti 2012; Rudnicka et al. 2008)

Hair disorder	Finding
Alopecia areata	Yellow/black dots, tapering/broken hair, and short villous hair
Androgenetic alopecia	Decreased hair density, perifollicular halo, alteration of hair shaft diameter, and empty follicles
Telogen effluvium	Decreased hair density and lack of features of androgenetic alopecia
Lichen planopilaris	Decreased hair density, white dots, follicular prominence with scaling, perifollicular erythema/violaceous pigmentation, scaling, and loss of follicular ostia
Trichorrhexis nodosa	Multiple hair shaft breaks at acute angles with fraying and nodes
Monilethrix	Beaded hair shaft, multiple nodes, and constrictions and breaks
Trichotillomania	Multiple short broken hair of variable length, split and frayed hair, and coiled hair shafts
Discoid lupus erythematosus	Loss of follicular openings/pigment network, scalp atrophy, tortuous and arborizing telangiectasia, brown dots, and hyperkeratotic perifollicular scales
Tinea capitis	Inflammation (erythema, scaling, and pigmentation), broken hair, comma hair, vellus hair, and blotch perifollicular pigmentation

Fig. 56 Measurement of BSA by Wallace rule of nine. (Schematic images by Dr. Nitin Ranjan, Dermacosm Clinic, Aligarh, U.P. India)

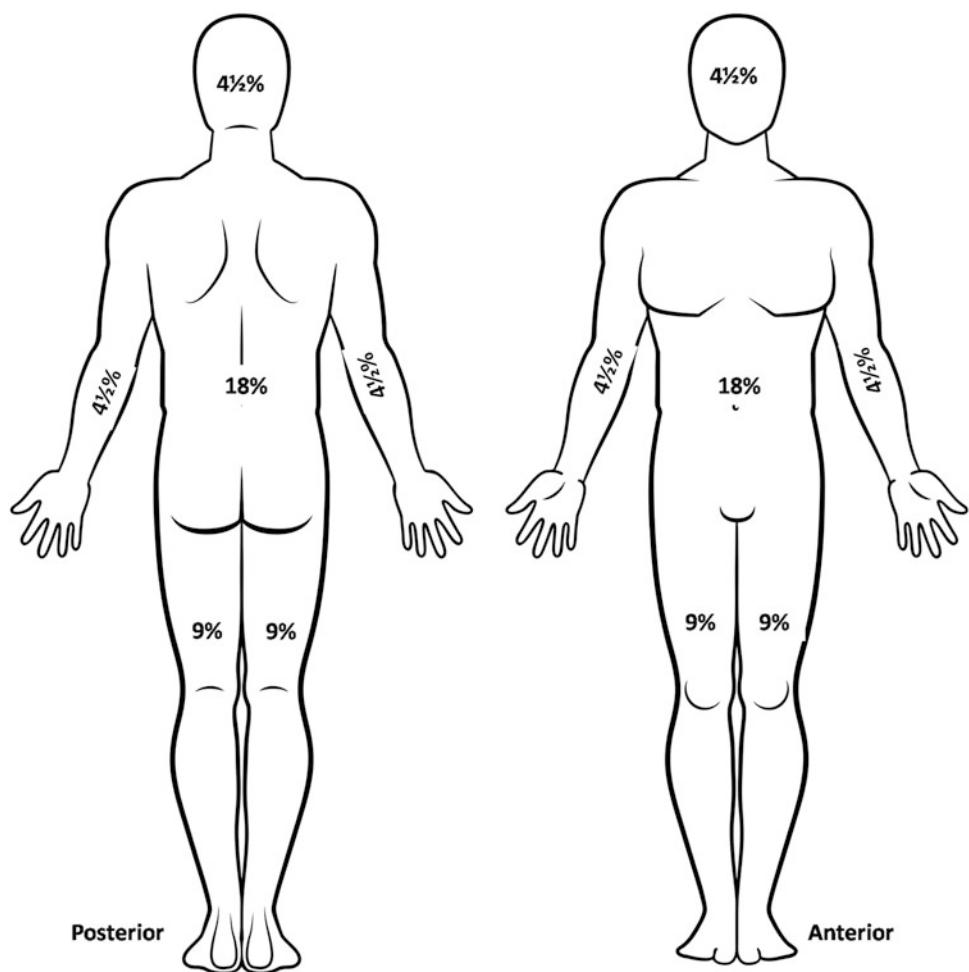


Table 12 Assessment of PASI score (Fredriksson and Pettersson 1978)

1. BSA involved is calculated as per Wallace rule of nines. The body area (A) involved for:

Head (h) = 10%

Trunk (t) = 20%

Upper limbs (u) = 30%

Lower limbs (l) = 40%

2. The psoriasis severity assessment is done for the three target symptoms of erythema (E), infiltration (I), and desquamation (D) for each body area involved

3. Total PASI scoring is done on a scale of 0–4 for each body site involved

0 = no symptoms,

1 = mild symptoms

2 = moderate symptoms

3 = severe symptoms

4 = severest possible symptoms

4. The total PASI score is obtained by adding the values of sum of severity ratings for the three target symptoms multiplied with numerical value of the areas involved with the percentages of the four body areas

5. **The final formula for PASI score** = $0.1(E_h + I_h + D_h)A_h + 0.2(E_u + I_u + D_u)A_u + 0.3(E_t + I_t + D_t)A_t + 0.4(E_l + I_l + D_l)A_l$

6. **The total PASI score** = 0 to 72

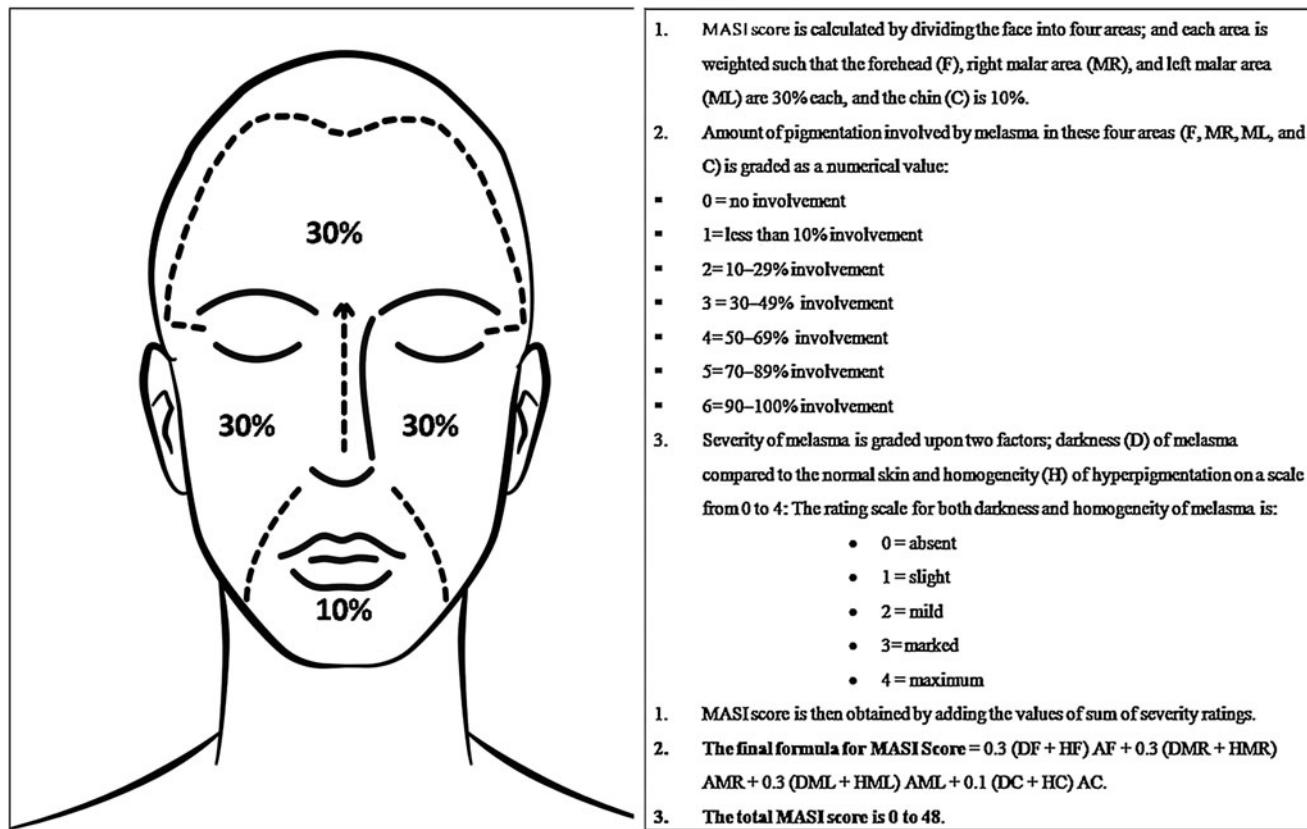


Fig. 57 Assessment of MASI score. (Schematic images by Dr. Nitin Ranjan, Dermacosm Clinic, Aligarh, U.P. India)

Table 13 Assessment of VASI (Bhor and Pande 2006; Hamzavi et al. 2004)

- A. The percentage of depigmented skin is calculated in terms of hand unit approximately equivalent to 1% of total BSA. One hand unit comprises the palm plus the volar surface of all digits
- B. The degree of pigmentation is estimated to the nearest of one of the following percentages:
 - 100% – complete depigmentation/no pigment is present
 - 90% – specks of pigment present
 - 75% – depigmented area exceeds the pigmented area
 - 50% – pigmented and depigmented areas are equal
 - 25% – pigmented area exceeds depigmented area
 - 10% – only specks of depigmentation present
- C. The VASI for each body region is calculated by the product of the area of vitiligo in hand units and the extent of depigmentation within each hand unit measured patch
- D. **Total body VASI** = Σ all body sites [hand units] \times [residual depigmentation]

Table 14 Assessment of VIDA score (Bhor and Pande 2006; Njoo et al. 1999)

The VIDA is a six-point scale for assessing vitiligo activity based on individual's own assessment of the present disease activity over time in the context of either expansion of existing lesions or appearance of new lesions

VIDA score:

- + 4: Activity of 6 weeks or less period
- + 3: Activity of 6 weeks to 3 months
- + 2: Activity of 3–6 months
- + 1: Activity of 6–12 months
- 0: Stable at least for 1 year
- 1: Stable at least for 1 year with spontaneous repigmentation

A low VIDA score indicates less activity

Table 15 Assessment of SCORAD index (Bhor and Pande 2006; Stalder et al. 1993)

The SCORAD index is a composite score based on three subscores: BSA involved is calculated as per Wallace rule of nines
Intensity of atopic dermatitis based on six clinical features of erythema, edema or papulations, oozing or crusting, excoriation, lichenification, and dryness graded on a scale of 0–3 for each body site involved
0 = absent
1 = mild
2 = moderate
3 = severe
The severity score for pruritus and sleep loss based on the average extent for the last 3 days or nights graded on a visual analogue scale of 0 to 10
Final SCORAD index = A/5 + 7(B/2) + C

Table 16 Assessment of urticaria activity score (UAS7) and severity grading (Hollis et al. 2018; Zuberbier et al. 2014)

Score	Wheals	Pruritus
0	None	None
1	Mild (<20 wheals/24 h)	Mild but not annoying
2	Moderate (20–50 wheals/24 h)	Moderate (troublesome but does not interfere with normal daily activity or sleep)
3	Intense (>50 wheals/24 h or large confluent areas of wheals)	Intense (severe pruritus, which is sufficiently troublesome to interfere with normal daily activity or sleep)

UAS7 is sum of UAS of 0–6 for each day over 7 consecutive days (maximum score 42)

Severity grading

0, Itch and hive free and indicative of no symptoms of CSU

1–6, Well-controlled urticaria

7–15, Mild urticaria

16–27, Moderate activity urticaria

28–42, Severe activity urticaria

Table 17 Assessment of SCORTEN (Seecof and Liantonio 2019; Bastuji-Garin et al. 2000)

Variable	Value (one point is assigned to each)
Age	>40 years
Concurrent illness (malignancy)	Present
Heart rate	>120 per min
Body surface area involved at day 1	>10%
Serum blood urea nitrogen	> 28 mg/dl (>10 mmol/L)
Serum bicarbonate	< 20 mEq/L (<20 mmol/L)
Serum glucose	> 252 mg/dl (>14 mmol/L)
Predicted rate of mortality	
0–1 points	= 3%
2 points	= 12%
3 points	= 35%
4 points	= 58%
>5 points	= 90%

Table 18 Important bedside clinical signs (Coulson et al. 2016; Garg et al. 2008)

Clinical sign	Definition	Clinical diagnosis
String of pearls sign	New lesions appearing at the margin of old lesion and arrangement resembling a cluster of jewels	Chronic bullous disease of childhood
Christmas tree pattern	Small papulosquamous lesions distributed typically in a pine tree pattern on the back	Pityriasis rosea
Wickham striae	Fine white or gray lines or dots over skin or oral mucosal lesions of lichen planus and attributed to hypergranulosis	Lichen planus
Milian's ear sign	Erythema and inflammatory edema remain superficial and well demarcated as the pinna has no deeper dermis and subcutaneous tissue	Erysipelas
Auspitz's sign (Grattage test)	On scraping off scales, pinpoint bleeding appearing from rupture of dilated capillaries in papillary dermis	Psoriasis (classic), actinic keratosis, and Darier's disease
Dermographism	Firm stroking of the unaffected skin producing a wheal along the shape of the stroke within seconds to minutes	Symptomatic dermatographism and urticaria
Darier's sign	Urticular wheal occurring in a lesion after it is rubbed with the blunt end of a pen	Urticaria pigmentosa
Pseudo-Darier's sign	Transient induration of lesion or piloerection occurring on rubbing	Congenital smooth muscle hamartoma
Fitzpatrick's dimple sign	Lateral pressure causing dimpling of the overlying skin due to tethering of the epidermis to the dermal lesion	Dermatofibroma
Buttonhole's sign	Flesh-colored soft papule felt as though it can be pushed into skin-like "button hole"	Type 1 neurofibromatosis
Crowe's sign	Axillary freckling	Type 1 neurofibromatosis
Shuster's sign	Horny plugs, discoid lesion, or scarring of concha	Discoid lupus erythematosus
Nikolsky's sign	Tangential pressure inducing separation of the skin on the unblistered/normal appearing skin or peripheral extension of blister due to acantholysis	Pemphigus
Pseudo-Nikolsky's sign	Tangential pressure inducing separation of the skin on the unblistered/normal appearing skin due to altered dermoepidermal integrity	Bullous pemphigoid, Stevens-Johnson syndrome, toxic epidermal necrolysis, epidermolysis bullosa, bullous impetigo, and staphylococcal scalded skin syndrome
Bulla-spread sign	Lateral pressure over blister causing it to spread beyond original margins signifying split in epidermal layers	Pemphigus
Asboe-Hansen Sign (indirect Nikolsky sign or Nikolsky II sign)	Lateral extension of blister with downward pressure applied perpendicularly due to epidermal split	Pemphigus
Buschke-Ollendorff sign	Deep dermal tenderness on pressing the lesion with a pinhead	Secondary syphilis and cutaneous vasculitis
Deck-chair sign	Erythrodermic plaques sparing abdominal skin folds	Ofuji papulo-erythroderma
Dory-flop sign	The entire hard chancre flipping out all at once due to underlying button-like induration on retracting the prepuce	Syphilitic chancre at coronal border of the prepuce
Matchbox sign	Patients collecting skin debris, the alleged parasites, in a matchbox, tissue paper, or small container	Delusions of parasitosis (acarophobia and entomophobia)
Heliotrope sign	A mildly edematous violaceous erythema involving periorbital skin	Dermatomyositis
Gottron's sign	Scaly erythematous eruption over dorsal hands, metacarpophalangeal joints, and proximal interphalangeal joints	Dermatomyositis
Holster sign	Confluent macular violaceous erythema over lateral side of hip and thigh	Dermatomyositis
Shawl sign	Confluent macular violaceous erythema over posterior neck and shoulders	Dermatomyositis
Groove sign of Greenblatt	Enlargement of both inguinal and femoral group of lymph nodes separated by Poupart's ligament producing a groove	Lymphogranuloma venereum
Forchheimer's sign	Dull-red macules or petechiae over soft palate during prodromal phase	Rubella, infectious mononucleosis
Leser-Trelat sign	Sudden eruption of numerous seborrheic keratoses	Internal malignancy

(continued)

Table 18 (continued)

Clinical sign	Definition	Clinical diagnosis
Pathergy phenomenon	Development of an inflammatory skin lesion (papule or pustule) or ulcer at the site of a minor trauma, bruise, venipuncture, or surgical incision	Behçet's disease, pyoderma gangrenosum, Sweet's syndrome, inflammatory bowel disease, and eosinophilic pustular folliculitis
Koebner's isomorphic phenomenon	Development of clinicopathologically isomorphic lesions in the traumatized uninvolved skin	Lichen planus, vitiligo, psoriasis
Pseudo-Koebner's phenomenon	Development of infective lesions due to autoinoculation over the traumatized skin	Human papilloma viral warts, molluscum contagiosum



Fig. 58 String of pearls sign or cluster of jewels sign or rosettes sign; new lesions appearing at the margin of old lesion and arrangement resembling a cluster of jewels in the early stage of chronic bullous disease of childhood. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 59 Christmas tree pattern in pityriasis rosea; the small papulosquamous lesions distributed typically in a pine tree pattern on the back. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 60 Milian's ear sign seen in erysipelas involving the ear; erythema and inflammatory edema remained superficial and well demarcated (arrowheads) as the pinna has no deeper dermis and subcutaneous tissue. In cellulitis, the inflammatory borders remain diffuse and ill-defined due to involvement of deeper dermis and subcutis. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 61 Auspitz's sign or Grattage test; scraping off scales with spatula from psoriasis plaque revealing pinpoint bleeding from rupture of dilated capillaries in the papillary dermis. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 62 Dermographism; firm stroking of the unaffected skin producing a wheal along the shape of the stroke within seconds to minutes in symptomatic dermatographism and urticaria. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 63 Darier's sign; urticarial wheal occurring in a lesion after it is rubbed with the blunt end of a pen in urticaria pigmentosa. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 64 Pseudo-Darier's sign; rubbing the congenital smooth muscle hamartomas such as leiomyoma cutis lesions producing transient piloerection and induration and distinguishing it from other congenital nevus. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 65 Fitzpatrick's dimple sign; squeezing of skin adjacent to lesion causing dimpled appearance on its surface in dermatofibroma due to tethering of the epidermis. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 66 Crowe's sign; axillary freckling characteristic in type 1 neurofibromatosis. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 67 Shuster's sign; presence of horny plugs, characteristic lesion, or scarring of concha in discoid lupus erythematosus. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 68 Nikolsky's sign and pseudo-Nikolsky's sign; tangential pressure inducing separation of the skin adjoining to a blister or peripheral extension of blister (wet Nikolsky's sign) or distant extension from a blister and normal appearing skin (dry Nikolsky's sign). It is due to acantholysis in pemphigus or in staphylococcal scalded skin syndrome or toxic epidermal necrolysis due to separation of epidermal necrosis (pseudo-Nikolsky's sign). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 69 Bulla-spread sign and Asboe-Hansen sign; the edge of an intact and tense bulla marked and pressure applied at the other edge or over it (Asboe-Hansen sign) leading to enlargement of bulla signifying acantholysis in epidermal layers. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 70 Deck-chair sign; typical sparing of abdominal skin folds in a patient of generalized erythroderma. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 71 Heliotrope sign; mildly edematous violaceous erythema involving periorbital skin in a patient with dermatomyositis. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 72 Gottron's sign; scaly erythematous lesions seen over dorsal hands, metacarpophalangeal joints, and proximal interphalangeal joints in dermatomyositis. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 73 Forchheimer's sign; dull-red macules or petechiae over soft palate during prodromal phase of rubella. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 74 Leser-Trelat sign; sudden appearance of eruption of numerous seborrheic keratoses in association with pruritus is usually a marker of internal malignancy. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 75 Pathergy phenomenon; development of an inflammatory pustule at the site of a minor bruise in a patient with Behcet's disease. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 76 Koebner's phenomena and Wickham striae which are fine white or gray lines or dots over skin (or oral mucosal) lesions of lichen planus (gets accentuated on visualization after putting a drop of immersion oil) and attributed to hypergranulosis; in true Koebner's phenomenon, there is development of clinicopathologically isomorphic lesions in the traumatized uninvolved skin. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

Table 19 Examination for nail abnormalities (Baran et al. 2010)

Common nail abnormalities	Probable clinical diagnosis
Nail dystrophy	Onychomycosis in 50%, trauma, psoriasis, lichen planus, benign tumors, congenital
Nail pitting	Psoriasis and alopecia areata, eczema, idiopathic
Koilonychia or platynychia	Plummer-Vinson syndrome, iron deficiency anemia, nutritional deficiencies, lichen planus, celiac disease, psoriasis, lichen planus, systemic lupus erythematosus, syphilis, rheumatic fever, malignancy, hereditary
Beau's lines	Previous acute systemic illness, malnutrition, chemotherapy, or infections or trauma, to nail fold
Leukonychia	Trauma, inherited
Melanonychia	Nevus and melanoma
Onycholysis (nail bed separation)	Trauma, psoriasis, fungal infections, thyroid disorders, peripheral vascular impairment, and photo-onycholysis
Nail fold swelling, loss of cuticle, and purulent discharge	Chronic paronychia
Dilated nail fold capillaries	Collagen vascular disorders
Terminal interphalangeal joint abnormality	Psoriatic arthropathy
Clubbing of nails	Congenital, chronic infective, neoplastic disorders of pulmonary and cardiovascular systems, thyroid disorders, and inflammatory bowel diseases
Pterygium unguis	Lichen planus, leprosy, onychotillomania, peripheral vascular disease, Raynaud's phenomenon, dyskeratosis congenita, nail dystrophy
Half and half nail	Chronic renal failure, cirrhosis, Crohn's disease, chemotherapy, idiopathic

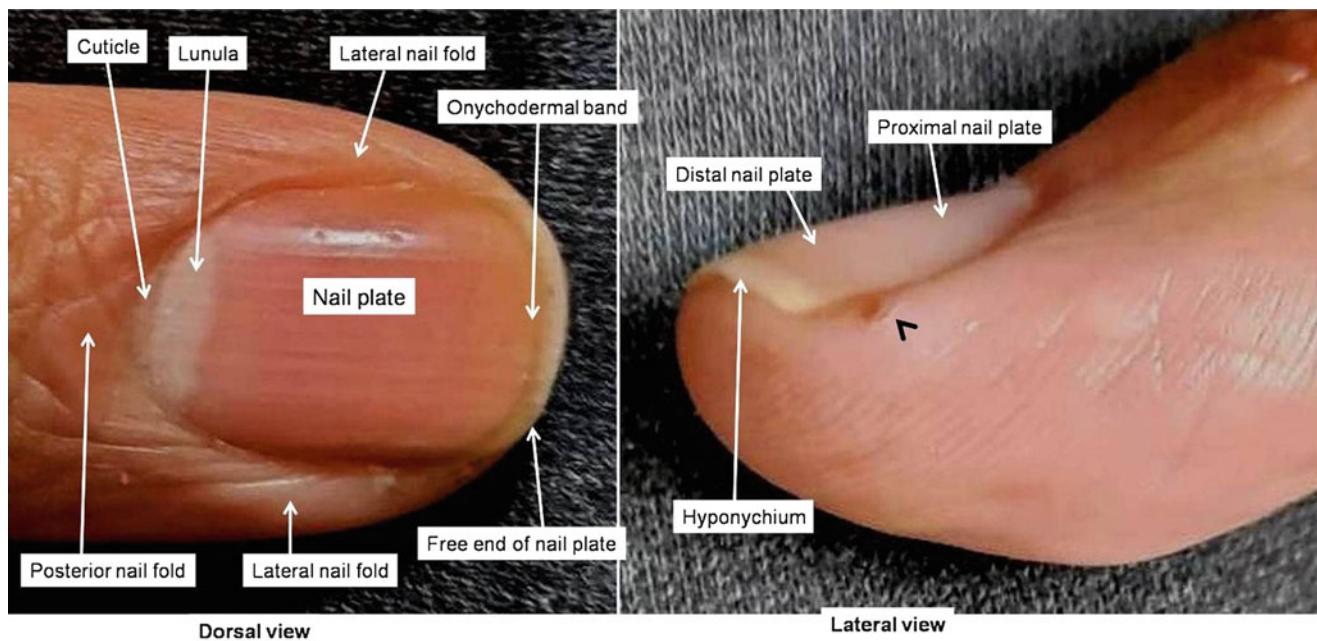


Fig. 77 Normal structure of a nail unit; black arrowhead indicating a skin tear (hangnail) of the lateral nail fold. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 78 Nail pitting in psoriasis; shallow, small, and irregular pits are characteristic, while in alopecia areata, the pitting is superficial, regularly distributed in geometric pattern along the longitudinal and transverse lines. Other common causes of nail pitting include eczema, lichen planus or idiopathic. Pitting results from parakeratosis in the stratum corneum and gradual shedding of parakeratotic cells leaving behind these distinct pits within the nail plate. Pitting affects more often fingernails than toenails. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 79 Nail dystrophy; deformed or partially destroyed nail plate that has become brittle. It is caused by onychomycosis in about 50% cases. Other common causes include trauma, psoriasis, lichen planus, benign tumors, and congenital abnormalities. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 80 Nail dystrophy and terminal interphalangeal joint abnormality in a patient with severe erythrodermic psoriasis; accumulated soft keratin between dystrophic nail plate and nail bed resulting in elevation of the brittle nail plate. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 82 Beau's lines; they are horizontal deep groove indentations over the nail plate because any disease process or illness (acute systemic illness, malnutrition, chemotherapy, or infections or trauma to nail fold) that is severe enough to affect cell division in the nail matrix leading to temporary cessation of the growth of the nail plate. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 81 Koilonychia or spoon nails; nail plate loses its convexity and becomes flat or concave in shape and may be brittle in early stages. Common causes include Plummer-Vinson syndrome, iron deficiency anemia, and nutritional deficiencies but may be hereditary or occur in lichen planus, celiac disease, psoriasis, lichen planus, systemic lupus erythematosus, syphilis, rheumatic fever, and malignancy. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

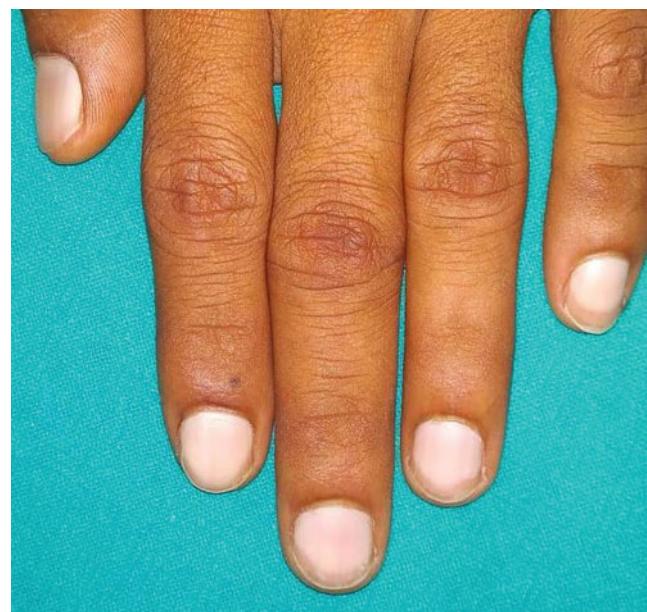


Fig. 83 Leukonychia (subtotal); matrix dysfunction causing milky porcelain white discoloration of nail plate that may be total leukonychia (mostly inherited form), partial affecting proximal 2/3rd of nail plate (subtotal leukonychia), or as longitudinal lines (leukonychia striata), transverse streaks (Mee's lines), or small 1–2 mm white spots (punctate leukonychia). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 84 Leukonychia striata; longitudinal white streaks alternating with red streaks and terminating in V-shape nicking of free edge of nail plate (arrow) characteristically seen in Darier's disease. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

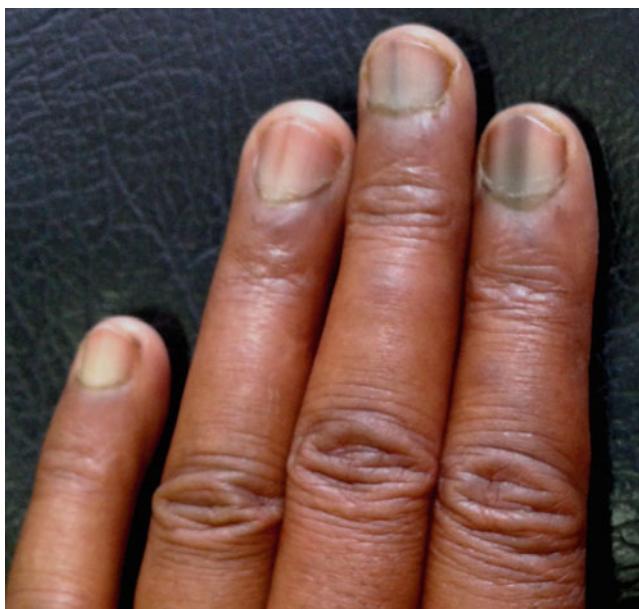


Fig. 85 Melanonychia striata; a longitudinal tan brown to black pigmented streak extending from proximal nail fold to the distal end of nail plate. It is produced by melanocytes in the nail matrix normally in subungual nevus and dark-skinned individuals. Here the regular pattern of periungual pigmentation of proximal nail fold is due to cuticle transparency and described as pseudo-Hutchinson's sign (true Hutchinson's sign in nail matrix melanoma invading the nail bed has irregular color, thickness, and spacing and is often destructive). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 86 Onycholysis; It is distal and/or lateral painless separation of the nail from nail bed. Trauma from certain occupations, manicure, or overuse of nail cosmetics and diseases such as psoriasis, fungal infections, thyroid disorders, peripheral vascular impairment, and photo-onycholysis are common causes. Most cases remain idiopathic (primary onycholysis). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 87 Onychomadesis. It is periodic shedding of the nails due to temporary arrest of nail matrix function that may be idiopathic. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 88 Nail fold swelling, loss of cuticle, and nail dystrophy in chronic paronychia manifestation of inflammation of nail folds with secondary effects on nail matrix, nail growth, and soft-tissue. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 90 Clubbing of nails; increased transverse and longitudinal nail curvature with hypertrophy of soft-tissue components of digit pulp. Clubbing of nails is commonly associated with congenital, chronic infective, neoplastic disorders of pulmonary and cardiovascular systems, thyroid disorders, and inflammatory bowel disease. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

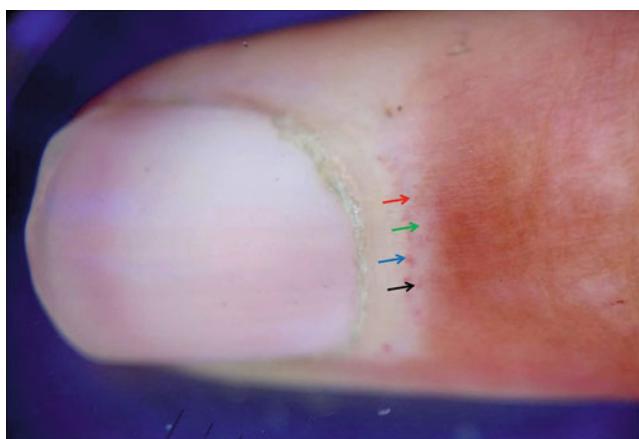


Fig. 89 Nail fold capillaries in systemic sclerosis under nail fold dermoscopy (capillaroscopy), ragged cuticle, dilated capillary (blue arrow), crisscross capillary (black arrow), bizarre capillary (red arrow), capillary dropouts, and avascular areas (green arrow). (Taken by Prof. Sanjeev Handa, Department of Dermatology, Venereology and Leprology, Post Graduate Institute of Medical Education and Research, Chandigarh, India)

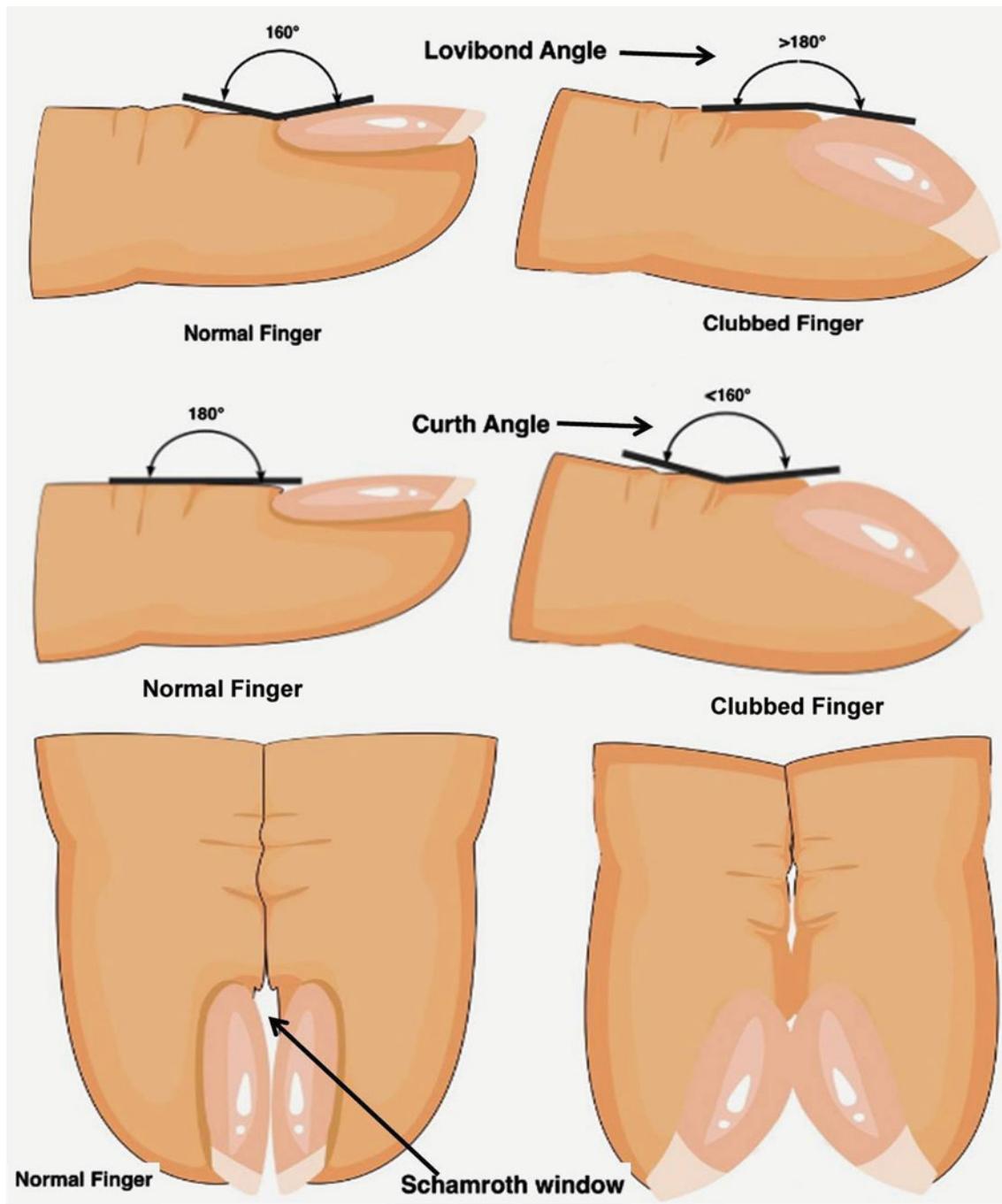


Fig. 91 Geometric assessment for nail clubbing includes: (1) Lovibond's angle; formed by nail as it exits from the proximal nail fold which is 160° in normal subjects and is usually increased to 180° in clubbing of nails. (2) Curth's angle; the angle formed by nail at distal interphalangeal joint which is 180° and decreases to 160° in clubbing.

(3) Schamroth's window; the diamond-shaped window produced when the dorsal surfaces of the corresponding finger of both hands are opposed and are obliterated in clubbing (Schamroth sign). (Schematic images by Dr. Nitin Ranjan, Dermacosm Clinic, Aligarh, U.P. India)



Fig. 92 Pterygium unguis; fusion between nail fold and underlying nail bed and matrix forming a central fibrotic band that divides the nail proximally in two, giving it a winged appearance. The fibrotic band obstructs normal nail growth. Common causes include lichen planus, leprosy, onychotillomania, peripheral vascular disease, Raynaud's phenomenon, dyskeratosis congenita, and nail dystrophy. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 93 Lindsay's half and half nail in a patient with chronic renal failure; seen as sharply demarcated two halves white proximally and red, pink, or brown distally. It is attributed to chronic renal failure, cirrhosis, Crohn's disease, and chemotherapy or may be idiopathic. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

Table 20 Assessment of trichogram (Galliker and Trüb 2012)

Type of hair	Characteristics
Anagen hair	80–88% Hairs thick With dark base Inner and outer root sheaths preserved Bulb at an angle of 20° with hair shaft
Telogen hair	10–15% Hairs thin Club-shaped Smooth contoured Straight hair shaft tapering into nonpigmented bulb Loose or no outer root sheath
Catagen hair	1–2% Similar to telogen hair except that the bulb is not smooth Loose and thick outer and inner root sheaths
Traumatized anagen hair	Angulated bulb Lack of outer or both outer and inner root sheaths Severely traumatized/dystrophic hairs lacking these features
Patterned hair loss	Frontal scalp having more telogen hair as compared to occipital scalp Low anagen-to-telogen ratio

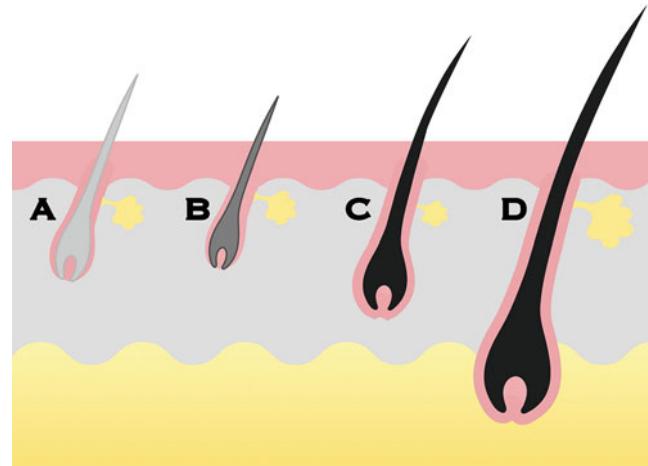


Fig. 94 Diagrammatic representation of types of hair follicles: (A) lanugo hairs that usually shed in utero at 8th–9th month of gestation are fine, soft, unmedullated, and unpigmented; (B) vellus hairs are soft, unmedullated, occasionally pigmented, and seldom more than 2 cm in length; (C) intermediate hairs in transition phase of development from vellus to terminal hair; (D) terminal hair is longer, coarse, medullated, and pigmented. They are normally present over scalp, eyebrows, and eyelashes in prepubertal age. Secondary “sexual terminal hair” develops from vellus hair after puberty. (Schematic images by Dr. Nitin Ranjan, Dermacosm Clinic, Aligarh, U.P. India)

Fig. 95 Diagrammatic representation of hair growth cycle; in the anagen phase, new hair forms and grows and is followed by catagen or regressing phase and telogen or resting phase leading to shedding of mature hair. Many discrete changes occur in the shape of hair follicles and dermal papillae during this virtuous hair growth cycle. (Schematic images by Dr. Nitin Ranjan, Dermacosm Clinic, Aligarh, U.P. India)

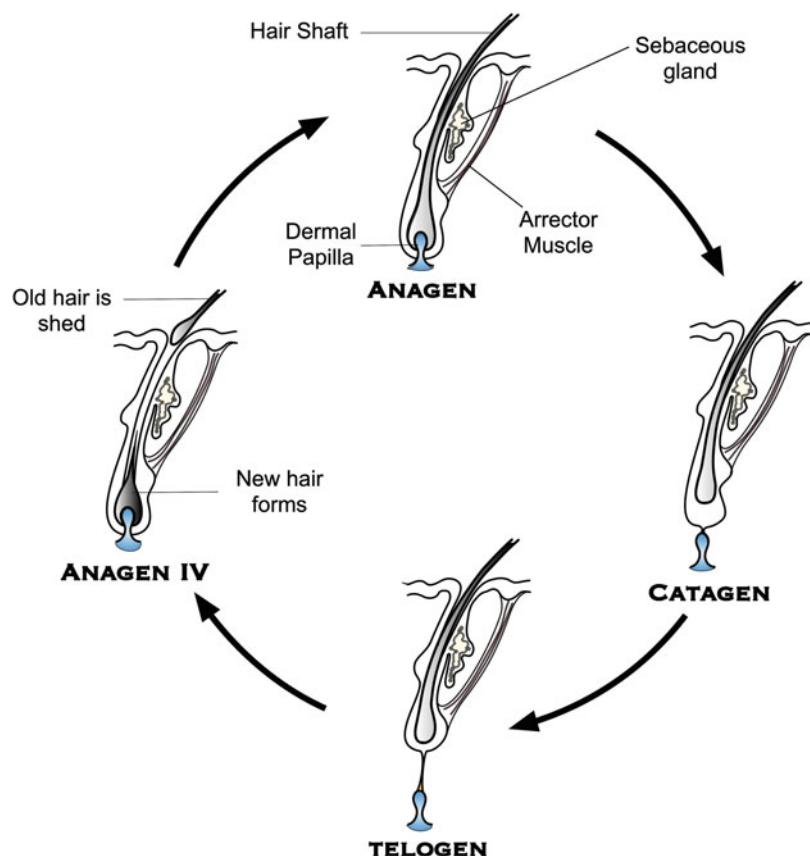


Table 21 Stages and evaluation of findings of TrichoScan (Riedel-Baima and Riedel 2009; Blume-Peytavi et al. 2008)

Stages

A 2 cm² scalp area is marked, trimmed to 1 mm, and photographed sequentially on days 0, 7, and 15 using trichoscope and compared for hair length and density

Dying of hair enhancing the contrast between hair and the scalp especially for persons having fair skin and light hairs

Evaluation

A. Hair length

No increase in hair length indicating percent of anagen hairs

Extent of increase in length indicating rate of hair growth

Visible hair growth indicating percent of telogen hairs

B. Hair density (number/cm²)

Showing density of terminal hair, vellus hair, anagen hair, and telogen hair

C. Hair thickness

Mean hair thickness calculated using a special software for analyzing digital photographs

At least 20% alteration in hair shaft diameter and an anagen:telogen ratio < 4:1 suggests patterned hair loss

Trimming of scalp hair not acceptable to some patients

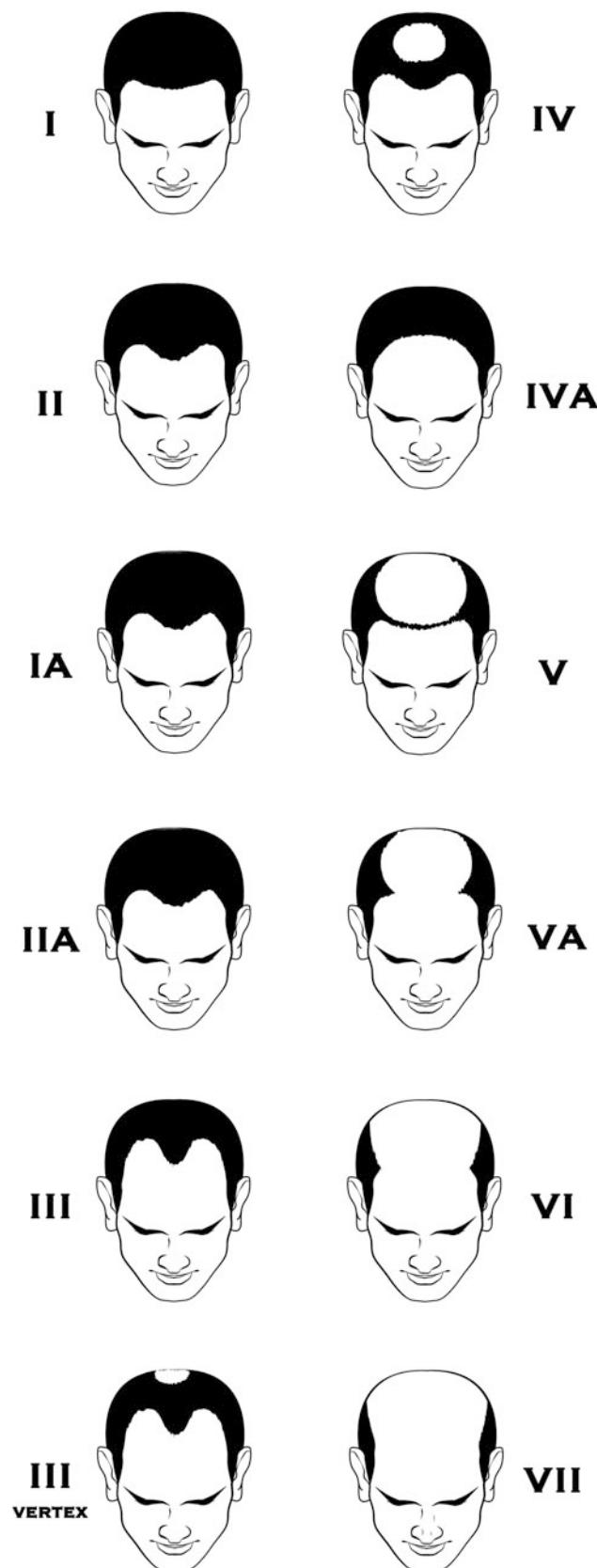


Fig. 96 Diagrammatic representation of commonly used classifications for patterned hair loss or androgenetic alopecia in men; Hamilton's

categorized hair loss: (A) types I–III for scalps, which are not bald, and (B) types IV–VIII scalps, which are bald. The more commonly used



Fig. 97 Diagrammatic representation of Ludwig scale (Ludwig 1977) for pattern hair loss in women (**Grade I** there is perceptible thinning of hair limited to the vertex 1–3 cm behind the frontal hairline, **Grade II** the hair loss and thinning over the vertex are more pronounced than seen

in Grade I, and **Grade III** complete denudation and baldness within the area over vertex as seen in Grades I and II). (Courtesy Dr. Nitin Ranjan, Dermacosm Clinic, Aligarh, U.P. India)

Table 22 Methodology and indications of KOH mount (Coulson et al. 2016; Pasricha and Khaitan 2005)

Methodology
Clean the sampling site with alcohol to remove any ointment or powder
Obtain test sample by scraping at edge of lesions using disposable scalpel blades or clipping from friable and discolored nails or debris under the nails
Hair are removed with roots intact in tinea capitis or cut off at skin level for piedra
Put test sample on a glass slide admixed with few drops of aqueous KOH (10–15%) and allowed to stand for 10–15 min after covering with glass cover slip or until keratin is dissolved
Nails are preferably kept in KOH for 30 min to dissolve keratin and other organic materials for easier viewing
Examine microscopically under low power (10x) objective and preferably under low illumination as refractile nature of hyphae and spores can be missed under bright light
Indications
Dermatophytosis including tinea (T.) capitis, T. corporis, T. cruris, T. manum, T. pedis, T. unguium, and onychomycosis
Candidiasis
Pityriasis versicolor
Systemic and subcutaneous mycoses

Fig. 96 (continued) worldwide is Norwood's classification which despite being a little complicated includes types I to VII. (**Type I:** no recession or minimal (IA) of the hairline. **Type II:** the recession of frontotemporal hairline which is triangular and usually symmetrical (IIB). **Type III:** hair loss which is minimal but to an extent of baldness according to Norwood. The temples have deep symmetrical recession and are bare or have sparse hair cover. The Type III vertex shows hair loss primarily from the vertex and limited degree of recession of frontotemporal hairline but not to the extent that occurs in Type III. **Type IV:** the vertex having sparse hair or no hair; the frontotemporal recession is more severe than in Type III, and both bald areas are

separated by a band of moderately dense hair extending across the vertex connecting sides of the scalp with fairly haired fringe. **Type V:** the larger vertex scalp hair loss separated from the frontotemporal region with a less distinct narrower and much sparser band of hair or no hair (Type VA) than seen in Type III. **Type VI:** the large hair loss over frontotemporal and vertex regions joined together with loss of the band of hair crossing the crown. **Type VII:** the hair loss most severe with only a narrow horseshoe-shaped band of hair, which are fine and not dense, on the sides and back of the scalp remaining) (schematic images by Dr. Nitin Ranjan, Dermacosm Clinic, Aligarh, U.P. India)

Table 23 Interpretation of findings of KOH mount and wet mount (Coulson et al. 2016; Pasricha and Khaitan 2005)

Element	Appearance in KOH mounts/wet mount
Dermatophytes in skin scrapings/nail clippings	Long, smooth, translucent, branching, and septate hyphal filaments with or without arthroconidiospores
Dermatophytes in hair	Spores, either within the hair shaft (endothrix) or outside the hair shaft like a sheath (ectothrix)
Piedra	Closely packed brown hyphae held in a mass by a viscous substance
Pityriasis versicolor	<i>Malassezia furfur</i> as thick-walled stout short filamentous yeast in clusters in characteristic “banana and grapes” or “spaghetti and meatballs” appearance
Cutaneous cryptococcosis	Capsulated forms of cryptococcosis in serum/exudates mounted on a slide with few drops of KOH and India ink
Trichomonas vaginalis in vaginal smears	Characteristic pear shape, flagella, and motility
Scabies mite (<i>Sarcoptes scabiei</i>) in skin scrapings	A characteristic flat, ovoid, 0.5 mm sized, creamy white mite having denticles on dorsal surface and eight short legs; scybala (mite products) visualized more often than mite itself



Fig. 98 KOH mount demonstrating stout hyphae and spores having “meatball and spaghetti” appearance of *Malassezia furfur* (*Pityrosporum* species) in pityriasis versicolor (40X). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Fig. 99 Wet mounts demonstrating crab louse (4X). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

Table 24 Methodology of Tzanck test (Coulson et al. 2016; Gupta and Singhi 2005; Roucco and Roucco 1999)

Tzanck test methodology

- Select a fresh blister in vesiculobullous dermatoses
- Incise open the roof of an intact blister along one side and fold it back
- Gently scrap the base and roof of the lesion with a scalpel blade (no. 15)
- Scrapings of the erosive lesions also obtained similarly after removing the crusts carefully with sterile forceps
- Spread the cellular material thus obtained onto an alcohol-cleaned microscopic slide as a thin smear; air-dry for 5 min
- Fix the smear in methanol by dipping the slide for 5 min in a Coplin jar containing methanol and allow the smear to dry
- Dilute the Giemsa stain ten times by adding 1 ml of Giemsa stain to 9 ml of distilled water
- Cover the smear with diluted Giemsa stain and leave it for 30 min
- Wash the slide and allow the smear to dry
- Examine under 10x lens to identify the fields and examine slides using a 40x or 100x (oil immersion) lens

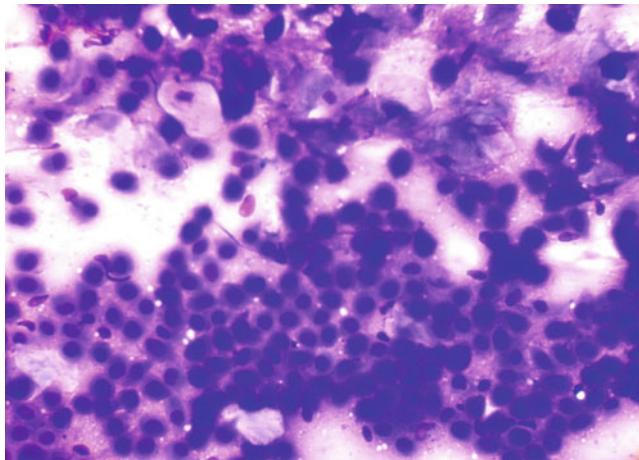


Fig. 100 Tzanck smear; multiple acantholytic cells (Tzanck cells) in pemphigus apparent as large round keratinocytes with an intensely stained nucleus and abundant basophilic cytoplasm with tendency to get condensed and form a perinuclear halo (in pemphigus foliaceus and IgA pemphigus, the Tzanck cells appear more elliptical) (Giemsa stain, 40X). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

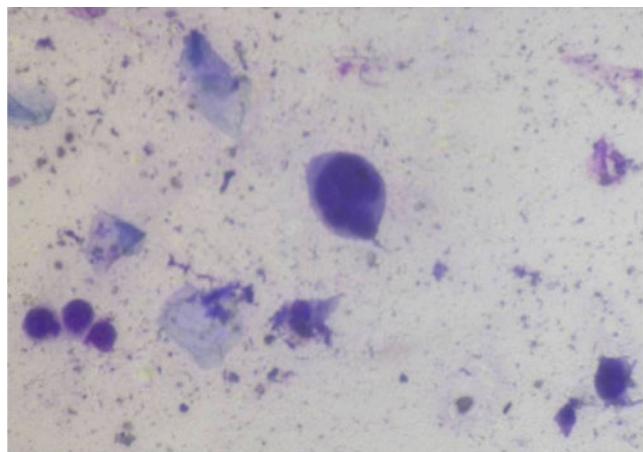


Fig. 101 Tzanck smear; a multinucleated giant cell in herpes simplex (Giemsa, 40X). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

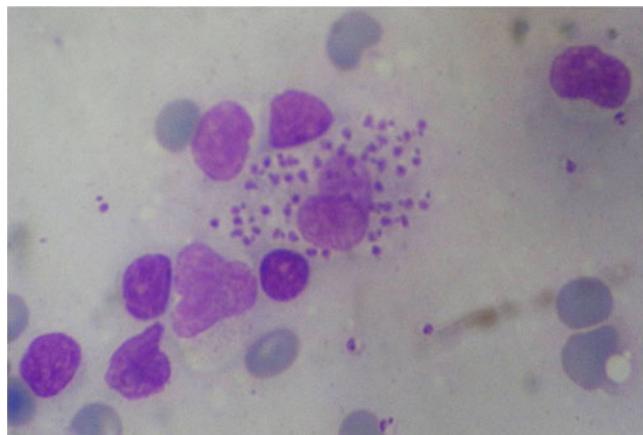


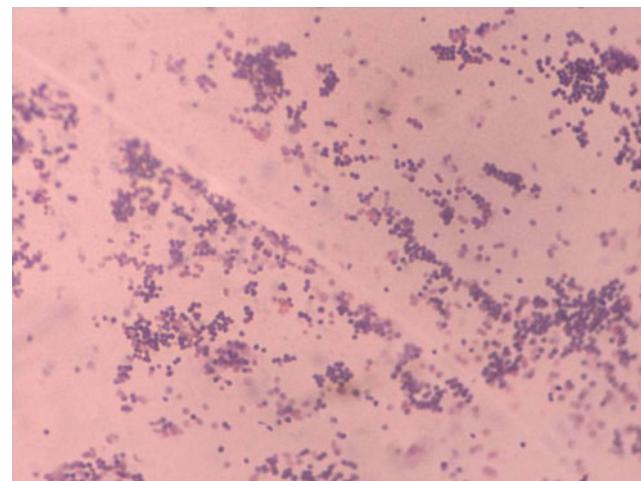
Fig. 102 Tzanck smear; numerous Leishman bodies (amastigotes) grouped together in a typical "swarm of bees" fashion within large macrophages (Giemsa stain, 40X). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

Table 25 Clinical applications for Tzanck test (Coulson et al. 2016; Gupta and Singhi 2005; Roucco and Roucco 1999)

Clinical disorder	Diagnostic features in Tzanck smear
Inflammatory disorders	
Pemphigus vulgaris and pemphigus foliaceus	Multiple acantholytic cells (Tzanck cells) highly diagnostic
Stevens-Johnson syndrome, toxic epidermal necrolysis, and erosive lichen planus	No acantholytic cells, plenty of leukocytes, necrotic basal cells, and fibroblasts
Bullous pemphigoid	No acantholytic cells, scarce epithelial cells, and leukocytes, particularly eosinophils with leukocyte adherence in abundance
<i>Staphylococcus</i> scalded skin syndrome	Dyskeratotic acantholytic cells and no or minimal skin inflammation
Infections	
Herpes simplex, herpes zoster, and varicella	Syncytial-multinucleated giant cells diagnostic
Leishmaniasis	Leishman-Donovan bodies (amastigote form)
Molluscum contagiosum	Intracytoplasmic inclusion bodies (Henderson-Patterson's bodies)
Hand, foot, and mouth disease	Syncytial nuclei and no acantholytic cells
Fungal infections	Fungal hyphae and spores; spherical, oval, or cigar-shaped yeasts; and asteroid bodies
Tumors	
Basal cell carcinoma	Clusters of basaloid cells
Squamous cell carcinoma	Absence of clusters, pleomorphism, atypia in nuclear and cytoplasm
Melanoma	Atypical melanocytes
Paget's disease	Paget cells
Erythroplasia of Queyrat	Poikilocaryosis, naked and clumped nuclei
Mastocytoma	Abundant mast cells with metachromatic granules
Histiocytosis X	Multinucleated atypical Langerhans cells
Genodermatoses	
Hailey-Hailey disease	Multiple acantholytic cells
Darier's disease	"Corps ronds" and "grains"
Others	
Spongiotic dermatitis	Tadpole cells, lymphocytes, or neutrophils
Neonatal pustular eruption	Abundant neutrophils in intransient neonatal pustulosis and infantile acropustulosis and eosinophils in eosinophilic pustulosis

Table 26 Requirements and methodology of Gram's staining (Coico 2005)

Equipment and reagents required
Bunsen burner, alcohol-cleaned microscope slide, and water
Crystal violet, Gram's iodine solution, acetone/ethanol (50:50), and safranin
Staining method
Prepare smear(s) from clinical samples (pus, discharge, etc.) over cleaned slides, air-dry, and fix smear(s) by gently passing over a flame but avoiding overheating
Cover the heat-fixed smear with crystal violet for 1 min and then rinse with water
Flood the slide with Gram's iodine solution for 1 min, and drain out the solution under running water
Decolorize with acetone (mix equal volumes of 95% ethanol +acetone) for 2–5 sec, and rinse quickly under running water
Counterstain with safranin for 1 min and gently wash in running water and allow to air-dry
After staining, scan under 10x lens to identify the fields, and examine slides using a 100x (oil immersion) lens
Notes
The length of the decolorization is critical as prolonged exposure to the decolorizing agent will remove all the stains from both types of bacteria. This may cause difficulty in differentiating the gram-positive from gram-negative bacteria
Some gram-positive bacteria may lose the stain easily and appear as a mixture of gram-positive and gram-negative bacteria (gram-variable)

**Fig. 103** Gram-stained smears; Gram-positive cocci (Gram's stain, 100X). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

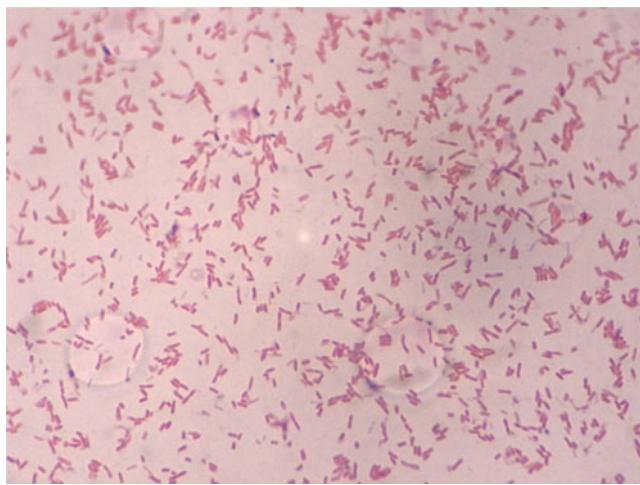


Fig. 104 Gram-stained smears; Gram-negative bacilli (Gram's stain, 100X). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

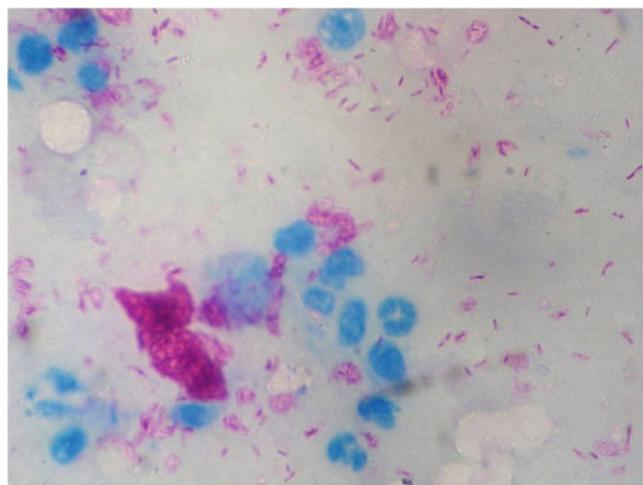


Fig. 106 Slit-skin smear in leprosy showing solid-stained living *M. leprae* with bacterial index (BI) = 6 (modified Ziehl-Neelsen stain, 100X). (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

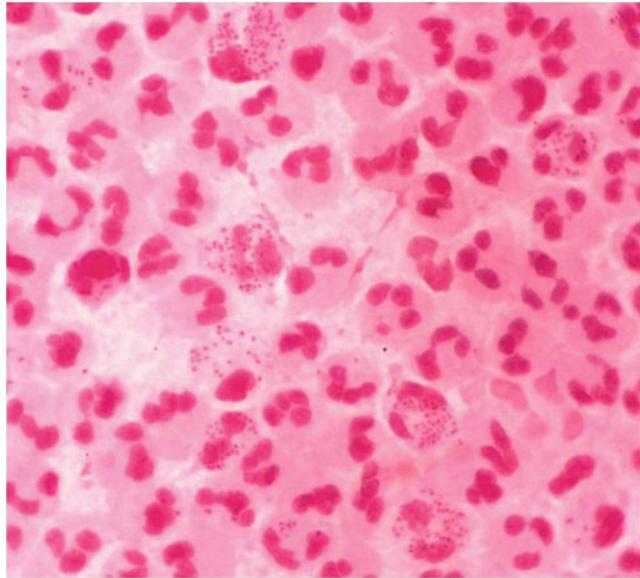


Fig. 105 Gram-stained smears; Gram-negative intracellular gonococci. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

Table 27 Requirements and stains of slit-skin smear tray in leprosy (Mahajan 2013; Jopling and McDougall 2000; WHO Expert Committee on leprosy 1988)

Requirements

- Gloves
- Swabs and spirit
- Bard-Parker scalpel handle and new blades (size 15)
- Medicated dressing strips
- Spirit lamp
- Microscope glass slides
- Marking pencils
- Record register
- Light microscope
- Immersion oil and blotting papers
- Slide box
- Sink with running water and staining rods
- Safe disposal bins

Stains

- 1% carbol fuchsin
- 5% sulfuric acid or 1% acid alcohol (1% hydrochloric acid in absolute ethyl alcohol)
- 1% methylene blue

Table 28 Indications and methodology slit-skin smears for *Mycobacterium leprae* (Mahajan 2013; Jopling and McDougall 2000; WHO Expert Committee on leprosy 1988)

Indications
To confirm diagnosis
To classify disease in Ridley-Jopling spectrum
To determine infectivity (high BI)
To categorize the diseases in multibacillary or paucibacillary (according to WHO's classification)
To assess progress of disease
To follow up a patient on treatment
Methodology
Explain the procedure and its necessity
Wash hands and with gloves on clean the selected site (one earlobe and two lesions) with alcohol/spirit
Squeeze the fold of skin between finger and thumb maintaining pressure till blanching of skin
Make a small incision, 4–5 mm in length and 2–3 mm deep into the dermis with a size 15 bard-Parker scalpel blade
Rotate the blade through right angle and the scrape the cut surface firmly 2–3 times to obtain tissue from its sides and bottom avoiding mixing with blood
The tissue obtained is smeared onto a microscope slide with standard thickness and diameter of about 5–8 mm, and air-dry for 5–10 min for modified Ziehl-Neelsen staining
Wipe the oozing blood and seal the wound with medicated strip
Wipe the blade clean with spirit and flame it for few seconds before discarding
Label the slide with patient's name/registration number and sites of smear
Staining
Pass smears gently over a flame to fix but avoiding overheating
Cover the smear/whole slide with prefiltered 1% carbol fuchsin solution
Heat the slide by holding the flame underneath it until vapors arise from the carbol fuchsin (hot Ziehl-Neelsen method). Repeat heating three times in 5 min time, avoid overheating, and ensure that stain does not boil
Leave the slide for 10–15 min without heating further. Addition of "tween 80" will reduce staining time to 5 min. If heating of carbol fuchsin is not possible, leave the stain for 20 min at room temperature (cold Ziehl-Neelsen method). However, results are better at 60 °C than at 22 °C
Wash gently under running water, and rinse until runoff water is colorless and the smears remain dark red
Decolorize smear with 5% sulfuric acid or 1% acid alcohol for 10 min
Rinse gently and cover the smear with counterstain 1% methylene blue for 1 min
Rinse with water and leave it in the rack to dry in an inclined position
After staining, scan under 10x lenses to identify the fields, and examine using a 100x oil immersion lens. Viable <i>Mycobacterium leprae</i> are seen against blue background as uniformly and intensely red-stained bacilli having length four times greater than breadth; they are described as solid-stained (S) bacilli. Dead lepra bacilli stain irregularly and are described as fragmented (F) or granular (G). Examine 100 adjacent oil immersion fields or until whole smear is examined

Table 29 Reading of slit-skin smear in leprosy and interpretation of results (Mahajan 2013; Jopling and McDougall 2000; WHO Expert Committee on leprosy 1988)

Reading of results
Morphological index (MI)
Percentage of singly lying and solidly stained (living) bacilli calculated after examining singly lying 200 bacilli counted carefully as stained solid (S), fragmented (F), or granular for each smear separately, and calculated average is MI of the patient
Ridley's logarithmic scale for bacteriological index (BI)
6+ many clumps of bacilli in an average field (over 1000)
5+ 100–1000 bacilli in an average field
4+ 10–100 bacilli in an average field
3+ 1–10 bacilli in an average field
2+ 1–10 bacilli in 10 fields
1+ 1–10 bacilli in 100 fields
Interpretation of results
The BI for each smear is recorded separately, and average calculated or highest BI is reported
Any patient with positive smears is categorized as multibacillary case and has high potential for infectivity (1 gm of skin tissue in lepromatous leprosy has approx. 7000 million leprosy bacilli) and disease progression
A steady decrease in MI indicates treatment efficacy (fall is more rapid with WHO multidrug therapy) during treatment (nearly 99.9% live bacilli get killed from action of rifampicin, and BI decreases 0.6–1.0 log per year)
No change in MI indicates drug resistance
A positive smear is diagnostic of leprosy or relapse after treatment

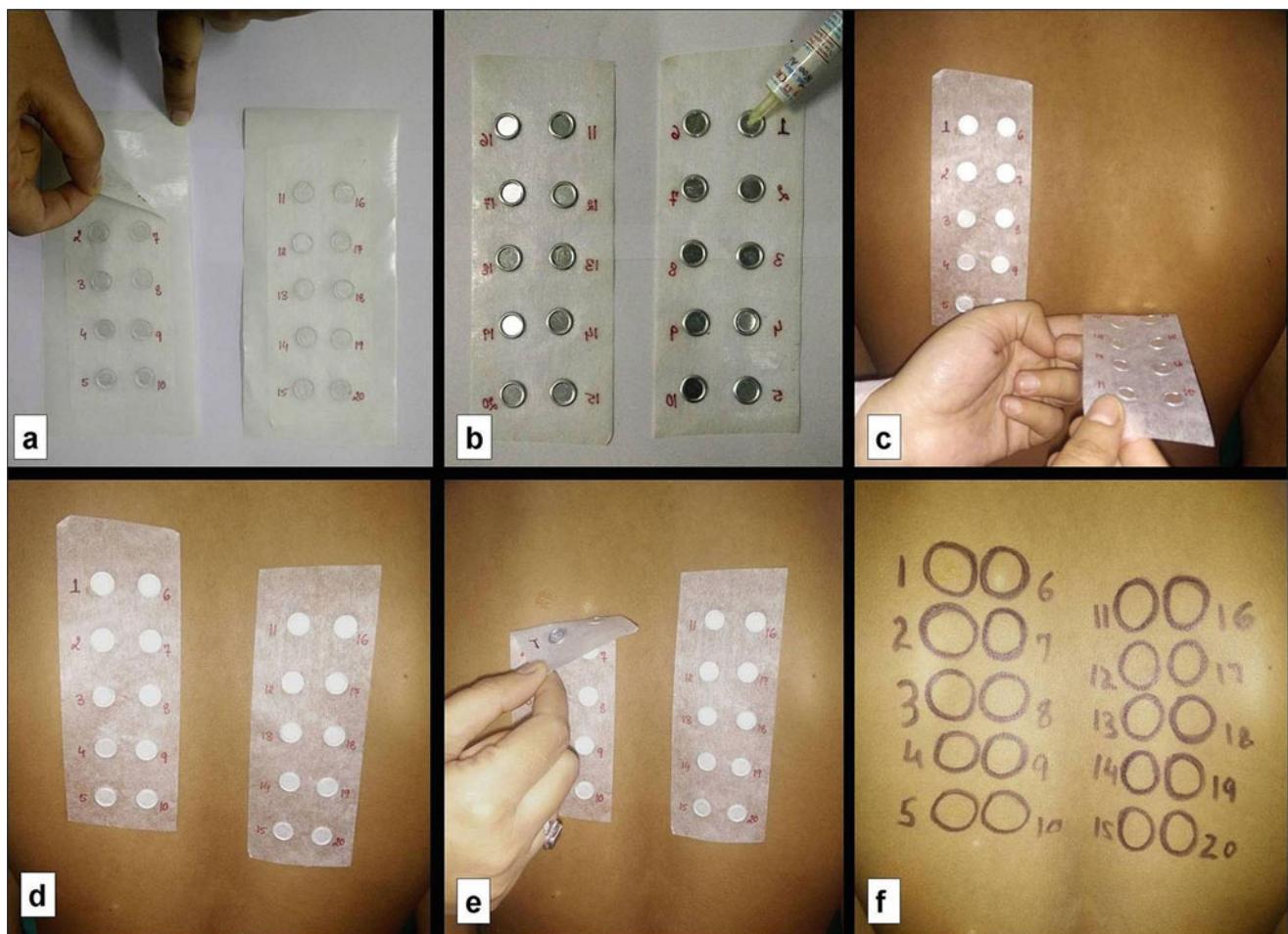


Fig. 107 Patch testing: (a) Finn chambers mounted on micropore/scancopore tape and covered with nonsticking release paper and can be peeled off easily; after placing the patch test unit on the table, the release paper is removed gently without loosening it at one end. (b) Finn chambers laid out on micropore/scancopore tape; a 5 mm ribbon of antigen in petrolatum from prefilled syringe is placed into Finn chamber. They have been numbered from upper right chamber downward and then on left side. (c) All the Finn chambers filled with the test antigens starting from upper right chamber and applied onto upper back from below upward pressing with palm for good apposition with patient sitting in

slightly bending forward. They are marked with marking pencil making a record of number and name of each antigen. (d) Finn chambers in place; order of the test allergen is reversed from right to left, that is, the upper right chamber will be no. 1 at left. (e) Removal of patch test from upper edge after 48 h. (f) The patch test sites marked with a skin marker immediately after removal; the first reading of results is made after skin regains its normal contour and nonspecific skin irritation subsides. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

Table 30 Instruction for the patient after application of patch test (Johansen et al. 2015; Rietschel and Fowler 2008)

Do not bathe, wash, or wet the back during this period
Avoid exercise/heavy work that may cause sweating
Avoid friction or rubbing, and lie down on the back lest the patches should become loose
Avoid scratching the patch test site, and report immediately if there is severe itching or irritation
Avoid exposure to sunlight
Come after 48 h for patch test reading

Table 31 Grading of patch test results (Johansen et al. 2015; Rietschel and Fowler 2008)

Grade	Interpretation
-	Negative
?	Doubtful reaction; faint erythema only
+	Weak positive reaction; palpable erythema, infiltration, and possibly papules
++	Strong positive reaction; erythema, infiltration, papules, and vesicles
+++	Extreme positive reaction; intense erythema and infiltration and coalescing vesicles or bulla
IR	Irritant reaction of different types (glazed erythema, burn-like erosion, pustules, and edge effect)

Table 32 Relevance of patch test results using COADEX system (Bourke et al. 2001)

Code	Interpretation
C (Current)	Current relevance; the patient has been exposed to allergen during current episode of dermatitis and improves when the exposure ceases
O (Old)	Old or past relevance; past episode of dermatitis from exposure to allergen
A (Active)	Actively sensitized; patient presents with a sensitization (late) reaction
D (Doubtful)	Relevance not known; not sure if exposure is current or old
E (Exposed)	Exposed; a history of exposure but not resulting in dermatitis from that exposure or no history of exposure but a definite positive allergic patch test
X (Cross-reaction)	Cross-reaction; the positive test is due to cross-reaction with another allergen

Table 33 Methodology and interpretation skin prick, puncture, or scratch test (ASCIA Skin Prick Testing Working Party 2016; Liang 2002)**Methodology**

After cleaning with soap and water or alcohol, the forearm is marked with a marking pen for the number of test allergens. Marks are made at least 2 cm apart

A drop of allergen solution is placed beside each mark

A drop of histamine (1 mg/ml) solution (positive control) and saline (negative control) are also placed similarly

A superficial “puncture” or two superficial “scratches” are made through each allergen to be tested in “skin puncture” or “scratch test,” respectively. The prick should be deep enough to reach epidermis but not causing bleeding

Excess allergen solution is dabbed off with a tissue

Observe skin reactions that occur within 20–30 min, and compare with that from controls

The positive control becomes itchy within a few minutes and develops a “wheal” and “flare” in the center. The negative control shows no response

Interpretation

Negative control must be negative

Positive control must be positive

Allergen wheal >3 mm is positive

Skin index* >0.6 is positive

*Skin Index (SI) = A (Allergen wheal size)/H (Histamine wheal size)

Wheal size <3 mm is always negative

Wheal size >3 mm and skin index <0.6 are possibly positive

Wheal size >3 mm and skin index >0.6 are positive

Wheal size >3 mm and skin index >1.0 are definitely positive

Remarks

Size of wheal is calculated as average of two perpendicular diameters

Any reading 2 mm larger than the negative control will then be read as positive

Erythema is measured as “redness score,” and a positive test must have redness score equivalent to that of histamine control

The size of the wheal indicates the degree of sensitivity to the allergen and not the severity of symptoms

False-positive reactions may occur from too closely placed test allergens or irritant reaction

False-negative reactions are due to prior intake of antihistamines or corticosteroid, decreased reactivity of individual, or highly diluted test allergen

Relevance of prick test results

A positive skin prick test does not predict the nature of the allergic symptoms

It may indicate a clinically true allergy but that may be irrelevant

A negative skin prick test result can occur even in the presence of true IgE-mediated allergy

It is generally not a useful diagnostic test for atopic dermatitis, chronic urticaria/angioedema, food intolerance, dermatitis herpetiformis, or other nonspecific rashes

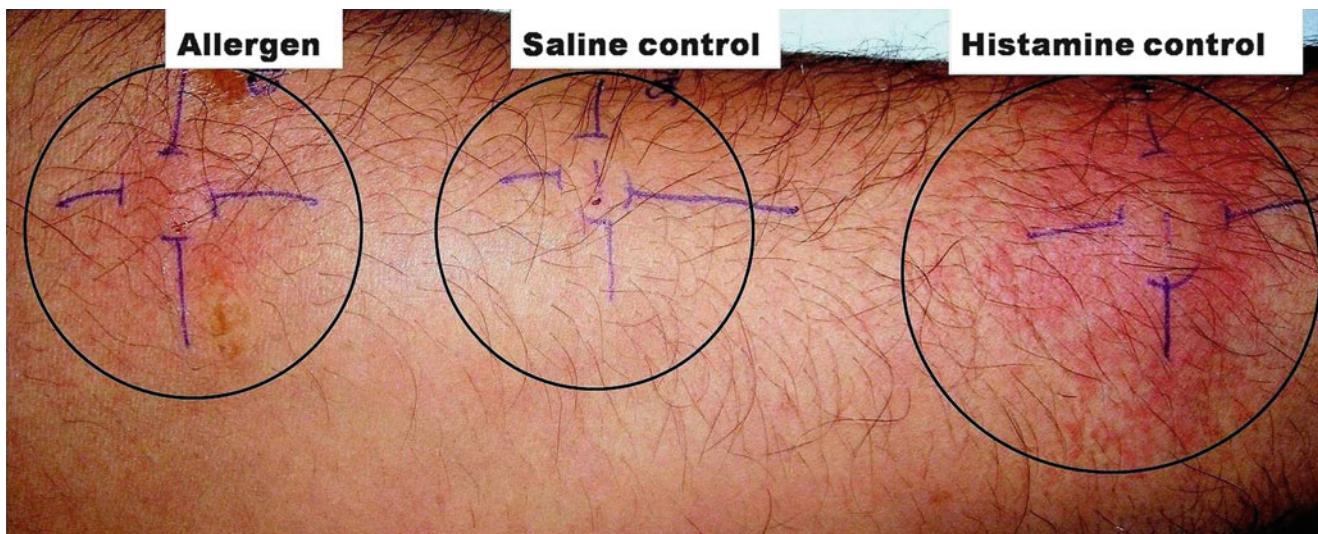


Fig. 108 A demonstration of positive skin prick test showing negative control (saline), positive control (histamine), and allergen wheal size (average of two diameters) >3 mm (skin index >0.6) at 30 min; allergen-induced wheal also has redness score of 2, equivalent to that of histamine control. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)

Table 34 Positive pathergy test (Sequeira and Daryani 2011; International Study Group for Behcet's Disease 1990)

Clinical diagnosis	Remarks
Behcet's disease	Positive pathergy test is one of the diagnostic criteria and indicative of disease activity. But it may be negative in nearly 50% cases
Pyoderma gangrenosum	Positive in 25% patients. Surgical debridement will aggravate pyoderma gangrenosum lesions
Sweet's syndrome	Rare
Inflammatory bowel disease	Rare
Interferon alpha-treated chronic myeloid leukemia patients	Rare
Spondyloarthropathies	Rare
Healthy individuals	Sometimes

Table 35 Indications of skin biopsy (Fernandez-Flores 2019; Coulson et al. 2016; Werner 2009; Garg et al. 2008)

Indication	Examples
Clinical diagnosis	Histopathological confirmation
Special pathological investigations aiding diagnosis	Immunopathology test, immunohistochemistry, immunoenzyme tests, electron microscopy, and microbiological investigations
For assessing progress after treatment or prognosis	For assessing response to treatment in cases of leprosy, mycosis fungoides, systemic lupus erythematosus, etc.
Persistent or recurrent lesions	Diagnosis of recurrent cases of basal cell carcinoma, squamous cell carcinoma, leprosy, subcutaneous mycosis, etc.
Therapeutic excisions	Small lesions (benign or malignant) including nevi, small lesions of basal cell carcinoma and squamous cell carcinoma, etc. (excisional biopsy)
Systemic diseases with dermatological signs	For early diagnosis of systemic diseases such as systemic lupus, amyloidosis, sarcoidosis, renal diseases, gastrointestinal diseases, necrobiosis lipoidica in diabetes mellitus

Table 36 Common methods of skin biopsy (Elston et al. 2016; Nischal et al. 2008; Savant 2008)

Biopsy method	Indications	Remarks
Punch biopsy	Skin lesions with deeper components, e.g., leprosy, panniculitis, and erythema nodosum To assess depth of invasion in neoplasia Removal of small lesions	Biopsy punch is available in sizes from 2 to 10 mm. A 4 mm biopsy punch is adequate It is simple, causes minimal scarring, and is useful for assessment of extent subcutaneous involvement Sample may be small and does not represent entire lesion or transition from normal to abnormal skin
Excision biopsy	Most small- to medium-sized lesions, e.g., nevi, early basal cell carcinoma, squamous cell carcinoma, etc.	Whole specimen is available for study Primary wound healing and good cosmetic results Additional advantage of therapeutic excision Chances of recurrence if excision is not adequate
Incisional biopsy or wedge biopsy	When large amount of tissue is needed for microscopy, culture, etc., e.g., in subcutaneous or deep mycoses and cutaneous tuberculosis To detect lateral edge of malignant lesions To examine deeper component such as subcutis	Whole specimen is available for study Primary wound healing and good cosmetic results Some skill is desirable
Shave biopsy (saucerization) (superficial and deep)	Benign superficial epidermal lesions such as seborrheic keratosis, actinic keratosis, plane warts, benign nevi, etc. Vesiculobullous lesions Therapeutic remodeling for scars, etc.	Simple method with no scarring Deep tissue not included Deep shave biopsy (saucerization) may cause local indentation
Others such as snick biopsy, clip biopsy, skin surface biopsy, and curette biopsy	Snick biopsy for actinic keratosis Clip biopsy for pedunculated lesions (acrochordon, warts, nevi) Skin surface biopsy for sampling superficial skin layers (as for scabies mite, dermatophytes, <i>Pityrosporum</i> sp. erythrasma); curette biopsy for actinic keratosis, warts, etc.	Sample is usually superficial

Fig. 109 Biopsy punches; round body biopsy punches both autoclavable metallic and disposable available in 2–10 mm in diameter. (Taken by Prof. Vikram K. Mahajan, Department of Dermatology, Venereology and Leprosy, Dr. R. P. Govt. Medical College, Kangra (Tanda), Himachal Pradesh, India)



Table 37 Skin biopsy as suggested techniques for common dermatoses (Elston et al. 2016; Nischal et al. 2008; Savant 2008)

Disease	Objective	Biopsy technique
Autoimmune bullous disease	Hematoxylin and eosin staining (H&E)	Saucerization biopsy of intact bulla
	Direct immunofluorescence (DIF)	Perilesional skin punch biopsy
Epidermolysis bullosa	H&E	Saucerization biopsy of intact bulla
Vasculitis	H&E	Punch or deep shave biopsy of well-established purpuric lesion (>72 h old)
	DIF	Punch or deep shave excision of acute lesions (<24 h)
Panniculitis	H&E	Deep incisional biopsy
Dermatomyositis and lupus erythematosus	H&E	Punch biopsy of established and active lesion (>6 months old)
	DIF	
Stevens-Johnson syndrome, toxic epidermal necrolysis, and staphylococcal scalded skin syndrome	H&E	Shave or punch biopsy including full thickness epidermis
Cicatricial alopecia	H&E	≥4 mm punch biopsy of established and active lesion (>6 months old)
	DIF	
Non-cicatricial alopecia	H&E	For patterned alopecia, telogen effluvium, or alopecia areata, ≥4 mm punch biopsy of established or recent active lesion
	DIF	
Basal cell carcinoma and squamous cell carcinoma	H&E	Shave or punch biopsy of adequate depth for invasive pattern or perineural invasion
Suspected melanoma	H&E	Complete excision preferred
Dermatofibrosarcoma protuberans	H&E	Deep incisional biopsy
Cutaneous T cell lymphoma	H&E	Broad deep shave biopsy
Primary cutaneous B cell lymphoma	H&E	Deep incisional biopsy

Table 38 Recommended transport media for specimens (Elston et al. 2016)

Type of test	Sites of biopsy	Recommended transport media	Remarks
Routine histopathology (H&E staining)	Lesion	Formalin 10% (buffered preferably)	Buffered formalin is prepared by adding 4 g of monosodium phosphate ($\text{NaH}_2\text{PO}_4 \cdot 2\text{H}_2\text{O}$, <i>mw</i> 156.01) and 6.5 g of sodium hydrogen phosphate (Na_2HPO_4 , <i>mw</i> 142) to 1 l of 10% formalin Addition of isopropyl alcohol in 1:10 ratio during winters prevents freezing artifact
DIF in vesiculobullous disorders	Perilesional skin	Normal saline, liquid nitrogen, Michel medium, or Zeus medium	Normal saline gives better results provided the specimen delivered to lab and processed within 24–48 h Avoid thawing of specimen transported in liquid nitrogen
Lupus band test	Uninvolved (covered) skin		
Microbiological cultures	Lesion	Non-bacteriostatic saline	Transport should be done immediately Send diced tissue for fungus/acid-fast bacilli cultures, or grind it with glass beads for routine cultures
Electron microscopy	Lesion	Glutaraldehyde solution 2.5%	Transport/store at 4 °C or with cold pack
Flow cytometry	Lesion	Fresh specimen on saline soaked gauze or Roswell Park Memorial Institute medium (RPMI medium)	—

histopathologic confirmation of diagnosis, tissue smears, direct immunofluorescence, and culture of microorganisms. Among various techniques (Table 36), skin biopsy using biopsy punch (Fig. 109) of various sizes is the most favored method for being convenient. In most instances, active edge of an early, fully evolved, but non-regressing lesion is selected for biopsy. However, disease and type of investigation and lesion to be biopsied often dictate site and biopsy technique (Table 37). After biopsy, the excised tissue is transferred to a labeled container with selected fixative agent along with patient's clinical details (Table 38) for transporting to pathology laboratory (Elston et al. 2016; Werner 2009; Nischal et al. 2008).

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