Overview of dermoscopy

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INTRODUCTION — Dermoscopy is a noninvasive, in vivo technique primarily used for the examination of pigmented skin lesions; however, it can also assist observers in assessing many amelanotic lesions. Dermatoscopy, epiluminescence microscopy, incident light microscopy, and skin-surface microscopy are synonyms.

Dermoscopy is performed with a handheld instrument called a dermatoscope. The procedure allows the visualization of subsurface skin structures in the epidermis, dermoepidermal junction, and upper dermis; these structures are usually not visible to the naked eye [1-3]. The dermoscopic images may be photographed or recorded digitally for storage or sequential analysis.

The basic principles of dermoscopy will be discussed in this topic. The dermoscopic diagnosis of skin lesions, including those in special anatomic areas, dermoscopy of nail pigmentations, and algorithms used for skin cancer triage are discussed separately.

(See "Dermoscopic evaluation of skin lesions".)

(See "Dermoscopy of pigmented lesions of the palms and soles".)

(See "Dermoscopy of facial lesions".)

(See "Dermoscopy of mucosal lesions".)

(See "Dermoscopy of nail pigmentations".)

(See "Dermoscopic algorithms for skin cancer triage".)

DERMOSCOPY PHYSICS — Natural light is reflected, scattered, or absorbed by objects. Under normal conditions, most of the light is reflected by the skin surface because of the higher refractive index (RI) of the stratum corneum (1.55) compared with that of the air (1.0).

Reduction of the skin surface reflection allows the visualization of deeper epidermal and dermal structures. This reduction can be achieved by attaching a glass plate (RI: 1.52) to the stratum corneum (RI: 1.55) using an RI matched immersion fluid as an interface or by using polarizing filters [4-6].

Several immersion fluids have been used, including water, alcohols (ethanol and isopropanol), oils (mineral oil, immersion oil, and olive oil), and water-soluble gels (ultrasound gel, cosmetic gels). Alcohols (in particular ethanol 70%) are the preferred immersion liquid due to their low viscosity, amphiphilic properties (ie, both water and lipid soluble), disinfectant capabilities, and image clarity. However, on some specific sites such as the mucosae and areas around the eyes and nails, water-soluble gels are preferred over alcohol since they are noncaustic and have higher viscosity [5].

Alternatively, reduction of the skin surface reflection can be obtained by using polarized light [7]. Polarized light dermoscopy utilizes two orthogonal filters in a process called cross-polarization (figure 1). After reaching the skin surface, part of the polarized light is reflected by the stratum corneum maintaining its polarization,
whereas part enters the skin and is scattered back from the deeper layers, losing its polarization. The light reflected by the skin surface, responsible for the glare of the skin, is blocked by the cross-polarized filter, since this light maintains its polarization. The backscattered light from the deeper layers passes through the cross-polarized filter since some of the polarized light has lost its angle of polarization. This makes the subsurface structures visible to the eye [6-8].

**TYPES OF DERMATOSCOPES** — Dermatoscopes consist of a transilluminating light source and magnifying optics. The most commonly used dermatoscopes have a 10-fold magnification [3].

Three types of dermatoscopes are available:

- Nonpolarized light, contact
- Polarized light, contact
- Polarized light, noncontact

Noncontact dermoscopy can only be performed using polarized light. Although nonpolarized and polarized light dermoscopy are not equivalent, they provide complementary information (table 1) [4,6,8,9]. For example, epidermal structures, such as comedo-like openings in seborrheic keratoses, are more conspicuous with nonpolarized dermoscopy, whereas blood vessels, red color areas, white areas, or white shiny streaks are better visualized with polarized light dermoscopy [4,6,10]. Structures visible in one mode and not in the other will blink when viewed with dermatoscopes that can toggle between polarized and nonpolarized light [11].

**COLORS AND STRUCTURES** — The visualization of colors and structures in the epidermis and papillary dermis has generated a new terminology for the morphologic description of skin lesions [12]. A histologic correlation has been established for most of the structures seen under dermoscopy [13,14].

**Colors** — The colors seen by dermoscopy include yellow, red, brown, blue, gray, black, and white (figure 2D) [15,16]. Melanin is the most important chromophore in pigmented lesions. The color of melanin depends upon its concentration and its localization in the skin: it usually appears black in the stratum corneum, brown in the epidermis and superficial dermis, and gray/blue to blue in the dermis. The red color is determined by vascularity; a thrombus will appear black. The white color is associated with collagen/fibrosis as seen in regression or scarring, the yellow with keratin.

**Structures** — The structures visualized in skin lesions are determined by the distribution and amount of pigment, keratin, collagen, and vascularity [9,12,15,17-19].

- The pigment network, negative network, streaks, aggregated or peripheral rim of globules, and homogeneous blue pigmentation are the hallmark of melanocytic lesions (picture 1A-C).
- Arborizing vessels, leaf-like structures, spoke-wheel-like/concentric structures, large blue/gray ovoid nests, multiple blue/gray non-aggregated globules, shiny white blotches and strands, and shallow ulceration are features of basal cell carcinomas (picture 2).
- Milia-like cysts, comedo-like openings, finger print-like structures, moth-eaten borders, gyri and sulci, and sharp demarcation are characteristic of seborrheic keratoses (picture 3). Red or blue/purple/black lagoons are seen in cherry angiomas or angiokeratomas (picture 4). (See "Dermoscopic evaluation of skin lesions", section on 'First step: Melanocytic versus nonmelanocytic'.)
- Atypical pigment network, blue-white veil, atypical vascular pattern, irregular streaks, atypical dots or globules, angulated lines creating a zigzag pattern or polygons, and regression structures are some of the features associated with melanoma (picture 5A-C). (See "Dermoscopic evaluation of skin lesions", section on 'Second step: Nevus versus suspicious lesion or melanoma'.)

A detailed description of the dermoscopic structures visualized in melanocytic and nonmelanocytic lesions and their histologic correlates is provided in the figures (figure 2A-C).
The diagnostic criteria for benign and malignant melanocytic and nonmelanocytic skin lesions are discussed separately. (See "Dermoscopic evaluation of skin lesions").

**Vascular structures** — In amelanotic and hypomelanotic lesions, the vascular structures may provide the only clues to the diagnosis. In pigmented lesions, the vascular morphology provides additional clues to the diagnosis [20,21].

Noncontact polarized light is the preferred type of dermatoscope for the visualization of blood vessels. However, if a contact dermatoscope is utilized, an ultrasound gel should be used as a liquid interface since the gel acts as a cushion and reduces the pressure applied to the skin, preventing the blanching of the vessels.

The dermoscopic evaluation of vascular structures includes morphology (hairpin, glomerular, or arborizing), distribution (focal, diffuse, central, or peripheral), arrangement (crown, in a string, clustered, or radial), and presence of a white or pink halo.

Melanocytic tumors may exhibit distinctive vascular morphologies, including comma, dotted, linear-irregular (also known as serpentine), and corkscrew (also known as tortuous) vessels (table 2A) [20,22,23].

Nonmelanocytic lesions commonly present a variety of vascular morphologies, including glomerular, hairpin, or arborizing vessels (table 2B) [18,20,23-26]. Glomerular vessels are most commonly associated with Bowenoid actinic keratosis, Bowen disease, squamous cell carcinoma, and clear cell acanthoma. Hairpin vessels with a white halo are typically seen in seborrheic keratoses and keratoacanthoma.

It is important to be aware that a given vessel morphology may not be exclusive to a particular type of lesion. For example, dotted vessels can be seen in melanocytic tumors, squamous cell carcinoma, basal cell carcinoma, porokeratosis, clear cell acanthoma, and psoriasis [22,25-28]. Polymorphous vessels are typically associated with melanoma, but can also be seen in basal cell carcinoma (BCC) [25]. Arborizing vessels are commonly seen in BCC, but they can also be seen in melanoma and intradermal nevi. Hairpin vessels are commonly associated with seborrheic keratoses, although they can also be seen in melanoma. Despite this overlap, the positive predictive value for a given vessel morphology can guide the clinician to the correct diagnosis if the clinical context is carefully considered (table 2A-B). (See "Dermoscopic evaluation of skin lesions", section on 'Second step: Nevus versus suspicious lesion or melanoma'.)

**CLINICAL ROLE OF DERMOSCOPY** — The importance of dermoscopy in the in vivo diagnosis of skin lesions has been increasingly recognized, following the identification of a large set of dermoscopic features in benign and malignant lesions [15,29]. Dermoscopy is widely used in Europe and Australia and is gaining popularity in the United States. While a survey of fellows of the US American Academy of Dermatology in 2010 found that at least 40 percent used dermatoscopy in their clinical practice [30], a similar survey conducted in 2014 demonstrated that 81 percent of US dermatologists were using dermoscopy [31].

Dermoscopy requires some formal training to be effectively practiced. Online tutorials on dermoscopy can be found at www.dermnetnz.org/doctors/dermoscopy-course/introduction.html; www.dermoscopy-ids.org/index.php/education/podcasts; or www.genomel.org/dermoscopy.

Cross-sectional studies, randomized trials, and systematic reviews of dermoscopy have indicated that dermoscopic examination has a higher discriminatory power than naked-eye examination to detect melanoma either in experimental or real-life clinical settings [12,32-40]. For clinicians with at least minimal training in dermoscopy, the addition of this procedure to the clinical examination increases the accuracy of the in vivo diagnosis of skin cancer [33]. (See "Evaluating diagnostic tests").

**Diagnostic accuracy for melanoma** — A meta-analysis of nine studies performed in clinical settings reported an odds ratio for the diagnosis of melanoma of 9.0 (95% CI 1.5-54.6) for dermoscopy plus clinical examination, compared with clinical examination alone [35]. The summary sensitivity was 90 percent (95% CI 80-95) and the specificity was 90 percent (95% CI 57-98) for dermoscopy plus clinical examination; sensitivity was 71 percent (95% CI 59-82) and specificity was 81 percent (95% CI 48-95) for clinical examination alone.
Sensitivity improved without a decrease in specificity, meaning that the higher rate of melanoma detection was not associated with a concomitant increase in the number of unnecessary excisions for benign lesions.

Several factors may affect the diagnostic performance of dermoscopy:

- Experience of the examiner
- Diagnostic algorithm and threshold for a positive test
- Prevalence of melanoma in the patient population examined
- Clinical context and patient-related factors [41,42]

In a systematic review of 27 studies performed in clinical and experimental settings, the diagnostic accuracy of dermoscopy was lower for inexperienced examiners compared with experts, and was inversely proportional to the prevalence of melanoma in the sample [36]. The degree of experience improved the diagnostic accuracy of complex algorithms, such as pattern analysis, whereas it did not affect the performance of simpler algorithms such as the ABCD rule of dermoscopy.

Two clinical trials performed in primary care settings have shown that a short training in dermoscopy enables non-dermatologists to use simplified diagnostic algorithms and improve their accuracy in the diagnosis of melanoma [33,43]. In one trial, 73 primary care physicians received one-day training in skin cancer detection and dermoscopy and were subsequently randomly assigned to use a polarized light handheld dermatoscope or the naked eye to assess the pigmented lesions of their patients for a period of 16-months [33]. All patients were also independently evaluated by expert dermatologists. The sensitivity for the referral of suspicious lesions was significantly higher in the dermoscopy group, compared with the naked-eye examination group (79 and 54 percent, respectively), without difference in specificity (71 and 72 percent, respectively).

Indications — Dermoscopic examination may be useful for patients with multiple common and/or atypical nevi who are at increased risk of melanoma. In those patients, dermoscopic examination of their nevi may help identify suspicious lesions not found with naked-eye preselection [44].

Although it will be beneficial to examine as many lesions as possible in patients with multiple nevi, special attention should be paid to the following [45]:

- Lesions with reported history of change
- Any lesions that are a concern for the patient
- Skin lesions that are clinically different from the other lesions (the "ugly duckling" sign)
- Lesions that appear clinically suspicious for melanoma

Purposes — Dermoscopy may have different purposes depending upon the clinical setting in which it is used.

In general dermatology and in primary care practices, the primary purpose of dermoscopy is the evaluation of pigmented and nonpigmented skin lesions to decide whether or not a lesion should be biopsied or referred. For this purpose, a minimal amount of training is needed [33,46-48].

In specialized dermatologic settings, which include management of high-risk patients (eg, patients with the dysplastic/atypical nevus syndrome), the main purposes of dermoscopy are to differentiate early melanoma from benign skin lesions and to minimize the unnecessary excision of benign nevi. Subtle signs of melanoma may be detected on dermoscopy by experienced clinicians before they become clinically evident to the naked eye.

Digital dermoscopy may also be useful for long- or short-term follow-up of patients with multiple common and atypical nevi [49-54]. Sequential digital dermoscopy imaging (SDDI) involves the capture and comparison of sequential dermoscopic images of one or more melanocytic lesions for short-term (less than 6 months) or long-term (6 to 12 months) surveillance. Several studies have indicated that SDDI has high sensitivity and specificity for detecting in situ or thin invasive melanomas that are difficult to diagnose otherwise [51-53,55]. One study showed that in the primary care setting the combination of dermoscopy and short-term digital...
monitoring reduced the excision or referral of benign pigmented skin lesions by 56 percent and increased the sensitivity for diagnosing melanoma from 38 to 72 percent [48].

In addition to its conventional use, dermoscopy has also been shown to improve the clinical diagnosis in other fields of dermatology, including infections/infestations as well as inflammatory skin diseases and hair diseases [56].

**Benefits**

- Dermoscopy improves the diagnosis of melanocytic lesions in clinical practice. Several meta-analyses of studies performed in experimental and clinical settings have indicated that dermoscopy increases the sensitivity for the diagnosis of melanoma without decreasing the specificity, compared with the naked-eye examination [34-36].

- Dermoscopy improves the confidence in the diagnosis of benign pigmented lesions, reducing the number of unnecessary biopsies. In a randomized trial, dermatologists using dermoscopy, compared with those using naked-eye examination, referred fewer patients for excision of benign lesions (9 versus 16 percent) without missing malignant lesions [37]. Several retrospective studies examined the numbers of excised benign and malignant lesions in dermatologic practices before and after the introduction of dermoscopy [57,58]. In one study, the ratio between benign and malignant excised lesions decreased from 18:1 to 4:1 over a three-year period [57].

- Dermoscopy allows digital surveillance and monitoring of melanocytic lesions in patients with multiple common or atypical nevi [49-54].

- Dermoscopy is useful in the diagnosis and differentiation of nonmelanocytic benign and malignant tumors such as basal cell carcinoma, dermatofibroma, seborrheic keratosis, and hemangioma [9,18,22,24].

**Limitations**

- The diagnostic accuracy of dermoscopy may be poorer than naked-eye examination when performed by individuals with limited experience in the interpretation of dermoscopy [36].

- Even in expert hands, dermoscopy may fail to recognize melanomas that lack specific dermoscopic criteria (featureless melanomas) [59].

- Dermoscopy alone cannot establish the diagnosis of malignancy; histopathologic examination remains the gold standard for skin cancer diagnosis.

- Dermoscopy requires at least a minimal amount of training to provide advantage over the clinical examination [60]. The correct interpretation of dermoscopic images depends upon knowledge of the significance of colors and structures manifested by a lesion. In addition, examining a lesion with reference to the clinical context and comparison to surrounding lesions is also important for rendering a correct diagnosis [41].

- Although digital dermoscopic images are suitable for distance consultation, interpretation of dermoscopic photographs may be slightly less accurate than in-vivo dermoscopy [61,62].

**SUMMARY AND RECOMMENDATIONS**

- Dermoscopy is a noninvasive, in vivo technique primarily used for the examination of skin lesions. A handheld instrument called a dermatoscope, consisting of a light source and magnifying optics, allows the visualization of subsurface skin structures that are usually not visible to the naked eye. (See 'Dermoscopy physics' above and 'Types of dermatoscopes' above.)

- Colors and structures visualized in skin lesions are mainly related to the amount, distribution, and localization of melanin, vasculature structures, collagen, and keratin (figure 2A-D and table 2A-B).
● The pigment network, negative network, streaks, aggregated globules or peripheral rim of globules, and homogeneous blue pigmentation are the hallmark of melanocytic lesions (picture 1A-C). Arborizing vessels, leaf-like structures, spoke-wheel-like structures/concentric globules, ovoid or round blue/gray non-aggregated areas, and shiny white blotches and strands are features of basal cell carcinomas (picture 2). Milia-like cysts, comedo-like openings, and gyri and sulci are characteristic of seborrheic keratoses (picture 3), whereas red or blue/purple/black lagoons are seen in cherry angiomas or angiokeratomas (picture 4). (See "Dermoscopic evaluation of skin lesions", section on 'First step: Melanocytic versus nonmelanocytic'.)

● Atypical pigment network, negative network, blue-white veil, atypical vascular pattern, irregular streaks, atypical dots or globules, regression structures, angulated lines forming a zigzag pattern or polygons (such as rhomboids), and peripheral tan structureless areas are some of the features associated with melanoma (picture 5A-C). (See "Dermoscopic evaluation of skin lesions", section on 'Second step: Nevus versus suspicious lesion or melanoma'.)

● For clinicians who have been formally trained, the addition of dermoscopy to clinical examination improves the sensitivity and specificity of the in vivo diagnosis of skin cancer, including melanoma. In particular, dermoscopy improves the confidence in the diagnosis of benign lesions and reduces the number of unnecessary biopsies. However, even in expert hands, dermoscopy may fail to recognize melanomas lacking specific dermoscopic features. (See 'Diagnostic accuracy for melanoma' above and 'Benefits' above and 'Limitations' above.)

● Dermoscopy may be useful in patients with multiple common or atypical nevi who are at increased risk for melanoma. Special attention should be paid to lesions with reported history of change and lesions appearing clinically different from the other lesions (the "ugly duckling" sign) or clinically suspicious of melanoma. (See 'Indications' above.)

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REFERENCES


Topic 13521 Version 8.0
Non-polarized light vibrate in different orientations. When non-polarized light is transmitted through a polarizing filter (filter A), the emerging light becomes polarized (vibrations in one plane). Polarized light that maintains its polarization after interacting with the skin is unable to pass through the cross-polarizing filter (filter B) and hence no light will emerge through the cross-polarized filter and the observer will see no structures. Polarized light that interacts with deeper parts of the skin undergoes multiple scattering events resulting in randomization of polarization. The scattered light emerging from the skin that is in the same plane as the cross-polarized filter (filter B) will pass through the filter allowing the observer to recognize structures.

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Graphic 59248 Version 1.0
## Differences between polarized and non-polarized dermoscopy

<table>
<thead>
<tr>
<th></th>
<th>Non-polarized dermoscopy (NPD)</th>
<th>Polarized dermoscopy (PD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technique</strong></td>
<td>Requires direct contact between the scope and the skin. Requires a liquid interface.</td>
<td>Although PD can be used in either the contact or non-contact mode, and can be used with or without a liquid interface, using a liquid interface and direct contact provides superior image clarity.</td>
</tr>
<tr>
<td><strong>Skin layers</strong></td>
<td>Superficial layers are better visualized than deeper layers.</td>
<td>Deep layers of epidermis and papillary dermis (depth of polarized light ~60 to 100 micrometers) are better visualized than superficial layers.</td>
</tr>
<tr>
<td><strong>Colors and structures</strong></td>
<td>Blue white-veil due to orthokeratosis is more conspicuous.</td>
<td>Pink and red colors are more conspicuous.</td>
</tr>
<tr>
<td></td>
<td>Milia-like cysts and comedo-like structures are easier to recognize under NPD.</td>
<td>Milia-like cysts and comedo-like structures are less conspicuous with PD.</td>
</tr>
<tr>
<td></td>
<td>The steel-blue color seen in blue nevi appears more homogeneous under NPD.</td>
<td>The blue color in blue nevi will appear darker with differing hues.</td>
</tr>
<tr>
<td></td>
<td>Regression areas (peppering, blue white areas and gray color) are more conspicuous with NPD.</td>
<td>The white scar-like areas are more conspicuous under PD.</td>
</tr>
<tr>
<td></td>
<td>The ability to visualize vascular structures is dependent upon the amount of pressure applied to the skin.</td>
<td>Vascular structures and collagen are more conspicuous.</td>
</tr>
<tr>
<td></td>
<td>Shiny white structures, including white shiny streaks, also known as crystalline structures, are only seen under PD.</td>
<td></td>
</tr>
</tbody>
</table>

**Data from:**


Graphic 71894 Version 6.0
**Colors seen under dermoscopy**

Yellow: Keratin.

Black: Melanin in stratum corneum, superficial layers of epidermis or throughout all layers of epidermis, with or without dermal involvement.

Brown: Melanin below the stratum corneum, especially if present in the dermo-epidermal junction and papillary dermis.

White: Lack of pigment (melanin), atrophy/fibrosis/collagen.

Gray: Free-melanin or melanophages in papillary dermis.

Red: Blood (thrombosed angiomas or angiokeratomas may reveal purple/black lagoons).

Blue: Melanin in the deep dermis (due to Tyndall effect).

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Graphic 71482 Version 3.0
Dermoscopic structures seen in melanocytic lesions.

(A) Pigment network.
(B) Negative network.

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Graphic 53263 Version 4.0
Dermoscopic structures seen in melanocytic lesions: Parallel pattern

The parallel pattern is typically seen in palmar and plantar melanocytic lesions.

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Graphic 55387 Version 2.0
Dermoscopic structures seen in melanocytic lesions

(A) Aggregated globules (solid square) and pigment network (solid arrow) in a melanocytic nevus.
(B) Homogeneous blue pigmentation seen in a blue nevus.
(C, D) Streaks: Pseudopods in a Spitz nevus (C) and radial streaming in a melanoma (D).

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Graphic 78335 Version 4.0
Dermoscopy of basal cell carcinomas

(A) Arborizing vessels.
(B) Spoke-wheel-like structures/concentric structures (solid squares) and leaf-like structures (dashed square).
(C) Multiple blue-gray nonaggregated globules and dots.
(D) Large blue-gray ovoid nest (solid arrow).

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Graphic 61313 Version 2.0
Dermoscopy of seborrheic keratosis

(A) Milia-like cysts (white arrows) and comedo-like openings (dashed black arrows).
(B) Network-like structures and fingerprint-like structures (solid square).
(C) Hairpin vessels (solid square), milia-like cysts (white arrow), and comedo-like openings (dashed black arrow).
(D) Gyri and sulci.

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Graphic 78870 Version 5.0
Dermoscopy of hemangioma and angiokeratoma

(A) Red lacunae seen in a hemangioma.
(B) Red, blue, and black lacunae seen in an angiokeratoma.

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Graphic 66439 Version 4.0
Dermoscopy of superficial spreading melanoma

Melanoma 0.98 mm. Atypical network, peripheral streaks (solid arrows), blue white-veil, and off-centered blotch (dashed square) are observed.

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Graphic 79576 Version 3.0
Dermoscopic image of thin melanoma

Superficial spreading melanoma 0.5 mm. Atypical globules (solid square) and atypical vessels, including serpentine vessels and dotted vessels (solid arrow).

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Graphic 60407 Version 2.0
Dermoscopic image of thick melanoma

Melanoma 3.8 mm. Atypical network (solid arrow), negative network (solid square), and atypical globules (dashed square) are observed.

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Graphic 73202 Version 2.0
**Dermoscopic structures seen in melanocytic lesions and their histopathologic correlations**

<table>
<thead>
<tr>
<th>Dermoscopic structures</th>
<th>Schematic illustration</th>
<th>Definition</th>
<th>Histopathological correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pigment network (reticulation)</td>
<td></td>
<td>Grid-like network consisting of pigmented lines and hypopigmented “holes.”</td>
<td>Melanin in keratinocytes and/or melanocytes along and above the dermo-epidermal junction (DEJ). Network lines correspond to the rete ridges. The “holes” correspond to the suprapapillary plate.</td>
</tr>
<tr>
<td>Negative network (reverse network, inverse network, or white network)</td>
<td></td>
<td>Serpiginous interconnecting hypopigmented lines, which surround irregularly shaped pigmented structures resembling elongated curvilinear globules.</td>
<td>Remains to be fully elucidated. One study found it to correlate with elongated rete ridges [1]. Some have speculated that it may also be related to either bridging of adjacent rete ridges, or large nests in the papillary dermis resulting in compression of adjacent rete ridges. These nests may correspond to globules that are not spherical in shape.</td>
</tr>
<tr>
<td>Angulated lines</td>
<td></td>
<td>Brown to bluish gray dots and lines arranged in an angulated linear pattern [2,3].</td>
<td>Remains to be elucidated but may correspond to pigment in the interfibrillar/interadnexal space.</td>
</tr>
<tr>
<td>Aggregated globules</td>
<td></td>
<td>Three to five or more clustered, well-demarcated, round to oval, symmetric structures that may be brown, black, blue, or white [4]. Diameters are greater than 0.1 mm.</td>
<td>Nests of nevus melanocytes at the DEJ or dermis.</td>
</tr>
<tr>
<td>Peripheral rim of globules</td>
<td></td>
<td>The central component consists of a reticular or homogeneous pattern. The peripheral component consists of a single row of globules.</td>
<td>Nests of nevus melanocytes at the periphery of the lesion, as seen in actively growing nevi. These nests correspond to nevus cells at the tip of rete ridges.</td>
</tr>
<tr>
<td>Streaks</td>
<td></td>
<td>Streaks (pseudopods and radial streaming) are radial projections at the periphery of the lesion, extending from the tumor toward the surrounding normal skin. May be brown or black in color. Pseudopods are fingerlike projections with small knobs at their tips. Whereas radial streaming are the same structures without the knobs.</td>
<td>Confluent junctional nests of melanocytes.</td>
</tr>
<tr>
<td>Homogeneous blue pigmentation</td>
<td></td>
<td>The entire lesion reveals a homogeneous steel-blue color. The surface can also have a whitish veil.</td>
<td>Pigmented dendritic or spindle-shaped cells in dermis.</td>
</tr>
<tr>
<td>Pseudonetwork</td>
<td></td>
<td>Diffuse pigmentation interrupted by adnexal opening. Usually seen in facial lesions.</td>
<td>Pigment in the epidermis or dermis in which the rete ridges are attenuated. The holes are due to the lack of pigment overlying adnexal openings.</td>
</tr>
</tbody>
</table>

List continued in figure "Dermoscopic structures 2". Melanocytic neoplasms: Dermoscopic structures and histopathologic correlation.

DEJ: dermo-epidermal junction.

**References:**


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Graphic 77673 Version 6.0
<table>
<thead>
<tr>
<th>Dermoscopic structures</th>
<th>Schematic illustration</th>
<th>Definition</th>
<th>Histopathological correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blotches</td>
<td><img src="image" alt="Blotches" /></td>
<td>Dark brown to black, usually homogenous areas of pigment that obscure visualization of any other structures.</td>
<td>Aggregates of melanin in the stratum corneum or throughout all layers of the skin.</td>
</tr>
<tr>
<td>Regression areas</td>
<td><img src="image" alt="Regression areas" /></td>
<td>White, scar-like depigmentation (lighter than the surrounding skin, shiny white under polarized dermoscopy) often combined with adjacent blue-gray areas or peppering.</td>
<td>Scar-like changes/White areas: thickened fibrotic papillary dermis. Blue areas: correlate with melanosis type of regression[4].</td>
</tr>
<tr>
<td>Blue-white veil</td>
<td><img src="image" alt="Blue-white veil" /></td>
<td>Confuent blue pigmentation with an overlying white ‘ground glass’ haze.</td>
<td>Aggregation of heavily pigmented cells and/or melanophages in combination with compact orthokeratosis of the stratum corneum.</td>
</tr>
<tr>
<td>Shiny white structures* (can only be seen with polarized dermoscopy)[5]</td>
<td><img src="image" alt="Shiny white structures" /></td>
<td>Rosettes: Appear as four shiny, white points creating a pattern reminiscent of a four-leaf clover[6].</td>
<td>Histopathological correlation has not been fully elucidated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crystaline structures: Shiny, white linear streaks that are often oriented parallel or orthogonal to each other[7].</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shiny white areas: Appear as larger structureless areas of shiny white color[9].</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shiny white blotches and strands: <strong>Blotches:</strong> Discrete, small or large, shiny white structureless areas <strong>Strands:</strong> Long thick or thin lines randomly distributed or in parallel arrangement</td>
<td></td>
</tr>
<tr>
<td>Parallel patterns</td>
<td><img src="image" alt="Parallel patterns" /></td>
<td>On palms and soles, parallel rows of pigmentation following the furrows (as seen in nevi), or ridges (as seen in melanoma) of the dermatoglyphics.</td>
<td>Pigmented melanocytes in the furrows (crista limitans) or ridges (crista intermedia) on skin of palms and soles.</td>
</tr>
</tbody>
</table>

This is a continuation of figure "Dermoscopic structures 1". Melanocytic neoplasms: Dermoscopic structures and histopathologic correlation.

* Shiny white structures can also be seen in nonmelanocytic lesions. Crystalline structures (also known as white shiny streaks) in melanocytic lesions are most common in melanoma and Spitz nevi[8]. Both crystalline structures and white shiny areas are common in dermatofibromas and basal cell carcinomas[9,10]. Rosettes are more common in actinic keratosis and squamous cell carcinomas[5].

References:


https://www.uptodate.com/contents/overview-of-dermoscopy/print?source=see_link


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Graphic 63870 Version 9.0
## Nonmelanocytic lesions: Dermoscopic structures and histopathologic correlation\(^{[1-4]}\)

<table>
<thead>
<tr>
<th>Dermoscopic structures</th>
<th>Schematic illustration</th>
<th>Definition</th>
<th>Histopathological correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milia-like cysts</td>
<td><img src="image1" alt="Milia-like cysts" /></td>
<td>Round whitish or yellowish structures that shine brightly (like &quot;stars in the sky&quot;) under non-polarized dermoscopy. Milia-like cysts have been further sub-classified as small-starry and large-cloudy milia-like cysts(^{[5]}).</td>
<td>Intraepidermal keratin-filled cysts.</td>
</tr>
<tr>
<td>Comedo-like openings</td>
<td><img src="image2" alt="Comedo-like openings" /></td>
<td>&quot;Blackhead&quot;-like plugs on the surface of the lesion. Concave invaginations in the surface of the epidermis filled with keratin. Some of these invaginations may correspond to follicular openings filled with keratin.</td>
<td></td>
</tr>
<tr>
<td>Fingerprint-like structures</td>
<td><img src="image3" alt="Fingerprint-like structures" /></td>
<td>Thin light brown parallel-running lines that do not interconnect to form a grid.</td>
<td>Epidermal ridges.</td>
</tr>
<tr>
<td>Ridges (gyri) and fissures (sulci)</td>
<td><img src="image4" alt="Ridges (gyri) and fissures (sulci)" /></td>
<td>Gyri (ridges) and sulci (fissures) that create a cerebriform surface. These invaginations can be filled with keratin, creating crypts. Epidermal ridges with or without keratin filling the invaginations.</td>
<td></td>
</tr>
<tr>
<td>Mottled border</td>
<td><img src="image5" alt="Mottled border" /></td>
<td>Concave invaginations of the lesion border. –</td>
<td></td>
</tr>
<tr>
<td>Network-like structure</td>
<td><img src="image6" alt="Network-like structure" /></td>
<td>Grid-like pattern that can be confused with the network seen in a melanocytic neoplasm. However network-like structures are due to ridges on the skin; the holes correspond to comedos or crypts. The network-like structure lines tend to appear broader as compared to the network seen in nevi. Clinical side lighting will often help confirm that the network-like structures are actually ridges. Ridges, crypts and comedo-like openings distributed in a manner giving the appearance of a grid.</td>
<td></td>
</tr>
<tr>
<td>Leaf-like structures</td>
<td><img src="image7" alt="Leaf-like structures" /></td>
<td>Brown to gray-blue discrete bulbous structures that often manifest shapes resembling a leaf.</td>
<td>Pigmented basal cell tumor islands at the dermo-epidermal junction (DEJ).</td>
</tr>
<tr>
<td>Spoke-wheel-like structures/concentric structures</td>
<td><img src="image8" alt="Spoke-wheel-like structures/concentric structures" /></td>
<td>Well-circumscribed brown to gray-blue-brown radial projections meeting at a darker brown central hub. Nests of superficial basal cell carcinoma.</td>
<td></td>
</tr>
<tr>
<td>Large blue-gray ovoid nests</td>
<td><img src="image9" alt="Large blue-gray ovoid nests" /></td>
<td>Large, well-circumscribed ovoid areas; larger than globules. Large basal cell tumor islands in the dermis.</td>
<td></td>
</tr>
<tr>
<td>Multiple blue-gray non-agregated globules and/or dots</td>
<td><img src="image10" alt="Multiple blue-gray non-agregated globules and/or dots" /></td>
<td>Round well-circumscribed structures randomly distributed within the lesion. Small basal cell tumor islands in the dermis.</td>
<td></td>
</tr>
<tr>
<td>Lacunae</td>
<td><img src="image11" alt="Lacunae" /></td>
<td>Red (angiomatous), maroon or black lagoons (angiokeratoma), often separated by septae. Dilated vascular spaces.</td>
<td></td>
</tr>
<tr>
<td>Keratinizing pearls (white circles)(^{[6]})</td>
<td><img src="image12" alt="Keratinizing pearls (white circles)" /></td>
<td>White to yellowish round structures surrounded by a white halo. Horn pearls within the epidermis.</td>
<td></td>
</tr>
</tbody>
</table>

### References:


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Vascular structures most commonly seen in melanocytic tumors

<table>
<thead>
<tr>
<th>Dermoscopic structures</th>
<th>Schematic illustration</th>
<th>Morphology</th>
<th>Diagnostic associations</th>
<th>Positive predictive value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comma vessels</td>
<td></td>
<td>Slightly curved vessels.</td>
<td>Dermal nevi[3]; congenital melanocytic nevi[3]</td>
<td>94 percent</td>
</tr>
<tr>
<td>Dotted</td>
<td></td>
<td>Red dots (0.01-0.02 mm).</td>
<td>Spitz nevi[3] and early melanoma[3] (dotted over milky-red background); Clark nevi (dotted over tan background)</td>
<td>90 percent PPV for a melanocytic skin lesion[3]</td>
</tr>
<tr>
<td>Milky-red globules/vascular blush</td>
<td></td>
<td>Ill-defined globules of milky-red color and ill-defined areas of milky-red color.</td>
<td>Melanoma, including amelanotic melanoma[3,5], desmoplastic melanoma[6], nodular melanoma[7]</td>
<td>79 percent[3]</td>
</tr>
<tr>
<td>Polymorphous</td>
<td></td>
<td>Combination of two or more vessel morphologies, the most common combination being dotted and serpentine vessels.</td>
<td>Melanoma[4], including amelanotic melanoma[5], desmoplastic melanoma[6], cutaneous melanoma metastases[8]</td>
<td>68 percent[3]</td>
</tr>
<tr>
<td>Corkscrew</td>
<td></td>
<td>Coiled and tortuous vessels.</td>
<td>Cutaneous melanoma metastases[8], nodular melanoma, desmoplastic melanoma</td>
<td>–</td>
</tr>
</tbody>
</table>

References:

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### Vascular structures most commonly seen in nonmelanocytic tumors

<table>
<thead>
<tr>
<th>Dermoscopic structures</th>
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<th>Positive predictive value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glomerular vessels</td>
<td><img src="image" alt="Glomerular vessels" /></td>
<td>Coiled vessels mimicking the glomerular apparatus of the kidney.</td>
<td>Bowenoid actinic keratosis, Bowen disease/squamous cell carcinoma[^1-4], Clear cell acanthoma</td>
<td>62 percent for squamous cell carcinoma</td>
</tr>
</tbody>
</table>
| Hairpin vessels        | ![Hairpin vessels](image) | U shape vessels. Not infrequently may be twisted upon its axis.  
Background:  
- White halo common in keratinocytic tumors  
- Pink halo common in irritated seborrheic keratosis but can also be seen in melanoma | Keratinizing tumors such as keratoacanthoma and seborrheic keratoses[^3,5,6], Basal cell carcinoma[^7] | 70 percent for seborrheic keratoses[^3] |
| Arborizing             | ![Arborizing](image) | Vessels with large diameter, branching irregularly into fine capillaries. | Basal cell carcinoma[^3,4,6], Can also be seen in cysts, furuncles and other adnexal tumors, Intradermal nevi | 94 percent for basal cell carcinoma[^3] |
| Crown                  | ![Crown](image) | Branching or non-branching vessels radiating toward the center of the lesion but without crossing its center. Often associated with white/yellowish "popcorn-like" globular structures. | Sebaceous hyperplasia[^3], Molluscum contagiosum | 83 percent |
| Dotted or glomerular in string of pearls or serpiginous distribution | ![Dotted or glomerular in string of pearls or serpiginous distribution](image) | Vessels distributed in a serpiginous pattern. | Clear cell acanthoma[^8] | 100 percent |
| Strawberry pattern     | ![Strawberry pattern](image) | White-yellow follicular openings surrounded by a white halo, over a background of red color. | Actinic keratosis[^6] | — |

The presence of a given vessel morphology is not exclusive to a particular diagnosis. For example, arborizing vessels are commonly seen in basal cell carcinoma, but they can also be seen in melanoma and intradermal nevi. Another example would be that although hairpin vessels are commonly associated with seborrheic keratoses, they can also be seen in melanoma. With that said, this table highlights vessels that are most commonly associated with nonmelanocytic tumors.

**References:**


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Contributor Disclosures

Ashfaq A Marghoob, MD Nothing to disclose Natalia Jaimes, MD Nothing to disclose Hensin Tsao, MD, PhD Consultant/Advisory Boards: Lubax [Internet image library]; Epiphany Dermatology [Med advisory board]. Rosamaria Corona, MD, DSc Nothing to disclose

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