

Dermoscopy of Infections and Infestations

Abstract

Dermoscopy is a non-invasive tool for the diagnosis of skin diseases. Entomodermoscopy is a branch of dermoscopy that deals with infections and infestations. The use of dermoscopy for diagnosis of infections and infestations is rapidly increasing as it can provide useful clues related to diagnosis and effectiveness of treatment. It serves as a useful adjunct to microbiological and histopathological examination. In some cases, like scabies dermoscopy can even clinch the diagnosis.

Keywords: *Dermoscopy, entomodermoscopy, infections and infestations, leishmaniasis, pediculosis, scabies*

Introduction

Dermoscopy is a non-invasive tool for the diagnosis of skin diseases. It was primarily used for diagnosis of skin tumors; however, of late its use has become widespread in general dermatology. Dermoscopy as a discipline is subclassified depending on the diseases in which it is used: entomodermoscopy refers to dermoscopy of infections and infestations, inflamoscopy to inflammatory disorders and pigmentaroscopy to disorders of pigmentation. It can also be classified depending on regions as onychoscopy, trichoscopy, and mucoscopy as dermoscopy of diseases involving nails, hairs, and mucous membrane, respectively.

The dermoscopic examination in infections and infestations requires special precautions as there is a risk of transmission of infection between patients and between patient and physician. The advances in dermoscope such as non-contact dermoscope and use of a barrier such as ice cap and the like, have reduced this risk and made entomodermoscopy safer. The interface fluid when used should be alcohol-based disinfectant to reduce infection transmission. In this article, we aim to provide an overview on use of dermoscopy in infections and infestations.

Infestations

Scabies

Scabies is an intensely pruritic skin disease caused by infestation with mite

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Sarcoptes scabiei var hominis. It is an obligate human parasite with female mite measuring approx. 0.3 X 0.5 mm and males being even smaller. The average number of mites present in a symptomatic individual is approximately 10–12. Skin scraping and demonstration of mite, ova or scybala (feces) are considered diagnostic. Dermoscopy can be used for rapid diagnosis of scabies and is 91% sensitive and 86% specific. It has higher sensitivity and lower specificity for diagnosis as compared to skin scraping.^[1] Triangle or delta-wing jet with contrails is the classical dermoscopic feature of scabies where triangle represent anterior part of mite and contrail represents the burrow. Another named sign in diagnosis of scabies is Hang glider sign in which brown triangle of the hang-glider corresponding to anterior part of mite [Figure 1].^[2] The abdomen of the mite and eggs are translucent and are not visible on dermoscopy. Application of ink can improve visualization of these structures. It is especially useful in nodular, crusted, and infantile scabies where the diagnosis is difficult clinically. In crusted scabies, noodle sign is seen which is nothing but presence of numerous burrows.^[3]

Pediculosis

Lice infestations are quite common worldwide. The three lice that infest humans are Head lice (*Pediculus humanis capitis*), body lice (*Pediculus humanis humanis*) and pubic or crab louse (*Phthirus pubis*). Head lice infestations are quite

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common and affect school-going children. Pubic louse is transmitted as a sexually transmitted infection and body lice affect homeless and destitute. Diagnosis of head lice is confirmed by visualization of lice or by the presence of nits along with scalp pruritus and cervical lymphadenopathy.^[4] Dermoscopy can be used for rapid diagnosis of pediculosis capitis and can be used for screening. It can also be used to monitor treatment as presence of only empty nits suggest cure.^[5] Dermoscopic features are:

1. Visualization of live crawling headlouse is diagnostic [Figure 2]
2. Nits containing vital nymph (live nits) are brown colored and ovoid in shape [Figure 3]
3. Empty nits are translucent and have fissured ends

4. Pseudo-nits, which can be scales resulting from seborrheic dermatitis, hair spray, or other external agents should be differentiated from nits. While nits (live or empty) are attached to hair shaft, the pseudo-nits appear as amorphous material and are not attached to hair-shaft.

Pubic louse or Phthirus pubis is approximately 1.5–2 mm long, has round body and stout posterior pair of legs and have large claws, hence the name Crab louse. Patients present with pubic pruritus and blue gray macules (maculae ceruleae), Dermoscopy can be used for rapid diagnosis as it is difficult to visualize the louse with naked eye. It can also be used to locate the louse in unusual places such as eyelashes. Nits are attached to base of hair; live nits are brown in color and empty nits are translucent [Figures 4 and 5].^[6] Use of video-dermoscopy is advisable

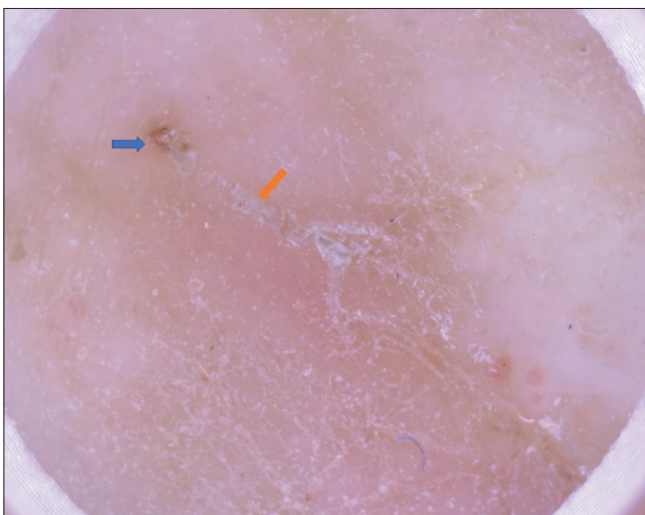


Figure 1: Dermoscopy of scabies shows triangle or delta wing jet (blue arrow) which represents mite and contrail (orange arrow) representing burrow (Heine Delta20, polarized, X10)



Figure 2: Dermoscopy shows live head louse with blood meal (blue arrow) and presence of nits (Heine Delta 20, polarized, X 10)



Figure 3: Dermoscopy shows live nits which are brown colored (white circle) and translucent empty nits (orange circle) (Heine Delta 20, polarized, X 10)



Figure 4: Direct microscopy showing pubic louse and nits attached to hair shaft (X4) (Courtesy Dr Pradeesh Armugam, Base Hospital, Lucknow)

as use of hand-held dermoscope in genital area is difficult and embarrassing.

Demodicosis

Demodex folliculorum is a commensal mite seen in pilosebaceous unit. When the density of mite increases, it may result in demodicosis which can present with rosacea or perioral dermatitis like clinical features. Diagnosis is confirmed by standardized skin surface biopsy with demodex count more than 5/cm². Dermoscopy can help in rapid diagnosis of demodicosis.^[7] Dermoscopic features of demodicosis are

1. Visualization of demodex tails as gelatinous, whitish creamy threads measuring 1–3 mm is the most specific feature [Figure 6]
2. Follicular gray dots and interfollicular scales can also be seen
3. Telangiectasias may be seen in cases of secondary demodicosis due to steroid abuse or in case of rosacea
4. Demodex mite can cause pruritus and can result in facial frictional melanoses.

Cutaneous larva migrans

Cutaneous larva migrans (CLM) is a parasitic disease caused by animal hookworm larvae, most commonly *Ancylostoma braziliense*. The hookworm larvae penetrate through intact skin and is characterized by intensely pruritic, serpiginous, creeping eruption with most common presentation over feet and buttocks. The diagnosis is based on classical clinical features. Dermoscopic features of CLM are not diagnostic but dermoscopic features may be used as an adjunct to the diagnosis. It reveals dotted vessels in empty burrow and translucent brownish or yellow structureless area representing the body of the larva [Figure 7].^[8]

Tick bite

Ticks are vectors of many bacterial and protozoal diseases including Lyme disease. Rocky mountain spotted fever, Indian tick typhus, ehrlichiosis, tick paralysis, and many other diseases. Diseases transmission requires 24–48 hours of tick attachment. It is important to identify and remove the tick for diagnostic and therapeutic purposes. Dermoscopy can aid in tick detection, species identification and locating retained hypostome (mouth parts) after tick removal. Dermoscopy shows tick as round lesion with surrounding erythema. Retained hypostome after removal of tick is seen as brown to black-grey areas [Figure 8].^[9]

Myiasis

Myiasis is defined as infestation of live humans by larvae of order Diptera. Cutaneous myiasis can be classified as furuncular, wound, and migratory myiasis. *Dermatobia hominis* is the most common cause of furuncular and wound myiasis. Furuncular myiasis is endemic in African

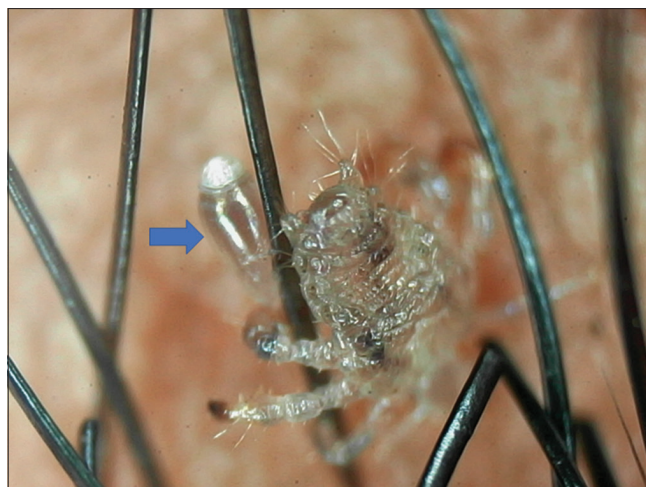


Figure 5: Dermoscopy showing pubic louse holding onto hair shaft and live nit attached to hair shaft (blue arrow) (Dinolite, polarized, X 50) (Courtesy Dr Hiral Shah, Assoc Prof, Medical college Baroda, SSG Hospital)



Figure 6: Dermoscopy of demodicosis shows gelatinous filament-like structure emerging from hair follicle (blue circle), reticular pattern of pigment is seen (blue arrow) (Dermlite DL4, polarized, X10)



Figure 7: Dermoscopy of cutaneous larva migrans shows translucent light pink structureless area suggestive of body of larvae (Dermlite DL4, polarized, X10) (Courtesy: Dr Enzo Erichetti, Consultant Dermatologist, University Hospital “Santa Maria della Misericordia”, Udine, Italy)

region and patients generally have travel history. Wound myiasis occurs in neglected patients in low socio-economic strata. Diagnosis is usually made based on clinical features in appropriate setting. On submerging the limb under water or oil, bubbles can be seen if the larva is alive.^[10] Dermoscopy can be used in diagnosis of myiasis. Larva feeds in subdermal area for 5–10 weeks and breathe through a pore. Dermoscopy shows creamy-white body and yellow structureless areas representing breathing spiracles in center which is surrounded by black dots representing small spines in a circular row.^[11] Wound myiasis is usually diagnosed by demonstration of live larvae in the wound. Dermoscopy can help in confirmation of diagnosis in which various body parts of larvae can be identified. Larvae appears as yellowish white structures with brown dots, respiratory spiracle, and tracheal tubes. Dermoscopy may also help in species identification.^[12]

Viral Infections

Human papilloma virus infection

Human papilloma virus (HPV) infection is a common viral infection and present clinically as verrucae (warts) on skin or mucous membranes. HPV infection is transmitted by direct/indirect contact. It is one of the most common sexually transmitted infections. Various types of HPV are associated with different types of warts. Oncogenic strains or high-risk types (HPV 6,11,16,18,31,35) of HPV are associated with cervical, penile, anal, and oral cancer.^[13]

Common warts

These are caused by HPV 1, 2, 4, 27, 57, and 63 and present as elevated rounded papules with rough, verrucous surface, commonly over hands. Dermoscopy shows well-defined lesions with irregular whitish structures surrounding hemorrhagic red to black dots and globules. Linear hairpin and coiled vessels may be seen. Hyperkeratotic warts show predominant whitish structures while exophytic or filiform



Figure 8: Dermoscopy shows tick as round shiny structure in external ear. It is surrounded by blood and crust (Dermlite DL4, polarized X10) Courtesy: Dr Bijju vasudevan, Prof, Department of Dermatology, AFMC, Pune

warts appear as finger like projections containing elongated and dilated vessels [Figure 9].^[14]

Flat warts

Also known as verrucae plana, they are caused by HPV type 3, 10, 28, and 41, characterized by flat-topped, skin colored papules and most commonly seen on face and dorsum of hand. Dermoscopy shows presence of regular red dots on white or light brown background. Absence of dermatoglyphics is another indicator on dermoscopy [Figure 10].^[14]

Plantar warts

Palmoplantar warts are caused by HPV 1, 2, 27, and 57 and appear as skin colored papules or plaques. They can progress to deep endophytic, sharply defined lesions known as myrmecia warts, usually occurring on weight bearing areas of metatarsal heads and heel. Dermoscopy shows prominent red to black dots and interrupted dermatoglyphics, especially after gentle paring. In contrast, calluses show presence of dermatoglyphics [Figure 11].^[14]

Genital warts

They are also known as condylomata acuminata and spread sexually. These are most commonly caused by HPV 6 and 11. Some HPV types like 16, 18, 31, 35 causing genital warts have oncogenic potential. Genital warts can present as exophytic or sessile soft papules involving anogenital skin. They generally involve foreskin, coronal sulcus, and glans in men and introitus, vagina, labia, and perineum in women. Dermoscopy helps in ruling out other differential diagnoses like molluscum contagiosum, pearly penile papules, condylomata lata, and Fordyce's spots. Dermoscopy depends on morphology of the genital warts. Sessile lesion shows dotted vessels and whitish network [Figure 12]. Pedunculated lesion shows whitish finger like projections and elongated dilated vessels in the finger-like projections [Figure 13].^[15]



Figure 9: Dermoscopy of common wart shows irregular white structures, red to black dots (blue circle) and hair pin vessels in the white structures (blue arrow) (Dermlite DL4, polarized X10)

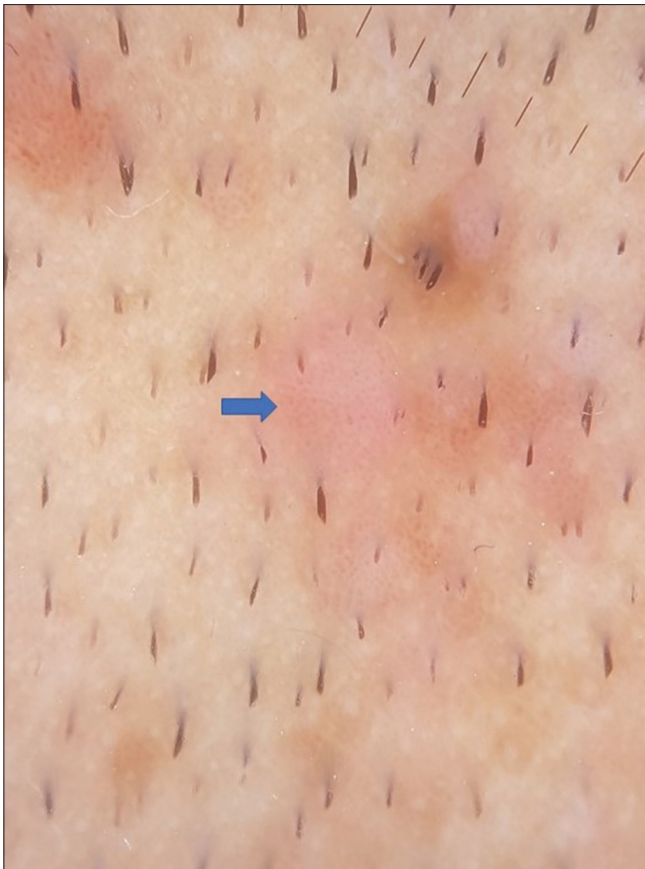


Figure 10: Dermoscopy of flat wart shows well defined lesion with presence of regular red dots in white to pink background (blue arrow). The lesion does not respect anatomical structures (Dermlite DL4, polarized X10)



Figure 11: Dermoscopy of plantar wart shows white scales on background of yellow structureless area (blue arrow), red to black dots can be seen in the center (blue circle). The dermatoglyphics over the lesion is characteristically absent (Dermlite DL4, polarized X10)

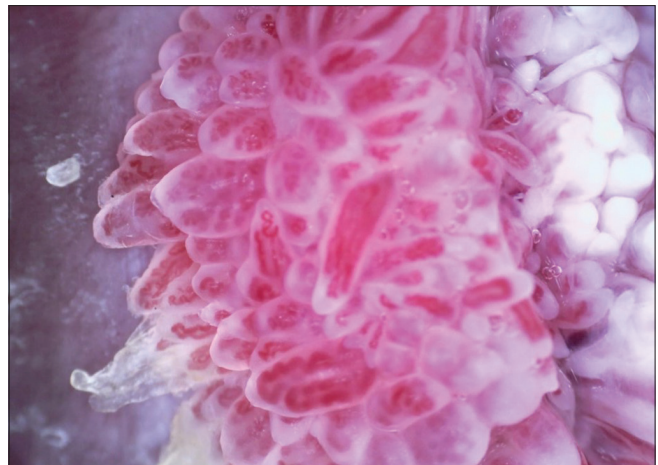


Figure 13: Dermoscopy of pedunculated genital wart at higher magnification shows white finger like projections and presence of looped vessels in them (Dinolite Edge, polarized X100)



Figure 12: Dermoscopy of genital wart shows presence of white to pink structures with dotted vessels in some area (blue circle) and linear vessels in other (blue arrow). The sessile part shows dotted vessels while pedunculated part shows linear vessels (Dermlite DL4, polarized X10)

Molluscum contagiosum (MC)

It is an infection caused by molluscipox virus. It is a common infection in children while in adult, genital molluscum is a sexually transmitted infection. It presents as asymptomatic, single, or multiple, skin colored, umbilicated

papules. The diagnosis of MC is clinical and confirmation is by demonstration of Henderson -Patterson bodies in Tzanck smear and histopathology rarely. The differential diagnoses of MC are common warts, keratoacanthoma, syringoma, and sebaceous hyperplasia. Dermoscopy of MC shows multiple yellow-white clods representing molluscum bodies and peripheral crown vessels [Figure 14].^[16]

Fungal Infections

Superficial fungal infections are one of the most common infections presenting to dermatology outpatient department for treatment and the diagnosis of these infections are made clinically and microbiological confirmation is done using 10% potassium hydroxide (KOH) mount and culture.

Tinea corporis

It is superficial infection of non-glabrous skin caused by dermatophytes. It includes infection of skin of trunk and limbs and excludes special sites like scalp, palms, and soles, groin, and feet. Fungi which cause infection of

stratum corneum, hair and nails are dermatophytes and are classified in three genera; *Microsporum*, *Trichophyton*, and *Epidermophyton*. The predominant species causing infection varies according to region. Tinea corporis presents with single or multiple annular, erythematous plaques with peripheral scaling. Dermoscopy helps in diagnosis, especially in patients with steroid modified tinea; it can also be used as a criterion to start systemic antifungal therapy based on involvement of vellus hair. Dermoscopy shows peripheral white scales with outer border being sharply demarcated [Figure 15]. Double edged scales may be seen in skin folds. Dotted vessels may be seen in the periphery of the lesion. Vellus hair involvement is seen as brown spots surrounded by white halo and loss of vellus hair. Involvement of vellus hair is an indication to start systemic treatment even in a patient with single lesion, as it can serve as reservoir of infection [Figure 16]. Double border is seen in steroid modified tinea [Figure 17].^[17] Tinea manuum shows white scales localized to furrows [Figure 18].



Figure 14: Dermoscopy of molluscum contagiosum shows yellow white clods (blue circle). Inset shows homogenous yellow white clods, rosette (four- clover leaf structure) and crown vessels (blue arrow) (Dermlite DL4, polarized X10)

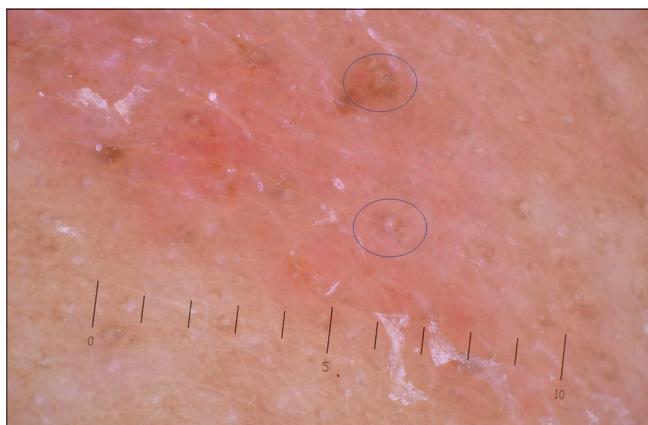


Figure 16: Dermoscopy of tinea corporis shows vellus hair involvement which is seen as loss of vellus hairs, brown spots and surrounding white halo (blue circle) (Dermlite DL4, polarized X10)

Pityriasis versicolor

Tinea versicolor is a superficial fungal infection caused by *Malassezia* species. It presents as hypo, hyperpigmented, or erythematous scaly macules on trunk and chest. Diagnosis is made on clinical grounds and microscopy showing “spaghetti and meatball” appearance. Dermoscopy shows fine white scaling localized to furrows and around the follicles [Figures 19 and 20]. Brownish reticular pigment network in hyperpigmented lesions and reduced pigmentary network in hypopigmented lesions can be seen. Kaur *et al.*, has described “Contrast halo sign” in 66.67% cases in their study where a ring of contrast color to that of primary lesion surrounds its periphery.^[18]

Cutaneous candidiasis

Cutaneous candidiasis is caused by candida species. It is common in extremes of age and is associated with immunosuppression like diabetes mellitus and HIV infection. It most commonly presents with erythematous and macerated plaques involving intertriginous areas of the body. Satellite pustules are seen. KOH mount shows

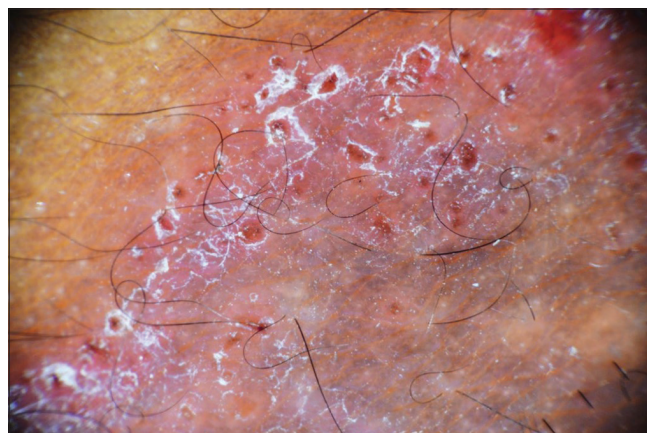


Figure 15: Dermoscopy of tinea corporis shows background erythema and peripheral white scales. (Dermlite DL4, polarized X10)



Figure 17: Dermoscopy of steroid modified tinea shows erythema in periphery with relative lack of scaling (blue arrow), white scales are seen as trailing scales in the center of the lesion (red arrow) (Dermlite DL4, polarized X10)

pseudohyphae. Inverse psoriasis and eczema can be a differential diagnosis and can make diagnosis difficult. Dermoscopy shows polycyclic erosions and peripheral yellow scales. These yellow scales appear like “cottage cheese”.. Dilated vessels may be seen in the center of lesion and satellite pustules in periphery [Figure 21].^[19]

Tinea nigra

It is superficial infection of skin of palms and soles caused by dematiaceous fungi *Hortaea Werneckii*. It presents as gradually progressive black or brown asymptomatic macules on palms and soles. It can be confused with acral melanoma. Dermoscopy may help in diagnosis and prevent unnecessary biopsy. Dermoscopy shows superficial, wispy, light brown strands in reticular pattern which does not respect furrows and ridges.^[20]

Subcutaneous fungal infections

Subcutaneous mycoses are a heterogenous group of disorders and caused by fungi which infect skin and subcutaneous tissue. The common subcutaneous mycoses are sporotrichosis, mycetoma, chromoblastomycosis,

phaeohyphomycosis, and basidiobolomycoses. Diagnosis of these conditions are based on clinical features, histopathology, and microbiological confirmation. Preliminary observation on dermoscopy of some conditions have been made and may be helpful in generating differential diagnosis.

Mycetoma

It is chronic infection of subcutaneous tissue caused by fungi (eumycetoma) or filamentous bacteria (actinomycetoma). Mycetoma is generally seen in people who walk barefoot and presents with painless or minimally painful, gradually progressive swelling involving feet with presence of discharging sinus and grains. Dermoscopy of eumycotic mycetoma shows yellow globules, red structureless areas, white superficial scales, and dotted vessels [Figure 22]. It can be used for treatment monitoring as there is reduction in white globules and red structureless areas on treatment. Dermoscopy of actinomycetoma shows yellow globules, white scales, red globules, and white structureless areas.

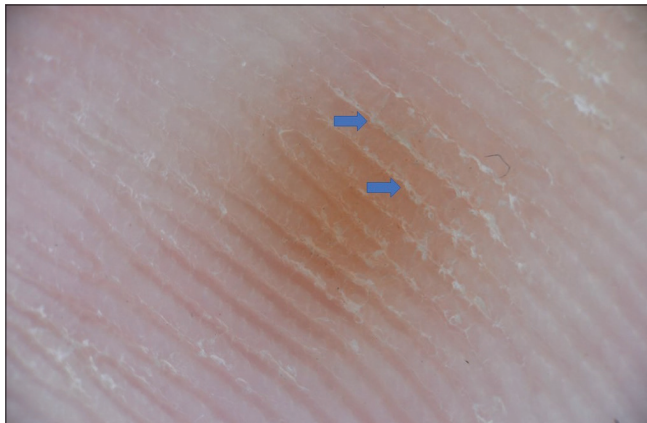


Figure 18: Dermoscopy of tinea manuum shows homogenous yellow background and white scales in the furrow (blue arrow) (Dermlite DL4, polarized X10)



Figure 20: Dermoscopy of pityriasis versicolor shows folliculotropism with scales around the hair follicle and reduced pigmentary network (blue circle) (Dermlite DL4, polarized, X10)

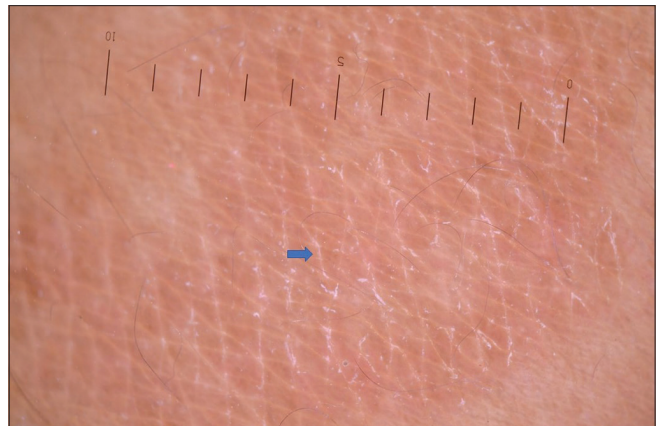


Figure 19: Dermoscopy of pityriasis versicolor shows presence of white scales in furrows (blue arrow) (Dermlite DL4, polarized, X10)

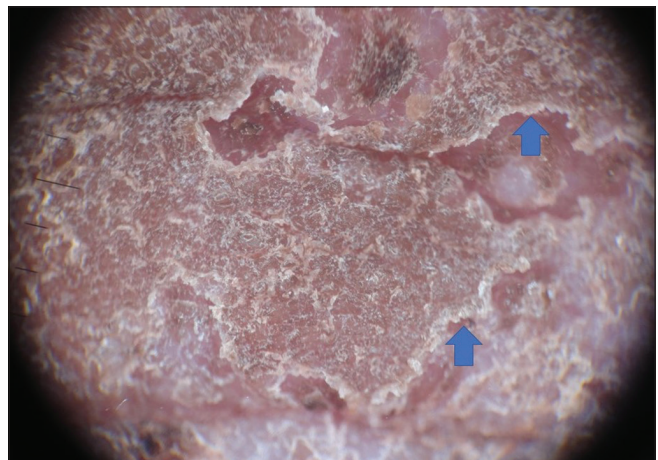


Figure 21: Dermoscopy of cutaneous candidiasis shows polycyclic erosions surrounded by yellow scales (blue arrows). These yellow scales give an appearance of cottage cheese like film (Dermlite DL4, polarised, X10) (Courtesy: Dr Balachandra Ankad, Prof and HOD, Department of Dermatology, S Nijalingappa medical college, Bagalkot)

These findings are mere observations and it is not possible to differentiate actinomycetoma from eumycetoma and even from other conditions like nocardiosis on dermoscopy.^[21,22]

Sporotrichosis is a subcutaneous mycoses caused by dimorphic fungus *Sporothrix schenckii*. It presents with erythematous papules and plaques with or without central ulceration in linear distribution. Dermoscopy shows yellowish structureless areas, arborizing telangiectasia, and white scar-like areas [Figure 23].^[23]

Bacterial Infections

Bacterial infections of skin are common and usually diagnosed on clinical grounds. Confirmation is done using



Figure 22: Dermoscopy of eumycotic mycetoma shows yellow globules (blue star), red structureless areas, white scales (blue arrow) and erythema-dotted vessels (orange star) (Dermlite DL4, polarized, X10) (Courtesy: Dr Anwita Sinha, MD, Military Hospital, Kirkee)

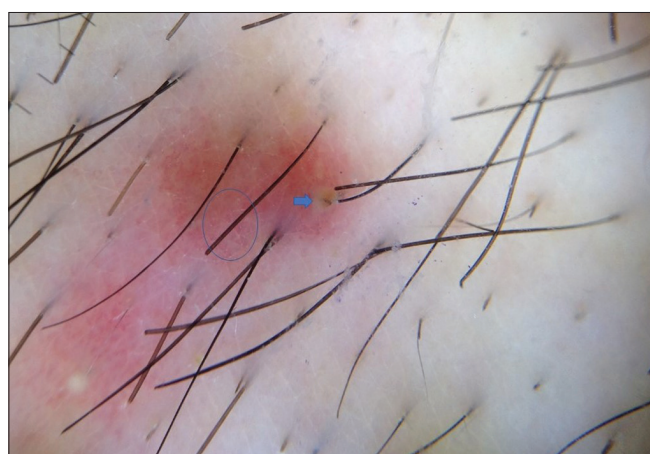


Figure 24: Dermoscopy of folliculitis shows central pustule around the follicle (blue arrow) and surrounding red dots and clods (blue circle) (Dermlite DL4, polarized, X10) (Courtesy: Dr Enzo Erichetti, Consultant Dermatologist, University Hospital “Santa Maria della Misericordia”, Udine, Italy)

gram stain and culture. Impetigo is caused by staphylococcus and presents with honey-colored crusts, most commonly over face. Dermoscopy shows peripheral scaling, yellow crusts, and dotted vessels. Folliculitis presents with pustules, dermoscopy may help in diagnosis when pustule is not prominent. It shows folliculocentric lesion with pustule around hair follicle and surrounding red dots and clods [Figure 24].^[24]

Pitted keratolysis

It is caused by gram positive organism *Kytococcus sedentarius*, which releases keratin dissolving enzymes to cause pits in the stratum corneum and presents with foul odor. It is more common in patients with hyperhidrosis. Dermoscopy enhance the visualization of shallow crater like irregular pits [Figure 25].^[25]

Trichomycosis axillaris

It is caused by *Corynebacterium* spp *tenuis* and *flavescens* and presents with yellowish concretions around hair



Figure 23: Dermoscopy of sporotrichosis shows yellow structureless areas (blue arrow), peripheral rim of erythema and red dots (orange arrow) and central ulceration (blue circle) (Dermlite DL4, polarised, X10) (Courtesy: Dr Enzo Erichetti, Consultant Dermatologist, University Hospital “Santa Maria della Misericordia”, Udine, Italy)

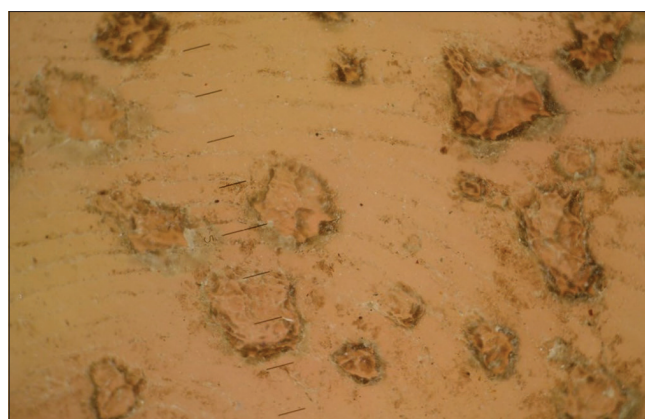


Figure 25: Dermoscopy of pitted keratolysis shows shallow, irregular pits, and absence of dermatoglyphics (Heine Delta 20, polarized, X 10)



Figure 26: Dermoscopy of *Trichomycosis axillaris* shows yellowish masses around hair follicle (blue arrow) (Dermlite DL4, polarized, X10) (Courtesy: Dr Enzo Erichetti, Consultant Dermatologist, University Hospital "Santa Maria della Misericordia", Udine, Italy)

shaft and malodor. Dermoscopy shows yellowish white masses around the hair shaft. Pediculosis and Piedra are clinical differential diagnosis [Figure 26].^[26] Piedra is a superficial fungal infection involving hair shaft. White Piedra is caused by *Trichosporon* spp and characterized by multiple white nodules along the hair shaft. Dermoscopy shows presence of ovular white masses along hair shaft. Black Piedra is caused by *Piedraia hortae* and presents with black colored firm nodules attached to hair shaft. Dermoscopy shows dark concretions attached to hair shafts.^[27]

Parasitic Infections

Leishmaniasis

Cutaneous leishmaniasis (CL) is endemic in certain parts of India. *Leishmania tropica* and *Donovani* are common causative organisms for CL. It presents with erythematous papule, plaque, or nodule-ulcerative lesion on exposed areas. The diagnosis is based on demonstration of amastigote form in smear and confirmation by culture. Delayed diagnosis may result in unnecessary morbidity as ulcer heals with atrophic scar if not diagnosed and treated promptly. Dermoscopy may help in diagnosis of CL. The dermoscopic features most commonly described in CL are: generalized erythema, yellow tears (yellow oval shaped structures), erosion and vascular features-like dotted vessels, glomerular vessels, and arborizing telangiectasia [Figure 27].^[28]

Post kala ajar dermal leishmaniasis is a late cutaneous manifestation of visceral leishmaniasis caused by *Leishmania donovani*. It presents with papulo-nodular erythematous plaques with facial involvement or symmetrically distributed hypopigmented macules. Dermoscopy of papules and plaques have been described as presence of generalized erythema, scaling, and yellow tears.^[29]



Figure 27: Dermoscopy of cutaneous leishmaniasis shows erosion (blue star), crust, white scale (blue arrow), and yellow tears (blue circle) on background of erythema (Dermlite DL4, polarized, X10)

Conclusion

Dermoscopy is a useful adjunct in diagnosis of infections and infestations. Some findings are characteristic and help in rapid diagnosis of diseases like scabies and pediculosis. However, many findings are preliminary observations and require further evaluation in larger studies to confirm. Entomodermoscopy as a science is progressing and will be helpful in diagnosis and treatment monitoring especially in resource limited setting where culture and other serological test may not always be possible.

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Conflicts of interest

There are no conflicts of interest.

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