INTRODUCTION

Psoriasis and seborrheic dermatitis are common erythematous – squamous dermatoses that may present with scaly erythematous patches on the scalp. Their differentiation is a diagnostic challenge, particularly when the lesions are isolated on the scalp. [1-3]

An overlap between psoriasis and seborrheic dermatitis is often called sebopsoriasis. This coexistence makes differential diagnosis even more complex. However, the existence and diagnostic criteria for sebopsoriasis remain controversial. [4, 5]

When psoriasis and seborrheic dermatitis are localized on the scalp, with no involvement of other skin sites, a skin biopsy may be helpful for diagnosis. In some cases, however, even a biopsy cannot provide accurate information necessary for differentiation. [6, 7]

Unlike skin biopsy which is an invasive diagnostic technique, dermoscopy as a non-invasive diagnostic technique allows us to visualize morphologic features which are invisible to the naked eye; it combines a method that renders the corneal layer and papillary dermis of the skin translucent with an optical system that magnifies the image projected onto the retina. Previously, dermoscopy had been used in differentiating malignant pigmentary disorders, but recently, a broad range of hair and scalp conditions have been evaluated by using the dermoscope. [8, 9]

Psoriasis has characteristic vascular patterns related to cutaneous microcirculation. So, using dermoscopy in clinical evaluation of psoriatic lesions in the scalp particularly in those cases in which no other body sites were involved is a useful tool. [10, 11]

Scalp psoriasis show characteristic dermoscopic features which are absent in seborrheic dermatitis, also dermoscopic features of scalp seborrheic dermatitis can differentiate it from scalp psoriasis. [12, 13]

Many studies stressed the significant role of the dermoscopy in differential diagnosis of scalp psoriasis and seborrheic dermatitis, in this study we will try to detect this diagnostic potential on Egyptian patients and compare our results with the results of these studies. [14, 15]

Psoriasis

Definition

Psoriasis is a chronic inflammatory cutaneous disorder with multisystem involvement. The most characteristic lesions consist of red scaly sharply demarcated indurated plaques present particularly over the extensor surfaces and the scalp. [16]

Epidemiology

Psoriasis is the third most common reason for office visits to dermatologists after acne and warts. [17] It affects about 1–3% of world population [18] the prevalence of psoriasis in Egypt is 1.5%. [19]The frequency of scalp involvement in patients with psoriasis ranges from 50–80 %.[20]

Psoriasis can be present at any age and has been reported at birth and in older people of advanced age. Accurate determination of the age of onset of psoriasis is a problematic, as studies which do so typically rely on a patient's recall of the onset of lesions or determine the onset from the physician's diagnosis as recorded on the initial visit, because minimal disease may be present for years before a consultation is sought. [21]A bimodal age of onset has been recognized in several large studies. The mean age of onset for the first presentation of psoriasis can range from 15 to 20 years of age, with a second peak occurring at 55–60 years. [22]

Two clinical presentations of psoriasis, type I and II, distinguished by a bimodal age at onset. Type 1 begins on or before age 40 years; Type II begins after the age of 40 years. Patients with early onset, or type I psoriasis, tended to have more relatives affected and more severe disease than patients who have a later onset of disease or type II psoriasis. In addition, strong associations have been reported with human leucocyte antigen (HLA)-Cw6 in patients with early onset, compared with later onset of psoriasis. [23]

Pathogenesis

Present evidence indicates that interactions between genes and the environment are important in the pathogenesis of psoriasis for example, sunlight is generally beneficial in a small minority of psoriatic patient.[24] However, psoriasis may be provoked by strong sunlight and cause summer exacerbations in exposed skin.[25]

At least nine chromosomal loci was identified with statistically significant evidence for linkage to psoriasis(nomenclature PSORS1–9).[26] However, the major psoriasis genetic determinant is PSORS1 which probably accounts for 35–50% of familial psoriasis, within those loci are genes and many of those genes are on pathways that lead to inflammation.[27]

The CARD14 gene (caspase-associated recruitment domain) was recently identified as the first gene directly linked to the most common form of psoriasis, a mutation in this gene in the presence of an environmental trigger was suggested to be enough to elicit plaque

psoriasis. [28] Psoriasis could be caused by abnormalities in the adaptive immune system (T cells) and in the innate immune functions of resident epidermal cells. So, psoriasis can be considered as an immune mediated disease. [29]

Keratinocytes constitutively express antimicrobial proteins such as β-defensin-2 (hBD2) and secretory leukocyte protease inhibitor (SLPI), which have direct antimicrobial activity against a broad spectrum of pathogens. In addition, keratinocytes can be stimulated to express other inducible antimicrobials such as hBD2, cathelicidinLL37 and skin-derived antileukoproteinase SKALP/elafin, Toll-like receptors (TLRs). They also secrete signaling molecules such as interleukin1, interleukin 8 and tumor necrotizing factor α. Since most of these constituents are highly expressed in lesional psoriatic skin, it is likely that they are involved in the initiation or control of the inflammatory process. [30]

Some cases of psoriasis are triggered by infections such as streptococcal infections in the upper respiratory tract, some drugs, hormones, hypocalcaemia and psychogenic factors.[31] The cardinal features of psoriatic lesions are epidermal hyperproliferation with loss of differentiation, dilatation and proliferation of dermal blood vessels and accumulation of inflammatory cells, particularly neutrophils and T lymphocytes.[32] There are multiple growth factors, which experimentally have been shown to modulate keratinocyte proliferation, are present in lesional skin.[33]

Dermal capillary loops in lesional skin are dilated, elongated, and twisted with a fourfold increase in endothelium of superficial microvasculature, these vascular changes occur early in lesional development.[34]

It has been demonstrated that epidermal keratinocytes are the primary source of angiogenic activity as they produce vascular endothelial growth factor, which is over-expressed in psoriatic epidermis. In addition to vascular growth, dermal capillaries contribute to the inflammatory process actively through surface expression of molecules involved in leukocyte homing [35]. Psoriasis at the site of an injury is well known (Koebner phenomenon), it usually occurs within two to six weeks of injury to the dermis. [36]

Cutaneous manifestation of psoriasis

Symptoms

Itching: It occurs in scalp psoriasis, guttate psoriasis, unstable psoriasis and secondary infected flexural psoriasis. If it presents in ordinary psoriasis, it is due to dryness of skin. [37]

Burning sensation: In erythrodermic and generalized pustular psoriasis. [38]

Clinical variants

Psoriasis reveals itself in many ways. The following are the most common subtypes of psoriasis. [39]

Chronic plaque psoriasis (psoriasis vulgaris)

It is the commonest form of psoriasis, it represents 70-80% of psoriatic types .Chronic plaque psoriasis is characterized by well demarcated papulosquamous plaques, which are dusky red, covered by white or silvery scales which on its removal reveal tiny bleeding points (Auspitz sign).[40]

The plaques are symmetrically distributed, occurring commonly on scalp, elbows, knees, lumbosacral region and umbilicus. Psoriatic plaques are associated with a rapid onset of intense pruritus or burning sensations, mostly due to the dryness and cracking of the psoriatic area.[41] A white blanching ring, known as Woronoff`s ring may be observed in the skin surrounding a psoriatic plaque.[42] With gradual peripheral extension, the plaques may develop different configurations for example; psoriasis gyrata, a curved linear pattern predominates; in annular psoriasis, ring-like lesions develop secondary to central clearing.[42] Plaque psoriasis may occur as single lesions at predisposed sites (e.g. extensor aspects of knees and elbows) or disseminated (generalized) over the body.[43]

Guttate psoriasis

It presents as showers of small pink papules (2-10) with fine scaling. The papules distribute more or less all over the body. Evidence of preceding streptococcal infection can be found in about two-thirds of such cases. [44]

Pustular psoriasis

It may be either localized or generalized.

Localized forms of pustular psoriasis

Acrodermatitis continua of Hallopeau

It is a rare form that usually affects fingers and toes around the nails and nail beds. Nail dystrophy and paronychial redness are often seen. Pustules tend to recur insistently in the same skin area. This form is resistant to treatment. It may be associated with palmo-plantar pustulosis, and may accompany plaque disease elsewhere. [45]

Palmoplantar pustulosis (palmoplantar pustular psoriasis)

It may be another variant, or perhaps a distinct disease. It is characterized by sterile pustules, often with associated hyperkeratosis. Presents as multiple sterile pustules on the palms and soles (initially yellowish fading to brown macular pinpoint lesions). Affected areas may become red, scaly and frequently painful. Eruptions of pustules occur unpredictably and may return repeatedly over years. [46]

Generalized pustular psoriasis (von Zumbusch)

It is characterized by disseminated deep-red erythematous areas and pustules, which may merge to extensive lakes of pus. It may be life threatening. [47]

Erythrodermic psoriasis

It is a severe, unstable psoriasis involving more than 90% of the skin surface area. It is a rare but potentially life-threatening form of psoriasis characterized by generalized erythema and scaling. It is may appear as the initial manifestation of psoriasis but it usually occurs in patients with previous chronic disease. [48]

Follicular psoriasis

It is a form of small-plaque disease affecting the hair follicles on the trunk and limbs. [49]

Psoriasis of palms and soles (nonpustular)

It refers to psoriasis that develops on the palms of the hands and soles of the feet. Palms and soles may be involved as part of a generalized eruption, or they may be the only locations involved in the manifestation of the disease. It may be indistinguishable from chronic eczema. It is presented as erythematous scaly plaques typical of psoriasis elsewhere in the body with more generalized thickening and scaling (keratoderma). [50]

Flexural (intertriginous)

It is characterized by thin, sharply demarcated, shiny erythematous plaques .The scales are minimal to absent. [51]

Nail psoriasis and psoriatic arthritis

About 10-30% of patients with psoriasis vulgaris develop psoriatic arthritis. [52] Psoriatic nail disease is commonly found in patients with psoriatic arthritis and it ranges from pitting, yellowish discoloration, and paronychia, to subungual hyperkeratosis, onycholysis, and severe onychodystrophy. [53]

Scalp psoriasis

The scalp is a favored site for psoriasis and may be the only site affected. It can be a part of large plaque psoriasis. [54] Plaques are similar to those of the skin except that the scale is more readily retained; it may extend beyond the hairline onto the forehead which is relatively common. [55] A dense, tight-feeling scale can cover the entire scalp. [56] Even in the most severe cases, the hair is not permanently lost. [57]

Involvement of the posterior auricular crease with scaling and fissuring is common in psoriasis. [58] Although involvement in this location may also occur in other dermatoses,

especially seborrheic dermatitis. The scales of scalp psoriasis range from thick adherent scales which demonstrates Auspitz's sign on manipulation to fine scales. [59]

Pruritus and burning may accompany the lesions and the severity can fluctuate with time.[60] Hair shafts may appear funneled together, producing what is known as the ''tepee sign''.[61] Hair shafts may also be dry and brittle, and, in some cases, the disease process leads to telogen effluvium, causing extensive hair loss.[62]

The lack of ultraviolet (UV) light exposure and frequency of friction injury to the scalp may contribute to the scalp's propensity to develop clinically evident psoriatic features. [63] It is generally accepted that scalp psoriasis, like all psoriasis, is related to genetic defects that affect certain parts of the immune system. There are undoubtedly environmental factors that trigger its initial development in genetically predisposed individuals. Psoriasis observed on the scalp could be an indication of psoriatic arthritis, as from 6 to 39% of those with psoriasis develop inflammation of the joints. [64]

Histopathology of psoriasis

A skin biopsy is not always helpful in the diagnosis of psoriasis because many of its histopathologic features are shared with other skin diseases. In the majority of cases, it is preferable to make a clinical diagnosis. [65] The classic histopathology of psoriasis may only be seen in a lesion that is one week to one month old. [66]

Glabrous skin

The main histopathological features of early psoriatic lesions of the glabrous skin are capillary dilatation and edema in the papillary dermis with a lymphocytic infiltrate surrounding the capillaries, parakeratosis, the neutrophils collect with parakeratosis and form Munro microabcesses and in some cases when there is marked exocytosis of neutrophils they may form small spongiform pustules of kogoj in the upper most portion of the prickle cell layer .On the other hand the histopathological features of fully developed psoriatic lesions are confluent parakeratosis, presence of Munro microabcess in the stratum corneum, diminished or absent granular cell layer, acanthosis with regular elongation of rete ridges with thickening in their lower portion, thinning of suprapapillary epidermis with occasional presence of ,dilated or tortuous capillaries, pallor of upper layer of epidermis and lymphatic infiltrate in the upper epidermis.[67]

Scalp skin

The scalp as a hair-bearing area in most people produces challenges in diagnosis as well as treatment. If scaling plaques are present on portions of the body in a distribution characteristic of psoriasis, then the diagnosis of the scalp disease is much easier to make. The histopathologic description of scalp psoriasis is the same as glabrous skin except that mounds of parakeratosis may flank the follicular openings. This change is also suggestive of seborrheic dermatitis, the chief differential diagnosis for psoriasis, especially when there is associated spongiosis of the infundibulum. An approach to scalp biopsy involves processing

of tissues by horizontal sections revealed no evidence of alopecia in involved scalp, hair follicles may have been smaller with a decreased hair shaft size, and sebaceous glands were also decreased in size. [68]

Light microscopy of hair bulbs reveals increased percentages of telogen and catagen hairs in psoriatic plaques compared to uninvolved areas and normal controls. A localized telogen effluvium may occur in some patients with scalp psoriasis. Scarring alopecia may rarely be associated with scalp psoriasis when other causes have been excluded. [69] Other less common scaling conditions of the scalp are easier to distinguish histologically from psoriasis are dermatomyositis, mycosis fungoides, and histocytosis-X [70]

Differential diagnosis of psoriasis

Differential diagnosis of plaque psoriasis includes seborrheic dermatitis, eczema, lichen planus, lichen simplex particularly on the scalp and near the elbow, psoriasiform drug eruptions, pityriasis lichenoides chronica, candidiasis especially when presents on the flexures. tinea cruris , subcorneal pustular dermatosis, pityriasis rubra pilaris especially in the erythrodermic phase, the psoriasiform lesions of syphilis, porokeratosis of mibelli on the palms and soles, patches of Bowen's and Paget's disease, penile erythroplasia.[71]

Accurate diagnosis can be achieved by characteristic presentation of psoriasis but if there is doubt biopsy could be done. Scalp psoriasis is characterized by a thick parakeratotic layer and interruption of the characteristic psoriasiform pattern by hair follicles and typical changes are found in the interfollicular areas. [72]

Prognosis

Psoriasis is a lifelong condition. There is currently no cure with recurrence is the rule but various treatments can help to control the symptoms. [73]

Guttate psoriasis has the best prognosis while erythrodermic and pustular psoriasis have an appreciable mortality. Chronic plaque psoriasis does not affect longevity, it may be complicated by depression, anxiety, sexual dysfunction, poor self-esteem, and suicidal thoughts may coexist with psoriasis, even in patients with less severe disease. [73]

Treatment of psoriasis

Psoriasis is a life-long condition that warrants long-term treatment strategies and it can be difficult to treat. Every patient with psoriasis presents with an individual problem. The treatment depends on sex, age, occupation and the natural history of the disease. [74] For patients with mild to moderate disease topical therapy plays an important role in their treatment, patients usually start with monotherapy and when there are severe symptoms multiple treatment modalities may be used in combination. [75]

Topical treatments

Topical treatments include shampoos containing keratolytics, such as salicylic acid; can be useful for assisting in the removal of scales. [76]

Other common treatments include corticosteroids, vitamin D3 analogs, retinoids, topical coal tar preparations, anthralin.[77] Many of these agents are either unpleasant to use (e.g., coal tar shampoos) or can be associated with adverse effects (e.g., drug therapies).[78]

Phototherapy

Phototherapy involves exposure of patients to specific wavelengths of light; either ultraviolet A (UVA) or ultraviolet B (UVB). Ultraviolet light is an effective, relatively safe modality that is a valuable tool in the treatment of psoriasis in many patients with moderate to severe psoriasis. It is available as psoralen plus UVA (PUVA), and narrow-band UVB (NB-UVB). Narrow-band UVB (NB-UVB) is safer than PUVA. Typical regimens for NB-UVB involve dosing 3 times per week for at least 3 months. [79]

Systemic treatments

Systemic treatments should be considered for psoriatic patients with more than 10-20% body surface involvement, pustular psoriasis, erythrodermic psoriasis and for patients not responding or unable to take topical medications or ultraviolet therapy.[80] There are three main systemic treatments ;methotrexate which is widely used systemic agent in the treatment of psoriasis and psoriatic arthritis, cyclosporine which is an effective immunosuppressive agent and it is very effective in the treatment of all forms of psoriasis, and acitretin which is the only oral retinoid approved by the FDA specifically for treating psoriasis.[81]

Biologic therapies

It was introduced for treatment of moderate to severe psoriasis, and for psoriatic arthritis. [82]

Biological drugs such as efalizumab, etanercept and infliximab have been shown to be safe as well as effective. [83] Long-term treatment with biologic agents may not result in decreased efficacy, and with retreatment, a similar efficacy is usually observed when compared to the initial treatment. [83]

Treatment of scalp psoriasis

Use the scalp preparation daily at first then as the condition improves, reduce the frequency. The creams may have to be applied regularly to keep the scalp clear. Topical steroids are best used only 2-3 times weekly to avoid complications. Cutting hair short helps control scalp psoriasis by making the treatments easier to apply, but is not appealing to everyone. Phototherapy is effective for chronic plaque psoriasis but difficult to deliver to the scalp. [84] Special targeted devices and UVB combs have been devised, and appear very helpful. Systemic agents may be justified for a few patients with severe scalp psoriasis that has failed to respond to treatments described above. These include acitretin, methotrexate, cyclosporine and biologic agents. [85]

Seborrheic dermatitis

Definition

It is a common chronic inflammatory skin condition with estimated prevalence about 2.3–11 %.[86]

Epidemiology

The disorder occurs throughout the world without racial or geographic predominance. Seborrheic dermatitis is more common in males than in females. Its incidence peaks in infants, adolescents, and adults over the age of 50. Infantile seborrheic dermatitis can affect as many as 70% of newborns up to 3 months of age, and usually disappears by age of 1 year. It generally skips school-aged children, and reappears in adolescents due to the increased amount of skin lipids because of rising hormonal levels. [87, 88]

The pathogenesis of seborrheic dermatitis

The pathogenesis of seborrheic dermatitis is not completely understood but it has been hypothesized that seborrheic dermatitis develops as an altered host immune response to malassezia species or their toxins, or to the free fatty acids produced by malassezia species , this is supported by the frequency of seborrhoeic dermatitis in immunosuppressed patients, an increase in non-immunogenic stimuli, such as neurokinin-1, CD16+, and complement in patients with seborrheic dermatitis, also a higher level of inflammatory interleukins, T_h1 helper cell and T_h2 helper cell stimulating interleukins in both lesional and non-lesional skin in patients with seborrheic dermatitis, possibly because of stimulation of the host immune system by malassezia.[89]

Clinical features

Seborreheic dermatitis may be associated with psoriasis as a prepsoriasis state in which the patient later develops psoriasis, in some patients a mix of lesions suggest the use of the term seborrhiasis .It has been noted that seborrheic dermatitis is more common in a variety of general medical disorders, including malabsorption, myocardial ischaemia, obesity, and epilepsy. Infant's seborrheic dermatitis presents clinically as scalp seborrheic dermatitis (cradle cap), it can also affect skin creases such as armpits and groin and in severe cases non-itchy salmon pink flaky patches may appear on the face, trunk and limbs. [90]

Dandruff which is a visible desquamation from the scalp surface appears to be the precursor of seborrheic dermatitis, and this may gradually progress through redness, irritation and increasing scaling of the scalp to true seborrheic dermatitis.[91] Seborrheic dermatitis has several morphological variant which in the adult form occur in various combinations and degrees of severity.[92] Within the scalp, seborrheic dermatitis causes ill-defined dry pink or skin coloured patches with yellowish or greasy-looking scales. It may spread to involve the greater part of the scalp and extend beyond the frontal hairline as the ‘corona seborrheica’. [93]

Seborrheic dermatitis is common within the eyebrows, on the edges of the eyelids (blepharitis), sticky crusts and fissures are common in the folds behind the ear. [94] On the trunk, seborrheic dermatitis simulates lesions of pityriasis rosea or pityriasis versicolor; yellowish-brown patches over the sternum, while on genitalia it often presents with yellow crusts and psoriasiform lesions. [95]

Diagnosis

In a classical case the diagnosis is easy, but in some cases the diagnosis can be difficult, partly because of the lack of well-defined diagnostic criteria. [95]

Histopathological features

The histopathological features of seborrheic dermatitis are combination of those observed in psoriasis and spongiotic dermatitis. Mild cases may exhibit only slight subacute spongiotic dermatitis. The stratum corneum contains focal areas of parakeratosis, with a predilection for the follicular ostia, a finding known as "shoulder parakeratosis". Occasional pyknotic neutrophils are present within parakeratotic foci. There is moderate acanthosis with regular elongation of the rete ridges, mild spongiosis, and focal exocytosis. [96]

Differential diagnosis

The clinical differential diagnosis of seborreheic dermatitis includes psoriasis, atopic dermatitis, tinea capitis, discoid lupus erythematosus, pemphigus foliaceus, pemphigus erythematosus, contact dermatitis, and other inflammatory diseases of the scalp. Microscopic examination of scrapings from the advancing margin, and examination under Wood's light will exclude ringworm infections, candidiasis and erythrasma. Patch tests may be needed to exclude allergic sensitization. Although the non-specific nature of the histological appearances of seborrheic dermatitis, biopsy will often reliably differentiate it from many of the conditions with which it may be confused e.g.; Darier's disease, pemphigus foliaceus and pemphigus erythromatosus. [97]

Prognosis

The condition usually responds well to treatment. It often relapses, so maintenance or intermittent treatment may be required.[98]

Treatment

Although seborrheic dermatitis is a chronic disease can generally be suppressed. But there is no permanent cure and the condition may require regular treatment for many years. [99] The treatment of seborrheic dermatitis (SD) includes mild corticosteroids, antifungal agents, immunomodulators, and keratolytics. [100]

Topical treatment

Low-potency topical steroids alone can be effective in managing symptoms but the disease is likely to recur quickly once steroid therapy is stopped. Antifungal agents should therefore be considered primary therapy as it is effective and tolerable to the patient, both to reduce relapse and to promote patient adherence.[101]Miconazole may be effective against seborrheic dermatitis, either as monotherapy or in combination with hydrocortisone.[102] Ciclopirox olamine, which has broad-spectrum antifungal activity and an anti-inflammatory effect, has been found to be effective in the treatment of seborrheic dermatitis.[103] Topical immunomodulators (calcineurin inhibitors) have been used to treat seborrheic dermatitis.[104]

Systemic treatment

Systemic antifungals may help if seborrheic dermatitis is severe or unresponsive to topical agents. [105]

Dermatoscopy

Dermatoscope synonyms

Dermatoscope, also known as dermoscope, epiluminescence microscope, skin surface microscope, magnified oil immersion diascopy, episcope, amplified surface microscopy or surface diascopy); however, dermoscopy is the term used by the international dermoscopy society(IDS) and experienced dermoscopists.[106]

Principle of dermoscopy

Although the technique of dermoscopy was invented more than hundred years back, the field of dermoscopy is relatively unexplored and provides exciting opportunities for original observations. Dermoscopy should not be viewed as just another magnifying glass, but is a completely new way to look at the skin; it shows not only surface features but also subsurface features. The benefits of this noninvasive technique multiply every day. Some dermoscopic patterns are observed consistently in certain diseases and this could be used for their diagnosis so, this office procedure may remove the need for a skin biopsy for diagnosis and follow up. Dermoscope is functionally similar to magnifying lens but with several add on features of specialized illuminating system (visible light, polarized light, and ultraviolet sources), adjustable magnification, the ability to assess structures as deep as in the reticular dermis, and the ability to record digital images for future analysis and comparison. [107,108]

Parts of dermoscopy

The essential components of dermoscope are:

1. **Achromatic lens**: It provides high magnification up to x1000 that can be achieved by special lens or with charge-coupled device (CCD) cameras used in modern videodermoscope, inbuilt illuminating system light emitting diodes (LED) which are the standard sources that provide high intensity of light while consuming less power. LED designated to emit lights of different colors for better visualization of the skin.[108]

2. **Power supply:** Handheld instruments are usually powered by batteries.[109]

3. **Display systems:** Handheld dermoscopes have a simple viewing be seen through viewing window. Videodermoscope have the ability to connect a computer or another display device or have their own display screen.[109]

4. **Inbuilt photographing systems:** They are an essential component of the dermoscope due to increasing the need to record and store images. The camera may be either an attachable conventional or digital camera or an inbuilt video camera and supporting software .So, we can capture, store, retrieve and interpretate the images.[110]

Technique of dermoscope

Dermoscope is a noninvasive technique allowing rapid and magnified (x10-x1000) in vivo observation of the skin. Dermoscopy may be carried out with the aid of classic dermoscopes, stereomicroscopes, dermoscopes connected to a digital camera, or even videodermatoscopy (VD) which represents the evolution of dermatoscopy and is performed with a video camera equipped with lenses providing higher magnification (x10 to x1000) in which an image obtained through a video camera is sent to a computer screen. At present, technologically advanced, high resolution digital cameras, built into videodermoscopes, considerably improve image resolution and enhance the quality of the obtained images. Moreover, the development of special dermoscopic extensions allows for the conversion of top end mobile phones into pocket dermoscopes. This provides an opportunity for a quick analysis of the image, transferring the photo via multimedia messages and email and thus creating a type of 'handheld' patient database. Depending on the skin disorder, both dermatoscopy and VD may be useful for differential diagnosis, prognostic evaluation, and monitoring response to treatment. Nowadays, it represents an important and relatively simple aid in daily clinical practice. [110,111]

At first dermoscopes used only non polarized light sources to illuminate the skin, requiring a liquid interface and direct contact between the dermoscope and the skin. With this approach, the amount of light reflected at the skin surface was reduced, thereby allowing visualizing structures below the stratum corneum. However, new commercially available polarized light dermoscopy (PD) allows visualization of deep skin structures without the necessity of a liquid interface or direct skin contact with the instrument. These dermoscopes are allowing viewing the skin with (polarized light contact dermoscopy [PCD]) or without (polarized light noncontact dermoscopy [PNCD]) a liquid interface. [112]

Polarized dermoscopy appears to block superficially reflected light more efficiently than NPD does, and this allows for better visualization of deep structures such as melanin with better color contrast. Polarized non contact dermoscopy allow better visualization of skin vascular patterns by improving the evaluation of the distribution and shape of skin blood vessels and pigment distribution, which could be very useful for the differential diagnosis of several skin conditions, e.g. skin tumors, psoriasis and seborrheic dermatitis. [113]

Immersion is routinely used for the dermoscopic evaluation of the lesions in order to increase the translucency of stratum corneum and the visualization of dermoscopic structures. It reduces the reflection of light from the skin's surface and enhances the transparency of the stratum corneum. The result is that the visibility of pigment containing structures in the epidermis is largely enhanced. This is also true for the clarity of the image of the dermo-epidermal junction and the upper dermis. The most common immersion fluids in dermoscopy are synthetic oil, ultrasonographic gel (USG), alcoholic disinfectants or simply water. Ultrasonographic gel seems to be the best immersion fluid as it is inexpensive, efficient, and ensures a good adhesion of the dermoscope to the lesion making it possible to analyze not only flat lesions but also those of verrucous type. When using USG gel, less pressure is required to obtain a better visibility of the vascular structures within the lesion. [114]

Types of dermoscopy instruments

Types of dermoscopy include handheld dermoscopes, basic digital dermoscopes and photographic equipment, or advanced digital dermoscopes. New devices on the market include simplified digital dermoscopes that may be contact to a computer or to an iPhone 4/4S and large expensive digital dermoscopes (videodermoscopies). [115]

Benefits of dermoscopy

Dermoscopy is an in vivo method has proven to be a valuable tool in the diagnosis of pigmented and non pigmented skin lesions increasing the clinical diagnostic accuracy and improving physicians' confidence in their clinical diagnosis. [116] The use of dermoscopy permits the visualization of morphologic features that are not visible to the naked eye, thus representing a link between macroscopic clinical dermatology and microscopic dermatopathology. Dermoscopy was primarily evolved for the assessment of pigmented lesions of the skin, especially in the early recognition of the malignant melanoma. [117] But, because of dermoscopy enables the recognition of vascular structures that usually are less visible to the naked eye. So, in the last years, dermoscopy has been employed also for the evaluation of a wide variety of cutaneous disorders, including inflammatory dermatoses (inflammoscopy), parasitic invasions (the so-called "entomodermoscopic method") and in examination of the hair and scalp, this is a very useful technique for the diagnosis and follow-up of hair and scalp disorders (known as trichoscopy), cutaneous and mucosal infections, nail abnormalities, and other dermatologic conditions. [118]

Dermoscopic criteria

Dermoscopy allows the identification of many different colors and structures, not seen by the naked eye. [119]

Colors

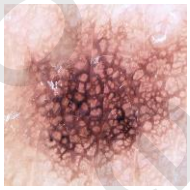
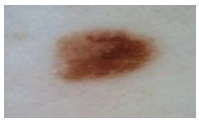
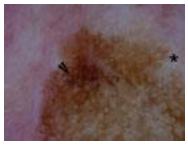
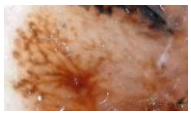
Colors produced by dermoscopy are shown in Figure1. [120]

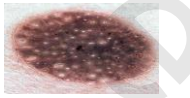
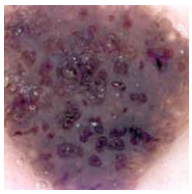
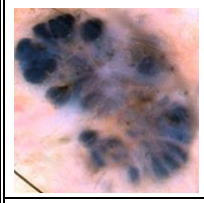
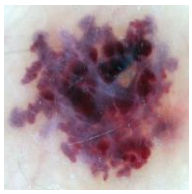
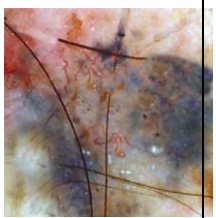
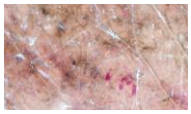
Fig (1): Colors seen with a dermoscopy.

Dermoscopic structures

Dermoscopic structures seen by dermoscopy are shown in (Tab.I). [116,121]

Table I: **Dermoscopic criteria and their corresponding histopathologic features**

DERMOSCOPIC CRITERIA AND THEIR CORRESPONDING HISTOPATHOLOGIC FEATURES			
Criterion	**Morphological definition**	**Associated histopathologic changes**	**Diagnosis**
Pigment network 	Network of brownish lines over a diffuse tan background	Pigmented rete ridges	Melanocytic lesion
Typical network 	Brown-colored, regularly meshed and narrowly spaced network	Regular and elongated rete ridges	Benign melanocytic lesion
Atypical network 	Black, brown or gray network with irregular meshes and thick lines	Irregular and broadened rete ridges	Melanoma
Dots/globules 	Black, brown and/or gray, round to oval, variably sized structures regularly or irregularly distributed within the lesion	Pigment aggregates within the stratum corneum, epidermis, dermo-epidermal junction or papillary dermis	If regular: benign melanocytic lesion; if irregular: melanoma
Streaks 	Irregular, linear structures not clearly combined with pigment network lines at the margins	Confluent junctional nests of melanocytes	Melanoma
Blue-whitish veil 	Irregular, confluent, gray-blue to whitish-blue diffuse pigmentation	Acanthotic epidermis with focal hypergranulosis above sheets of heavily pigmented melanocytes in the dermis	Melanoma

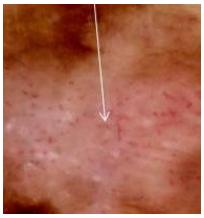
Blotches 	Black-, brown- and/or gray-colored areas with regular or irregular shape/distribution	Hyperpigmentation throughout the epidermis and/or upper dermis	If regular: benign melanocytic lesion; if irregular: melanoma
Regression structures 	White (scar-like) areas, blue (pepper-like) areas or combinations of both	Thickened papillary dermis with fibrosis and/or variable amounts of melanophages	Melanoma
Milia-like cysts 	White-yellowish, roundish dots	Intraepidermal horn globules, also called horn pseudocysts	Seborrheic keratosis (occasionally observed in papillomatous melanocytic nevi)
Comedo-like openings 	Brown-yellowish, round to oval or even irregularly shaped, sharply circumscribed structures	Keratin plugs situated within dilated follicular openings	Seborrheic keratosis
Leaf-like areas 	Brown-gray to gray-black patches revealing a leaf- like configuration	Pigmented, solid aggregations of basaloid cells in the papillary dermis	Basal cell carcinoma
Red-blue lacunas 	Sharply demarcated, roundish to oval areas with a reddish, red-bluish, or red-black color	Dilated vascular spaces situated in the upper dermis	Vascular lesion
Vascular structures  	Comma-like vessels Arborizing vessels. Hairpin vessels. Dotted or irregular vessels		Benign melanocytic lesion Basal cell carcinoma Seborrheic keratosis Melanoma

Significance of vascular structures

The vascular structures in non melanocytic and melanocytic tumors illustrated in (Tab. II). [122,123]

Table II: Definitions of the different morphologic types of vascular patterns seen by dermoscopy

Vascular structure	Melanocytic tumours	Vascular structure	Non melanocytic tumours
Comma vessels 	Slightly curved vessels	Hairpin vessels 	U-shaped vascular loops, which may be twisted.
Dotted vessels 	Appear as tiny red dots. In melanoma, dysplastic nevi, congenital nevi, and Spitz nevi.	Arborizing vessels 	Large vessels branch irregularly into smaller &thinner one. Frequently seen in basal cell carcinomas
Linear irregular vessels 	linear vascular structures of varying size and shape. Characteristically associated with melanomas.	Glomerular vessels 	Tortuous capillaries that resemble glomerular apparatus of the kidney. Often distributed in clusters and are commonly seen in Bowen's disease
Polymorphous atypical vessels 	Represent a combination of 2 or more different types of vascular structures. Highly indicative of melanoma.	Corkscrew vessels 	Linear irregular spiral vessels areas containing atypical linear vessels

Atypical hairpin vessels 	Serpentine-shaped vessels of varying size and shape. They are usually surrounded by a pink hue	Crown vessels consist of linear or curved vessels,may be arborizing 	located around the perimeter of a lesion. These vessels are directed toward the center of the lesion but they do not cross the lesion's center. Characteristically seen in sebaceous hyperplasia.
Milky red globules 	Reddish globules that usually seen in association with areas of a milky red color. Their presence speaks in favor of an invasive melanoma.	Dotted or glomerular vessels distributed in a serpiginous (ie, string of pearls) pattern 	This particular vascular architecture is the hallmark of clear cell acanthomas
Erythematous blush (pink veil or milky red areas) 	Is a pinkish color or hue seen within a melanocytic tumor.		

The scalp

The scalp is unique among skin areas in humans, with high follicular density and a high rate of sebum production. The relatively dark and warm environment on the scalp surface provides a welcoming environment for the many scalp conditions and for infections and infestations which can occur when items such as fingers, combs, hats, or styling implements come into contact with the hair and scalp and introduce microorganisms. Inflammatory conditions may also produce changes in the scalp. Many common scalp conditions have similar symptoms and clinical features, complicating diagnosis, but a correct diagnosis is critical to determining proper treatment. [124]

Trichoscopy structures

Dermoscopy of the scalp can be performed with or without an interface solution, which is referred as “dry dermoscopy”. Dry dermoscopy is useful to observe tertiary structures of skin surface, such as hairs. We utilize dry dermoscopy to evaluate scaling and follicular hyperkeratosis while we use an interface solution (thermal water) to analyze follicular and vascular patterns. Structures which may be visualized by trichoscopy include hair shafts, hair follicle openings, the perifollicular epidermis and cutaneous microvessels. Trichoscopy performed with a handheld dermoscope or a videodermoscope became an indispensable tool in differential diagnosis of hair and scalp diseases. (125)

Normal scalp

Hair shafts

Normal hair shafts are uniform in shape and color with continuous, interrupted, fragmented or absent medulla. About 10% of normal human scalp hairs are short, hypopigmented vellus hairs. Trichoscopy also allows assessing the number of hairs in one follicular unit. In healthy individuals two to three hairs emerge from one follicular unit. (126)

Hair shaft abnormalities

Trichoscopy allows analyzing acquired and congenital hair shaft abnormalities. Acquired hair shaft abnormalities, which may be evaluated by trichoscopy include (micro-exclamation mark hairs, tapered hairs and tulip hairs in trichotillomania), regrowing upright or pigtail hairs (in various diseases). The number of hairs in one follicular unit is decreased in non-cicatricial alopecia and increased above 4 in tufted folliculitis, folliculitis decalvans or lichen planopilaris. (127)

Hair follicle openings

"Dots" is a common term for hair follicle openings seen by trichoscopy. Trichoscopy may distinguish whether hair follicle openings are normal, empty, fibrotic or containing biological material, such as hyperkeratotic plugs or hair residues. (127)

Perifollicular epidermis

Dermoscopy of the normal scalp shows honeycomb pigment in sun-exposed areas or in subjects with high phototypes VI, VII. In children, dermoscopy often shows “dirty dots” corresponding to dust particles retained in the scalp which can be easily removed after shampooing. This feature is not observed in adolescents or adults as sebaceous secretion avoids particle deposition. (128)

Microvessels

Dermoscopy of the normal scalp with normal vascular patterns shows interfollicular simple red loops which are multiple fine, red, hairpin shaped structures that correspond to the capillaries in the dermal papillae, and arborizing red lines which are vessels of larger caliber that correspond to the subpapillary vascular plexus.[128]

Trioschopic findings in alopecias (Non-cicatricial, some cicatricial alopecias) and genetic hair shaft dystrophies are shown in (Tab. III). [129]

Table III: Trischopic characteristic of some alopecias and genetic hair dystrophies

AGA	AA	Trichotillomania	LPP	DLE	Hair shaft disorders	Telogen effluvium	Tinea capitis
Hair shaft diameter variation of>20% hair shaft (earliest feature)	Yellow dots with short vellus, dystrophic and tapered hairs	Hair shafts of variable length	Peripilar casts	Atrophy	Monilethrix (beaded shaft)	Diagnosis of exclusion	Black dot tinea shows stubs of broken hair shafts with scaling
Peripilar halo in early stages	Black dots (cadaverized broken hairs)	Longitudinal splitting of hair shafts	Target pattern "blue-grey dots"	Complete follicular paucity	Trichorrhexis nodosa (brush fractures)	Decreased hair density with presence of empty follicles over the entire scalp area with no site predilection	Comma shaped stubs are a specific feature
Predominance of follicles bearing single hair	Trichogram shows dystrophic fractured and telogen roots	Coiled fractured hair shafts	Spared intervening follicles	Arborizing telengiectasia	Trichorrhexis invaginata (shaft nodes)		Blotchy pigmentation, erythema, scaling, pustules and follicular scale-crust formation are seen in inflammatory tinea capitis
Hypertrophy of sebaceous glands			Trichogram shows anagen roots	Hyperkeratotic follicular scales	Pilitorti (twisted shafts)		
			White dots				

AGA – Androgenetic alopecia; AA – Alopecia areata; LPP – Lichen planopilaris; DLE – Discoid lupus erythematosus

Trichoscopy in general medicine

This includes possible application of trichoscopy in identifying follicular spicules in multiple myeloma, follicular mucinosis in lymphoproliferative disorders, scalp lesions in langerhans histiocytosis or altered interfollicular microvessels in dermatomyositis and scleroderma. [130]

Inflammatory and infectious scalp disorders

Tinea capitis

Trichoscopy is an effective, quick, cheap, and noninvasive tool that can aid in the diagnosis of tinea capitis. The distinctive features are broken hairs and comma hairs. Comma hairs correspond to hair shafts that have ruptured because of the presence of multiple hyphae; they have a uniform thickness and color and marked distal angulation. Corkscrew hairs were proposed as a new dermoscopic marker of tinea capitis in black children, in whom clinical features can occasionally be more difficult to see. (131)

Scalp psoriasis

Dermoscopic features of scalp psoriasis are studied extensively. Similar to dermoscopy of plaque psoriasis on glabrous skin, the evaluation of microvascular alterations seems to have the highest diagnostic value. The images produced at low magnification (i.e., from a handheld dermoscope) are somewhat different from those obtained with high-magnification trichoscopy (>×50) produced by digital videodermoscopes. At low magnification, rings or lines consisting of red globules may be observed as the most characteristic finding. High magnification reveals that the "globules" are coiled (glomerular) capillaries. Another type of vascular abnormality commonly observed in psoriasis is the presence of clusters of multiple vessels homogeneously distributed in the field of view. These vessels may be linear, looped, lace-like, or comma shaped .The vessel caliber tends to be slightly larger than that of capillaries in normal skin. Vascular abnormalities in scalp psoriasis usually coexist with white or white-silver scaling. It must be emphasized that the diagnosis of psoriasis is based principally on clinical features. Dermoscopy (on glabrous skin) and trichoscopy (on hair-bearing skin) have only accessory value. (132, 133)

Scalp seborrheic dermatitis

The trichoscopic features of scalp seborrheic dermatitis have been studied extensively in the last years. The most frequent trichoscopic finding is the presence of multiple thin arborizing vessels. Featureless areas with no particular vascular pattern also may be found. Scaling typically is yellowish, which differentiates seborrheic dermatitis from psoriasis. Yellow scales color can be dermoscopically detected in cases of acute dermatitis and also in long-standing lesions. Although the dermoscopic pattern of each disease subtype has not been separately investigated, several studies including generalized dermatitis, chronic dermatitis, seborrheic dermatitis, and other subtypes, reported similar dermoscopic findings. This is reasonable, because all entities included in the spectrum of dermatitis share common histopathologic characteristics. (134)

Hair shafts in patients with seborrheic dermatitis show that the cuticle is significantly thicker in these patients than in normal subjects on trichoscopy. (134)

Seborrheic dermatitis and psoriasis

Dermatoscopy is very useful to distinguish scalp seborrheic dermatitis form scalp psoriasis based on the vascular pattern. The vascular pattern of psoriasis is characterized by red dots and globules, twisted red loops, and glomerular vessels. In seborrheic dermatitis the most common patterns are arborizing vessels and featureless vessels in the absence of red dots and globules. [135]