REVIEW ARTICLE

Dermascope - A Futuristic Tool for Diagnosis: A Systematic Review.

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Abstract:

Dermascopy is non-invasive procedure for the assessment of skin, dermoepidermal junction, and structures of dermis which are not visible to naked eyes. The dermascope is going to link between clinical and histopathological examination for proper diagnosis of skin diseases. Many patients prefer to have dermascopic examination. The patterns of several infections needs urgent, accurate attention of dermatologist or a clinician. The dermascopic examination is becoming popular among clinicians for evaluation of various skin diseases. It is becoming essential clinical tool for evaluation of skin lesions. It is becoming most popular diagnostic tool in the field of research.

The scope of dermascope is continuously expanding now a days because of advanced production technology, which might reduce the cost of dermascope. The combination of optical coherence tomographic system makes the scope as one of the part of remote health care monitoring system. Many companies have come up with different types of scopes for various uses. In this article we review the uses of scope, available companies and basics of examination concepts. It also comprehensively reviews available literature on various uses, in the diagnosis of diseases and the perspective of dermascope for dermatologist, clinicians, trainers and researchers. The goal is to introduce this subject to those not yet familiar with it, in order to instigate and encourage them for training and practice of this technique and is growing importance for everyday usage.

Key words: Diagnostic tool, Skin disease, Scope, scopy.

Introduction

Dermoscopy is a very useful technique for the analysis of pigmented skin lesions. It represents a link between clinical and histological views, permitting an earlier diagnosis of skin melanoma. It also helps in the diagnosis of many other pigmented skin lesions, such as seborrheic keratosis, pigmented basal cell carcinoma, hemangioma, blue nevus, atypical nevus, and mole, which can often clinically simulate melanoma [1,2]. In this article, dermoscopy is reviewed from its history to the basic concepts of the interpretation of dermoscopic images. Early diagnosis and prompt surgical excision are the most important aims in the prevention of cutaneous melanoma. Dermoscopy has increased the accuracy in the detection of melanoma because of dermoscopic-specific features that can be easily detected by trained dermoscopists.

Dermatoscopy (also known for dermoscopy or epiluminescence microscopy (ELM), Skin surface microscopy) is the examination of skin lesions with a dermatoscope. This traditionally consists of a magnifier (typically x10), a non-polarised light source, a transparent plate and a liquid medium between the instrument and the skin and allows inspection of skin lesions unobstructed by skin surface reflections [3-5]. Modern dermatoscopes dispense with the use of liquid medium and instead use polarised light to cancel out skin surface reflections. When the images or video clips are digitally captured or processed, the instrument can be referred to as a "digital epiluminescence dermatoscope" [3-5].

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This instrument is useful to dermatologists in distinguishing benign from malignant (cancerous) lesions, especially in the diagnosis of melanoma.

History of Dermascope and Dermascopy:

Skin surface microscopy started in 1663 by Kolhaus and was improved with the addition of immersion oil in 1878 by Ernst Abbe. The German dermatologist, Johann Saphier, added a built-in light source to the instrument [3]. Goldman was the first dermatologist to coin the term "dermascopy" and to use the dermatoscope to evaluate pigmented cutaneous lesions [1-3]. In 2001, a California medical device manufacturer, 3Gen, introduced the first polarized dermatoscope, the DermLite [4-6]. Polarised illumination, coupled with a cross-polarised viewer, reduces (polarised) skin surface reflection, thus allowing visualisation of skin structures (the light from which is depolarised) without using an immersion fluid [4-6]. Examination of several lesions is thus more convenient because physicians no longer have to stop and apply immersion oil, alcohol, or water to the skin before examining each lesion [1-3]. With the marketing of polarised dermatoscopes, dermatoscopy increased in popularity among physicians worldwide. [5-8] Although images produced by polarised light dermatoscopes are slightly different from those produced by a traditional skin contact glass dermatoscope, they have certain advantages, such as vascular patterns not being potentially missed through compression of the skin by a glass contact plate [1,2].

There devices can be grouped as:

- Oil immersion devices – which require contact with the skin and the use of an interface medium to reduce surface light scatter.
- Cross-polarised devices – which use cross-polarised light to reduce surface light scatter.
- Hybrid devices – which have the option to use either cross-polarised or oil immersion to reduce surface light scatter.

Common systems for digital dermoscopy are Easyscan, Molemax, Dermo Genius, Fotofinder. Instrument illumination and oil brings out features not seen with loupe binocular magnification and is much more portable than the operating microscope. Traditional instruments were non-polarized and need oil or liquid medium between the glass plate of the instrument and skin to inspect skin lesions [3]. Polarized light sources cancel out most skin surface reflections and permit examination without the oil.

Non-polarised devices (oil immersion/contact)

Although a number of contact devices are currently available, the two main devices are the Heine Delta 20 and the DermLite II fluid. Both devices give a very bright image, although subtle optical differences between the two devices exist [5,6].

Polarised devices

The breakthrough in dermoscopy came with the introduction of the polarised devices. Now it was possible to examine multiple lesions with dermoscopy quickly, without the need to coat the patient in copious amounts of oil or interface fluid. The original DermLite devices, especially the DL100 – although groundbreaking when launched – were quickly surpassed in quality by newer DermLite devices making them less attractive as a device for clinical practice. The arrival of the DermLite II PRO HR a device at last able to compete with the established oil immersion devices, combining bright illumination with magnification to provide a very high quality image [4-7]. The added versatility of non-contact enables multiple lesions to be quickly examined, making them the first choice device for many dermatologists.

Hybrid devices:

Oil immersion and cross-polarisation devices differ in the images they produce, due to the refractive properties of morphological structures under polarising light. This has led to the development of devices that can produce images by both oil immersion and cross- polarisation. The first device to combine this increased functionality was the DermLite II Hybrid. Although not as bright as either the Heine Delta 20 or the Dermlite II PRO HR, it is the one which became a very popular device within short time [5,6]. However, the arrival of the brighter DermLite DL3 has effectively sealed the fate of the DermLite II Hybrid, relegating it to the second division of hybrid devices. The DermLite DL3 has brighter imaging than the DermLite II PRO HR in the polarised mode and is comparable to the Heine Delta 20 in the non-polarised mode [1,2,6]. With advances in technology, hybrid devices are able to produce clear polarised and non-polarised images.

With the Dino-Lite DermaScope a new generation of compact and affordable dermatoscopes has seen the light. These handy, easy-to-use USB digital microscopes can be quickly deployed and used to create sharp and clear photos and videos of a wide variety of skin problems without pain or long waiting times for the patient. All Dino-Lite DermaScopes have a built-in adjustable polarizer that reduces the gloss effects of the skin. This allows better imaging of the skin layers, lesions and nevi [4-6]. The DermaScope supports the use of water or oil, but this is not always necessary.

The Dino-Lite DermaScopes are available with different levels of magnification, the best-selling models have two different levels of magnification (about 20x to about 45x) without the need to change the distance to the skin [3-6]. If the extra cap is used, it is also possible to take an image with a larger surface area with a magnification of approximately 10x.

Selection of device:

The selection of a dermoscopy device is a personal choice, reflected by clinical practice. If the clinician is looking at one or a couple of lesions, then the device that delivers the best optical quality should be considered: this is currently the DermLite DL3, the DermLite II Fluid or the Heine Delta 20 [1-3,5,6]. If, however, the clinician is involved in screening multiple lesions, then a polarised device that allows quick

visualisation of many lesions, such as the Dermlite II PRO HR or the DermLite DL3, is the device to consider [1].

Ideal for quick scan or screening

Due to these properties, the Derma Scopes are particularly suitable for rapid, detailed images of the skin that can be stored, edited, or analysed. This allows the doctor or dermatologist to work more efficiently and makes the DermaScopes ideal for quick scans, screening or pre-screening of potential patients. Because of the speed of operation, simplicity in use and digital storage and sharing of images the Dino-Lite dermatoscopes are commonly used tools for teledermatology, a rapidly growing form of service which contributes to the necessary efficiency improvements in healthcare.

The DermaScope Polarizer (MEDL4DW) with a 1.3 megapixel camera, is often used by General Practitioners or practice nurses and is suitable for dermatological photography in general practice. [5-8]The DermaScope Polarizer HR (MELD7DW) features a high-resolution 5-megapixel camera and a sleek metal housing and is used by all who have higher demands on the equipment.

Finally, there are two DermaScopes with a higher magnification (10-70x and 200x), a 1.3 megapixel model (MEDL4DM) and a 5 megapixel version (MEDL7DM) [5-8]. These models are often used for specific dermatological applications or analyzing skin biopsies. The Dino-Lite Derma Scopes are definitely not just for medical professionals such as general practitioners or dermatologists, the ease of use and affordability also make the Derma Scope a great tool for skin therapists or aesthetic professions.

Advantages of dermascopy:

With doctors who are experts in the specific field of dermoscopy, the diagnostic accuracy for melanoma is significantly better than for those dermatologists who do not have any specialized training in dermatoscopy [9]. Thus, with specialists trained in dermoscopy, there is considerable improvement in the sensitivity as well as specificity, compared with naked eye examination. The accuracy by dermatoscopy was increased up to 20% in the case of sensitivity and up to 10% in the case of specificity, compared with naked eye examination [10,11]. By using dermatoscopy the specificity is thereby increased, reducing the frequency of unnecessary surgical excisions of benign lesions [12,13]. However, the classical melanoma-specific criteria such as multicomponent pattern, atypical pigmented network, irregular dots/globules, irregular streaks, multiple colors, blue-whitish veil or regression structures may not be present in all of these lesions. For some early melanomas change, as evidenced by sequential dermoscopic monitoring, may be the only feature suggesting malignancy [1,2]. At present, even with dermoscopy, the diagnosis of these early melanomas remains to be a challenge for dermatologist. Patient education, digital dermoscopic follow up and consensus of diagnosis have been proposed to overcome this problem.

Viva Scope subsequent to dermoscopy may improve the diagnostic accuracy of equivocal skin lesions compared with dermoscopy alone, particularly for malignant melanomas. In terms of margin delineation, Viva Scope 1500 mapping for LM and LMM may improve the accuracy in terms of complete excision of lesions compared with dermoscopically determined margins [14]. In addition, the use of Viva Scope appears to be a cost-effective strategy in the diagnostic assessment of suspected skin cancer and the margin delineation of LM prior to surgical treatment [14].

Application of dermatoscope:

1) Early detection of melanoma.
2) For monitoring skin lesions suspicious of melanoma. Digital dermatoscopy images are stored and compared to images obtained during the patient's next visit. Suspicious changes in such a lesion are an indication for excision. Skin lesions, which appear unchanged over time are considered benign [15,16].
3) Aid in the diagnosis of skin tumors - such as basal cell carcinoma [17], squamous cell carcinomas [18], cylindromas [19], dermatofibromas, angiomas, seborrheic keratosis and many other common skin tumors have classical dermatoscopic findings [20].
4) Aid in the diagnosis of scabies and pubic louse. By staining the skin with India ink, a dermatoscope can help identify the location of the mite in the burrow, facilitating scraping of the scabetic burrow. By magnifying pubic louse, it allows for rapid diagnosis of the difficult to see small insects [21,22].
5) Aid in the diagnosis of warts. By allowing a physician to visualize the structure of a wart, to distinguish it from corn, callouses, trauma, or foreign bodies.
6) Aid in the diagnosis of fungal infections. To differentiate "black dot" tinea, or tinea capitis from alopecia areata [23].
7) Aid in the diagnosis of hair and scalp diseases, such as alopecia areata,[24] female androgenic alopecia [25], monilethrix, [26] Netherton syndrome,[27] andwoolly. hair syndrome.[28] Dermoscopy of hair and scalp is called trichoscopy [29,30].
8) Determination of surgical margin of hard to define skin cancers. By allowing the surgeon to correctly identify the true extent of the tumor, repeat surgery often is decreased.

The Diagnostic criteria have been laid down to diagnose the lesions. It is important to understand the basics of dermascopic picture so it will be easy to understand. The use of dermascopy should be primary goal for suspicious lesions to determine whether lesion

should be biopsied or not. So none of the patient should leave the clinic undiagnosed. The classic dermascopy uses oil like mineral oil, immersion oil, fluid like alcohol, water and KY jelly to examine [1,2]. With polarized light it is possible to visualize the deep skin structures without any fluid interface. The development of production technology made the listing of demacopes along with better sophistication. It is better to encourage clinician to start using the cutting edge technology for better and early diagnosis of suspicious lesions.

The general principles should be followed in uncertainty like scales, crusts or inflammation. In such scenario general test like tape, scrape, blanching test will be useful to diagnose or differentiate lesions like nevus, acral melanoma, subcorneal hemorrhage, clark nevi. Many times wobble sign should be considered in nodular pigmented lesions because melanoma tends to be firm and fixed to the skin [30].

Key Tips to improve imaging with dermascopeand maintenance of scope

Use 70% isopropyl alcohol gel as the interface medium for contact devices, to reduce the possibility of cross-contamination between patients. Use ultrasound gel for visualising the nail folds, as alcohol gel will run off the nail. Use ultrasound gel in peri-ocular regions, to avoid irritating the eye with alcohol. Use alcohol wipes (70% isopropyl alcohol) to clean the device between patients, as the alcohol and ultrasound gel can dry, leaving a residue on the faceplate [1,2]. Apply the alcohol gel to the lesion if on a horizontal surface or to the faceplate of the device if on a vertical surface, and apply the device to the skin carefully, in a rolling motion to avoid air bubbles.

Criteria for various skin lesions for better diagnosis.

To ensure consistency when describing the morphology of a lesion and the structures seen with dermoscopy, a specific language should be used. The language used comprises the dermoscopic alphabet. First, the overall morphology or global features of the lesion are described. Reticular, Globular, homogenous, starburst, parallel, cobblestone, multicomponent, lacunar, non- specific [31,32]. Secondly, local features or dermoscopic structures, which are pigment network, dots and globules, streaks, blue and white structures, pigment blotches, hypopigmentation, blue white structures, regression structures, vascular structures, comedo-like openings [31,32].

Since the mid 1990's clinicians have endeavoured to simplify the process of diagnosing melanoma by incorporating dermoscopic features seen into scoring algorithms. These algorithms are promoted to augment the diagnosis of melanoma, particularly to clinicians new to dermoscopy [32-40]. The most widely reported algorithms are seven-point checklist, Menzies scoring, Three –point check list [33]. ABCD algorithm (Asymmetry, Border, Colors, Dermoscopic structures) [34], CASH algorithm [35]. One should remember that the above mentioned algorithms will not provide a diagnosis. These are not going to take into the accounts of individual skin type, age or risk factors, tumor history, and index of suspicion [1,2]. Patterns of other lesions discrption had been well explained elsewhere in literature.

The suspicious lesions like melanomas with other pigmented lesions should be differentiated in early stage using criteria given by consensus meeting on dermascopy in 2001. It is essential to differentiate between melanomas and other pigmented lesions using following three criteria. These are dermascopic asymmetry of color and structure, atypical pigment network, blue white structures [36]. Among these three point check list if two characteristics are present then chances of melanoma should be considered. Other skin lesions and conditions can be differentiated and diagnosed using dermascope. Literature available to differentiate port wine stains [40], vascular structures [41], seborrhoeic keratosis [42], various melanocytic nevi [43-48] acral skin pigmentation[49]. Various other skin lesions, alopecia, molluscum contagiosum [50-58] can be diagnosed using dermascope.

A teledermatology opinion is best placed within the framework of the local skin referral pathway, and provided by experts, usually clinicians, with professional responsibility for the public involved [59]. This provides a sound governance framework from which to build and deliver a service. Teledermoscopy provides the next level in diagnostic confidence by increasing the detail of information available for referral management [59]. Teledermoscopy is proven to enhance skin cancer triage efficiency in the health care setting. Benign lesions can be diagnosed more confidently and additionally malign lesions can be managed more effectively. Of fundamental importance is the provision of a dermoscopic image highlighting the diagnostic detail of a lesion, thus allowing a confident diagnosis.

Conclusion:

The Dermatoscope is a diagnostic tool, a magnifier (typically 10x) with light source to examine skin, hair, tumors, cutaneous pathology. It is a skin surface microscope with diffuse illumination. Details in surface tissue color, borders, and structures can be more critically seen and documented. Product choice depends on portability desired, wire connections tether the unit. Skin and pathology appearance varies with light source, polarization, oil, pressure, and sometimes temperature of the room. Extends your surface examination of intact tissue for skin cancer evaluation, pigmented Lesion analysis, grading

characteristics of a mole for odds of malignancy, Lesion Scoring Concepts, Hair analysis.

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