

# Dermoscopic Characteristic Structures of Melanocytic Lesions

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## Abstract

Dermoscopy has recorded continuous development in the past decades. Both global and individual features of dermoscopic morphology that play a role in identifying melanomas have enjoyed particular attention by researchers. Dermoscopy has gained an undoubted place in the detection of early melanomas. This paper is a review of data existent in literature that approach of dermoscopic morphology features of melanocytic pigmented skin lesions. This work highlights such situations where these features may be found in non-melanocytic pigmented skin lesions thus inducing confused diagnosis.

**Keywords:** Dermoscopy; Melanom; Basal cell carcinomas; Blood vessels

## Introduction

Dermoscopy also known as dermatoscopy or surface cutaneous microscopy has gained an irrefutable position in the diagnosis of pigmented cutaneous mucous lesions worldwide, enabling improved accuracy of clinical diagnosis by 5-30% [1-13]. Depending on the doctors' expertise, on the clinical and dermoscopic features of the analysed lesion and on the algorithm used for diagnosis [5,14-19]. This positive impact of dermoscopy on the clinical diagnosis of pigmented lesions does not seem to be influenced by the skin colour [20]. Dermoscopy has made it possible to obtain a wider view of morphological structures and a richer chromatique, thus allowing earlier recognition of potentially malignant pigmented lesions and leading to much more efficient and adequate management thereof [5,6,15,19,21-23]. However, the sensitivity of such a technique is not absolute in diagnosing melanomas varying between 68-94% in studies [8,12,23-37]. Knowledge and understanding of the dermoscopic aspects present in pigmented lesions, integration of clinical and histopathological data permit a higher performance in the identification of earlier melanomas, when the melanomas are curable [1,9,11,14,16,19,35,37,38]. According to literature data the odds ratio index for dermoscopic diagnosis of melanomas is 15.6 times that of naked eye diagnosis [29-34].

As a result of the development of dermoscopy over the last three decades new targets have been added to its primary role of establishing whether a lesion is suspicious and necessitates biopsy or follow-up [12,33,39]. Nowadays there is a tendency to use dermoscopy for pre-surgery establishment of tumour borders and for monitoring the response to some topical therapies (such as lentigo maligna, superficial basal cell carcinoma, Bowen disease) [40-43]. Dermoscopy has modified the management of mucocutaneous pigmented lesions, thus reducing significantly the number of excised benign lesions compared to the number of excised malign lesions. Now some studies present a ratio lowered from 18:1 to 4:1 [2,29,44-46].

Dermoscopy has the advantage of a more precise selection of pigmented lesions suspect of malignity to be excised and also enables revealing some apparently clinically banal pigmented lesions, which are dermoscopically bizarre [6,28,47,48].

Dermoscopy has a positive impact on the performance of histopathological diagnosis, especially in difficult cases such as melanomas on the naevi, collision tumours, in situ melanomas, thin melanomas as well as desmoplastic, spitzoid and nodular melanomas [2,30,31,49]. In such situations a clinician should mark the

dermoscopically suspect area so that the pathologist can pay increased attention to its examination, thus eliminating the likelihood of wrong diagnosis on one side and reducing costs on the other side.

## Dermoscopic Morphologic Elements in Melanocytic Lesions

Further down we present the dermoscopic features together with the underlying histopathological structures. Mention should be made that there are differences between conventional contact dermoscopy and polarized light dermoscopy, that have to be considered even if they are subtle, in order to avoid wrong diagnoses and inadequate therapies [33].

## Colours

The chromatique of dermoscopic images plays a major role in establishing the nature of pigmented lesions and ultimately in making a diagnosis [29,50]. The hue of the noticed colours, their number and distribution are important for diagnosis. The dermoscopic colours seen in pigmented lesions are: light or dark brown, black, gray, blue, red, white and yellow [21-24,27]. In polarized light dermoscopy the colours are darker than in conventional dermoscopy [33]. Melanin, the most important chromophor in the skin generates the following colours depending on its location: black if it lies in the corneum stratum of the epidermis, dark or light brown if it is in the other epidermal strata, including the dermoepidermal junction, blue-gray if melanin lies in papillary dermis and steel-blue if it is in reticular dermis [21-27].

Blue colour is a dermoscopic aspect associated with malignancy which often diminishes the diagnostic significance of any other present dermoscopic feature [12,51-53]. An adequate interpretation of the diagnostic signification of this colour can be achieved considering the type of present dermoscopic structures present (such as regression

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structures, blue-white veil, homogenous blue pattern, lagoons, rainbow pattern) as well as by including the clinical data [21,22,51-53].

Blue-black colour recently described by Argenziano as a predictable feature of nodular melanomas with sensitivity of 78.2% can be improved by association with standard dermoscopic criteria of melanomas [11,54].

White colour is dermoscopically defined as the colour lighter than the skin adjacent to the pigmented lesion [5,21-27]. It appears as a consequence of fibrosis and is described in melanomas, scars, dermatofibromas and occasionally in basal cell carcinomas [55]. Recently white globules generated by balloon cell nevus nests have been described [50].

Yellow colour is generated by keratin plugs having a light or dark hue depending on the oxidation level and on the presence of melanin [21-27]. Hemoglobin, the second chromophore in the skin can generate the following colours: red, violaceous, blue, black and pale-brown depending on the oxidation level and on its location [5,21-27].

### Dots

These are round dermoscopic structures under 0.1 mm in diameter that may have any of the above described colours [21-23]. Dots are caused by melanin free or present in melanocytes, melanophages or keratinocytes [5,22,27].

Peripheral black dots (at the edge of lesion or in the vicinity thereof) are highly specific of melanoma (92% specificity) occurring in 42% of melanomas [5,22].

Multiple brown dots, especially when they are focally distributed are highly specific of melanomas (97% specificity, 30% sensitivity) being produced by suprabasal melanocytes [22,27]. Blue-gray dots (peppering/pepper like/ blue-white granules/multiple blue-white dots/bluish areas) are generated by small melanin clusters, free or present in melanophages in papillary and reticular dermis [5,21-27,51]. Blue-gray dots appear in melanomas, in naevi with severe dysplasia but they may also appear in non-melanocytic pigmented lesions [52,56-58].

Blue-gray dots are hardly visible in polarised light dermoscopy, subsequently they may be ignored because of the darker appearance of colours observed. This technique shows them to be brown [33].

Red dots are caused by blood vessels in an array vertical to the skin surface or by small melanocytic nests free of melanin. The presence of a large number of red dots in a lesion especially when grouped and/or associated with a negative network favour the diagnosis of a possible classical Spitz naevus [5,21-27,38].

### Globules

These are round sometimes angular structures over 0.1 mm in diameter, which are caused by free melanin, melanocytes or melanophages clusters in the deep epidermal strata, at dermoepidermal junction, in the papillary dermis and rarely in the reticular dermis [5,6,21-28,50,59]. Their presence is considered a dermoscopic argument in favour of melanocytic nature of a pigmented lesion. The peripheral globule rim in a pigmented lesion can be interpreted as an indicator for lesion growth. The clinician should choose the management, namely follow-up or excision considering the patient age and the type of dermoscopic pattern. Digital dermoscopy has shown that 80% of peripheral globule rim naevi increase in diameter [59].

Red globules are a subtle feature highly specific to melanoma, where they can be occasionally observed [60].

White globules have been described in balloon cell naevi being generated by junctional or dermal melanocytic nests. In this case the white colour is caused by absence of melanin or may be an optic effect created by the peculiar features of cytoplasm of such naevus cells [50].

### False Melanocytic Parameter

Although the presence of the globules is an argument in favour of the melanocytic nature of a pigmented lesion, the globules have been also found in non-melanocytic lesions such as: Kaposi disease, Bowen disease, pigmented basal cell carcinomas, dermatofibromas, subcorneal hemorrhage and cutaneous metastasis caused by breast cancer [60-67]. In such cases globules may be generated by siderophages, by irregular load of melanin at the dermoepidermal junction, respectively by melanin load of epithelial cell nests and by tumour islands colonized with melanocytes [64,65].

### Pigmented Network

It consists of pigmented lines and pigment free holes looking like a honey comb [59]. The network holes are generated by dermal papillae while pigmented lines are caused by elongated pigmented rete ridges [21,22,27,28,59]. The appearance of the pigmented network depends on the size and configuration of interpapillary rete ridges but equally by the features of dermal papillae [59]. The chromatique of a pigmented network varies from light/dark brown to black, to gray and it can be even or uneven.

Regular typical pigmented network occurs in benign flat melanocytic lesions and presents relatively even chromatique, gradually fading from the center to the peripheral area. At the same time the line thickness narrows gradually while the network holes are equal in size and shape [22,27,28,59,68]. The irregular atypical pigmented network is often found in malignant and dysplastic melanocytic lesions [21,22,68,69]. The irregular pigmented network is characterized by: uneven chromatique, lines of various thicknesses that can end suddenly, holes of various shapes and sizes [5,21-28,59].

The atypical pigmented network is specific for melanomas, being mentioned with an odds ratio of 9 [28]. The inverse also called negative network has hypopigmented lines while the network holes are pigmented [21,22]. This last network is found in melanomas and Spitz naevi and results from the presence of depigmented rete ridges and highly pigmented dermal papillae [27,70]. The pigmented pseudo-network is present only on the face where the rete ridges are short, homogenous pigmentation being interrupted by the hypopigmented openings of hair follicles and of sweat glands [5,21-28,59].

The malignancy features of the pseudo-network are represented by: perifollicular gray dots, irregular or annular, gray short lines, rhomboidal structures which obscure follicular openings [5,21-27,58,59]. Dermoscopy has significantly improved the diagnosis of early lentigo maligna lesions [55].

### False Melanocytic Parameter

The pigmented network may be present in non-melanocytic lesions such as: dermatofibroma, solar lentigo, simplex lentigo, lentiginos, seborrheic keratosis, supernumerary breast and very rarely in basal cell carcinomas and pigmented Bowen disease [27,28,60-62,71-77]. The pigmented pseudo-network on the face can be also found in non-melanocytic lesions thereof: seborrheic keratosis, pigmented actinic keratosis [58].

### Pigmented Streaks

They are caused by junctional melanocytic nests with variable

melanin load, supposed to be parallel to the skin surface, regardless of cytomorphological characteristics of the melanocytes in such nests [21,22,27,37]. For simplification purpose some authors group under the category of streaks the following terms: pseudopods and radial streaming, all of them being histopathologically similar [28]. The pigmented streaks are shown dermoscopically as lines of varying thicknesses and chromatique (brown/black/gray) that do not belong to a pigmented network and can be in a regular or irregular arrangement. Their array seems to be more important than their presence, when a lesion is suspected to be melanoma [28]. The branched streaks are pigmented, branched, more prominent and thicker streaks than the lines of a regular pigmented network. These structures are produced by the alteration and disarray of a pigmented network.

Pseudopods are black or brown digital pigmented bulging projections that can be observed at the periphery of a melanocytic lesion, being linked to the pigmented network or the tumour mass [22,27,78]. They can be arranged evenly at the lesion periphery like in Spitz naevus or unevenly as in melanomas. Pigmented Network Types and Presence of Pigmented Streaks Benign melanocytic lesions have a typical, regular network that fades gradually towards its periphery, while malignant melanocytic lesions have an atypical pigmented network that contains altered areas where streaks can be observed [21-27].

### False Melanocytic Parameter

As dermoscopy has been used more frequently in studying more diverse lesions, dermoscopic morphology has become even more striking. For instance, if the irregular streaks were considered to be present only in melanomas, now they are also described in pigmented basal cell carcinoma, pigmented Bowen disease, pigmented seborrheic keratoses [58,64,66,72-74]. Hypopigmented structureless areas are zones free of any dermoscopic structural elements (dots, globules, pigmented network, streaks). These areas - because of the low pigment amount or of its absence - are shown as hypopigmented or coloured like normal skin.

Histopathological correlations are not fully understood, except for low pigment amount in the involved areas, so, their diagnostic significance is reduced. Clark naevi can have a spotted reticular pattern with hypopigmented areas. Likewise, in congenital naevi there can be hypopigmented perifollicular areas [38,79].

Blotchy areas are hyperpigmented structureless areas where the intensity of the pigmentation makes it impossible to observe underlying structures. Their colour varies from black, gray-black to dark-brown. Histopathologically there is a high pigmented load in the epidermis [21]. Such hyperpigmented structureless areas are symmetrical or central in benign melanocytic lesions while they are irregular and often eccentric in malignant melanocytic lesions [80].

Black lamella is a dermoscopic structure characteristic of hyperpigmented junctional naevi resulting from hyperpigmentation and thickening of the corneum layer. It manifests as a central, round, homogenous, black zone which covers most of the lesion surface. Since black lamella obscures other dermoscopic structures, tape stripping can be used to remove it [27].

The blue-white veil is revealed as a diffuse irregular blurred blue-whitish pigmentation looking like a ground-glass haze [5,21-28,53,81]. Sometimes this veil may have a grayish-blue hue. This structure can be more clearly observed by contact dermoscopy and less clearly by polarized light dermoscopy [33,61].

It is considered that the blue-white veil cannot cover the entire lesion surface and it is clinically found in papular or nodular parts of the lesions. Histologically, the blue-white veil is caused by high aggregates of melanocytes, melanophages and melanin in the dermis while the overlying epidermis shows compact orthokeratosis, hypergranulosis and acanthosis [5,21-28,53,81]. The blue-white veil is a highly specific feature of melanoma with a 97% sensitivity [22]. It is a dermoscopic specific feature for thick melanomas where there is a large amount of malignant melanocytes, melanophages and free melanin in dermis [28,82].

The blue-white veil can also be observed occasionally in Spitz naevus, Reed naevus, angiokeratomas [22]. One cannot differentiate dermoscopically between the blue-white veil in Spitz or Reed naevi and that in melanomas. The blue-white veil does not appear in Clark naevus, thus enabling a clinician to be highly suspicious when coming across this dermoscopic structure [28,53]. The blue-white veil should be differentiated from regression structures consisting of scar-like areas and peppering which does not always come easy [51,52,56].

Regression areas are located in flat parts possibly hypopigmented or even achromic unlike the blue-white veil which is located in the prominent thick part of melanomas [28]. The blue-white veil should sometimes be differentiated from blue-gray ovoid nests in basal cell carcinoma and from red-bluish lagoons in hemangiomas [5,6,21-27,83]. Dermoscopic Specific Features of Regression Process Partial regression has been described in 10 to 35% of primary melanomas, while complete regression is extremely rare, the literature mentioning just 40 cases [51].

Dermoscopic regression is characterized by scar-like areas and by peppering (also called pepper-like or blue-white structures or multiple blue-white dots or bluish areas) [5,21-27,56,69,81,84]. Some authors have grouped them together with the blue-white veil into blue-white structures (BWS) since they are -on one side easier to identify and -on the other side they are not easy to differentiate the blue-white veil from regression area [81,85]. Histopathologically scar areas are caused by fibrosis while blue-grayish dots are generated by melanosis [5,21-27,52,56,81].

The presence of dermoscopic regression structures is highly suggestive of malignancy, but the final diagnostic conclusion should also consider the global dermoscopic pattern and the clinical data [52,56]. The presence of dermoscopic regression structures warns about clinical, dermoscopic and histopathologic diagnosis difficulties [5,21-27,56,81,85]. Scar-like depigmentation (scar-like areas) occurs in late regression phenomenon [5,21-27,56,85]. This dermoscopic aspect is specific to superficial spreading melanomas being often associated with other dermoscopic features that support the diagnosis of melanomas. Scar-like areas should be dermoscopically differentiated from: hypopigmented areas in melanocytic naevi, normal skin areas that may occur in melanocytic naevi, achromic halo of Sutton naevi, central white spot in dermatofibromas, post-trauma scars in melanocytic naevi, post-surgical scars in recurrent naevi [5,21-27].

Scar-like areas should be differentiated from hypopigmented structureless areas that occur frequently in atypical naevi and in congenital naevi [79]. Peppering (pepper-like, blue-gray area, multiple blue-gray granules) are dermoscopically seen as multiple, blue-gray, mottled dots located in a hypopigmented area [5,21-27,51,56]. This dermoscopic feature is hard to observe with polarized light dermoscopy [33], which can be a reason to examine melanocytic lesions with both types of dermoscopic techniques considering the significance of such a feature in finding out melanomas.



The diagnosis signification of blue-gray dots should be interpreted considering their regular or irregular distribution, the percentage of covered areas and the presence of white, red or blue colours and melanocytic or non-melanocytic nature of lesions [84].

In benign melanocytic lesions, if the regression structures occur, then they usually take less than 10% of lesion surface, are evenly distributed and there are no additional malign features [51,52,56]. The presence of such structures in non-melanocytic lesions should be assessed with the highest attention since melanomas may mimic banal non-melanocytic lesions such as seborrheic keratosis and hemangiomas [12]. We can very rarely identify a fully regressed melanoma, which can present scar-like aspect or blue-gray dots covering the entire lesion [84,86]. In situ melanomas blue-grayish regression areas can have a reticular arrangement considered as a highly specific dermoscopic parameter of melanomas [81].

The dermoscopic island is defined as a well-circumscribed area which can be completely differentiated from the global lesion pattern and can express an early malign process being a factor predictable of early melanomas [11]. The identification and understanding of the diagnostic significance of individual dermoscopic parameters along with the global dermoscopic pattern of pigmented skin lesions enable high accuracy of the diagnosis. The major objective of dermoscopy is high identification of in situ melanomas and thin melanomas, which have an excellent prognostic.

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