Dermoscopic Island

A New Descriptor for Thin Melanoma

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Objectives: To determine the frequency and the features of the dermoscopic island (DI) in melanocytic lesions and to assess its specificity for the diagnosis of melanoma. Dermoscopy improves the diagnostic accuracy of melanoma, but only a few dermoscopic descriptors specific for thin melanomas have been identified. We defined a new descriptor, the dermoscopic island, a well-circumscribed area showing a uniform dermoscopic pattern that differs from the rest of the pigmented lesion.

Design: Dermoscopic images of 96 in situ melanomas, 266 invasive melanomas, and 612 dermoscopic atypical nevi were evaluated to establish the presence and the main pattern of the DI. Also, clinical and histologic characteristics were analyzed.

Setting: Dermoscopic images were collected from lesions excised between 2003 and 2008 at the Department of Dermatology, University of Modena and Reggio Emilia.

Main Outcome Measures: Specificity and odds ratio for melanoma; dermoscopic and histologic characteristics of lesions with a DI.

Results: The DI was present in 10.4% of in situ melanomas, 4.1% of invasive melanomas, and 3.1% of dermoscopic atypical nevi. The odds ratio for melanoma was 1.922, and specificity was 96.9%. Invasive melanomas with a DI were thinner than those lacking this descriptor. In addition, more than half of the melanomas with a DI arose on a nevus. The DI appeared mainly reticular on a reticular background.

Conclusion: The DI is characteristic of thin melanoma arising in a nevus; thus, it can be considered a potential early sign of transformation of a nevus into a melanoma.

Arch Dermatol. 2010;146(11):1257-1262

Melanoma is a lethal cancer among skin malignancies, with an increasing incidence in the United States and Europe.1-2 Despite a high cure rate for in situ/early melanomas, advanced melanomas have a poor prognosis. Thus, early diagnosis of melanoma represents a crucial end point for physicians.

During the past few decades, dermoscopy has become a powerful diagnostic tool enabling the exploration of subsurface structures of the skin, improving diagnostic accuracy when used by experts.3-4 Although many dermoscopic criteria have been successfully used for the diagnosis of melanoma, no specific findings have been reported for in situ melanomas or very thin malignancies.5-7 Pizzichetta et al7 considering 37 in situ and 53 invasive melanomas, found that dermoscopic criteria are similar in these 2 populations. However, some malignant lesions, especially in the early stages of growth, may lack specific dermoscopic features and are difficult to diagnose even using dermoscopy.9-10

Bolognia et al11 described macroscopic “small dark dots,” roundish areas of brown or black hyperpigmentation 3 mm or smaller in diameter, located at the periphery of the lesion and conferring an asymmetrical or eccentric pigment distribution, that in 3 patients were due to a focus of melanoma in a preexisting nevus. Some researchers12-15 have focused their attention on the significance of eccentric peripheral hyperpigmentation among melanocytic lesions, stating that this kind of pigment distribution is considerably more frequent in melanomas than in benign lesions.

During our daily clinical practice, we noticed a series of in situ melanomas with a dermoscopic appearance characterized by the presence of a well-defined lesion area showing a uniform dermoscopic pattern different from the remainder of the lesion. We named this area dermoscopic island (DI). The DI may be located at the...
periphery of the lesion or in a paracentral position. Whereas the description of eccentric peripheral hyperpigmentation considers only asymmetrical pigment distribution, we are focusing on a variation of the dermoscopic pattern in different areas of the lesion, regardless of the degree and distribution of the pigmentation. In this study, we analyzed the frequency and the characteristics of the DI in melanocytic lesions. The objective was to find out whether this new descriptor could predict melanoma and, in particular, whether it represented the expression of an early phase of malignant transformation from nevus into melanoma.

**METHODS**

The DI was defined as a well-circumscribed area showing a uniform dermoscopic pattern that differs from the remaining pigmented lesion. Lesions with a DI show an asymmetrical aspect that is sometimes appreciable by visual inspection. The DI may touch the border of the lesion or may be included in it. It may involve more than half of the lesion area or only a small part of the pigmented lesion.

For this retrospective study, we selected 1240 dermoscopic images (magnified 20-fold) of 96 in situ melanomas, 266 invasive melanomas, and 612 dermoscopic atypical nevi (melanocytic nevi removed with the suspicion of a melanoma) excised between March 1, 2003, and December 31, 2008, at the Dermatology Department of the University of Modena and Reggio Emilia. Acral, facial, and mucosal lesions were excluded for their site-specific dermoscopic aspects. Dermoscopic images having a histologic report were included. All the images were independently reviewed by 3 expert dermoscopists (S. Borsari, C.L., and S. Seidenari) for the presence of a DI. Investigators were blinded to the diagnosis. The descriptor was considered present when at least 2 observers agreed.

Ninety 50-fold magnified images of lesions containing a DI were then examined to assess the dermoscopic pattern of the DI and the remaining lesion. Patterns were classified as reticular, globular, homogeneous (with structureless pigmentation), or starburst (with a network showing a prevalent radial distribution) (Figure 1). On these images, the total dermoscopy score (TDS) and the 7-point checklist score were also calculated. According to these semiquantitative algorithms, lesions with a TDS higher than 5.45 and a 7-point checklist score higher than 3 are considered malignant.

Dermoscopic images had previously been collected by a digital epiluminescence microscope (FotoFinder; TeachScreen Software GmbH, Bad Birnbach, Germany) using 20- to 50-fold magnification. The instrument and the calibration method have been described elsewhere. In this study, images at 20-fold magnification were used to assess the presence or absence of a DI, whereas 50-fold magnified images were used to establish the dermoscopic pattern and to evaluate other dermoscopic aspects. Clinical data, that is, patient age and sex and lesion sites, were collected in a spreadsheet file (Microsoft Excel, Microsoft Corp, Redmond, Washington).

Histologic slides were evaluated by a trained pathologist (A.M.C.). For each lesion, the histopathologic diagnosis was recorded in the following categories: nevus (junctional, compound, dermal, blue, Spitz/Reed, or combined), in situ melanoma (with atypical melanocytes restricted to the dermoepidermal junction and the epidermis), and invasive melanoma. In the case of melanoma, the thickness and the presence of a preexisting nevus were determined from the histologic report. To ensure that lesions with a DI had been entirely analyzed, all cases with a DI were reviewed by the pathologist, aware of the area of concern. The study was performed under the supervision of the ethics committee of Policlinico of Modena, and data were collected according to Protocol No. 1338/C.E.
Relative frequencies of the DI, along with other dermoscopic and histologic features, were analyzed in all cases (dermoscopic atypical nevi and in situ and invasive melanomas). Differences between dermoscopic atypical nevi, in situ melanomas, and invasive melanomas were tested by the Pearson $\chi^2$ test and the Fisher exact test. $P < .05$ was regarded as statistically significant. Concerning the DI, percentages (and 95% confidence intervals) for sensitivity, specificity, and positive and negative predictive values and odds ratio were calculated. Statistical examinations were performed using a software program (SPSS, version 12.0 for Windows; SPSS Inc, Chicago, Illinois).

**RESULTS**

Based on the inclusion criteria, 974 melanocytic lesions of 903 patients (467 women and 436 men; mean [SD] age, 45.09 [17.21] years) were selected for the retrospective study. All the lesions were surgically removed and histopathologically examined. The case study was composed of 612 dermoscopic atypical nevi (359 compound, 117 junctional, 24 dermal, 16 blue, 94 Spitz/Reed, and 2 combined), 96 in situ melanomas, and 266 invasive melanomas.

A DI was present in 19 dermoscopic atypical nevi (3.1%) (Figure 2), 10 in situ melanomas (10.4%) (Figure 3), and 11 invasive melanomas (4.1%) (Figure 4). There were 42 DIs belonging to 40 lesions; 1 nevus and 1 in situ melanoma had 2 islands.

In 47.6% of cases the DI was observed in an eccentric position (not involving the center of the lesion), it touched the border in 85.7% of cases, and 52.4% of the DIs involved half of the lesion area or more. In 39 cases, the island was associated with hyperpigmentation, whereas in 3 cases it was the same color as the lesion.

Sensitivity for the diagnosis of melanoma was 5.8%, specificity was 96.9%, the positive predictive value was 0.525, and the negative predictive value was 0.635. The odds ratio was 1.922. The presence of a DI was found to be significant for melanomas ($\chi^2$ test $P = .04$) (Table 1); its presence, furthermore, was significantly more frequent in situ with respect to invasive melanomas ($P = .02$).

The histologic characteristics of the melanomas are given in Table 2. Among lesions with a DI, 60% of in situ and 54.5% of invasive melanomas arose from a pre-existing nevus (Figure 5); conversely, melanomas lacking a DI were less frequently associated with a nevus (37.2% of in situ and 23.1% of invasive melanomas). The frequent finding of a preexisting nevus in tumors containing a DI was statistically significant in the group of invasive melanomas and in all melanomas. Moreover,
Invasive MMs

All MMs

for invasive melanomas). (1.46) for dermoscopic atypical nevi and 2.86 (1.28) for

whereas the mean (SD) 7-point checklist score was 2.63

Though observed.

The mean (SD) TDS was 5.48 (0.84) for dermoscopic atypical nevi and 5.72 (0.88) for melanomas, whereas the mean (SD) 7-point checklist score was 2.63 (1.46) for dermoscopic atypical nevi and 2.86 (1.28) for melanomas (2.5 [1.08] for in situ melanomas and 3.18 [1.4] for invasive melanomas).

Table 1. Statistical Analysis Results on the Presence of the Dermoscopic Island for the Diagnosis of Melanoma

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>0.058 (0.034-0.082)</td>
</tr>
<tr>
<td>Specificity</td>
<td>0.969 (0.955-0.983)</td>
</tr>
<tr>
<td>Positive predictive value</td>
<td>0.525 (0.370-0.680)</td>
</tr>
<tr>
<td>Negative predictive value</td>
<td>0.635 (0.486-0.794)</td>
</tr>
<tr>
<td>Odds ratio</td>
<td>1.922 (1.019-3.626)</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>4.2</td>
</tr>
<tr>
<td>$P$ value</td>
<td>.04</td>
</tr>
</tbody>
</table>

Abbreviation: CI, confidence interval.

Table 2. Dermoscopic Island and Histologic Characteristics of Melanomas

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>In Situ MMs</th>
<th>Invasive MMs</th>
<th>All MMs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With a DI</td>
<td>Without a DI</td>
<td>With a DI</td>
</tr>
<tr>
<td>Ex nevus, No. (%)</td>
<td>(n=10)</td>
<td>(n=86)</td>
<td>(n=11)</td>
</tr>
<tr>
<td>Thickness, mean (SD), mm</td>
<td>NA</td>
<td>NA</td>
<td>0.64 (0.29)</td>
</tr>
</tbody>
</table>

Abbreviations: DI, dermoscopic island; MMs, melanomas; NA, not applicable.

During the dermoscopic observation of pigmented lesions, we observed melanocytic lesions presenting a uniform dermoscopic pattern in a well-circumscribed area, different from the dermoscopic pattern of the remaining lesion. The clinical impression was that this was more frequent in melanomas at an early stage. To assess whether this was true, we performed a retrospective study of 1240 dermoscopic images of melanomas of different thicknesses and dermoscopically atypical nevi excised during a 5-year period. We identified a dermoscopic descriptor, DI, in 40 lesions, which were further assessed for the presence of other dermoscopic and histologic characteristics.

In a predermoscopy era, Bologna et al11 examined 59 cases of melanocytic nevi with eccentric "small dark dots" described as peripheral foci of brown or black hyperpigmentation 3 mm or smaller in diameter. Forty-one of the dark dots were due to increased melanin in epidermal melanocytes or keratinocytes, usually accompanied by melanophages; of these, 6 were associated with slight or moderate melanocytic nuclear atypia. Three of the dark dots were due to melanoma arising in a nevus. The authors concluded that a low percentage of small dark dots in melanocytic nevi are due to melanoma and that biopsy specimens of nevi with small dark dots should be sectioned to ensure histologic examination of this focus of hyperpigmentation.

Subsequently, other authors have focused their attention on the significance of asymmetrical pigment distribution in melanocytic lesions, as assessed by means of dermoscopy.13-15 An eccentric focus of hyperpigmentation is considerably more frequent in melanomas than in benign lesions. Blum et al13 considered eccentric foci to be a sign of possible transformation of an atypical nevus into a melanoma and recommended excision of these lesions or, at least, dermoscopic follow-up at 3 months. On the other hand, Fikrle and Pizinger14 considered eccentric peripheral hyperpigmentation to be a single dermoscopic descriptor unable to discriminate between malignant and benign melanocytic lesions. Focusing on lesions that lack specific dermoscopic features of malignancy, Arevalo et al15 did not find any difference in the frequency of eccentric hyperpigmentation in melanomas with respect to nevi and affirmed that such lesions do not require closer observation than other benign nevi lacking specific dermoscopic features of melanoma.
By introducing the concept of DI, we focused our attention on a variation of the dermoscopic pattern in 2 different areas of a melanocytic lesion. The DI represents a well-circumscribed dermoscopic focus that may be located in any region of the lesion and may involve a variable amount of the lesion surface. It differs from the previously described eccentric peripheral hyperpigmentation, which only considers an asymmetrical pigment distribution.

The DI was found to be significantly more frequent in melanomas than in benign lesions. In comparing eccentric hyperpigmentation with a DI, DI gave a lower number of true positives (5.8% of melanomas in the present case study contained a DI vs 18.5%-28.3% of melanomas with eccentric hyperpigmentation reported by other researchers) and a lower number of true negatives (3.1% of benign lesions containing a DI vs 4.5%-12.5% of benign lesions with eccentric hyperpigmentation). Thus, it can be stated that compared with eccentric hyperpigmentation, the DI is a less sensitive but a more specific descriptor for melanoma.

The subpopulation of 40 lesions containing a DI included dermoscopic atypical nevi and melanomas showing a TDS higher than 5.45, corresponding to a high probability of melanoma and indicating the necessity of performing an excisional biopsy. Most lesions with a DI show asymmetry along 2 axes and at least 2 colors. The 7-point checklist score was higher than 3 in invasive melanomas. It was not possible to distinguish between in situ melanomas and dermoscopic atypical nevi because in both populations, the score was below 3. Results of semiquantitative algorithms in lesions containing the descriptor show how difficult it is to correctly classify these nevi and to distinguish them from early melanomas using the traditional dermoscopic criteria.

On the basis of the present results, if a melanocytic lesion has a DI, it is twice as likely to be a melanoma than a nevus (odds ratio, 1.922). Because the DI is mainly found in in situ and early invasive melanomas (the mean thickness of invasive melanomas containing the descriptor was 0.64 mm), it may represent an aid to diagnosis, especially for initial lesions, which are precisely those we want to remove as early as possible. There was a significant association between the DI of melanomas and the histologic finding of a preexisting nevus. Thus, the DI may represent the morphologic equivalent of a malignant transformation at the primary site of the new melanoma and a characteristic of thin melanomas arising on a nevus.

During this study, the presence or absence of the DI was assessed using ×20 magnification. One limitation

Table 3. Main Patterns of the Dermoscopic Islands

<table>
<thead>
<tr>
<th>Pattern</th>
<th>In Nevi (n=20)</th>
<th>In In Situ MMs (n=11)</th>
<th>In Invasive MMs (n=11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reticular</td>
<td>16 (80)</td>
<td>9 (82)</td>
<td>4 (36)</td>
</tr>
<tr>
<td>Globular</td>
<td>0</td>
<td>0</td>
<td>2 (18)</td>
</tr>
<tr>
<td>Homogeneous</td>
<td>2 (10)</td>
<td>0</td>
<td>2 (18)</td>
</tr>
<tr>
<td>Starburst</td>
<td>2 (10)</td>
<td>2 (18)</td>
<td>3 (27)</td>
</tr>
</tbody>
</table>

Abbreviations: DIs, dermoscopic islands; MMs, melanomas.

Table 4. Combination of the Patterns of the Dermoscopic Island and That of the Remaining Lesion

<table>
<thead>
<tr>
<th>Pattern</th>
<th>In Nevi (n=20)</th>
<th>In In Situ MMs (n=11)</th>
<th>In Invasive MMs (n=11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reticular/reticular</td>
<td>12 (60)</td>
<td>4 (36)</td>
<td>4 (36)</td>
</tr>
<tr>
<td>Reticular/globular</td>
<td>2 (10)</td>
<td>4 (36)</td>
<td>0</td>
</tr>
<tr>
<td>Reticular/homogeneous</td>
<td>2 (10)</td>
<td>1 (9)</td>
<td>0</td>
</tr>
<tr>
<td>Globular/reticular</td>
<td>0</td>
<td>0</td>
<td>1 (9)</td>
</tr>
<tr>
<td>Globular/globular</td>
<td>0</td>
<td>0</td>
<td>1 (9)</td>
</tr>
<tr>
<td>Homogeneous/reticular</td>
<td>2 (10)</td>
<td>0</td>
<td>1 (9)</td>
</tr>
<tr>
<td>Homogeneous/homogeneous</td>
<td>0</td>
<td>0</td>
<td>1 (9)</td>
</tr>
<tr>
<td>Starburst/reticular</td>
<td>1 (5)</td>
<td>1 (9)</td>
<td>2 (18)</td>
</tr>
<tr>
<td>Starburst/globular</td>
<td>1 (5)</td>
<td>1 (9)</td>
<td>0</td>
</tr>
<tr>
<td>Starburst/homogeneous</td>
<td>0</td>
<td>0</td>
<td>1 (9)</td>
</tr>
</tbody>
</table>

Abbreviations: DIs, dermoscopic islands; MMs, melanomas.

Figure 5. An example of a dermoscopic island corresponding to a melanoma arising in a nevus. A, The dermoscopic image shows a starburst island on a globular background (original magnification ×30). B, Histopathologic examination reveals a compound nevus left of the vertical line and atypical melanocytes along the dermoepidermal junction right of the vertical line (hematoxylin-eosin, ×50).
of this study is the inability to determine whether the descriptor would have been easily detectable using a lower magnification. Higher magnifications (×50) were used subsequently to establish the main dermoscopic pattern of lesions. Another limitation is the low number of lesions with a DI. This new descriptor has limited sensitivity; moreover, it is not sufficient, alone, to discriminate between malignant and benign melanocytic lesions.

Nevertheless, in view of the high likelihood of malignancy of a melanocytic lesion with a DI, excision of the pigmented lesion is warranted regardless of the scores achieved by semiquantitative algorithms. Because the DI may not be appreciated clinically, it is important to mark the region of interest with a pen or a suture before excision; in fact, because the island is localized in a small and peripheral part of the lesion in half of the patients, it could be overlooked during histologic examination and the melanoma could be missed.

Accepted for Publication: March 22, 2010.

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Author Contributions: Drs Borsari, Longo, Ferrari, and Seidenari had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Seidenari. Acquisition of data: Borsari, Longo, Ferrari, Benati, Bassoli, Schianchi, Giusti, and Cesinaro. Analysis and interpretation of data: Borsari, Pellacani, and Seidenari. Drafting of the manuscript: Borsari, Longo, Ferrari, Benati, Bassoli, Schianchi, Giusti, Cesinaro, Pellacani, and Seidenari. Critical revision of the manuscript for important intellectual content: Seidenari. Statistical analysis: Pellacani. Administrative, technical, and material support: Cesinaro.

Financial Disclosure: None reported.

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