Dermoscopy of pigmented skin lesions

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Dermoscopy is an in vivo method for the early diagnosis of malignant melanoma and the differential diagnosis of pigmented lesions of the skin. It has been shown to increase diagnostic accuracy over clinical visual inspection in the hands of experienced physicians. This article is a review of the principles of dermoscopy as well as recent technological developments. (J Am Acad Dermatol 2005;52:109-21.)

In the last two decades a rising incidence of malignant melanoma has been observed.1-7 Because of a lack of adequate therapies for metastatic melanoma, the best treatment currently is still early diagnosis and prompt surgical excision of the primary cancer.5,7 Dermoscopy (also known as epiluminescence microscopy, dermatoscopy, and amplified surface microscopy) is an in vivo method, that has been reported to be a useful tool for the early recognition of malignant melanoma.8-11 The performance of dermoscopy has been investigated by many authors. Its use increases diagnostic accuracy between 5% and 30% over clinical visual inspection, depending on the type of skin lesion and experience of the physician.12-16 This was confirmed by recent evidence-based publications and based on a meta-analysis of the literature.17,18 This article is a review of the principles of dermoscopy as well as recent technological developments.

HISTORY OF DERMOSCOPY

Skin surface microscopy started in 1663 with Kolhaus who investigated the small vessels in the nailfold with the help of a microscope.11,19 In 1878, Abbe described the use of immersion oil in light microscopy20 and this principle was transferred to skin surface microscopy by the German dermatologist, Unna, in 1893.21 He introduced the term “diascopy” and described the use of immersion oil and a glass spatula for the interpretation of lichen planus and for the evaluation of the infiltrate in lupus erythematosus. The term “dermatoscopy” was introduced in 1920 by the German dermatologist Johann Saphier who published a series of communications using a new diagnostic tool resembling a binocular microscope with a built-in light source for the examination of the skin.22-25 He used this new tool in various indications and did some interesting morphological observations on anatomical structures of the skin which indicated the high performance of his equipment. Skin surface microscopy was further developed in the United States by Goldman in the 1950s. He published a series of interesting articles on new devices on what he called “Dermoscopy.”26-29 He was the first dermatologist to use this new technique for the evaluation of pigmented skin lesions. In 1971, Rona MacKie30 clearly identified, for the first time, the advantage of surface microscopy for the improvement of preoperative diagnosis of pigmented skin lesions and for the differential diagnosis of benign versus malignant lesions. These investigations were continued mainly in Europe by several Austrian and German groups. The first Consensus Conference on Skin Surface Microscopy was held in 1989 in Hamburg31 and the Consensus Netmeeting on Dermoscopy, which was held in 2001 in Rome32 (http://www.dermoscopy.org), was the first international meeting of its kind. Today dermoscopy has become a routine technique in Europe and is gaining acceptance in other countries.
PHYSICAL ASPECTS

Light is either reflected, dispersed, or absorbed by the stratum corneum because of its refraction index and its optical density, which is different from air. Thus, deeper underlying structures cannot be adequately visualized. However, when various immersion liquids are used, they render the skin surface translucent and reduce the reflection, so that underlying structures are readily visible. The application of a glass plate flattens the skin surface and provides an even surface. Optical magnification is used for examination. Taken together, these optical means allow the visualization of certain epidermal, dermo-epidermal, and dermal structures.

MATERIAL FOR DERMOSCOPY

Dermoscopy requires optical magnification and liquid immersion. This can be performed with very simple, inexpensive equipment. Specially designed handheld devices with 10 to 20 times magnification are commercially available (Dermatoscope [Heine AG]; DermoGenius Basic [Rodenstock Präzisionsoptik]; Episcope [Welch-Allyn]; DermLite [3Gen, LLC]). Photographic documentation can be performed with a dermoscopic attachment to a standard camera (Dermaphot, Heine, AG) which can be used also with some digital cameras. Most recently, digital cameras have been designed that are attached to computers. This allows easy storage, retrieval, and follow-up of pigmented skin lesions. For dermatologists with less experience in dermoscopy, some of the systems may offer the possibility of computer-assisted diagnosis for malignant melanoma or for consulting an expert through telemedicine.

DERMOSCOPIC CRITERIA

Colors

The use of dermoscopy allows the identification of many different structures and colors, not seen by the naked eye.

Colors play an important role in dermoscopy. Common colors are light brown, dark brown, black, blue, blue-gray, red, yellow, and white. The most important chromophore in melanocytic neoplasms is melanin. The color of melanin essentially depends on its localization in the skin. The color black is due to melanin located in the stratum corneum and the upper epidermis, light to dark brown in the epidermis, and steel-blue in the reticular dermis. The color blue occurs when there is melanin localized within the deeper parts of the skin because the portions of visible light with shorter wavelengths (blue-violet end of spectrum) are more dispersed than portions with longer wavelengths (red end of visible spectrum). The color red is associated with an increased number or dilatation of blood vessels, trauma, or neovascularization. The color white is often caused by regression and/or scarring.

Dermoscopic structures

In this context we will use the nomenclature as proposed by the recent Consensus Netmeeting (held in Rome in 2001) with some revisions:

**Pigment network.** The pigment network is a grid-like (honeycomb-like) network consisting of pigmented “lines” and hypopigmented “holes.” The anatomic basis of the

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**Table I. Vascular architecture of pigmented skin lesions according to Kreusch and Koch**

<table>
<thead>
<tr>
<th>Morphological aspect</th>
<th>Type of pathology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree-like vessels</td>
<td>Pigmented BCC of any type (discrete in superficial BCCs)</td>
</tr>
<tr>
<td>Corona vessels</td>
<td>Sebaceous gland hyperplasia</td>
</tr>
<tr>
<td>Comma-shaped vessels</td>
<td>Dermal nevi</td>
</tr>
<tr>
<td>Point vessels</td>
<td>Thin malignant melanomas</td>
</tr>
<tr>
<td>Hairpin vessels</td>
<td>Dermal nevi</td>
</tr>
</tbody>
</table>

BCC, Basal cell carcinoma; SCC, squamous cell carcinoma.
pigment network is either melanin pigment in keratinocytes, or in melanocytes along the dermoepidermal junction. The reticulation (network) represents the rete ridge pattern of the epidermis. The relatively hypomelanotic holes in the network correspond to tips of the dermal papillae and the overlying suprapapillary plates of the epidermis.

The pigment network can be either typical or atypical. A typical network is relatively uniform, regularly meshed, homogeneous in color, and usually thinning out at the periphery. An atypical network is nonuniform, with darker and/or broadened lines and “holes” that are heterogeneous in area and shape. The lines are often hyperpigmented and may end abruptly at the periphery.

If the rete ridges are short or less pigmented, the pigment network may not be visible. Areas devoid of any network (but without signs of regression) are called “structureless areas.”

**Dots.** Dots are small, round structures less than 0.1 mm in diameter, which may be black, brown, gray, or blue-gray. Black dots are caused by pigment accumulation in the stratum corneum and in the upper part of the epidermis. Brown dots represent focal melanin accumulations at the dermoepidermal junction. Gray-blue granules (peppered) are caused by tiny melanin structures in the papillary dermis. Gray-blue or blue granules are due to loose melanin, fine melanin particles or melanin “dust” in melanophages or free in the deep papillary or reticular dermis.

**Globules.** Globules are symmetrical, round to oval, well-demarcated structures that may be brown, black, or red. They have a diameter which is usually larger than 0.1 mm and correspond to nests of pigmented benign or malignant melanocytes, clumps of melanin, and/or melanophages situated usually in the lower epidermis, at the dermoepidermal junction, or in the papillary dermis.

Both dots and globules may occur in benign as well as in malignant melanocytic proliferations. In benign lesions, they are rather regular in size and shape and quite evenly distributed (frequently in the center of a lesion). In melanomas they tend to vary in size and shape and are frequently found in the periphery of lesions.

**Branched streaks.** Branched streaks are an expression of an altered pigmented network in which the network becomes disrupted or broken up. Their pathological correlations are remnants of pigmented rete ridges and bridging nests of melanocytic cells within the epidermis and papillary dermis.

**Radial streaming.** Radial streaming appears as radially and asymmetrically arranged, parallel linear extensions at the periphery of a lesion. Histologically, they represent confluent pigmented junctional nests of pigmented melanocytes.

**Pseudopods.** Pseudopods represent fingerlike projections of dark pigment (brown to black) at the periphery of the lesion. They may have small knobs at their tips, and are either connected to the pigment network or directly connected to the tumor body. They correspond as well to intraepidermal or junctional confluent radial nests of melanocytes. Menzies et al found pseudopods to be one of the most specific features of superficial spreading melanoma.

**Streaks.** “Streaks” is a term used by some authors interchangeably with radial streaming or
Fig 3. A, Macroscopic picture of a superficial spreading malignant melanoma (Breslow thickness 0.52 mm; Clark level II). B, Dermoscopy of A shows (atypical) pigment network and branched streaks and can therefore be considered a melanocytic lesion.

Fig 4. A, Macroscopic picture of a blue nevus. B, Dermoscopy of A shows steel-blue areas (no pigment network, no aggregated globules, no branched streaks).

Fig 5. A, Macroscopic picture of a seborrheic keratosis. B, Dermoscopy of A shows comedo-like openings (a), multiple milia-like cysts (b), and fissures (c).

Fig 6. A, Macroscopic picture of a seborrheic keratosis. B, Dermoscopy of A shows comedo-like openings and multiple milia-like cysts.
pseudopods. This is because both these structures have the same histopathological correlation.\textsuperscript{11,37,42,46} Streaks can be irregular, when they are unevenly distributed (malignant melanoma), or regular (symmetrical radial arrangement over the entire lesion). The latter is particularly found in the pigmented spindle cell nevi (Reed’s nevi).\textsuperscript{51-53}

**Structureless areas.** Structureless areas represent areas devoid of any discernible structures (eg, globules, network). They tend to be hypopigmented, which is due to the absence of pigment or diminution of pigment intensity within a pigmented skin lesion.\textsuperscript{11}

**Blotches.** A blotch (also called black lamella by some authors) is caused by a large concentration of melanin pigment localized throughout the epidermis and/or dermis visually obscuring the underlying structures.\textsuperscript{41-43,46}

**Regression pattern.** Regression appears as white scar-like depigmentation (lighter than the surrounding skin) or “peppering” (speckled multiple blue-gray granules within a hypopigmented area). Histologically, regression shows fibrosis, loss of pigmentation, epidermal thinning, effacement of the rete ridges, and melanin granules free in the dermis or in melanophages scattered in the papillary dermis.\textsuperscript{53,46}

**Blue-white veil.** Blue-white veil is an irregular, indistinct, confluent blue pigmentation with an overlying white, ground-glass haze.\textsuperscript{13,32} The pigmentation cannot occupy the entire lesion.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{image1.png}
\caption{A, Macroscopic picture of a basal cell carcinoma. B, Dermoscopy of A shows multiple spoke wheel areas.}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{image2.png}
\caption{A, Macroscopic picture of an angioma. B, Dermoscopy of A shows red lagoons.}
\end{figure}
Histopathologically this corresponds to an aggregation of heavily pigmented cells or melanin in the dermis (blue color) in combination with a compact orthokeratosis.13,32,36,43,46,54

**Vascular pattern.** Pigmented skin lesions may have dermoscopically visible vascular patterns, which include “comma vessels,” “point vessels,” “tree-like vessels,” “wreath-like vessels,” and “hairpin-like vessels” (Table I).55-57 Atypical vascular patterns may include linear, dotted, or globular red structures irregularly distributed within the lesion.32,36,58,59 Some of the vascular patterns may be caused by neovascularization. For the evaluation of vascular patterns, there has to be as little pressure as possible on the lesion during examination because otherwise the vessels are simply compressed and will not be visible. The use of ultrasound gel for immersion helps to reduce the pressure necessary for the best evaluation of the skin lesion.57

**Milia-like cysts.** Milia-like cysts are round whitish or yellowish structures which are mainly seen in seborrheic keratoses.8 They correspond to intraepidermal keratin-filled cysts and may also be seen in congenital nevi as well as in some papillomatous melanocytic nevi. At times, milia-like cysts are pigmented, and thus, can resemble globules.

*References 8, 11, 13, 32, 36, 37, 49, 55, 60-63.

**Comedo-like openings (crypts, pseudofollicular openings).** Comedo-like openings (with “blackhead-like plugs”) are mainly seen in seborrhic keratoses or in some rare cases in papillomatous melanocytic nevi.1 The keratin-filled invaginations of the epidermis correspond to the comedo-like structures histopathologically.

†References 8, 11, 13, 32, 36, 37, 49, 55, 60-64.

**Fissures and ridges (“brain-like appearance”).** Fissures are irregular, linear keratin-filled depressions, commonly seen in seborrheic keratoses.63 They may also be seen in melanocytic nevi with congenital patterns and in some dermal melanocytic nevi. Multiple fissures might give a “brain-like appearance” to the lesion.32,36,63,65 This pattern has also been named “gyri and sulci” or “mountain and valley pattern” by some authors.11

**Fingerprint-like structures.** Some flat seborrhic keratoses (also known as solar lentigines) can show tiny ridges running parallel and producing a pattern that resembles fingerprints.11,32,65,66

**Moth-eaten border.** Some flat seborrhic keratoses (mainly on the face) have a concave border so that the pigment ends with a curved structure, which has been compared to a moth-eaten garment.11,13,32,63,65,66

**Leaf-like areas.** Leaf-like areas (maple leaf-like areas) are seen as brown to gray-blue discrete bulbous blobs, sometimes forming a leaf-like pattern.9 Their distribution reminds one of the shape of finger pads. In absence of a pigment network, they are suggestive of pigmented basal cell carcinoma.11,32,67

‡References 8, 9, 11, 13, 32, 36, 37, 39, 55, 65, 67, 68.

**Spoke wheel–like structures.** Spoke wheel–like structures are well-circumscribed, brown to gray-blue-brown, radial projections meeting at a darker brown central hub.11,32,67 In the absence of a pigment network, they are highly suggestive of basal cell carcinoma.

Table II. Pattern analysis according to Pehamberger et al39 (modified)

<table>
<thead>
<tr>
<th>Lentigo simplex</th>
<th>Junctional nevus</th>
<th>Compound nevus</th>
<th>Dermal nevus</th>
<th>Blue nevus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular pigment network without interruptions</td>
<td>Regular pigment network without interruptions</td>
<td>Regular pigment network without interruptions</td>
<td>No criteria for melanocytic lesion</td>
<td>Steel-blue areas</td>
</tr>
<tr>
<td>Regular border, thins out at periphery</td>
<td>Regular border, thins out at periphery</td>
<td>Regular border, thins out at periphery</td>
<td>No pigment network</td>
<td>No pigment network</td>
</tr>
<tr>
<td>Black dots over grids of pigment network</td>
<td>Heterogeneous holes of pigment network</td>
<td>Heterogeneous holes of pigment network</td>
<td>Brown globules</td>
<td>Ill-defined</td>
</tr>
<tr>
<td>Brown-black globules at center of the lesion</td>
<td>Brown globules</td>
<td>Brown globules</td>
<td>Homogeneous colors</td>
<td>White veils possible</td>
</tr>
<tr>
<td>Homogeneous colors</td>
<td>Homogeneous colors</td>
<td>Symmetric papular appearance</td>
<td>&quot;Pseudonetwork&quot;</td>
<td>No pseudonetwork</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All criteria for melanocytic lesion possible</td>
<td>&quot;Comma&quot;-shaped blood vessels</td>
<td></td>
</tr>
</tbody>
</table>

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Large blue-gray ovoid nests. Ovoid nests are large, well-circumscribed, confluent or near-confluent, pigmented ovoid areas, larger than globules, and not intimately connected to a pigmented tumor body.\textsuperscript{11,32,67} When a network is absent, ovoid nests are highly suggestive of basal cell carcinoma.

Multiple blue-gray globules. Multiple blue-gray globules are round, well-circumscribed structures that are, in the absence of a pigment network, highly suggestive of basal cell carcinoma.\textsuperscript{11,32,67} They have to be differentiated from multiple blue-gray dots (which correspond to melanophages and melanin dust).
DIFFERENTIAL DIAGNOSIS OF PIGMENTED LESIONS OF THE SKIN

There are many publications on the subject of the differential diagnosis of pigmented lesions of the skin. The 5 algorithms most commonly used are pattern analysis,8,39,62 the ABCD rule of dermoscopy,11,45,70 the 7-point checklist,32,36,44 the Menzies method,13,32,49 and the revised pattern analysis.71

The Board of the Consensus Netmeeting agreed on a two-step procedure for the classification of pigmented lesions of the skin (Fig 1). A similar approach has been proposed by other authors in the past.

The first step is the differentiation between a melanocytic and a nonmelanocytic lesion. For this decision, the algorithm in Fig 2 is used. Are aggregated globules, pigment network, branched streaks (Fig 3), homogeneous blue pigmentation (blue nevus: Fig 4), or a parallel pattern (palms, soles, and mucosa) visible? If this is the case, the lesion should be considered as a melanocytic lesion (Fig 3). If not, the lesion should be evaluated for the presence of comedo-like plugs, multiple milia-like cysts, and comedo-like openings, irregular crypts, light brown fingerprint-like structures, or “fissures and ridges” (brain-like appearance) pattern. If so, the lesion is suggestive of a seborrhoeic keratosis (Figs 5 and 6). If not, the lesion has to be evaluated for the presence of comedo-like plugs, multiple milia-like cysts, and comedo-like openings, irregular crypts, light brown fingerprint-like structures, or “fissures and ridges” (brain-like appearance) pattern. If so, the lesion is suggestive of a seborrhoeic keratosis (Figs 5 and 6).

Once the lesion is identified to be of melanocytic origin, the decision has to be made if the melanocytic lesion is benign, suspect, or malignant. To accomplish this, 4 different approaches are the most commonly used.

Pattern analysis (Pehamberger et al)
Pattern recognition has historically been used by clinicians and histopathologists to differentiate benign lesions from malignant neoplasms. A similar process has been found useful with dermoscopy, and has been termed “pattern analysis.” It allows distinction between benign and malignant growth features. It was described by Pehamberger and colleagues based on the analysis of more than 7000 pigmented skin lesions.8,39,62 Table II shows the typical patterns of some common, pigmented skin lesions using pattern analysis.

ABCD rule of dermoscopy (Stolz et al)
The ABCD rule of dermoscopy, described by Stolz et al in 1993 was based on an analysis of 157 pigmented skin lesions.11,70 The complete ABCD rule is explained in Table III.

For the evaluation of asymmetry, the lesion is divided into 4 segments (2 perpendicular axes). The axes are oriented so that the lowest asymmetry is obtained. For asymmetry in both axes, a value of 2 is obtained. To calculate the subscore, the value of each ABCD category has to be multiplied by the corresponding weight factor. To obtain the total score value, the different ABCD subscores have to be added.

The total score ranges from 1 to 8.9. A lesion with a total score greater than 5.45 should be considered as melanoma. A lesion with a total score of 4.75 or less can be considered as benign. A lesion with a score value between 4.75 and 5.45 should be
considered “suspicious” and should therefore be monitored closely or removed.\textsuperscript{11,70}

\textbf{7-point checklist}

In 1998 Argenziano and colleagues described a 7-point checklist based on the analysis of 342 pigmented skin lesions.\textsuperscript{32,36,44} They distinguish 3 major criteria and 4 minor criteria (Table IV). Each major criterion has a score of 2 points while each minor criterion has a score of 1 point. A minimum total score of 3 is required for the diagnosis of malignant melanoma.

\textbf{Menzies method}

In the Menzies method\textsuperscript{13,32,49} for diagnosing melanoma, both of the following negative features must not be found: a single color (tan, dark brown, gray, black, blue, and red, but white is not considered) and “point and axial symmetry of pigmentation” (refers to pattern symmetry around any axis through the center of the lesion). This does not require the lesion to have symmetry of shape. Additionally, at least one positive feature must be found (Table V).

\textbf{Exceptions to the algorithms}

The ABCD rule is not applicable for pigmented lesions on the palms, soles, or face.\textsuperscript{11} Palms and soles have a particular anatomy which is characterized by marked orthokeratosis and the presence of sulci and gyri. The sweat ducts join the surface at the summits of the gyri.\textsuperscript{31,52} A classification of 10 different dermoscopy patterns on the palms and soles has been proposed by Saida et al.\textsuperscript{72}

The face has a very particular anatomic architecture especially concerning the dermoepidermal junction where rete ridges are shorter. That is why facial lesions often do not exhibit a regular pigment network. Dermoscopy shows a broadened pigment reticulation which is called a “pseudonetwork.” This does not correspond to the projection of pigmented rete ridges. It is due to a homogeneous pigmentation which is interrupted by the surface openings of the adnexal structures.\textsuperscript{11,66,73}

The differential diagnosis of a pseudonetwork is solar lentigo, seborrheic keratosis, lentigo simplex, melanoma in situ, lichen planus–like keratosis, and pigmented actinic keratosis.\textsuperscript{11,66,73} These lesions are often difficult to distinguish dermoscopically. However, when there are multiple colors and a broadened, thickened, and irregular “pseudonetwork,” melanoma is often the diagnosis suggested. Other, more specific characteristics include an “annular granular” or “rhomboidal pattern.”\textsuperscript{11,66,73}

\textbf{Revised pattern analysis}

The overall general appearance of color, architectural order, symmetry of pattern, and homogeneity (CASH) are important components in distinguishing these two groups. Benign melanocytic lesions tend to have few colors, architectural order, symmetry of pattern, or homogeneity. Malignant melanoma often has many colors and much architectural disorder, asymmetry of pattern, and heterogeneity.

\textit{The reticular pattern} or network pattern is the most common global feature in melanocytic lesions. This pattern represents the junctional component

\begin{table}
\centering
\caption{Pattern of benign and malignant lesions}
\begin{tabular}{llll}
\hline
 & Benign & Malignant \\
\hline
Dots & Centrally located or situated right on the network & Unevenly distributed and scattered focally at the periphery \\
Globules & Uniform in size, shape, and color, symmetrically located at the periphery, centrally located, or uniform throughout the lesion as in a cobblestone pattern & Globules that are unevenly distributed and when reddish are highly suggestive of melanoma \\
Streaks & Radial streaming or pseudopods tend to be symmetrical and uniform at the periphery & Radial streaming or pseudopods tend to be focal and irregular at periphery \\
Blue-white veil & Tends to be centrally located & Tends to be asymmetrically located or diffuse almost over entire lesion \\
Blotch & Centrally located or may be diffuse hyperpigmented area that extends almost to periphery of the lesion & Asymmetrically located or there are often multiple asymmetrical blotches \\
Network & Typical network that consists of light to dark uniform pigmented lines and hypopigmented holes & Atypical network that may be nonuniform with black/brown or gray thickened lines and holes of different sizes and shapes \\
Network borders & Either fades into the periphery or is symmetrically sharp & Focally sharp \\
\hline
\end{tabular}
\end{table}
of a melanocytic nevus (Clark nevus, dysplastic nevus).32,36,71

Another pattern is the so-called **globular pattern**. It is characterized by the presence of numerous “aggregated globules.” This pattern is commonly seen in a congenital nevus, superficial type.32,36,71

The **cobblestone pattern** is very similar to the globular pattern but is composed of closer aggregated globules, which are somehow angulated, resembling cobblestones.

The **homogeneous pattern** appears as diffuse pigmentation, which might be brown, gray-blue, gray-black, or reddish black.32,36,71 No pigment network or any other distinctive dermoscopy structure is found. An example is the homogeneous steel-blue color seen in blue nevi.

The so-called **starburst pattern** is characterized by the presence of streaks in a radial arrangement, which is visible at the periphery of the lesion.32,36,71 This pattern is commonly seen in Reed nevi or Spitz nevi.

The **parallel pattern** is exclusively found on the palms and soles due to the particular anatomy of these areas.32,36,71

The combination of 3 or more distinctive dermoscopic structures (ie, network, dots, and globules as well diffuse areas of hyperpigmentation and hypopigmentation) within a given lesion is called **multi-component pattern**. This pattern is highly suggestive of melanoma, but might be observed in some cases in acquired melanocytic nevi and congenital nevi.

The term “lesions with indeterminate patterns” are dermoscopic patterns that can be seen in both benign and malignant pigmented lesions. Clinically and dermoscopically, one cannot make a distinction between whether they are melanomas or atypical nevi.

In addition to the global features already mentioned, the local features (dermoscopic structures such as the pigment network, dots, and globules, etc) are important to evaluate melanocytic lesions (Table VI).

**PERSPECTIVES**

Because computer hardware has become user-friendly and more affordable, digital dermoscopy will become more integrated into the clinical setting. The currently available digital dermoscopic systems already have an acceptable picture quality which comes close to a photograph.74 Digital images offer the possibility of computer storage and retrieval of dermoscopic images and patient data.48,75-76 Some systems even offer the potential of “computer-assisted diagnosis.”79-94 Because diagnostic accuracy with dermoscopy has been shown to depend on the experience of the dermatologist, such objective systems might help less-experienced dermatologists in the future.

Another expanding field is teledermoscopy. At the beginning of the digital dermoscopic era, teledermoscopy was used between experts to exchange difficult or interesting images. The development of new electronic media and the evolution of the Internet will have an important impact as the infrastructure becomes available to almost everyone, and the exchange is now easy to perform. Recent studies were able to show the feasibility and importance of teledermoscopy.35-38 This was recently used in a Consensus Netmeeting on Dermoscopy held in Rome during the first World57,69 Congress on Dermoscopy (http://www.dermoscopy.org).32

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**REFERENCES**


ADDITIONAL READING


