Non-pigmented (amelanotic) lesions

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As originally described, pattern analysis is a method for assessing pigmented lesions. This restriction to pigmented lesions is not an accident: patterns formed by melanin pigment are more prominent and more specific diagnostically than other features seen at dermatoscopy. The absence of melanin structures in non-pigmented lesions restricts the range of features available for diagnosis. Furthermore, because structures pigmented by melanin are the building blocks of current diagnostic algorithms, alternative methods are required to diagnose non-pigmented lesions.

We define as "pigmented" any lesion containing any area at all pigmented by melanin (i.e. black, brown, gray, or blue). While a "non-pigmented" lesion lacks these colors, white, yellow, orange, pink, or red may be seen, either singly or in combination. As these lesions only lack melanin pigment, "amelanotic" is a more accurate term than "non-pigmented". The latter term, although less precise, remains more popular. In this chapter we use both terms interchangeably. The assessment of amelanotic lesions is challenging and a specific diagnosis is not always possible even when dermatoscopy is added to clinical examination. For some non-pigmented lesions, diagnosis with the unaided eye is easier than with dermatoscopy. Other non-pigmented lesions that are difficult to diagnose with the unaided eye have specific dermatoscopy features. However, in most cases a satisfactory level of diagnostic accuracy is only achieved by supplementing dermatoscopic features with clinical findings. Because many inflammatory diseases have to be included in the list of differential diagnoses, the number of possible diagnoses is higher than for pigmented lesions.

Clues used in the diagnosis of non-pigmented (amelanotic) lesions

In the absence of melanin pigment, other clues must be used in the diagnosis of non-pigmented lesions. In general, these clues may also be seen in pigmented lesions, but being less specific, they are of less significance when diagnosis can proceed on the basis of structures pigmented by melanin. The pattern of non-pigmented lesions is usually structureless. However, non-pigmented lesions may show patterns of white, yellow, orange, pink, skin colored, or red clods; and white lines, circles or dots.

Ulceration

Ulceration is not a strong clue to a specific diagnosis, but in the absence of a clear history of trauma it is a good clue to malignancy. As an over-riding principle, in the absence of a clear and convincing history of trauma, any solitary ulcerated non-pigmented lesion should be submitted for histopathology. Ulceration is usually manifested dermatoscopically as an orange or yellow structureless area, which represents dried serum crust. Bleeding due to ulceration will be seen at dermatoscopy as either red clods or red structureless zones. Sometimes ulceration appears together with necrosis. Necrosis can be white, yellow or black. Especially when a contact fluid is used, ulceration may not be apparent dermatoscopically with the appearance of ulceration often mimicking compacted keratin. However, adherent fiber, either clothing fabric or loose hair, is an indirect dermatoscopic clue to ulceration. Fibers adhere to ulcerated surfaces because of the sticky consistency of the serum.
Surface scale

The multiple air-tissue interfaces created by scale means that more light, incident on the skin surface, is reflected, making scale appear white. Like ulceration, scale is usually better assessed clinically. Dermatoscopes are designed to make surface scale more transparent, i.e. invisible, to allow better visualization of pigment structures and vessels. If serum is present in the stratum corneum (e.g. in a spongiotic dermatitis), scale appears yellow and not white. Scale may be present both in inflammatory diseases (e.g. psoriasis) and in neoplasms (e.g. Bowen’s disease). In both cases, scale is produced by hyper- and parakeratosis of the stratum corneum, with conglomerates of corneocytes (keratinocytes that form the stratum corneum) with preserved nuclei remaining adherent to the skin surface because of incomplete desquamation. When visible, scale is seen on dermatoscopy as white or silvery polygonal clods that are not entirely homogeneous.

Keratin

While scale indicates mild hyper- and parakeratosis, keratin corresponds to prominent hyperkeratosis. Subsurface keratin (e.g. in the milieu of seborrheic keratosis) has no contact with air and usually appears white on dermatoscopy. Surface keratin that has contact with air usually appears yellow or orange. This color is emphasized by any serum inclusions. In non-pigmented (amelanotic) seborrheic keratoses the infundibular keratin plugs (“comedo-like openings”) are usually yellow. If melanin is admixed with keratin, keratin plugs can be even brown or black as in some hyperpigmented seborrheic keratoses.

White clues

In dermatoscopy, “white” is defined as lighter than surrounding normal skin. All basic elements except pseudopods have a white variant. There are two types of white lines. One is seen only with polarizing dermatoscopes; the other is seen regardless of instrument type. Polarizing-specific white lines are arranged as two groups of parallel lines at right angles to each other. These lines may be short or long, but do not cross each other. They are most commonly found in melanoma, Spitz nevus, basal cell carcinoma, and dermatofibroma, but can also occasionally be seen in a wide range of other lesions including scar tissue. Polarizing-specific white lines correspond to fibrosis and sclerosis in the dermis. Usually the overlying epidermis is devoid of rete ridges (i.e. flat). White lines are also produced by fibrosis of the papillary dermis when the rete ridges are intact. These white lines often (but not always) form the reticular pattern, and are seen regardless of the type of dermatoscope used. They are most often seen in melanomas, nevi, and dermatofibromas but they are absent in basal cell carcinomas. While they can be seen in benign lesions, white lines of any type in amelanotic lesions should be regarded as a clue to malignancy. White circles are the most specific clue to actinic keratoses (flat lesions) and well-differentiated squamous cell carcinomas/keratoacanthomas (raised lesions) but can also be found in lesions of cutaneous lupus erythematosus. White circles correspond to acanthosis of follicular epithelium with prominent hypergranulosis. White dots or clods usually correspond to keratin filled cysts (milia). These are better seen with non-polarizing contact dermatoscopes. If multiple white dots or small round clods are present they usually point to a seborrheic keratosis but are also seen in congenital nevi. Although multiple white dots and clods representing keratin filled cysts are a clue to seborrheic keratosis they are not unusual in basal cell carcinoma and are also occasionally found in melanoma.
The white clods of sebaceous gland hyperplasia are visible with polarized and with non-polarized dermatoscopy. Their white color is duller than polarizing-specific white clods or milia. Single white dots or clods may also represent pus in skin abscesses such as folliculitis or furuncles, but also in myiasis.

Dots and clods that are only visible with polarized dermatoscopy (polarizing-specific white clods) do not correspond to milia. Polarizing-specific white clods have the same significance as polarizing specific white lines and correspond to dermal fibrosis and sclerosis. They nearly always appear together with polarizing specific white lines and are found in some basal cell carcinomas and melanomas. Four white dots arranged in a square (four-dot clod) are a polarizing specific structure seen particularly in actinic keratoses, but also in other lesions, and even on severely sun-damaged skin without any discrete lesion. With non-polarized dermatoscopes, this structure may be seen less clearly as a single circle or clod. A white structureless zone in a flat lesion usually corresponds to fibrosis or sclerosis. It can be found in flat melanomas and basal cell carcinomas but also in other flat lesions including inflammatory conditions such as lupus erythematosus and in flat scars. A white structureless zone in a raised lesion usually represents subsurface keratin as in well-differentiated squamous cell carcinomas/keratoacanthomas or in pilomatrixoma. A peripheral white rim can be found in some pyogenic granulomas. It corresponds to the reactive epidermal hyperplasia that surrounds the overgrowth of granulation tissue. For the sake of completeness it should be mentioned that necrotic tissue and calcinosis may appear white on dermatoscopy.

Other clues

Scale, keratin, ulceration and white clues there are not the only clues that help diagnose non-pigmented lesions. Yellow color usually corresponds to keratin or a serum crust, which indicates ulceration. A yellow structureless zone can also be found when there is a dermal accumulation of macrophages that are replete with lipids (xanthoma cells). These xanthoma cells can be found in any xanthomatous lesion, most notably in xanthelasma and in xanthogranuloma. Yellow color can also be found in nevus sebaceous, in which the increased number of sebaceous glands is responsible for the yellow appearance on dermatoscopy. The yellow clods of initial cutaneous leishmaniasis most probably correspond to widened infundibula on the background of a granulomatous inflammation in the dermis whereas the yellow clods of lymphangioma correspond to dilated lymphatic vessels filled with lymphatic fluid.

Vascular patterns

In dermatoscopic assessment of pigmented lesions, blood vessel morphology is only ever accorded the status of being a clue to diagnosis, as patterns formed by vessels are less specific and hence less important than pigment patterns and colors. The patterns formed by blood vessels are no more diagnostically specific in amelanotic lesions, but in the absence of melanin pigment, analysis of vessel patterns must assume greater importance. Vessels may be seen as dots, clods or lines. Lines may be straight, curved, looped, serpentine, helical or coiled. When one vessel type predominates, this is called a "monomorphous" pattern of vessels. When more than one type of vessel is seen, the pattern is called "polymorphous". In addition to the type of vessels, their arrangement — both how vessels are arranged relative to each other, and how vessels are distributed throughout the lesion — may also be of diagnostic significance.
In the majority of cases, vessels appear to be distributed randomly, i.e. not arranged in any specific manner throughout the lesion. Vessels as dots or coils may be arranged in straight lines (linear arrangement) or in serpentine lines (serpiginous arrangement). When vessels as dots or coils are not uniformly distributed but are denser at some sites than others, this arrangement is termed "clustered". Linear vessels of any type at the periphery that are oriented towards but do not cross the center are termed "radial". The arrangement of linear vessels (most commonly curved, sometimes serpentine or looped) in the center of skin colored or light brown clods is termed "centered". Straight linear vessels that intersect each other nearly at right angles have a "reticular" arrangement. Finally, serpentine vessels may be arranged such that multiple vessels originate from one common vessel; the derivative vessels typically originate from a thicker vessel. This arrangement is termed "branched".

Vessel morphology varies with lesion thickness. The capillary loops that rise from the superficial vascular plexus and extend towards the surface of the skin may appear as dots or curved or looped lines, depending on the angle from which they are viewed. In flat lesions, most vessels are viewed end on and so appear as dots or short curved lines. As a lesion becomes thicker, there is a tendency for more vessels to be viewed obliquely and thus seen as loops. As malignant neoplasms become thicker, neovascularization becomes more common. This variation means the same vessel morphology may have different diagnostic significance in nodules compared to flat lesions.

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