Published in final edited form as:

Br J Dermatol. 2009 June ; 160(6): 1318–1321. doi:10.1111/j.1365-2133.2009.09073.x.

Dermoscopic patterns and subclinical melanocytic nests in normal-appearing skin

A. Scope,

Dermatology Service, Memorial Sloan-Kettering Cancer Center, 160 East 53rd Street, 2nd Floor, New York, NY 10022, U.S.A.

A.A. Marghoob,

Dermatology Service, Memorial Sloan-Kettering Cancer Center, 160 East 53rd Street, 2nd Floor, New York, NY 10022, U.S.A.

C.S. Chen,

Dermatology Service, Memorial Sloan-Kettering Cancer Center, 160 East 53rd Street, 2nd Floor, New York, NY 10022, U.S.A.

J.A. Lieb,

Dermatology Service, Memorial Sloan-Kettering Cancer Center, 160 East 53rd Street, 2nd Floor, New York, NY 10022, U.S.A.

M.A. Weinstock, and

Dermatopathology Unit, VA Medical Center and Department of Dermatology, Rhode Island Hospital and Brown University, Providence, RI, U.S.A.

A.C. Halpern

Dermatology Service, Memorial Sloan-Kettering Cancer Center, 160 East 53rd Street, 2nd Floor, New York, NY 10022, U.S.A.

for the SONIC Study Group

Summary

Background—Dermoscopic patterns of normal-appearing skin have received little scrutiny. We have recently completed an analysis of dermoscopic patterns of naevi in children.

Objectives—To describe dermoscopic patterns in the normal-appearing skin surrounding naevi and to explore histological features of patterned background skin.

Methods—Dermoscopic images of back naevi were obtained from a population-based sample of fifth grade students. The dermoscopic pattern of the background skin around the naevi was analysed. We examined histological features of background skin patterns in a convenience sample of seven specimens from six adult patients.

Results—We observed a dermoscopic pattern in the background of normal-appearing skin in 41% of 1192 dermoscopic images from the backs of the 443 children. The background skin pattern was less frequent in individuals with a fair skin ($P < 0.001$). A globular pattern was observed in

Correspondence, Allan C. Halpern. halperna@mskcc.org.

Conflicts of interest

None declared.

Additional SONIC Study Group members

Stephen W. Dusza [Memorial Sloan-Kettering Cancer Center (MSKCC)], Susan A. Oliveria (MSKCC), Alan C. Geller (Boston University), Jaya Satagopen (MSKCC), Marianne Berwick (University of New Mexico), Maureen K. Henegan (MSKCC) and Marilyn Bishop (Framingham Public Schools System).

201 images (17%) and a reticular pattern was seen in 287 images (24%), of which 112 images also showed globules. Inter-rater reliability between the two observers for a random sample of 100 images was excellent ($\kappa = 0.77$). In four specimens with a globular background pattern, microscopic melanocytic nests were observed in the normal-appearing skin. No subclinical naevus nests were observed in three reticular pattern specimens.

Conclusions—Dermoscopically recognized patterns are commonly present in clinically normal skin. Microscopic melanocytic nests may be observed in normal-appearing skin with a globular skin pattern.

Keywords

children; dermoscopy; skin

The study of naevi in children (SONIC) documents the evolution of naevi in a population-based cohort of children.¹ We have recently completed the baseline crosssectional analysis of dermoscopic patterns of naevi in children.² Here we describe subtle dermoscopic patterns that can be reproducibly recognized in normal-appearing skin surrounding naevi.

Methods

Subjects

This population-based study included fifth grade students (aged 10–11 years) from all 10 schools of the Framingham, MA school system. Sixty-one per cent (270 out of 443) of participating students were male. Of the students, 70% were non-Hispanic Caucasians, 20% Hispanics, 4% African-Americans, 5% Asians and 0.2% Native Americans. The full spectrum of pigment phenotypes was observed, with fair skin observed in 278 students (63%), light olive in 33 students (7%) and dark skin in 131 students (30%). Additional baseline characteristics of the students are described elsewhere.¹ The study was approved by the Institutional Review Board at Boston University.

Observation of dermoscopic patterns in background skin

Dermoscopic images of 1204 back naevi were obtained from a sample of 443 students. Imaging was performed during Autumn to avoid the effects of acute ultraviolet exposure on dermoscopic patterns.^{3,4} Images of poor quality (< 1% of the total) were excluded resulting in 1192 images for analysis. The dermoscopic pattern of background skin around the naevus was analysed by an observer trained in dermoscopy (J.A.L.). The naevus in each of the images was digitally blocked from view. A random sample of 100 images from 92 individuals was analysed by a second observer (A.S.) to assess the consistency of background skin pattern recognition.

Microscopic study of background skin patterns

The histopathological features of seven specimens from six adults showing reticular or globular background skin patterns were studied (Table 1). All patients were male, non-Hispanic Caucasians with fair skin, mean age 64 years (range 55–77). The patients underwent routine excision for suspicious lesions. Prior to excision, the dermoscopic pattern in the background skin was assessed by two observers (A.A.M. and C.S.C.). In these specimens the excess tips of the excision ('dog ears') were submitted to frozen tissue processing with horizontal ribbon sectioning from the cornified layer to the papillary dermis. These frozen sections were stained with haematoxylin and eosin and analysed by light microscopy.

Results

The background skin pattern was analysed in 1192 dermoscopic images from the backs of 443 students. Observed background skin patterns are shown in Figure 1. In 704 images (59%), the background skin was homogeneous, i.e. without a specific recognizable pattern. In 201 images (17%), a globular pattern was observed consisting of light brown to grey round structures dispersed at a variable density in the background skin. In 287 images (24%), a reticular pattern was observed consisting of a light brown pigmented network; in 112 of the images showing a reticular pattern, globules were also observed in the background skin. A homogeneous background skin was more frequently observed in individuals with a fair skin colour, while a reticular pattern was more frequently observed in individuals with a darker skin colour ($P < 0.001$). Inter-rater reliability between the two observers for assignment to background skin classifications was excellent [$\kappa = 0.77$, 95% confidence interval 0.66–0.79, $P < 0.001$].⁵

Details of six patients presenting with seven suspicious lesions at the Memorial Sloan-Kettering Cancer Center are presented in Table 1. In three patients presenting with four lesions, a globular dermoscopic pattern was noted in the background skin. In all four of these specimens, microscopic melanocytic nests were observed in the normal-appearing skin on vertically (patient 1) or horizontally sectioned (patients 3 and 4) histopathology (Fig. 2). In contrast, in three specimens with a reticular pattern in the normal-appearing skin, horizontal section histopathological analysis did not reveal any noteworthy findings.

Discussion

The observation of a subtle dermoscopic background skin pattern is novel and intriguing. We were able to observe reproducibly a pattern in about 40% of the fifth grade children. The patterns observed were globular showing faint light brown to grey globules, and reticular, showing a faint network with or without globules. The dermoscopic structures in the background skin resemble pigmented patterns commonly observed in naevi but appear much fainter and may be overlooked unless specifically sought. Individuals with a darker skin appear to harbour the reticular dermoscopic pattern significantly more frequently in their naevi and background skin. This finding may be related to higher constitutive activity of melanocytes and enhanced transfer of melanin to keratinocytes. The significance of these patterns needs to be elucidated. As a first step, we explored the histopathological features of the background skin patterns in a small convenience sample of patients at our institution. We found that normal-appearing skin with a globular dermoscopic pattern may display subclinical melanocytic nests on histopathology. Recently, Dadzie *et al.*⁷ made an independent observation of the presence of incidental naevic aggregates in biopsy specimens. They analysed the presence of subclinical nests in 2500 specimens and found an incidence of 0.8%. If our observations are substantiated by larger series, it suggests that a dermoscopically identified globular background pattern may be a marker for the presence of subclinical nests.

We postulate that subclinical melanocytic nests are developmentally driven, perhaps even congenital, and may be the seeds that give rise to clinically apparent acquired naevi with a globular dermoscopic pattern. These naevi may arise in a nested pattern from their inception without a lentiginous component. This hypothesis may also explain the appearance of naevi that display clinical, dermoscopic and histopathological features commonly seen in congenital naevi, but that develop after 2 years of age;^{8,9} these naevi are termed 'congenital melanocytic naevus-like naevi'.

Our study has several limitations. Firstly, the association between globular background skin and the presence of microscopic melanocytic nests was carried out in a very small sample of patients and should be considered a preliminary observation that needs to be confirmed in larger series. Secondly, our background skin pattern observations were made in a study restricted to the backs of healthy children, while the histopathological correlation was performed on a convenience sample of adult patients. Middle-aged and elderly adults with sun-damaged skin often develop nonuniform background skin pigmentation with multiple lentigines.¹⁰ Dermoscopically, these lentigines mostly display a reticular pattern which correlates on histopathology with increased melanin in melanocytes and keratinocytes in elongated rete ridges.¹¹ Therefore, the histopathological findings in the background skin of adults may not be representative of the skin of children. In addition, dermoscopic patterns were analysed in the normal-appearing skin adjacent to naevi, hence the term 'background skin' used in this study; similarly, the histopathological correlation study was carried out in the normal-appearing tips of excision specimens. Finally, the term 'globular background skin pattern' is an interim term as 'globules' in background skin may prove, with additional correlation studies, to be a morphological entity distinct from the globules described in melanocytic lesions.

In conclusion, background skin displays dermoscopically recognizable patterns. Microscopic melanocytic nests can be observed in normal-appearing skin that displays a globular dermoscopic pattern. Further studies are needed to quantify the distribution of skin patterns by age and anatomical site, and to explore the association of skin patterns with the presence of subclinical naevus nests and with host naevus phenotype.

Acknowledgments

The research was funded through NIH/NIAMS AR049342-02: 'The Framingham School Naevus Study'.

References

1. Geller AC, Oliveria SA, Bishop M, et al. Study of health outcomes in school children: key challenges and lessons learned from the Framingham Schools' Natural History of Naevi Study. *J Sch Health*. 2007; 77:312–318. [PubMed: 17600588]
2. Scope A, Marghoob AA, Dusza SW, et al. Dermoscopic patterns of naevi in fifth grade children of the Framingham school system. *Br J Dermatol*. 2008; 158:1041–1049. [PubMed: 18363751]
3. Dervis E, Koc K, Karaoglu A. Influence of PUVA therapy on dermoscopic features of acquired melanocytic naevi. *Eur J Dermatol*. 2004; 14:230–234. [PubMed: 15319155]
4. Hofmann-Wellenhof R, Soyer HP, Wolf IH, et al. Ultraviolet radiation of melanocytic naevi: a dermoscopic study. *Arch Dermatol*. 1998; 134:845–850. [PubMed: 9681348]
5. Fleiss, JL.; Levin, B.; Cho Paik, M. *Statistical Methods for Rates and Proportions*. 3rd edn. New York: Wiley; 2003.
6. Hofmann-Wellenhof R, Blum A, Wolf IH, et al. Dermoscopic classification of atypical melanocytic naevi (Clark naevi). *Arch Dermatol*. 2001; 137:1575–1580. [PubMed: 11735707]
7. Dadzie OE, Goerig R, Bhawan J. Incidental microscopic foci of naevic aggregates in skin. *Am J Dermatopathol*. 2008; 30:45–50. [PubMed: 18212544]
8. Argenziano G, Zalaudek I, Ferrara G. Proposal of a new classification system for melanocytic naevi. *Br J Dermatol*. 2007; 157:217–227. [PubMed: 17553053]
9. Zalaudek I, Hofmann-Wellenhof R, Kittler H, et al. A dual concept of nevogenesis: theoretical considerations based on dermoscopic features of melanocytic naevi. *J Dtsch Dermatol Ges*. 2007; 5:985–991. [PubMed: 17976139]
10. Gilchrist, BA.; Rogers, GS. Photoaging. In: Lim, HW.; Soter, NA., editors. *Clinical Photomedicine*. New York: Marcel Dekker, Inc.; 1993. p. 95-111.

11. Wang, SQ.; Rabinovitz, H.; Oliviero, MC. Dermoscopic patterns of solar lentigines and seborrheic keratoses. In: Marghoob, AA.; Braun, RP.; Kopf, AW., editors. Atlas of Dermoscopy. London: Taylor and Francis; 2005. p. 60-71.

Fig 1. Dermoscopic patterns in the background skin. (a) Globular pattern in the background skin showing small faint globules (arrows). (b) Reticular pattern in the background skin. (c) Background skin without any dermoscopic pattern. (d) Image processing technique (Canfield Scientific, Inc., Fairfield, NJ, U.S.A.) improves the visibility of the globular background skin. The software utilizes a standardized approach to spectral gating that emphasizes pixels in the far blue end of the visible spectrum, thus simulating ultraviolet photography. For comparison, the same processing is shown for the reticular (e) and homogeneous (f) background skin patterns.

Fig 2. Histological findings in background skin with a globular pattern. (a) Globular pattern in normal-appearing skin, showing faint, small, brown globules (arrows). (b) Horizontal sectioning of normal-appearing skin with a globular pattern showing small junctional melanocytic nests (arrows). (Haematoxylin and eosin staining; original magnification $\times 40$, frozen section.)

Table 1

Details of patients and specimens analysed by histopathology

Patient	Age (years)/sex/skin cancer history	Anatomic location	Dermoscopic pattern of background skin	Histopathological finding of perilesional background skin	Histopathological diagnosis of excised lesion
1	55/M/early MM	Lower back	Globular	Melanocytic nests	MM
2	61/M/early MM, SCC, BCC	Posterior neck	Globular	Melanocytic nests	Follicular infundibular cyst
3	66/M/stage 3 MM	Shoulder	Reticular	Negative	MM
4	58/M/stage 4 MM	Shoulder	Globular	Melanocytic nests	DN
		Mid-abdomen	Globular	Melanocytic nests	DN
5	77/M/SCC, BCC	Arm	Reticular	Negative	BCC
6	66/M/SCC	Shoulder	Reticular	Negative	SCC <i>in situ</i>

MM, melanoma; SCC, squamous cell carcinoma; BCC, basal cell carcinoma; DN, dysplastic naevus