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ORIGINAL ARTICLE

Dermoscopic Study of Cutaneous Malignant Melanoma: Descriptive Analysis of 45 Cases

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Abstract. *Introduction*. Dermoscopy or epiluminescence microscopy is a novel in vivo technique that can be used for the diagnosis of pigmented cutaneous lesions. The aim of this study was to analyze the dermoscopic patterns observed in a consecutive series of primary cutaneous melanomas.
Material and methods. A cross-sectional study was carried out in which clinical, histological, and dermoscopic characteristics were analyzed in 45 primary melanomas.
Results. Two thirds of the series were thin melanomas and 50 % were in situ melanomas. According to the ABCD rule, there was clinical suspicion of melanoma in 72 % of the lesions. Specific dermoscopic patterns were observed in 93 %. A multicomponent pattern was the most commonly observed (71 %). A nonspecific pattern was observed in 7% of lesions. The most noteworthy local findings were irregular pigmented patches (80 %), irregular dots and globules (68 % and 62 %), atypical pigmented network (57 %), blue-gray veil (42 %), and radial streaming and pseudopods (20 %). In addition, hypopigmented areas (86 %), regression structures (80 %), and vascular abnormalities (73 %) were also often seen. Acral lesions presented patterns characteristic of these sites.
Conclusion. Analysis of dermoscopic patterns aids early definitive diagnosis of melanoma and is particularly useful in the case of clinically indolent lesions. Dermoscopic findings provide information complementary to that obtained by conventional histology.

Key words: dermoscopy, epiluminescence microscopy, malignant melanoma.

ESTUDIO DERMOSCÓPICO DEL MELANOMA MALIGNO CUTÁNEO: ANÁLISIS DESCRIPTIVO DE 45 CASOS

Resumen. *Introducción.* La dermatoscopia o microscopía de epiluminiscencia es una novedosa técnica de microscopía *in vivo* útil para el diagnóstico de las lesiones pigmentadas cutáneas. El objetivo del presente trabajo es analizar los patrones dermoscópicos de una serie consecutiva de melanomas cutáneos primarios.
Material y métodos. Se trata de un estudio de corte transversal, en el que se analizan las características clínicas, histológicas y dermoscópicas de 45 melanomas primarios.
Resultados. Las dos terceras partes de la serie eran melanomas de espesor fino y el 50% melanomas *in situ*. Clínicamente, el 72 % de las lesiones eran sospechosas de melanoma (regla ABCD). Dermoscópicamente, el 93% presentaron patrones dermoscópicos específicos. El patrón global más frecuente fue el multicomponente (71 %). El 7% de las lesiones mostraron un patrón inespecífico. Los hallazgos locales más destacables fueron las manchas de pigmento irregulares (80 %), el retículo pigmentado atípico (57 %), los puntos y glóbulos irregulares (68 y 62 %), las proyecciones radiales/pseudópodos (20 %) y el velo azul-gris (42 %). Además, destacó la presencia de áreas hipopigmentadas (86 %), estructuras de regresión (80 %) y vascularización atípica (73 %). Las lesiones acras mostraron patrones característicos de estas localizaciones.
Conclusión. El análisis de patrones dermoscópicos facilita el diagnóstico de certeza del melanoma en estadios precoces, y es particularmente útil en lesiones poco expresivas clínicamente. La identificación de hallazgos dermoscópicos ofrece información complementaria al estudio histológico convencional.

Palabras clave: dermatoscopia, microscopía de epiluminiscencia, melanoma maligno.

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Introduction

Malignant cutaneous melanoma is 1 of the tumors whose incidence and mortality have risen most rapidly during the last few decades in Spain.[1] Early diagnosis of melanoma is a key objective, given the malignant potential of the tumor and the lack of effective treatments for advanced disease.[2]

Clinicians can diagnose 65% to 80% of melanomas correctly using the ABCD (asymmetry, border, color, diameter) rule.[3] However, the onset of some melanomas seems to have little clinical relevance and can go undetected by an expert.

Dermoscopy, or epiluminescence microscopy, is a simple in vivo technique that enables us to visualize submicroscopic structures that are not visible to the naked eye.[T] The diagnostic accuracy of dermoscopy in melanoma is between 5% and 30% better than that of visual inspection, as was recently confirmed in evidence-based publications including 1 meta-analysis.[4,5]

Dermoscopy is based on the identification of colors and structures that show a surprisingly strong histological correlation.[6] The Consensus Meeting on Dermoscopy held via the Internet has recently standardized the terminology and designed a 2-stage dermoscopic diagnostic method that allows us to ascertain, first, whether a pigmented lesion is melanocytic or not (based on the presence or absence of specific criteria) and, second, whether the lesion is benign or malignant.[7] The validity of 4 algorithms for the differential diagnosis of melanocytic lesions (pattern analysis,[8] the 7-point checklist,[9] the Menzies method,[10] and the ABCD rule[11]) has been studied. The pattern analysis proposed by Pehamberger[8] in 1987 is the most complete diagnostic system and offers the highest diagnostic yield according to the results of the virtual consensus meeting.[7]

We studied the dermoscopic patterns of a series of primary cutaneous melanomas and evaluated the contribution of dermoscopy to the conventional histological and clinical analysis of this tumor.

Materials and Methods

We undertook a cross-sectional study of 45 primary cutaneous melanomas diagnosed consecutively between August 2004 and December 2005 at the dermatology unit of the Hospital Costa del Sol in Marbella, Spain. The preoperative diagnosis was based on clinical criteria (ABCD rule) and dermoscopic criteria using the 2-stage diagnostic procedure standardized at the virtual consensus meeting (Figure 1). All the melanomas were confirmed by histopathology. The clinical characteristics (age, sex, site, size, and height), histological characteristics (histologic type, Breslow thickness, Clark level, regression, ulcerations, and nevus), and dermoscopic characteristics of the melanomas were studied.

We analyzed the dermoscopic images of all the primary melanomas obtained at consultation using the Dermlite foto system (magnification ×10) and evaluated the presence or absence of global and local dermoscopic patterns as defined by the virtual consensus meeting (Table 1).[7]

Statistical analysis was by calculation of the absolute and relative frequencies of the different clinicopathological and dermoscopic variables.

Results

Clinicopathologic Characteristics

The mean age was 57 years and the ratio of men to women 1:1. The most frequent melanoma site was the trunk (51%), followed by the lower limbs (17%). The most common histological type was superficial spreading melanoma (64%). Two-thirds were thin melanomas (1 mm or less) and half were melanoma in situ. Lesions were suspected to be malignant in 73% of cases according to the ABCD criteria (Table 2).

Dermoscopic Characteristics

In 93% of cases, the lesions presented melanoma-specific dermoscopic patterns (Table 3).

Overall Characteristics

A multicomponent pattern was observed in 71% of the melanomas, although other patterns were also found: homogeneous (8%), reticular (6%), globular (4%), and parallel (2%). The pattern was nonspecific in 7% of the lesions.

Local Characteristics

We observed irregularly pigmented patches (80%), hypopigmented areas (86%), atypical pigment network (57%), irregular globules and dots (68% and 62%), radial streaming and pseudopods (20%), and blue-gray veil (42%). Regression structures were also found (blue-gray dots and/or white scar) in 80% of the lesions, and this was significant in 20% of cases. Abnormal vascularization was observed in 74% of cases, and this involved erythema (64%) and/or vascular structures (35%). The acral lesions had their own patterns: pseudonetwork on the face and parallel on the soles.

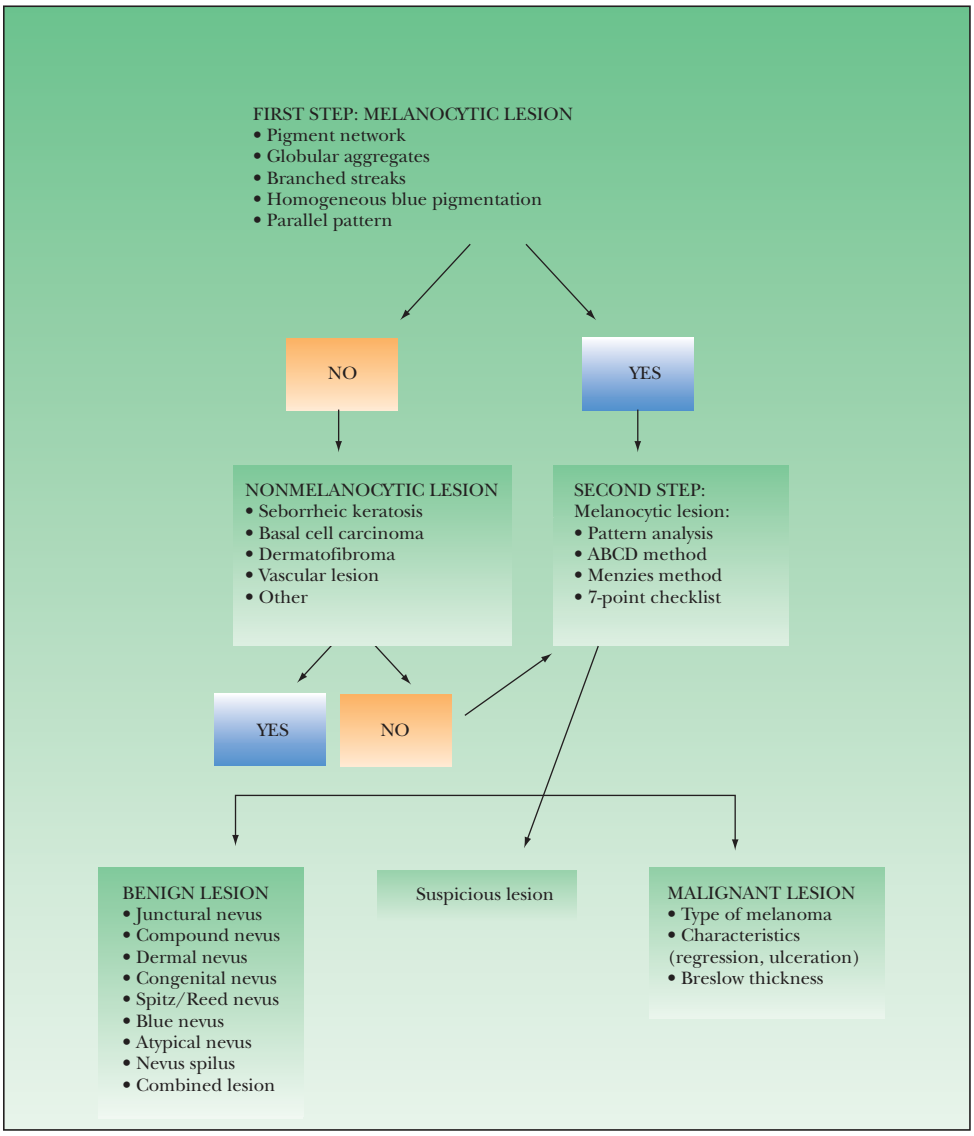

Figure 1. Two-stage algorithm for dermoscopic diagnosis.

Discussion

We studied the dermoscopic characteristics of a consecutive series of 45 primary cutaneous melanomas of which two-thirds were thin and half were in situ. Pattern analysis enabled us to identify dermoscopic findings (overall or local) that were melanoma-specific in 93% of cases, that is, a diagnosis that was 20% more accurate than clinical diagnosis.

As for overall dermoscopic characteristics, the multicomponent pattern was the most common presentation, reported in 71% of cases (Figure 2). This pattern is defined by the presence of 3 or more different dermoscopic structures and is melanoma-specific.[8] Other patterns—reticular, globular, or homogeneous—are sometimes observed. No specific dermoscopic findings were observed in 7% of the melanomas (Figure 3), which is similar to the percentage reported by Menzies et al[10] (8% of melanomas). Therefore, all lesions with a nonspecific pattern should be removed, particularly if the clinical history is suggestive (pruritus, bleeding, or change in appearance), as they could be melanomas.

Local dermoscopic characteristics were also very significant and 57% of melanomas showed an atypical pigment network. The pigment network consists of a mesh of brown or black lines that suggests melanocyte hyperplasia of the rete ridges.[6] It has been reported in melanocytic nevus and in melanoma; however, whereas in the former the network is thin, regular, and becomes thinner at the periphery, in melanoma it tends to be thick and irregular, and often finishes abruptly.

We found irregular globules and dots in 68% and 62%, respectively, of melanomas. The dots and globules are round brown or black structures that vary in size (dots <0.1 mm and globules >0.1 mm) and that are associated with the

Table 1. Analysis of Patterns Reviewed at the Consensus Net Meeting on Dermoscopy [t]

Criterion	*Definition*	*Significance*
Overall Pattern		
Reticular	Pigmented network covering most of the lesion	Melanocytic nevus
Globular	Numerous round or oval grayish black and/or brown structures with different sizes	Melanocytic nevus
Cobblestone	Large globules that are very close together, arranged polygonally in the form of cobblestones	Melanocytic nevus
Homogeneous	Diffuse brown, blue-gray to blackish gray pigmentation in the absence of other local distinguishing features	Melanocytic nevus
Starburst	Pigmented streaks at the periphery of a pigmented cutaneous lesion	Spitz/Reed nevus
Parallel	In melanocytic lesions on the soles and palms, the pigmentation can follow the grooves or ridges of the dermatoglyphs	Acral nevus/acral melanoma
Multicomponent	Combination of 3 or more dermoscopic structures	Melanoma
Nonspecific	Pigmented lesion with no distinguishing dermoscopic features	Melanoma
Local Pattern		
Pigment network		
Typical	Brown pigmented network, fine mesh, and regular distribution, generally becoming thinner towards the periphery	Melanocytic nevus
Atypical	Black, brown, or gray pigmented reticule, irregular distribution and thick mesh (prominent)	Melanoma
Dots and globules		
Regular	Brown or black, round or oval structures of different sizes that are regularly distributed	Melanocytic nevus
Irregular	Black or brown, round or oval structures of different sizes that are irregularly distributed	Melanoma
Streaks		
Regular	Linear structures not connected with the network lines and distributed regularly at the periphery of the lesion	Melanocytic nevus
Irregular	Linear structures not connected with the network lines and distributed irregularly at the periphery of the lesion	Melanoma
Blue-gray veil	Unstructured irregular blue-gray area with ground glass appearance. The pigmentation cannot occupy the whole lesion and usually coincides with the highest part of the lesion	Melanoma
Pigment patches		
Regular	Areas of unstructured brown, black, or gray symmetrically distributed pigment	Melanocytic nevus
Irregular	Areas of unstructured brown, black, or gray asymmetrically distributed pigment	Melanoma
Hypopigmentation	Unstructured areas of pigmentation that is less pronounced than in the rest of the lesion	Nonspecific
Regression structures	Scar-type white depigmentation and/or blue peppered dots that usually coincides with the flattest part of the lesion	Melanoma
Vascular structures	Comma-shaped vessels Hairpin vessels Dotted vessels Irregular linear vessels Vessels and/or erythema in regression areas	Dermal nevus Seborrheic keratosis/melanoma Melanoma Melanoma Melanoma

(Continued)

Table 1. Analysis of Patterns Reviewed at the Consensus Net Meeting on Dermoscopy [t] *(continued)*

Criterion	*Definition*	*Significance*
Facial Patterns		
Typical pseudonetwork	Round orifices of the same size corresponding to the follicular orifices	Benign lesion
Annular-granular structures	Multiple blue-gray dots surrounding follicular orifices with an annular and granular appearance	Melanoma
Gray pseudonetwork	Gray pigmentation around the follicular orifices formed by the confluence of granular-annular structures	Melanoma
Rhomboid structure	Brown gray pigmentation around the follicular orifices with rhomboid appearance	Melanoma
Asymmetric follicular appearance	Eccentric pigmentation around the follicular openings	Melanoma
Patterns on Palms and Soles		
Groove pattern	Pigmentation following superficial grooves	Acral nevus
Lattice pattern	Pigmentation following and crossing the ridges	Acral nevus
Fibrillar pattern	Fine pigmented filaments perpendicular to the grooves	Acral nevus
Ridge pattern	Pigmentation following superficial ridges	Melanoma

[a]Argenziano G, et al.[7]

presence of melanocytic nests.[6] In mature melanocytic nevus, they are located at the center of the lesion, but may be found on the periphery in active junctional nevus. Nevertheless, the presence of irregular globules and dots at the edge of a melanocytic lesion is suggestive of melanoma.[9]

While uncommon, irregular streaks are very specific to melanoma.[9,12] In 20% of our melanomas, we observed the presence of brown or black linear structures with a fine ending (radial streaming) or a bulbous ending that were located at the periphery of the tumor. In histological terms, these structures are melanocytic nests that are parallel to the surface.[6] Regular streaks are characteristic of Spitz/Reed nevus with a starburst pattern, whereas irregular and asymmetric streaks are typical of melanoma.

One of the most constant dermoscopic findings was irregular pigmented blotches (single or multiple, but always asymmetric), observed in 84% of the melanomas. This group includes unstructured evenly pigmented areas of another color (black, brown, or blue). The pigmented blotches are an accumulation of melanin in the horny layer (black), epidermis (brown), or dermis (blue).[6] In junctional nevus, the presence of a central pigmented blotch (black lamella) is not uncommon; however, in dysplastic nevus, especially in melanoma, these blotches are usually irregular and numerous.[9]

We identified blue-gray veil in 42% of the melanomas of our series. This is defined as an area of grayish pigmentation with a ground glass appearance. This finding is very characteristic of melanoma, although it has also been reported in nonmelanocytic lesions such as basal cell carcinoma.[8] In histologic terms, it corresponds to pigmented cell aggregates in the dermis in combination with hyperorthokeratosis.[13] In palpable lesions, it usually indicates the thickest part of the tumor; however, in flat lesions, veil can be observed in areas with tumor regression due to the confluence of blue-gray dots when the lesion is examined under low magnification.[6]

Hypopigmentation was a common characteristic (observed in 86% of our melanomas). Irregular multifocal hypopigmentation is typical of melanoma, although it can also present in dysplastic nevus.[13] In our study, we found hypopigmented areas that were occasionally focal and eccentric and more often numerous and randomly mixed with other pigmented structures. Hypopigmentation was the dominant finding in lesions with a nonspecific pattern.

Regression structures (blue-gray dots and/or starburst scarring) can be observed in benign or malignant melanocytic or nonmelanocytic lesions; however, the presence of regression in a melanocytic lesion is suggestive of melanoma.[9] We found regression structures in 80% of the melanomas, the most common being blue-gray dots corresponding to melanophage accumulation with or without areas of white regression (scar fibrosis). In 20% of cases, regression structures made up 50% of the lesion and the correlation with histologic regression was greater in these melanomas. Histopathology could underestimate the percentage of tumor regression, although we do not know the prognostic consequences of the finding. Furthermore, regression is an

Table 2. Clinicopathologic Characteristics of Our Series

Variable	*Frequency*	*%*
Site		
Trunk	23	51.1
Lower limbs	8	17.8
Upper limbs	7	15.6
Head/neck	5	11.1
Soles	2	4.4
ABCD Criteria for Melanoma		
Presence	33	73.3
Size		
< 10 mm	16	35.6
> 10 mm	29	64.4
Elevation		
Flat	19	42.2
Palpable	18	40.0
Nodular	8	17.8
Type		
SSM	29	64.4
NM	7	15.6
LMM	7	15.6
ALM	2	4.4
Breslow Thickness		
Breslow < 1 mm	30	66.7
Breslow > 1 mm	15	33.3
Clark Level		
I	22	48.9
II	6	13.3
III	7	15.6
IV	9	20.0
V	1	2.2
Regression		
Regression	12	26.7
Regression > 50%	3	6.7
Ulceration		
Present	5	11.1
Not present	40	88.9
Nevus		
Present	17	37.8
Not present	28	62.2

Abbreviations: ALM, acral lentiginous melanoma; LMM: lentigo maligna melanoma; NM, nodular melanoma; SSM, superficial spreading melanoma.

Table 3. Dermoscopic Characteristics of Our Series

Variable	*Frequency*	*%*
Dermoscopic Criteria of Melanoma		
Presence	42	93.0
Color		
Brown	41	91.1
Black	24	53.3
Blue-gray	38	84.4
White	26	57.8
Red	38	84.4
Pattern		
Nonspecific	3	6.7
Network	3	6.7
Globular	2	4.4
Homogeneous	4	8.9
Parallel	1	2.2
Multicomponent	32	71.1
Atypical Pigment Network		
Absent	19	42.2
Present	26	57.8
Irregular Dots		
Absent	14	31.1
Present	31	68.9
Irregular Globules		
Absent	16	35.6
Present	28	62.2
Irregular Streaks		
Absent	36	80.0
Present	9	20.0
Irregular Blotches		
Absent	7	15.6
Present	38	84.4
Hypopigmentation		
Absent	6	13.3
Present	39	86.7
Regression		
Absent	9	20.0
Present	36	80.0
50% Regression		
Absent	36	80.0
Present	9	20.0
Veil		
Absent	26	57.8
Present	19	42.2
Abnormal Vessels		
Absence	12	26.7
Erythema	17	37.8
Structure	4	8.9
Erythema + structure	12	26.7
Facial Lesion Patterns		
Atypical pseudonetwork	2	4.4
Present	2	100.0
Acral Lesion Patterns	2	4.4
Ridge pattern		
Present	1	50.0
Fibrillar pattern		
Present	1	50.0

important confounder in the histology of pigmented lesions; therefore, if identified by dermoscopy, it should be reported to the pathologist so that an accurate diagnosis can be established.[14,15] In these cases, we also recommend complete removal of the lesion, given that incisional biopsy has a low diagnostic yield.

Vascularization was a remarkable characteristic of the melanomas in our series and various melanoma-specific vascular patterns have been reported.[16] In our series, erythema was present in 64% of the melanomas, and abnormal vascular structures (irregular, dotted, or

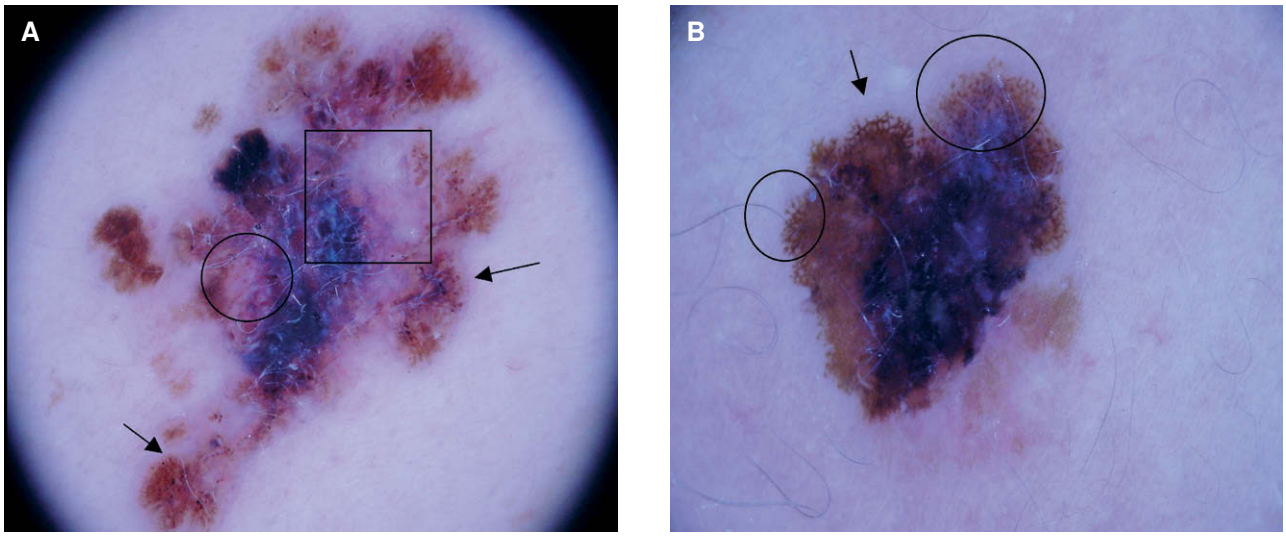

Figure 2. Two multicomponent melanomas. A, Superficial spreading melanoma (Breslow thickness 0.5 mm) presenting differently colored pigmented blotches, irregular globules and dots at the periphery (arrows), and a central blue-gray veil. Areas of gray and white regression (square) and abnormal vascular structures (oval) can be identified. B, Superficial spreading melanoma (Breslow thickness 0.8 mm). Note the presence of a central evenly pigmented blotch with areas of blue-gray veil and the existence of a prominent pigment network (arrow), irregular globules (oval), and pseudopods (circle) at the periphery.

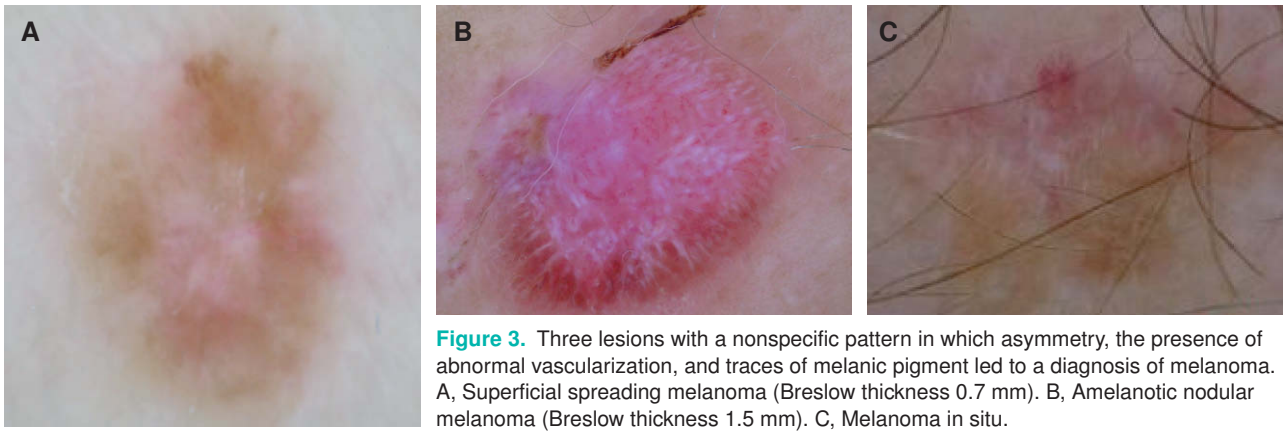

Figure 3. Three lesions with a nonspecific pattern in which asymmetry, the presence of abnormal vascularization, and traces of melanic pigment led to a diagnosis of melanoma. A, Superficial spreading melanoma (Breslow thickness 0.7 mm). B, Amelanotic nodular melanoma (Breslow thickness 1.5 mm). C, Melanoma in situ.

polymorphous linear vessels) were observed in 35% of cases. The presence of atypical vascularization was a significant finding in 3 hypomelanotic melanomas. The vascular pattern is essential for the identification of some amelanotic melanomas,[17,18] as it is sometimes the only variable that can be evaluated by dermoscopy. In our experience, a global architectural characteristic, asymmetry, and some local dermoscopic findings (atypical pigment network, eccentric globules, and irregular blotches of even pigmentation) were extremely useful in the diagnosis of melanomas that were small and clinically uninformative (Figure 4). Similarly, in melanomas with a nonspecific dermoscopic pattern, details such as the presence of abnormal vessels and traces of melanic pigment were revealing.

Lastly, acral lesions showed distinct dermoscopic findings. On the face, the wealth of pilosebaceous follicles and flattened rete ridges lead the pigmented lesions to adopt a configuration known as pigmented pseudonetwork. The 2 cases of facial lentigo maligna melanoma in our series showed a pseudonetwork with asymmetric occlusion of the follicular orifices, presence of annular granular structures, and rhomboid areas (Figure 5). These signs have been considered characteristic of incipient lentigo maligna melanoma.[19-22] Selective biopsy of the rhomboid areas enabled us to diagnose 1 case after several inconclusive blind biopsies.

On palms and soles, pigmentation follows the dermatoglyphs and there have been several reports of linear patterns for melanocytic lesions of hairless skin. The parallel groove pattern and its latticed variation are associated with benign lesions, the parallel ridge pattern is melanoma-specific, and the fibrillar pattern, despite having been reported in both categories, is exceptional in melanoma.[23]

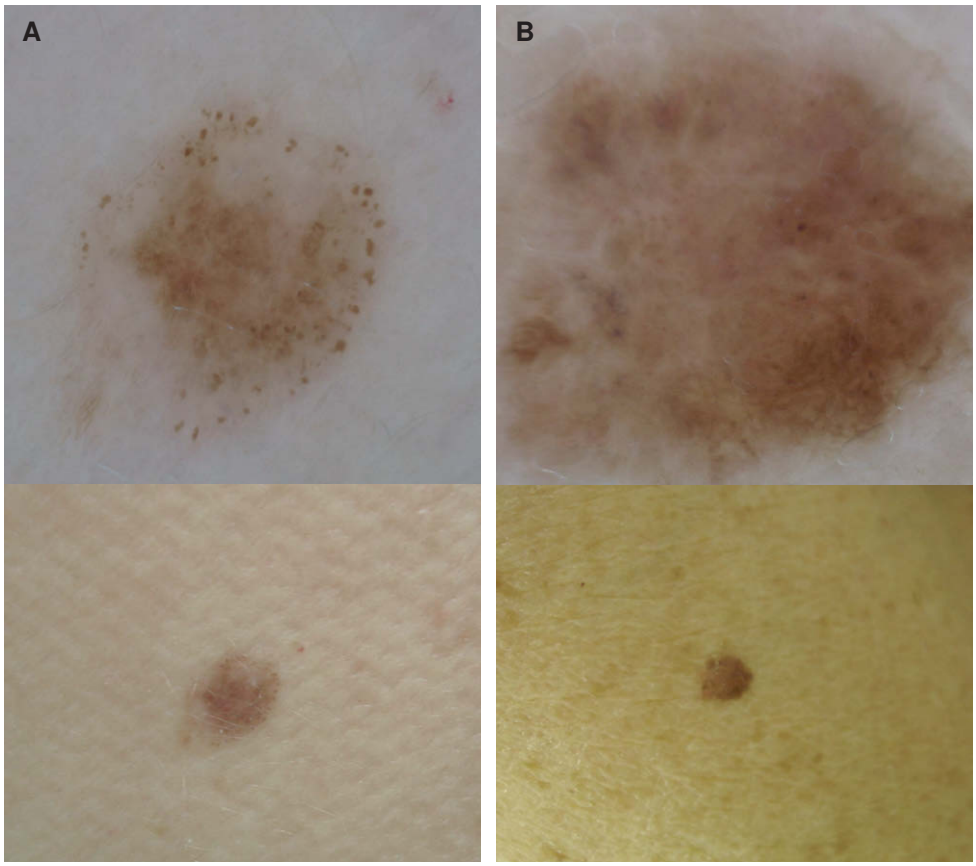

Figure 4. Two clinically unremarkable cases of melanoma, with dermoscopic findings that are relevant for diagnosis. A, Melanoma in situ presenting an atypical globular pattern suggestive of melanoma. B, Melanoma in situ showing asymmetry, areas of irregular pigmented network, and irregularly distributed globules together with areas of scar fibrosis.

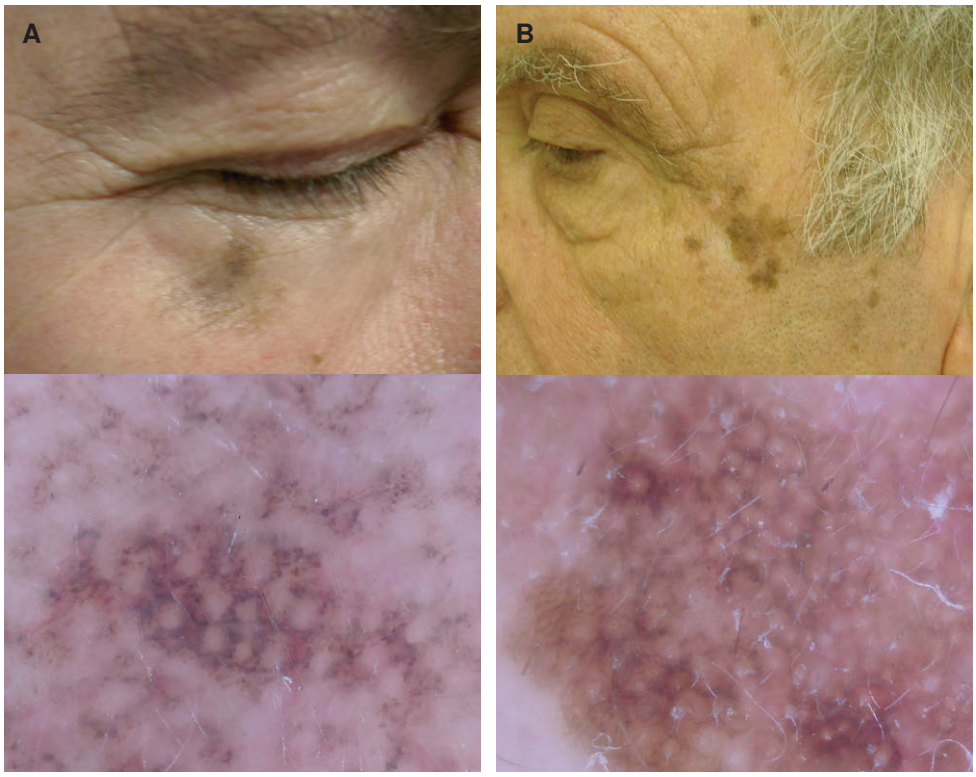

Figure 5. Two lentigo maligna melanomas on the face. A, Pigmented lesion showing a pigmented pseudonetwork with slate gray globules and dots that give an annular granular image. B, Pigmented pseudonetwork with rhomboid structures. These findings are specific to early-stage facial lentigo maligna melanoma.

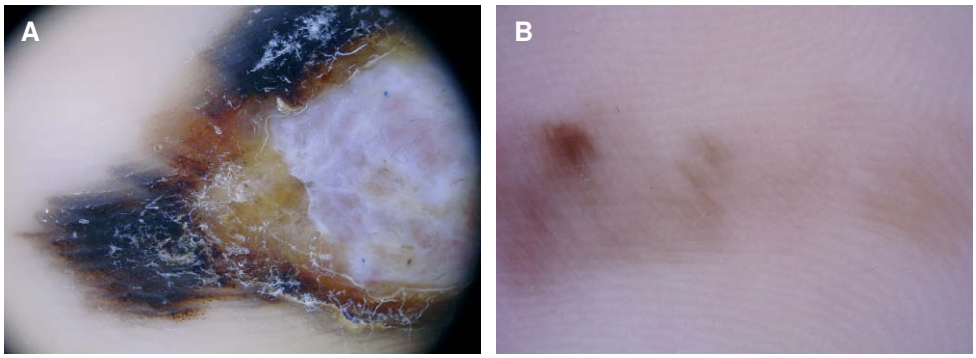

Figure 6. A, Acral lentiginous melanoma (Breslow thickness 8 mm). Detail of periphery of lesion showing a ridge pattern that is characteristic of melanomas at these sites. B, Acral melanoma in situ. Note the fibrillar pattern of the asymmetrical hypomelanotic lesion.

Of the plantar lesions included in our study, 1 showed a ridge pattern at the periphery that coincided with the in situ component of the tumor. The other showed a fibrillar pattern (Figure 6).

In summary, 93% of the melanomas in our series were identified thanks to the presence of specific dermoscopic patterns, even in the most biologically incipient lesions (melanomas in situ). However, dermoscopy has limitations for recognizing hypomelanotic and amelanotic lesions.[24] In our series, 7% of the melanomas were unremarkable, although we believe the true percentage is greater, given that we did not include those melanomas that were resected with no clinical suspicion and without performing dermoscopy. In these cases, the clinical history and dermoscopic information might be revealing.

To conclude, dermoscopy gives the clinician new criteria to make possible a more accurate diagnosis of melanoma and to detect it earlier. Dermoscopy offers a view of the surface of the whole tumor and complements histology by bringing to light findings that could go undetected using conventional histology.

Acknowledgments

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Conflict of interests

The authors declare no conflicts of interest.

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