Characteristic Epiluminescent Microscopic Features of Early Malignant Melanoma on Glabrous Skin

A Videomicroscopic Analysis

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Objective: To investigate the characteristic epiluminescent microscopic features of early lesions of malignant melanoma affecting glabrous skin, which is the most prevalent site of the neoplasm in nonwhite populations.

Design: The epiluminescent microscopic features of various kinds of melanocytic lesions affecting glabrous skin were investigated using a videomicroscope. All the diagnoses were determined clinically and histopathologically using the standard criteria.

Setting: A dermatology clinic at a university hospital.

Patients: The following 130 melanocytic lesions consecutively diagnosed at our department were examined: 16 lesions of acral lentiginous melanoma, 6 lesions of malignant melanoma in situ, and 108 lesions of benign melanocytic nevus (acquired or congenital).

Main Outcome Measure: The incidence of each characteristic epiluminescent feature was compared among disease categories.

Results: On epiluminescent microscopy, malignant melanoma in situ and the macular portions of invasive malignant melanoma showed accentuated pigmentation on the ridges of the skin markings, which are arranged in parallel patterns on glabrous skin. This "parallel ridge pattern" was found in 5 (83%) of 6 lesions of malignant melanoma in situ and in 15 (94%) of 16 lesions of malignant melanoma. The parallel ridge pattern was rarely found in the lesions of benign melanocytic nevus. Most benign melanocytic nevi showed 1 of the following 3 typical epiluminescent patterns: (1) a parallel furrow pattern exhibiting pigmentation on the parallel sulci of the skin markings (54%), (2) a latticelike pattern (21%), and (3) a fibrillar pattern showing filamentous or meshlike pigmentation (15%). The remaining 11 benign nevi (10%) showed a nontypical pattern.

Conclusion: Because epiluminescent microscopic features of early malignant melanoma on glabrous skin are characteristic, we can effectively detect early lesions using this noninvasive method.

Arch Dermatol. 1998;134:563-568

EPILUMINESCENT microscopy, also called dermatoscopy or surface microscopy, is now widely used for the clinical evaluation of pigmented skin lesions.\(^1\)\(^-\)\(^1\(^1\)\) The most important use of this technique is in the accurate diagnosis of malignant melanoma, particularly in its early stages. Although many investigators have reported valuable findings on the subject, most authors investigated pigmented lesions of nonglabrous skin. In a previous study of the use of a videomicroscope,\(^1\(^3\)\) the macular and plaque portions of acral lentiginous melanoma of glabrous skin exhibited accentuated pigmentation of the ridges of the skin markings that run mostly in parallel on these anatomical sites. In this study, also with the use of a videomicroscope, we investigated epiluminescent microscopic features of early lesions of malignant melanoma on glabrous skin, comparing them with those of benign melanocytic nevi on these sites.

RESULTS

MALIGNANT MELANOMA IN SITU

The clinical data of 6 patients with malignant melanoma in situ are shown in Table 2. The main epiluminescent microscopic features of malignant melanoma in situ are summarized in Table 3. All the lesions showed an abrupt edge, namely, a sharply cut-off margin of pigmentation, at least in a portion. Five of the 6 lesions showed accentuated pigmentation on the ridges of the skin markings that run mostly in a parallel pattern on the anatomical sites (Figure 1). In contrast, the furrows of the skin markings were comparatively devoid of pigmentation. This
MATERIALS AND METHODS

A total of 130 pigmented lesions on glabrous skin, including 6 lesions of malignant melanoma in situ, 16 of acral lentiginous melanoma, and 108 of acquired or congenital melanocytic nevus, were investigated using a videomicroscope. All the lesions were seen in Japanese patients at the Department of Dermatology, Shinshu University Hospital, Matsumoto, Japan, from November 5, 1990, to June 30, 1996 (Table 1). Informed consent was obtained from all patients. The diagnoses were all determined clinically and histopathologically based on the standard criteria. Lentigo simplex was classified as acquired melanocytic nevus. Most of the melanocytic nevi were from the foot, as follows: 72 lesions on the sole or volar aspect of the toes and 36 lesions on the palm or volar aspect of the fingers. All the lesions of malignant melanoma and malignant melanoma in situ were from the sole of the foot.

As described in detail in a previous report,11 each lesional site was immersed with mineral oil and covered with a glass slide. With the camera probe applied to the slide, the magnified features, ×20, ×50, and ×100, were viewed on a color monitor of the videomicroscope and recorded on a video floppy disk.

pigmentation pattern was observed in large areas of all cases. We designated this feature as a “parallel ridge pattern.” Corresponding to this epiluminescent finding, histopathological examination revealed that a proliferation of atypical melanocytes with melanin granules was prominent on the crista profunda intermedia, ie, epidermal rete ridges beneath the surface ridges and passed through by an intraepidermal eccrine duct. Diffuse multicomponent pigmentation composed of pigmented blotches of variegated shades of brown was observed in portions of 3 lesions. Peripheral black dots of various sizes were detected in 4 lesions, which corresponded histopathologically to the aggregated melanin granules shed into the cornified layer of the epidermis. One lesion of melanoma in situ (patient 2 in Table 2) did not show the parallel ridge pattern but exhibited the fibrillar pattern of subtype A (Figure 2), one observed in some lesions of melanocytic nevus as described later. In this lesion, depigmentation was observed on the periphery, resulting in an irregular, asymmetric configuration of the lesion. Pseudopods were rarely found in the lesions of melanoma in situ on the sole. Furthermore, the parallel furrow and latticelike patterns, which were the most common patterns in benign nevi, were not detected in any lesions of melanoma in situ.

MALIGNANT MELANOMA

The 16 invasive primary lesions of acral lentiginous melanoma ranged from 15 to 75 mm in maximum diameter and from 1.0 to 8.0 mm in Breslow tumor thickness (Table 4). The epiluminescent microscopic features of the macular portions of the lesions are summarized in Table 3. The epiluminescent findings of the macular portions were essentially identical to those observed in the malignant melanoma in situ lesions. The parallel ridge pattern was a predominant feature of 15 (94%) of the 16 lesions. The diffuse multicomponent pigmentation was found in 12 lesions of malignant melanoma (75%) at least in some portions within the lesions. The abrupt edge (73%) and peripheral dots (62%) were also frequently detected. In the invasive portions of malignant melanoma, blotches of varying shades of brown, randomly distributed black dots or brown globules, the blue-gray veil (ie, diffuse bluish-gray pigmentation with a somewhat whitish hue), and depigmented areas were frequently recognized. The fibrillar pattern was detected in some small areas of 7 (44%) of the 16 lesions. The parallel furrow
and the latticelike patterns were rare in the lesions of malignant melanoma, detected only in small portions in 4 of the 16 lesions.

**BENIGN MELANOCYTIC NEVUS**

The results of epiluminescent microscopy of 108 lesions of acquired or congenital melanocytic nevus on glistening skin are summarized in Table 5. Ten lesions were judged clinically, histopathologically, or both, to be congenital melanocytic nevi. The maximum diameter of the lesions of acquired melanocytic nevus ranged from 1 to 12 mm and that of congenital nevus from 6 to 15.5 mm. All these acquired and congenital lesions were judged histologically benign because of their overall symmetrical structure and because the proliferating melanocytes (nevus cells) showed no nuclear atypia, although some of the lesions showed solitary arranged melanocytes in the lower epidermis.

Epiluminescent microscopic features of 97 (90%) of the 108 benign nevi were classified into 1 of the following 3 typical patterns: (1) a parallel furrow pattern exhibiting pigmentation on the parallel sulci of the skin markings, which was observed in 58 (54%) of 108 lesions (Figure 3). In 19 (33%) of the 58 lesions showing the parallel furrow pattern, small brown globules were arranged in regular manner on the ridges of the skin markings, usually sparing the eccrine pores. (2) A latticelike pattern, considered a variant of the parallel furrow pattern, showed pigmentation on the furrows and on the lines crossing the furrows (Figure 4). This pattern was found in 23 nevi (21%). (3) A fibrillar pattern, in which filamentous or mshlike pigmentation slanted the skin markings, was found in 16 lesions (15%).

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**Figure 1.** Clinical (A), videomicroscopic (B, magnification x100), and histopathological (C, magnification x75) features of malignant melanoma in situ of the sole of the foot. The characteristic parallel ridge pattern exhibiting selective pigmentation of the ridges of the skin markings is clearly demonstrated with videomicroscopy.

**Figure 2.** Clinical (A), videomicroscopic (B, magnification x50), and histopathological features (C, magnification x150) of malignant melanoma in situ. The fibrillar pattern of subtype A is clearly observed with videomicroscopy.
The following 2 subtypes of the fibrillar pattern were recognized: delicate filamentous pigmentation arranged in parallel marks (subtype A, 8 lesions) (Figure 5) and fibrillar pigmentation densely arranged in a meshlike pattern (subtype B, 8 lesions) (Figure 6). In benign melanocytic nevi more than 7 mm in maximum diameter, the incidence of the fibrillar pattern increased to 50% (10 of 20 lesions). In most nevi showing the 3 typical patterns, the entire lesion was composed of only 1 pattern, whereas 3 lesions exhibited the parallel furrow and the fibrillar patterns. The remaining 11 lesions (10%) of benign melanocytic nevi showed epiluminescent features that did not belong to any of the 3 typical patterns. These were classified as a nontypical pattern. Some lesions with the nontypical pattern were accompanied by diffuse pigmentation, and some of them were congenital nevi. The parallel ridge pattern characteristic of malignant melanoma and melanoma in situ was not detected in any benign melanocytic nevi. In addition, the margin of the benign melanocytic nevi mostly faded out, and the abrupt edge was rare. Peripheral dots were also seldom detected.

The relationship between the epiluminescent patterns and the histopathological subtypes of the nevi is summarized in Table 5. All 7 lesions of lentigo simplex showed the parallel furrow pattern. Compound-type nevi were more likely to have the nontypical pattern than junctional type nevi. In the parallel furrow and the lattice-like patterns, nests of melanocytes containing melanin granules were mainly found in the crista profunda limitans, ie, the rete ridges beneath the furrow.

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lower epidermis, arranged as solitary cells and in nests, and the nests occasionally bridged the neighboring rete ridges. Three lesions showed the histopathological features of so-called dysplastic nevi. Including these 3 lesions, all the lesions with the nontypical pattern were judged benign because of their overall symmetry and the limitation of proliferation of the melanocytes to the lower epidermis and because the proliferating melanocytes had no distinct nuclear atypia.

**COMMENT**

We focused the current epiluminescent microscopic study on melanocytic lesions affecting glabrous skin. These acral areas are the most prevalent sites of malignant melanoma in nonwhite populations. The findings in benign melanocytic nevi elicited in this study are essentially the same as those seen in a previous study, although the term used to describe the parallel pattern in the previous report was changed to the “parallel furrow pattern.” As in the previous study, some lesions of benign nevus were found whose magnified features did not belong to any typical pattern, and these were grouped as a “nontypical pattern.” Similar findings of melanocytic nevi on glabrous skin have been reported by other investigators using a dermatoscope or a videomicroscope.

The most important finding in this study is that all but 1 lesion of malignant melanoma in situ exhibited a unique epiluminescent feature, namely the parallel ridge pattern showing accentuated pigmentation on the ridges of the skin markings. This feature was not detected in any lesions of benign melanocytic nevus, and thus, the specificity of the finding was 100%. The sensitivity of the finding was also high, being 83% in malignant melanoma in situ and 94% in the macular portion of acral lentiginous melanoma. In a previous study, a serrated pattern in the macular portions of malignant melanoma of the sole was reported. The serrated pattern probably corresponds to the radial streaming reported in melanoma lesions of nonglabrous skin. The serrated pattern is con-
sidered to be extensions of the parallel ridge pattern at the margin of the lesions. The histological background of the parallel ridge pattern was a prominent proliferation of atypical melanocytes in the crista profunda intermedia. It is still unclear why the melanocytes of malignant melanoma, including the in situ lesions, predominantly affect these particular rete ridges of the epidermis. The abrupt edge and peripheral dots may also be important in diagnosing malignant melanoma on glabrous skin, as they were almost exclusively found in lesions of malignant melanoma and melanoma in situ. The diagnostic significance of these findings has already been reported in malignant melanoma of nonglabrous skin.1-11

Based on the results of this study, melanocytic lesions on glabrous skin showing predominantly the parallel furrow pattern or the latticelike pattern may be judged to be benign. One lesion of melanoma in situ on the sole showed almost entirely the fibrillar pattern. The fibrillar pattern observed in this lesion corresponded to subtype A and could not be distinguished from that found in the benign nevi. The fibrillar pattern may reflect the proliferation of melanocytes arranged as solitary cells or in small nests in the lower epidermis. Further study is necessary to clarify how to manage the lesions showing the fibrillar pattern. Another point to be investigated is the differentiation of benign nevi showing the nontypical pattern from malignant melanoma. This may be possible because benign nevi showing the nontypical pattern are usually devoid of the characteristic parallel ridge pattern, which is found in almost all lesions of malignant melanoma including in situ lesions. We cannot completely exclude the possibility, however, that early lesions of melanoma in situ that cannot be histologically diagnosed at present show the nontypical pattern. In addition, interobserver and intraobserver variability in the recognition of the characteristic patterns revealed in this study must be further evaluated.

The findings of the present study in which we used a videomicroscope support the usefulness of epiluminescent microscopy in detecting and diagnosing early malignant melanoma on glabrous skin. To confirm the validity of this conclusion, however, many more melanocytic lesions must be investigated with this method.

Accepted for publication November 17, 1997.

This study was supported in part by the Grant-in-Aid for Cancer Research 9-23 from the Ministry of Health and Welfare, Tokyo, the Government of Japan.

Presented in part at the 19th World Congress of Dermatology and the Fourth World Conference on Melanoma, Sydney, Australia, June 12 and 16, 1997.

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