

DERMOSCOPY – A NEW EFFECTIVE TOOL FOR AN IMPROVEMENT OF DIAGNOSIS OF PIGMENTED SKIN LESIONS

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Dermoscopy is an *in vivo* non-invasive method for making the diagnosis of pigmented skin lesions (PSL) more accurate. It links clinical dermatology and dermatopathology by enabling the visualization of morphological features not discernible by naked eye. With training and experience, dermoscopy has been shown to significantly increase the clinical diagnosis of pigmented skin lesions, with a 10-27% improvement in the diagnosis of melanoma compared to that achieved by clinical examination alone. There are many variants of dermoscope, but all of them have the same essential characteristics - they reduce the reflection and stratum corneum becomes translucent, allowing viewing the underlying skin layers - epidermis, dermo-epidermal junction and upper parts of dermis. Digital dermoscopy has many advantages versus non-digital, for example, follow-up of the lesion. Many authors from all over the world by using the "teledermoscopy" associate to perform multi-centre studies for developing the new diagnostic algorithms, as well as for collection of images and computer-aided diagnosis of PSLs. All dermoscopic methods were classified in two groups: first step - algorithm for differentiating melanocytic from non-melanocytic lesions, and second step - differentiating benign melanocytic lesions from melanoma. Because of their simplicity for using by less experienced physicians, two of them, ABCD rule and 7-point checklist, are mostly used. In the future, dermoscopy will take the prominent place in medical practice due to increase in need of early recognition of melanoma. *Acta Medica Medianae* 2006;45(2):59-64.

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Introduction

Since 1951, when Goldman began using dermoscopy as a diagnostic tool to evaluate pigmented skin lesions (PSL), it has undergone extensive improvement not only in instrument quality and availability, but also in the definition and characterization of dermoscopic criteria (1). Dermoscopy (dermatoscopy, epiluminescence microscopy, amplified surface microscopy, incident light microscopy, contact skin microscopy) is an *in vivo* non-invasive method for the diagnosis of pigmented skin lesions (2). It is a valuable tool for improving both clinical classification and treatment of patients with PSL (3,4). It is used to observe *in vivo* pattern of the intra- and extracellular pigment in pigmented

lesions; also, it allows the identification of the intra- and extravasal blood pigment. The less pigmented lesion, the easier identification (5). This technique links clinical dermatology and dermatopathology by enabling the visualization of morphological features not discernible by naked eye (6). It allows a better visualization of surface and subsurface structures (7). Histopathological studies have shown that several of these features are due to distinct alterations of epidermis, dermoepidermal junction, and papillary dermis (8). The early phase of melanoma is difficult to identify because it can share many clinical features with an atypical nevus. Because the tumor thickness is the most important prognostic factor for the prognosis of the melanoma, the early detection of thin melanomas is essential. The ABCDE rule for the clinical diagnosis of melanoma is the most widely used clinical method for the screening of pigmented skin lesions (9). Several clinical studies have described diagnostic accuracy rates ranging from 65-80%, thus indicating a need for additional diagnostic tools (10,11). However, about 10% of melanomas flagrantly disregard ABCDE rule and many nevi also display one or more ABCDE criteria (12). In spite of assertion of few authors that none of the studies commented that dermatoscopy improved the sensitivity and specificity of diagnosis enough to alter the clinical management of the pig-

mented skin lesion, and that it only increased the accuracy of diagnosis of equivocal lesions that were to undergo biopsy anyway (13), recent studies clearly display different preferences of this diagnostic method. Dermoscopy offers the early diagnosis of melanoma and the differential diagnosis of PSLs (14). With training and experience, dermoscopy has been shown to significantly increase the clinical diagnosis of melanocytic, non-melanocytic, benign and malignant skin lesions, with a 10-27% improvement in the diagnosis of melanoma compared to that achieved by clinical examination alone (15). About two thirds of melanoma in early phase are not symptomatic and can be exclusively diagnosed by dermoscopy (3). The major effect is a more effective preselection of lesions submitted to surgery: there are more malignant lesions excised after dermoscopy compared to lesions excised without it (16). It has limitations due to the fact that qualitative evaluation of many morphologic characteristics of PSL observed by this technique may be extremely complex and subjective and they heavily depend on experience of the viewer (17). It has proven that dermoscopy may improve diagnostic performance only when examiners are well-trained in recognizing various diagnostic features that become visible by the dermoscopic examination (18). The identification of specific diagnostic patterns related to distribution of colors and dermoscopy structures can suggest a malignant or benign PSL. However, dermoscopy is not 100% accurate in differentiating melanoma from its simulators (particularly dysplastic nevi or Spitz nevi), because they are frequently characterized by common dermoscopic features, which may be a morphological, and probably even biological continuum (19, 20). Nevertheless, even with its imperfection, dermoscopy represents a new semiology in the management of PSLs, which has a wide application, from the formal studies of researchers to the daily practice of dermatologists (21).

Equipment and contemporary aspects

Normally, light is reflected, dispersed or absorbed by the stratum corneum due to differences in refractive index and optical density between the skin and air. The skin appears opaque and the underlying structures cannot be adequately examined. When light comes directly from dermoscope (a hand-held microscope with a light source) at an acute angle of 20° and through an immersion liquid, with a slight pressure by glass slide, reflection is reduced and stratum corneum becomes translucent, allowing to view the underlying skin layers - epidermis, dermo-epidermal junction and, to a lesser extent, the dermis (22,23). The dermoscope (dermatoscope) (Figure 1) contains an optical system which includes monocular observation, magnification x 6-40 (most frequently x 10), and the use of an illumination system. Another optical instrument, the stereomicroscope allows an accurate binocular observation with different magnifications (x 6-

80). It permits a three-dimensional appearance of the lesions and simultaneous viewing by another observer.



Figure 1. Dermatoscope

The stereomicroscope is expensive, takes up space, and is available only in a few centers. Recently, the digital revolution of dermoscopy has started. Another optical system, the video-dermatoscope, includes a video probe that transmits images of the PSL to a color monitor. The greatest benefit to digital dermoscopy over the non-digital is that it is designed for the follow-up (24,25). The technologic features of the digital camera, optical system, monitor, digitized board, and of the software can influence the resolution and quality of the images. Thus, a physician can send photo images of PSLs via Internet worldwide and consult more experienced colleagues. Dermoscopy itself is based on a two-dimensional picture and thought ideal for telemedicine purposes (26). Many authors from all over the world by using the "teledermoscopy" try to provide detailed dermoscopic criteria of PSLs which are not well-known in order to allow a better management of these tumors. They associate to perform multicentre studies for collection of dermoscopic images and computer-aided diagnosis of PSLs (4,27,28). Advances in computer science and applied mathematics allow the basic technology of dermoscopy to be extended to a more complex application: predicting whether observed spots are cancerous. Several teams are working toward computer-assisted diagnosis of melanoma using different mathematical and analytical strategies (29).

Nowadays, there are some studies proposed by International Dermoscopy Society; for example, about amelanotic and nodular melanoma, scalp pigmented tumors, dermoscopy confidence, etc. Physicians not expert in the use of dermoscopy improve their dermoscopic recognition of melanoma using Web-based teaching programs. But, one should bear in mind that *in vivo* dermoscopy (together with clinical observation) gives more precise findings than dermoscopy based on photographic images (30).

Combination of digital dermoscopy with a specific computer program, based on an artificial neural network may represent an additional useful tool for the early diagnosis of melanoma, particularly for clinicians with minimal training, but it cannot replace experienced dermatologist in the diagnosis of PSL (31,32).

Diagnostic methods

The conventional diagnosis in dermoscopy is based on the simultaneous assessment of morphologic criteria. For the purpose of correct interpretation of results obtained by dermoscopic review, some methods are developed. There was a need to make an agreement about classification of dermoscopic procedures. For this reason, the classification of all existing dermoscopic analytical methods was done at First Dermoscopic Congress in Rome, in 2001. All methods were classified in two groups:

First step: algorithm for differentiating melanocytic from non-melanocytic lesions. The presence of a pigment network, aggregated globules, branched streaks, homogenous blue pigmentation or parallel pigment pattern is determined. If present, the lesion should be considered a melanocytic lesion (Figures 2 and 3).

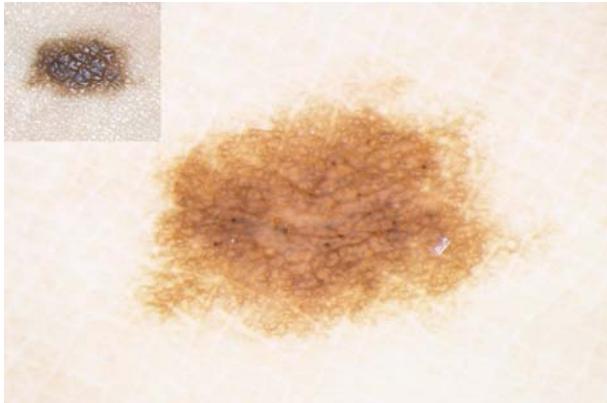


Figure 2. Clinical (upper left corner) and dermoscopic images of nevus (reticular pattern)

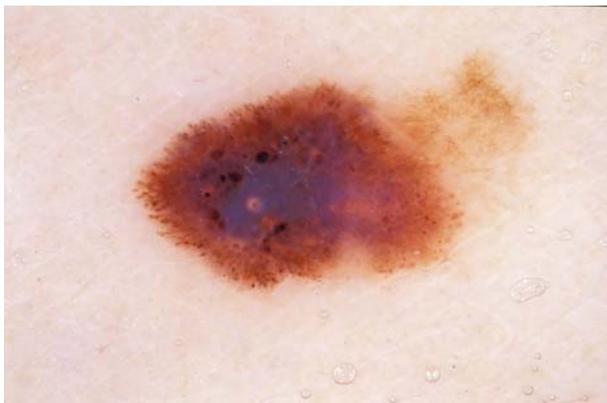


Figure 3. Dermoscopic image of early invasive melanoma. Note the blue-whitish veil in the centre of the lesion, irregular streaks in the left part of the lesion and unevenly distributed dots and globules (original magnification $\times 10$).

If not, one should evaluate lesion for the presence of dermoscopic features which are specific for seborrheic keratosis (milia-like cysts, comedo-like openings, brain-like appearance, light-brown fingerprints), solar lentigo (mouth-eaten borders), basal cell carcinoma (arborizing vessels, leaf-like areas, large blue-gray ovoid nests, spoke wheel areas, ulceration) (Figure 4),

vascular lesion (red-blue lacunas) or dermatofibroma (central white patch). If all the preceding questions were answered with "no", the lesion should be considered a melanocytic lesion (14).

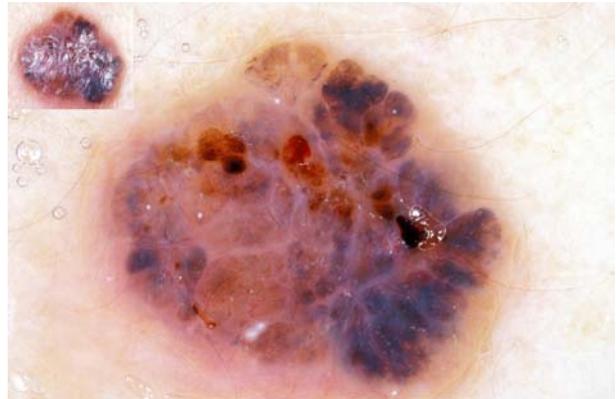


Figure 4. Clinical and dermoscopic images of pigmented basal cell carcinoma. Note the leaf-like areas predominantly in the right part of lesion and slightly visible arborizing vessels throughout the lesion

Second step: differentiating of benign melanocytic lesions from melanoma. For this proceeding, some algorithms are developed: pattern analysis, ABCD rule, Menzies method, 7-point checklist, 7 FFM, 3-point checklist etc. Pattern analysis was, historically, the first diagnostic procedure suggested for dermoscopy, meaning the qualitative assessment of the numerous dermoscopic criteria within a lesion detectable by an expert. The other dermoscopic algorithms are proposed for the evaluation of PSLs in daily clinical practice. With each method the morphologic diagnosis of PSL is based on particular dermoscopic criteria. Two of these algorithms, ABCD rule and 7-point checklist, are mostly used, because of their simplicity for using by less experienced physicians (not only by dermoscopic experts), as well as new 3-point-checklist.

- **ABCD rule**, a semiquantitative score system, introduced by Stolz and coworkers (33) is based on four criteria: **A**ssymetry (of colors and structures) - in 0, 1 or 2 axes (score 0-2); **B**order - abrupt ending of pigment pattern at the periphery in 0-8 segments (score 0-8); **C**olor - presence of up to 6 colors - white, red, light brown, dark brown, blue-gray and black (score 0-6), and **D**ermoscopic structures - presence of network, homogenous areas, branched streaks, dots and globules (score 0-5). Each criterion has its own score and it has to be multiplied by a given weight factor yielding a total dermoscopy score (TDS). TDS values less than 4.75 indicate a benign melanocytic lesion, values between 4.8 and 5.45 indicate a suspicious lesion and values greater than 5.45 are highly suspicious for melanoma. ABCD rule has recently obtained another important role - possibility to provide some useful information for the preoperative assessment of melanoma thickness greater than 0.75 mm (34).

- **7-point checklist**, based on the pattern analysis is introduced by Argenziano et coworkers

(35). It has seven criteria, divided into major and minor criteria, according to the odd ratios calculated by multivariate analysis of 342 PSLs. *Major criteria* are: Atypical pigment network, Blue-whitish veil and Atypical vascular pattern and each of them has score two. *Minor criteria* are: irregular streaks, irregular pigmentation, irregular dots and globules, and regression structures, all with score one. By simple addition of the individual scores, a minimum total score of 3 is required for the diagnosis of melanoma (Figure 3).

Nevertheless, recent data demonstrate that simplified algorithms, like ABCD rule or 7-point checklist, yield no improvement in diagnostic accuracy in melanoma detection compared with classic pattern analysis, when taught to previously untrained physicians (36). But, for experienced dermoscopist, with any algorithm chosen, dermoscopy opens up a world of colors and structures that cannot be seen with the naked eye. These extra criteria should be put together with the patient's personal and family history plus the history and clinical appearance of a lesion before a decision for or against excision is made (37).

Dermoscopy in future

Dermoscopy is still a new, unexplored field with permanent progression. In the future, with its development, the management of PSLs will be changed in better way, as well as an observation of some other dermatoses. It will be possible by the help of technical development. There is a need for better standardization of diagnostic criteria and methods and for this reason many conferences and virtual Consensus Net Meetings make such attempts. Several research groups

work to make the diagnostic criteria more precise and adaptable for common physician's using. Many courses were organized for dermatologists with special interest for effective management of PSLs. There are some ongoing Internet studies with participation of experts from all over the world. In many dermatology magazines, there are more and more dermoscopy references. Some books from this scientific field written by famous experts have been published in recent years. Due to above cited facts, it is clear that dermoscopy in future will take the prominent place in medical practice. In the future, this method could probably find its place even in potential application in other clinical diagnoses, for example, in examination of other accessible surface lesions on anatomical structures such as rectum, stomach, or trachea.

Conclusion

Dermoscopy has opened a new page in the examination of PSLs and, especially in the early identification of cutaneous melanoma. Looking for specific dermoscopy features not seen with the naked eye allows increased diagnostic accuracy of melanoma and benign moles, as well as of non-melanocytic lesions. With new possibilities offered by digital instruments for follow-up examination, teledermoscopy and computer-aided diagnosis, this method changes the vision of pigmented skin tumors and help us to make an earlier diagnosis of melanoma. Early diagnosis is essential in order to make the melanoma curable. For this reason, dermoscopy is the first violin in the fight against melanoma. But it has to grease its strings very well to be effective in that struggle!

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DERMOSKOPIJA – NOVO EFIKASNO SREDSTVO ZA TAČNIJU DIJAGNOSTIKU PIGMENTNIH KOŽNIH LEZIJA

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Dermoskopiya je *in vivo* neinvazivna metoda za tačniju dijagnostiku pigmentnih kožnih lezija (PKL). Ona povezuje kliničku dermatologiju i dermatopatologiju omogućavajući vizuelizaciju morfoloških struktura, nevidljivih golim okom. Rano otkrivanje "tankih" melanoma je ostvarljivo korišćenjem ove procedure. Pokazano je da, uz trening i solidno iskustvo, dermoskopiya značajno poboljšava kliničku dijagnozu PKL, sa 10-27% uspešnijom dijagnozom melanoma u poređenju sa samim kliničkim pregledom. Postoje mnoge varijante dermoskopa, ali je za sve zajednička osnovna karakteristika – redukcija odbijanja svetlosti, što omogućava da stratum corneum postane translucentan, a to omogućava da se vide i dublji slojevi kože - epidermis, dermo-epidermalna granica i gornji delovi dermisa. Digitalna dermoskopiya ima mnoge prednosti u odnosu na ne-digitalnu, na primer, periodično praćenje lezije. Mnogi autori širom sveta korišćenjem "teledermoskopije" se udružuju da bi ostvarili multicentrične studije za razvoj novih dijagnostičkih algoritмова, za skupljanje dermoskopskih slika, kao i za kompjuter-pomažuću dijagnostiku PKL. Sve dermoskopske metode su klasifikovane u dve grupe: Prvi korak - algoritam za razlikovanje melanocitnih od nemelanocitnih lezija i Drugi korak – algoritam za razlikovanje benignih melanocitnih lezija od melanoma. Zbog njihove jednostavnosti za korišćenje i od strane manje iskusnih lekara, dva algoritma, ABCD pravilo i Provera 7 kriterijuma, su najšire korišćeni. Dermoskopiya će u budućnosti zauzeti značajno mesto u medicinskoj praksi, između ostalog i zbog povećanja potrebe za ranim prepoznavanjem melanoma. *Acta Medica Medianae 2006;45(2):59-64.*

Ključne reči: dermoskopiya, dijagnoza, pigmentne kožne lezije