**Ex Vivo Dermoscopy of Melanocytic Tumors**

**Time for Dermatopathologists to Learn Dermoscopy**

Alon Scope, MD; Klaus J. Busam, MD; Josep Malvehy, MD; Susana Puig, MD, PhD; Steve A. McClain, MD; Ralph P. Braun, MD; Ashfaq A. Marghoob, MD

**Background:** We have identified cases of skin cancer with discordances between clinical, dermoscopic, and histopathologic findings that were likely due to sampling errors in the pathology laboratory. This has prompted us to explore the use of ex vivo dermoscopy as an ancillary method of gross pathology, which may serve to guide tissue sectioning. Noncontact polarized dermoscopy was applied to pigmented lesions before excision and at least 6 hours after specimen fixation in formalin.

**Observations:** The orientation of the lesion, overall dermoscopic pattern, and dermoscopic pigmented structures (network, globules, and peripheral streaks) were readily correlated between the in vivo and ex vivo images for 2 melanomas and 4 dysplastic nevi. Blood vessels were not observed in the ex vivo dermoscopic images, which limited their correlation with the in vivo dermoscopic images for basal cell carcinoma.

**Conclusions:** Dermoscopy can be applied to fixed tissues, with findings comparable to those of in vivo examination. This observation may serve as the first step toward using dermoscopy to guide tissue sectioning in gross pathology.

Arch Dermatol. 2007;143(12):1548-1552
METHODS

As part of routine patient care at Memorial Sloan-Kettering Cancer Center, all biopsied lesions are photographed clinically and dermoscopically before surgery. We obtained polarized dermoscopic images of a series of pigmented lesions before biopsy (in vivo dermoscopy) and after at least 6 hours of fixation in formalin (ex vivo dermoscopy). The clinical images were obtained using a digital camera (Nikon CoolPix 4500; Nikon Inc, Melville, New York). All in vivo dermoscopic images were captured using the same camera attached to a polarized noncontact dermoscopy lens (DermLite FOTO; 3GEN, LLC, Dana Point, California). Lesions were excised according to routine protocol and fixed in formalin. After the specimen was in formalin for at least 6 hours, it was removed and placed on gauze; ex vivo dermoscopic images of the lesion were obtained with the same polarized noncontact dermoscopy lens. The in vivo and ex vivo polarized dermoscopic imaging was performed using a noncontact technique, ie, there was no physical contact between the camera and the tissue. In addition, one of us (A.A.M.) evaluated the lesions in vivo and ex vivo using a commercially available, handheld, polarized noncontact dermoscope (DermLite Pro-HR; 3GEN, LLC).

RESULTS

The lesions consisted of 2 melanomas, 4 dysplastic nevi, and 1 basal cell carcinoma. All lesions were located on the torso; 6 of the lesions were less than 1.5 cm in diameter and 1 melanoma was 3 cm in diameter (Figure 1). The orientation of the lesion, overall dermoscopic pattern, and dermoscopic pigmented structures (network, globules, and peripheral streaks) were readily correlated between the in vivo and ex vivo images for the melanomas and nevi (Figures 1, 2, and 3). Blood vessels and vascular blush were not observed in the ex vivo dermoscopic images, which limited the correlation with the in vivo images for the nonpigmented basal cell carcinoma.

A technical limitation noted during ex vivo imaging with the polarized noncontact dermoscopy lens was that specimens tended to develop subtle undulations, making it difficult to obtain images in which the entire lesion was in sharp focus. However, this problem was overcome during handheld noncontact dermoscopic evaluation by making simple, slight adjustments to the focal distance from the specimen (ie, moving slightly closer to or further from the specimen).

Figure 1. Ulcerated melanoma (A) that shows on in vivo dermoscopy (B) a dark blotch with a blue-white veil and an irregular scalloped border. The area depicted by the left yellow rectangle in B is shown at higher magnification in vivo (C) and ex vivo after 6 hours in formalin (D). The same irregular peripheral streaks can be seen readily in both images (arrows). Similarly, the area depicted by the right yellow rectangle in B, shown at higher magnification in vivo (E) and ex vivo after 6 hours in formalin (F), demonstrates the same peripheral network in both images (arrows).

COMMENT

Dermoscopy has been shown to increase the sensitivity and specificity of clinical diagnosis of melanoma, which has led to the detection of earlier, more subtle melanomas. Most structures seen on dermoscopy have been correlated with distinct microscopic alterations in tissue morphologic features. Thus, dermoscopy can be viewed not only as a diagnostic aid at the bedside but also as a useful tool in evaluating gross pathology and in predicting histopathologic findings. Herein, we present preliminary findings suggesting that dermoscopic evaluation can also be performed ex vivo in the pathology laboratory. Pigmented structures in melanocytic lesions visualized with in vivo dermoscopy were also observed by means of polarized dermoscopy of the excised specimen after at least 6 hours of fixation in formalin.

Thus, we propose the following scheme for improving communication between clinicians and pathologists con-
cerning pigmented lesions: (1) The clinician will attach clinical and dermoscopic images (or, less preferably, a hand-drawn figure if photographic equipment is not available) to the pathology department requisition form, indicating on the images areas and structures of concern. Surface markings on the specimen, as previously described,

will facilitate the correct orientation of the specimen in the pathology laboratory. (2) The pathologist will then extract the specimen from the bottle and observe the gross pathology with the use of a handheld, polarized noncontact dermoscope (Figure 3C), comparing personal observations with the clinician’s notes on the in vivo images. As we have preliminarily demonstrated, the pathologist should be able to identify the dermoscopic structures ex vivo. (3) The pathologist will then guide the tissue sectioning so as to include the areas of concern.

One could envision that dermoscopic terms and perhaps even the dermoscopic image may find their way into the gross description of the pathologic analysis report read by the clinician. Thus, the clinician and pathologist who use dermoscopy as a common lesion map are likely to have a better correlation. To realize our suggested method, the pathologist need not be an expert in dermoscopy. However, proficiency in dermoscopy may eventually prove to be rewarding for pathologists as a way of adding meaningful gross analysis to their practices.

Melanoma can be overlooked because of improper tissue sectioning, particularly in cases of early melanoma associated with a preexisting nevus and, in our experience, in wide-excision specimens when remaining melanoma may be subtle on gross inspection. An advantage of dermoscopy is the en face plane of view, ensuring gross examination of the entire surface of the lesion. Furthermore, if dermoscopic evaluation becomes part of the gross examination protocol, it is more likely that the prosector will be trained in and become familiar with subtle dermoscopic and clinical features requiring more attention than occurs in the current setting of most pathology laboratories. Adding a dermoscopic image of equivocal melanocytic lesions has been shown to improve histopathologic interobserver agreement ($k$ values increased from 0.81 to 0.88), probably reflecting a more accurate diagnosis. This has been supported by other studies in which dermoscopic findings were added when assigning the histopathologic diagnosis.

In some lesions, the correct diagnosis was made after a more extensive search for subtle clues in the specimen, driven by the appreciation of suggestive dermoscopic findings by the pathologist.
One limitation is the inability to obtain sharp focus for the entire surface of the ex vivo dermoscopic image. This limitation can be remedied by using a dermoscopy lens with a glass contact plate. Pressing the scope against the specimen will flatten it and provide sharp focus for the entire image. However, we avoided contact dermoscopy for the

---

Figure 3. Images of a 4-mm pigmented lesion that had recently become larger and was on the knee of a 53-year-old woman. A, Clinical photograph of the lesion. B, In vivo dermoscopy shows a lightly pigmented lesion with a central blue-white area that is particularly worrisome (asterisk), dotted vessels (circle), and an atypical broken network (arrow). The lesion was excised and sent for analysis with a dermoscopic image on which the blue-white area was highlighted. C, The pathologist uses dermoscopy to perform gross examination of the lesion. D, The blue-white area (asterisk) and atypical network (arrow) are readily identified in this ex vivo dermoscopic image; however, the dotted vessels are now not apparent. The pathology report specified which sections contain the blue area (the direction of sectioning is shown by the diagonal lines). E, The histopathologic specimen of a portion of a melanocytic nevus corresponding to the blue area illustrates nests and fascicles of pigmented spindle and epithelioid melanocytes at the dermoepidermal junction and superficial dermis. The blue-white area noted on dermoscopy likely correlates with melanophages (arrows) and coarse fibrosis (asterisks) in the superficial dermis, along with the overlying acanthotic epidermis with hyperkeratosis and hypergranulosis (hematoxylin-eosin, original magnification ×200). F, In contrast, histopathologic findings from the brown reticulated periphery of the lesion show junctional melanocytic nests and pigmented basal keratinocytes, without melanophages or fibrosis in the dermis and without the epidermal changes seen in the blue-white area (hematoxylin-eosin, original magnification ×100). The final diagnosis was a moderately dysplastic nevus with Spitzoid features.
ex vivo specimens because we foresaw this to be a barrier to practice in the pathology laboratory. We anticipate that handheld polarized noncontact dermoscopy, rather than contact dermoscopy, will be used by pathologists. Another limitation is the loss of vascular structures and vascular blush (pink veil) that occurs in fixed tissue. This limitation affected the correlation of in vivo and ex vivo images of nonpigmented basal cell carcinoma, in which arborizing vessels are pertinent to diagnosis. This may limit the usefulness of ex vivo dermoscopy to pigmented lesions and obviate its use for amelanotic melanoma, nonmelanoma skin cancer, and inflammatory dermatoses.

In times when the economics of tissue processing cannot be ignored, a concern is that dermoscopy at the pathology laboratory would slow the gross examination process, require additional time from the pathologists, and thereby be impractical and too costly. We are cognizant of these issues and do not suggest applying dermoscopy for pathologic examination of excisions of clinically benign nevi removed for cosmetic reasons. However, we believe that the disadvantages of extra time and cost are outweighed by the benefit of a more accurate diagnosis for excisions of lesions clinically suggestive of melanoma. The statistical probability of making the correct diagnosis in melanoma currently relies on random sampling of less than 2% of the lesion. A more exhaustive sectioning of the block has been shown to increase the assessment of melanoma thickness in 40% of lesions, resulting in a change in clinical management in 10% of patients. Such exhaustive sectioning is also cumbersome and expensive. Thus, guided sectioning can be viewed as a way to improve the statistical probability of reaching the correct diagnosis. Proper selection of the tissue section may be particularly important for large complex excisions, such as medium to large congenital nevi with focal features that are suggestive of melanoma or wide-excision specimens with a focal remnant of pigmentation. Whether ex vivo dermoscopy will be applied only to a subset of excised melanocytic lesions with a higher clinical index of suspicion for malignancy or greater morphologic heterogeneity remains to be seen. A formal study is needed to assess the possible influence of ex vivo dermoscopy on pathologic diagnosis, clinicopathologic correlation, and proper selection of lesions for this technique (eg, based on size, anatomic site, and the distribution of dermoscopic structures).

In summary, dermoscopy can be applied to fixed tissues, with findings comparable to those of in vivo examination. This observation may serve as the first step toward using dermoscopy to guide tissue sectioning in gross pathology. Precise correlations between in vivo and ex vivo images can reduce errors, help determine the appropriate areas to step section, and ultimately improve patient care. Such a system would translate to better communication between the pathologist and the clinician—the next best thing to the time when dermatologists were both clinicians and pathologists.

Accepted for Publication: May 15, 2007.
Correspondence: Ashfaq A. Marghoob, MD, Dermatology Service, Department of Medicine, Memorial Sloan-Kettering Cancer Center, 160 E 53rd St, New York, NY 10022 (marghooa@mskcc.org).

Author Contributions: All authors have contributed to the study in a manner that meets authorship criteria, have seen the final draft of the manuscript, and approve the validity of the data presented. Study concept and design: Scope, Malvey, Puig, Braun, and Marghoob. Acquisition of data: Scope, Busam, and Marghoob. Analysis and interpretation of data: Scope, Malvey, Puig, McClain, and Marghoob. Drafting of the manuscript: Scope, Busam, Malvey, Puig, and Marghoob. Critical revision of the manuscript for important intellectual content: Malvey, Puig, McClain, and Braun. Study supervision: Marghoob.

Financial Disclosure: None reported.

Funding/Support: The polarized noncontact dermoscopy lens was provided by 3GEN, LLC.

Additional Contributions: Alexandros D. Polydorides, MD, PhD, fellow at the Department of Pathology, Memorial Sloan-Kettering Cancer Center, tested the applicability of dermoscopy in gross pathology.

REFERENCES