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Histopathological Correlates of the Parallel-Furrow Pattern Seen in Acral Melanocytic Naevi at Dermatoscopy

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Key Words

Acral melanocytic naevus • Dermatoscopy, parallel-furrow pattern • Horny layer melanin

In a paper that has recently appeared in *Dermatology*, Kimoto et al. [1] reported on a new method to acquire three-dimensional images of the pigmentation belonging to acral melanocytic naevi (AMN). The authors showed that the parallel-furrow pattern (PFP) and the fibrillar pattern seen at dermatoscopy are mainly determined by the presence of melanin columns within the horny layer. These data combine and confirm the histopathological findings from either sagittal [2, 3] or tangential histology [4]. The authors conclude that such 'melanin columns [...] mainly contribute to the PFP or the fibrillar pattern' [1].

Such an assumption is not always true. In fact, the palmoplantar epidermis is characterized by alternating cristae profundae intermediae, containing the intra-epidermal eccrine ducts and covered by surface ridges, and cristae profundae limitantes, covered by surface furrows. It is therefore obvious that any anatomical structure below the furrows, i.e. the horny layer, the crista profunda limitans and the underlying dermis, may host pigment deposits able to configure a PFP at dermatoscopy.

We wish to report and discuss herein a peculiar case of AMN featuring PFP and analysed by transverse section histology, which is an effective tool to relate the dermatoscopic findings to the microscopic structures both in hairy [5] and acral volar skin [4].

A 65-year-old white woman self-referred for a dark lesion on the right sole that had slowly grown for years. At the physical examination, we observed an oval, slightly elevated and pigmented lesion, measuring about 10 × 7 mm (fig. 1a). Dermatoscopy showed a double-dotted PFP (fig. 1b). An excisional biopsy was performed and the specimen divided into two parts along the minor axis of the lesion. Half a lesion was processed for routine histological examination, which showed typical melanocytes gathered in intra-epidermal and dermal nests (fig. 2a). A diagnosis of

Fig. 1. a Pigmented lesion of the right sole. b Dermatoscopic examination highlights a double-dotted PFP.

compound melanocytic naevus was made. The remaining portion of the lesion was used for transverse histological sectioning to reproduce the original dermatoscopic plan, as tissue sections were parallel to the skin surface (fig. 2b).

The analysis of transverse sections showed several pigmented structures: types of melanin in the horny layer under the ridges, junctional and papillary nests of melanocytes, as well as melanocyte cords in the subpapillary dermis (fig. 2c–h). Junctional nests were present in both cristae limitantes and cristae intermediae. This finding, that was also presented in the paper by Kimoto et al. [1], is quite surprising. In fact, it is commonly stated that the histopathological correlates of the PFP and parallel-ridge pattern (i.e. the dermatoscopic hallmark of acral melanoma) are a proliferation of pigmented cells within the cristae limitantes or the cris-

Fig. 2. **a** Low magnification of a sagittal section of a lesion shows junctional and dermal nests of melanocytes. Haematoxylin-eosin. Original magnification $\times 10$. **b** The black rectangle in the dermatoscopic image (top) identifies the part of the naevus that corresponds to that shown in the photomicrographs (**c-h**). The bottom part of **b** is a schematic representation of a sagittal section of the naevus showing the levels of the sections shown in the photomicrographs (**c-h**). **c** A superficial section shows the presence of pigmentation in the horny layer overlying the cristae intermediae, which are identified indirectly by the presence of the eccrine ducts (asterisks). Tangential histology, haematoxylin-eosin. Original magnification $\times 10$. **d** A detail micrograph highlights the corneal pigmentation around the eccrine ducts, i.e. along the superficial ridges. Tangential histology, haematoxylin-eosin. Original magnification $\times 40$. **e, f** In a deeper section, melanocytes are grouped in nests infiltrating the dermal papillae where melanophages are also seen. **e** Tangential histology, haematoxylin-eosin. Original magnification $\times 10$. **f** Tangential histology, haematoxylin-eosin. Original magnification $\times 40$. **g, h** In a section involving the deeper portion of the dermo-epidermal junction, intra-epidermal nests of naevocytes (IN) are visible at the dermo-epidermal junction of both cristae intermediae and limitantes. Due to the convexity of the lesion, the right part of the picture shows the subpapillary dermis, which features parallel cords of melanocytes under every crista. Dotted lines grossly identify surface ridges. **g** Tangential histology, haematoxylin-eosin. Original magnification $\times 10$. **h** Tangential histology, haematoxylin-eosin. Original magnification $\times 40$.

tae intermediae, respectively [3]. In AMN, melanin is released by such cells to the surrounding keratinocytes and persists to the horny layer, which would be therefore pigmented under the furrows in the PFP. This phenomenon does not take place in acral melanoma, where the horny layer is not pigmented under the ridges [6]. Very interestingly, in the rarest AMN featuring a parallel-ridge pattern, the horny layer is pigmented under the ridges [6, 7]. These findings imply two facts. First, the pigmentation of the horny layer is not necessary to determine a parallel pattern at dermatoscopy. Second, as suggested by several authors, the presence of melanin columns in melanocytic lesions of acral volar skin can be considered as a histological key of benignity [1, 2, 8].

In the case of Kimoto et al. [1], only the pigmented nests in the cristae limitantes released the pigment to the horny layer, while those in the cristae intermediae did not so that a PFP was made. In contrast, in our case, only the pigmented nests of the cristae intermediae released the pigment to the horny layer, but the dermatoscopic appearance was not a parallel-ridge pattern.

Keeping the eccrine ducts as a point of reference for the structures lying under the ridges, the dermatoscopic-histological correlation clearly showed that the double-dotted pigmentation of the furrows was mostly due to the presence of two lines of melanocyte nests in the dermal papillae, running parallel and squashing an intermingled crista limitans. The subpapillary, parallel cords of melanocytes, localized under the surface furrows, did not seem to contribute significantly to the PFP.

To sum up, we think that the correlation between dermatoscopic features of acral volar lesions and micro-anatomical structures still remains to be fully clarified. Studies like that by Kimoto et al. [1], which introduce reliable and cheap methods of investigation, are truly welcome. In particular, phenomena like the release of melanin towards the horny layer only in benign lesions and the proliferation of malignant cells almost exclusively at the dermo-epidermal junction of the cristae intermediae still represent a biological mystery and deserve further research for their diagnostic and prognostic implications.

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