REVIEW ARTICLE

Utility of Dermoscopy in Vitiligo: An Overview

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Abstract

Vitiligo is associated with significant psychological burden and stigmatization, especially among dark complexion population. Dermoscopy is a noninvasive method that allows *in vivo* evaluation of pigmentation and microstructures of skin not visible to the naked eye. The identification of specific dermoscopic patterns might help in assessing the stability of vitiligo lesions, which is of vital importance in determining the modality of treatment. This review aims at providing a comprehensive overview of dermoscopy and its utility in vitiligo.

Keywords: Dermoscopy, Vitiligo, Vitiligo stability.

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Introduction

The clinical course of vitiligo is unpredictable, often progressive, and harbors significant psychological burden, including stigmatization and anxiety. [1,2]

Dermoscopy, the dermatologist's stethoscope facilitates visualization of subsurface structures of the skin using optical magnification, liquid immersion, and cross-polarized lighting.[3] Early diagnosis, treatment, and timely monitoring of patients might help prevent progression of the disease.

Inability to assess clinical outcome leads to a disappointed patient, who eventually engages in doctor shopping. In the absence of reliable laboratory indicators, it becomes important to identify clinical parameters of vitiligo that can determine disease stability.[4]

Vitiligo, a benign pigmentary disorder often becomes the most challenging to treat, partly due to its progressive nature. The mainstay of management is by assessing the disease stability which is presently based on mainly clinical criteria and rarely histopathological criteria. But disease activity based on patient's history alone is imprecise and subject to recall bias. Furthermore it is not practical to perform biopsy on all vitiligo lesions to ascertain stability.

In this challenging scenario, dermoscopy could be used as a non-invasive tool to determine the clinical stability in vitiligo with the help of specific dermoscopic patterns.[5,6] The literature search was done using the keywords "dermoscopy," "vitiligo," and "vitiligo stability" in databases such as PubMed and Google Scholar, and out of 51 articles published in the time period between 2000 and 2020, 33 full text articles were retrieved.

History of Dermoscopy

Skin surface microscopy was initially introduced in 1663 by Johan C Kolharus, who used the method to inspect nailfold capillaries. Over 200 years later, its application in dermatology was evolving, but evaluation of skin lesions did not occur until the late 20th century.[7]

In 1951, Leon Goldman, known as the father of dermatoscopy, used this technique to evaluate pigmented lesions.

After 1971, dermatoscopy was recognized as a noninvasive method to visualize subsurface features like epidermis, dermoepidermal junction, and superficial dermis that are not visible to the naked eye.[8]

Early 21st century saw the development of video dermoscopes, which in contrast to the conventional ones, enable digital visualization, easy image storage, and monitoring of lesions.[7] Synonyms used for dermoscopy are dermatoscopy, skin surface microscopy, epiluminescence microscopy, and incident light microscopy.[8]

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Components of a Dermoscope

Achromatic Lens

Most instruments provide a magnification of 10×, but higher magnifications up to 1000× can be achieved using special lenses.

In-built Illumination System

Designed to emit different color lights for better visualization as penetration of light is proportional to the wavelength of light.

- Halogen lamps emit yellow light, which alters the color contrast of the images.
- Light emitting diodes (LED) provide white light of high intensity and have less power consumption than halogen lamps.

Latest dermoscopes (especially video dermoscope) have multispectral illumination system consisting of white light, polarized light, and ultraviolet (UV) light.

Contact plates are either graduated (which has an in-built scale to measure the dimension of the lesion) or nongraduated.[8]

Power Supply

Handheld instruments usually are powered by batteries, for example, rechargeable lithium battery, AA battery and rechargeable handles (Delta20).

Additional Features

In-built photography system, attachable camera or an in-built camera, and software which supports capturing and storage of images.[9]

Principle of Dermoscopy

The basic principle of dermoscopy is transillumination and high magnification so as to better visualize subtle features.

Light incident on skin can undergo reflection, refraction, diffraction and absorption. Dry, scaly skin reflects most of the incident light whereas smooth and oily skin allows its transmission reaching deeper dermis. Based on this principle, application of linkage fluid improves the translucency of the skin.

Terminology and Interpretation

Kittler's Classification

Classic dermatoscopy helps in the diagnosis of pigmented as well as nonpigmented skin tumors, including both benign and malignant lesions.[10]

Dermoscopic terminology is a language by itself, and the dictionary will be reviewed every 5 years and adapted if necessary.[11]

Basic Elements

The patterns observed can be categorized into five simple geometric elements.[10] These are:

- *Lines*: A structure with parallel edges where length is much greater than the breadth
- *Dots*: A tiny round spot (very small to possess any shape)
- *Clods*: A well-circumscribed solid object larger than a dot not having a fixed shape
- *Circles*: A curved line equidistant from a central point
- *Pseudopods*: A line with a bulbous end (can be a variant of a streak)
- *Structureless*: An area with none of the above elements dominating

Pattern

Comprises of repetition of the same basic element. For example, in the "structureless" pattern, the area is characterized by the absence of any of the basic elements, or at least with no basic element dominating.

There can be different types of patterns, and they help in narrowing down a diagnosis:

- *Reticular pattern*: Defined by a pigment network
- *Globular pattern*: Numerous, variously sized, round-to-oval structures with brown to black color
- *Homogenous pattern*: A diffuse area of color in the absence of a pigment network or other distinctive local features
- *Starburst pattern*: Radial arrangement of streaks at the periphery of a lesion
- *Unspecific*: Relatively featureless lesions that cannot be categorized into any of the above

Mechanism of Depigmentation in Vitiligo

In vitiligo, destruction of melanocytes occurs and three major factors have been implicated. First, inheritance of a set of three "vitiligo" genes predispose them to destruction. Second, inherent defect in melanocytes, that is, melanocytes from patients with vitiligo differ from normal individuals.[12]

In a study by Lahari and Malakar, three hypotheses important in vitiligo pathogenesis have been described: neural hypothesis, self-destruct hypothesis, and the autoimmune hypothesis (most validated). Aberrations of both cell-mediated and humoral-mediated immunity are involved. Perilesional and circulating T-cells are strongly suggestive of melanocyte-specific cytotoxic T-cells. UVB therapy is based on the principle of promoting T-cell apoptosis.[13] Integrated theory suggests that vitiligo is a result of convergence of multiple pathological pathways and hence may be regarded as a syndrome with multifactorial etiology.[14]

Clinical Classification of Vitiligo

Different classification systems have been postulated, but in the Indian context a topographical classification is preferred, which is helpful in deciding the treatment and prognosis.[15]

- Segmental: Lesions distributed along dermatome or lines of cleavage
- Nonsegmental
  - Vitiligo areata (localized, partial, or focal) shows one or two macules
  - Vitiligo acrofacialis involving face and tips of hand and feet
  - Vitiligo vulgaris (generalized, universal)
  - Vitiligo mucosal

Dermoscopy in Vitiligo

Skin markings, follicular or sweat pores, and other surface features can be seen better with white light because nonpolarized light gets reflected at the air–skin interface whereas subsurface structures are better visualized with polarized light because these waves penetrate deeper.[16]

Pigmented lesions like melanomas are usually examined by dermatoscopy.

For a fairer facial skin in contrast, a conventional pigment network is seen, which is due to the presence of short rete ridges, and hence unable to produce a pigmentary pattern.

The classical pattern analysis is even more complex and involves assessment of global dermatoscopy features (pattern: reticular, globular, cobblestone, homogenous, starburst, parallel, multicomponent, or nonspecific) and local dermatoscopy features (pigment network, dots, globules, streaks, blue–whitish veil, regression structures, hypopigmentation, blotches, or vascular structures).[7]

Dermoscopy in Other Hypopigmented Lesions

Immense social stigma is associated with vitiligo and is of particular concern especially among darker skin population. So there is a need of the hour to formulate standardized criteria to differentiate vitiligo from other hypopigmented macular diseases. Dermoscopy has been well documented use in the diagnosis of pigmented melanocytic skin lesions. But recently its use in the diagnosis and differentiation of hypopigmented skin lesions has gained popularity.[17]

In idiopathic guttate hypomelanosis, diagnosis is mainly clinical. Guttate vitiligo shows a dense white shade and follicular hyperpigmentation but lacks a hyperpigmented patchy network.[18]

Nevus depigmentosus also displays white fluorescence under Wood's lamp. In dermoscopy, patches have irregular and serrated borders with pseudopod pattern and faint reticular network within the patch. Hairs within the patches are of normal color and no peripheral hyperpigmentation can be seen.[19]

Pityriasis alba in dermoscopy shows ill-demarcated white areas with fine scales.[20] In pityriasis versicolor, diffuse hypopigmented ill-defined blotches and satellite lesions were present in the majority lesions.[21,22]

Extragenital lichen sclerosus et atrophicus shows white structureless areas, comedo-like openings and telangiectasia of different caliber. Erythematous halo and follicular plugging is seen in active lesions.[17,23] These characteristic dermoscopic features can be used to differentiate among various hypopigmented macules and hence avoids biopsy, which is traumatic especially in children.

Pigmented lesions like melanoma and melanocytic nevus are well-known findings in dermoscopy. Evolving lesions of vitiligo will have dermoscopic findings of reduced, absent or reversed pigmentary network, perifollicular pigmentation, and white glow under UV light.[24]

Dermoscopic Patterns in Vitiligo and its Significance

The occurrence of hair follicle pigmentary units is difficult to observe with the naked eye, hence we might clinically miss the early signs of recovery. Pigmentation islands contain two main forms: the marginal type and central type, which refers to pigmentation islands in the normal skin at the edge of white macules and at the center of white macules, respectively.[3]

In a study by Al Refu, the following parameters of the hypopigmented patch were taken into consideration: presence of altered pigmentation within the patch, edge, and demarcation, as well as presence of scales.[17] The white glow under UV light and leukotrichia are characteristic for vitiligo.[17]

In a study by Jha et al., most useful dermoscopic clues were observed in the perifollicular region. Similarly, Wang et al. concluded that perifollicular pigmentation in progressive vitiligo and marginal hyperpigmentation in stable vitiligo were significant dermoscopic findings.[3,25]

It is important to identify unstable vitiligo because it tends to worsen with therapeutic options like phototherapy.[26]

Residual perifollicular pigmentation is seen in active lesions, spontaneous remission, or after treatment. It is also observed in lichen planus pigmentosus, melanoderma in the elderly, and melanocytic nevi. But a pattern of hypopigmentation with residual perifollicular pigmentation is specific for vitiligo.[27]

Epidermal melanocytes, which are derived from neural crest cells, mainly reside in perifollicular and interfollicular compartments. Most melanocytic stem cells reside in the perifollicular compartment. A majority of melanocytes in the interfollicular compartment are lost in the early phase of the disease, followed by those in the perifollicular compartment. Hence it explains the clinical pattern of residual perifollicular pigmentation in vitiligo. Kang et al. demonstrated that during repigmentation, the melanocytes are mainly located on the edge of lesions and around the follicle and may represent early reservoirs of pigmentation.[27,28]

The risk of developing into type A or generalized vitiligo is higher if associated family history is present. Generalized vitiligo has significant impact on the quality of life in both children and adults. Hence, a reliable early diagnosis of this condition is important so that appropriate counseling and management can be started at an early stage of the disease.[27]

Dermoscopy recently has been used to predict disease activity in vitiligo post skin grafting wherein post-grafting trichrome sign indicated subsequent depigmentation and Manchurian gravy sign indicated repigmentation.[29]

Role of Dermoscopy in Vitiligo Disease Stability

The cornerstone of vitiligo management is the correct categorization of a case into either stable or unstable vitiligo. It is also a vital prerequisite before vitiligo surgery. This distinction at present is based mainly on clinical criteria because there is significant overlap of histopathological features between the two groups. But disease activity based on patient's history alone is imprecise and cannot be relied upon always.

The presence of nonsegmental vitiligo, mucosal vitiligo, longer duration, onset in upper body, positive Koebner phenomenon, and positive family history could be predictors of progressive disease.[4,30,31]

Recent studies in vitiligo focus on the outcome, how to measure these outcomes, and which instruments are most suitable to measure these, thus aiming to standardize the monitoring among medical professionals worldwide.

Under these circumstances, a noninvasive tool like dermoscope might help us determine the clinical stability of vitiligo lesions with the help of specific dermoscopic patterns. But there is a need to standardize these findings.[5,6]

Conclusion

Dermoscopy is a noninvasive tool that that helps in the diagnosis of early vitiligo and to differentiate it from other hypopigmentary disorders, thus avoiding unwarranted biopsy.

Specific dermoscopic patterns can be utilized to ascertain disease activity and accordingly decide on the management protocol.

Hence, dermoscopic examination should be encouraged as a routine tool in all cases of vitiligo, from the time of diagnosis throughout the course of management. Future studies based on dermoscopic findings in different treatment modalities are called for.

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