Level of Confidence in Diagnosis: Clinical Examination Versus Dermoscopy Examination

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BACKGROUND Confidence is an important factor in decision making and may influence patient care.

OBJECTIVES To evaluate whether short-training-based dermoscopy increases confidence in the diagnosis of skin lesions.

METHODS AND MATERIALS After a 1-hour course on dermoscopy, 20 pairs of clinical and dermoscopic images of lesions were presented to 19 dermatology residents with little or no dermoscopy experience. After viewing the clinical image, they were asked to assess their confidence in the diagnosis in a seven-point scale, with 1 reflecting that the respondent was 100% confident that the lesion was benign, while number 7 reflected 100% confidence that it was malignant. The same technique was used for dermoscopic images.

RESULTS Ten of the 20 pairs of evaluations showed a significant difference ($p < .05$). The largest differences were observed in lesions where clinical scores suggested that participants were uncertain about the diagnosis, but tended to decide that the lesion was benign after dermoscopy. Dermoscopy did not improve confidence in the evaluation of dysplastic lesions as well as lesions with obvious clinical diagnoses.

CONCLUSIONS Short-training-based dermoscopy improved confidence in the diagnosis of clinically challenging skin lesions, but the impact was not demonstrable for clinically obvious lesions and dysplastic nevi.

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Despite great advances in recent years, clinical decision making related to pigmented lesions of the skin is still fraught with considerable uncertainty. Making decisions in complex dynamic systems, such as the clinical setting, continuously engages processes of knowledge acquisition and application, demanding the ability to distinguish relevant from irrelevant information.[1] Ideally, a skillful physician should be able to identify crucial elements from the patient history, assess both positive and negative physical findings, and, if necessary, use additional diagnostic tools, in order to arrive at a confident diagnostic hypothesis, leading to an accurate diagnosis. The degree of certainty in the correctness of the diagnosis is defined as confidence.[2] Confidence plays a central role in decision making,[2] and may affect patient-physician relationship. Physician's ambivalence or uncertainty, while interpreted by some patients as judicious reserve, may increase anxiety in other patients.

The clinical diagnosis with the unaided eye results in many overlooked melanomas.[3] To guard against this, many physicians adopt a "surgical prophylaxis" view[4] that results in a very low yield of melanomas on biopsies. Dermoscopy has evolved to become a valuable instrument for the dermatologist in the assess-

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ment of pigmented lesions of the skin. Several approaches (pattern analysis, ABCD rule, seven-point checklist, Menzies method, revised two-step pattern analysis, ABC rule, and three-point checklist) are now in popular use for the correct differentiation of pigmented lesions as melanocytic versus nonmelanocytic, and, secondly, characterization of their features as benign, suspicious, or malignant.[5] The addition of dermoscopy to classic unaided eye examination in melanoma screening improves the accuracy of melanoma detection, especially for formally trained operators.[6,7] Short-term dermoscopy training has been shown to improve diagnostic performance as well.[8,9]

We propose that physicians' confidence is improved by the use of dermoscopy, compared with confidence in diagnosing skin lesions with the unaided eye. To evaluate this hypothesis, we conducted a study to assess changes in physicians' confidence in diagnosing lesions as benign versus malignant after reviewing clinical and dermoscopic images.

Materials and Methods

Subjects

Nineteen dermatology residents (New York University) with little or no dermoscopy experience attended a lecture on the fundamentals of dermoscopy. Following the lecture, they were invited to take part in a study designed to assess their level of confidence in classifying lesions as benign or malignant, based initially on the clinical examination and then on dermoscopic examination. Although evidence indicates that dermoscopy requires training and practice to achieve clinical accuracy,[10] recruiting physicians who were naïve to dermoscopy and were submitted to the same training session has the added advantage of controlling the level of expertise. Expertise has been shown to be associated with confidence in decision making.[1]

Methods

Twenty lesions were chosen for this study. These lesions consisted of six melanomas (four invasive, two in situ), five dysplastic nevi, three seborrheic keratoses, two hemangiomas, one nevus spilus, one congenital nevus, one blue nevus, and one tick. The lesions were classified as (1) challenging to diagnose clinically but more obvious to diagnose dermoscopically, (2) challenging to diagnose both clinically and dermoscopically, and (3) lesions that were very obvious to diagnose both clinically and dermoscopically. Lesion selection and categorization were performed by two of the study dermatologists (A.A.M., A.K.). The study lesions were presented to all study participants at the same time, in a small lecture room. Before the presentation, each participant was supplied with an Optionfinder hand-held wireless keypad (Option Technologies Interactive, Orlando, FL, USA; http://www.optionfinder.com), and instructed on its use. Although the keypad consisted of buttons labeled 0 to 10, only numbers 1 to 7 were activated for use in this study. The keypad scoring system was provided by 3M (St. Paul, MN, USA). Each hand-held unit had a unique identifier, and responses were anonymously recorded and coded in the database according to this unique identifier. Participants were allowed to change their response at any time while viewing the current image of the lesion. But once all responses were recognized by the system, a final warning was given to the participants that the session was going to be closed, and they had a last chance to change their scores. Once the session was closed, the keypads were deactivated, and no further changes could be made or recorded.

When participants were shown the clinical image, they were asked to assess their confidence in the diagnosis of the lesion on a Likert-type scale from 1 to 7. Selection of number 1 reflected that the respondent was 100% confident in a benign diagnosis; number 2, the respondent was almost sure that the lesion was benign; number 3, the lesion was probably benign; number 4, not confident about the lesion being benign or malignant; number 5, the lesion was probably malignant; number 6, almost certain that the lesion was malignant, and number 7,

100% confident that the lesion was malignant. Next, participants used the same scoring process, in a 1 to 7 scale, to evaluate the dermoscopic image of the same lesion. Close-up clinical and dermoscopic images were presented to the participants in succession, and all 20 lesions (40 images) were presented in the same manner. No clinical history was included to avoid the influence of factors other than dermoscopy. A centralized computer tallied and logged all responses. In a few cases, the participants did not complete the review of all the lesions due to extraneous circumstances, such as attending to hospital patients.

TABLE 1. Mean Scores of Confidence in the Diagnosis for Clinical and Dermoscopic Images

Lesion Type (Number)	*Clinical Score*	*Dermoscopic Score*	p-*Value for Difference*
Dysplastic nevus (1)	1.89	1.95	.77
Malignant melanoma in situ (2)	4.37	4.52	.56
Seborrheic keratosis (3)	3.78	2.05	<.0001
Malignant melanoma (4)	5.26	5.63	.13
Blue nevus (5)	1.94	1.5	.03
Malignant melanoma (6)	5.05	5.72	.004
Dysplastic nevus (7)	3.31	3.58	.38
Hemangioma (8)	4.28	3.61	.07
Congenital nevus (9)	2.29	1.94	.19
Seborrheic keratosis (10)	4.41	4.41	1.0
Malignant melanoma in situ (11)	3.41	2.05	<.0001
Nevus spilus (12)	3.72	3.28	.16
Dysplastic nevus (13)	4.41	5.06	.03
Hemangioma (14)	2.94	1.18	<.0001
Malignant melanoma (15)	4.0	5.47	.0006
Dysplastic nevus (16)	3.33	2.83	.07
Malignant melanoma (17)	5.22	6.11	.001
Tick (18)	3.06	1.0	<.0001
Dysplastic nevus (19)	2.89	3.5	.11
Seborrheic keratosis (20)	4.33	3.11	.02

Analysis

Descriptive frequencies, means, and medians were calculated to describe the responses. As each lesion was observed and scored twice, once clinically and once dermoscopically, paired *t*-tests were used to evaluate differences in mean response scores between clinical and dermoscopic evaluations. The data were analyzed using Stata version 8.0 (Stata Corp., College Station, TX, USA).

Results

Eleven of the 19 participants evaluated all 20 pairs of images. Of the eight participants who did not complete all of the evaluations, the median number of evaluations completed was 18, with a range of 13 to 19. The mean scores for the clinical and dermoscopic evaluations of all lesions, along with associated *p*-values for the difference between clinical and dermoscopic evaluations, are presented in Table 1.

Ten of the 20 pairs of evaluations showed a significant difference at a *p*-value of $<.05$. The largest observed differences between clinical and dermoscopic impressions tended to be in the lesions where the participants were initially uncertain (lesions 3, 14, and 18), but after viewing the dermoscopic image, participants tended to lower their lesion score, indicating increased confidence that the lesion was benign (clinically challenging but clearly benign on dermoscopy). For those lesions in which the initial clinical score indicated that participants were confident regarding the diagnosis (benign—low scores or malignant—high scores), differences between clinical and dermoscopic evaluations were not observed (clinically easy, dermoscopy had no impact). Of note, for one lesion (lesion 11), the participants significantly lowered their evaluation score, even though the lesion was histologically a melanoma in situ.

When the lesions were grouped according to histopathology as benign, dysplastic, and malignant, there were significant differences in confidence scores after dermoscopy in the benign ($p<.0001$) and malignant ($p=.03$) lesions, while no difference was observed in the dysplastic lesions ($p=.38$)

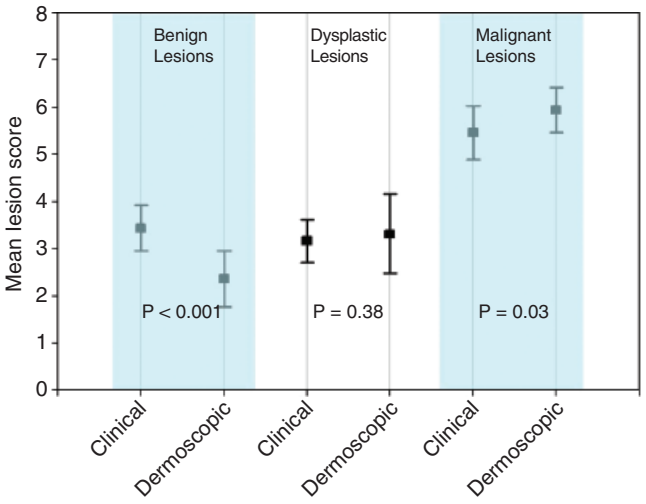

Figure 1. Mean scores for clinical and dermoscopic evaluations of benign, dysplastic, and malignant lesions.

(Figure 1). When mean differences in individual lesion scores were explored, with positive scores indicating increasing confidence that the lesion was truly malignant and negative scores indicating increasing confidence that the lesion was truly benign (Figure 2), malignant lesions tended to have positive scores, while benign lesions tended to have negative scores. Histologically dysplastic nevi, which typically are challenging lesions clinically and dermoscopically, had relatively modest differences between clinical and dermoscopic scores, indicating no net improvement in diagnostic confidence for these lesions (no impact in clinically and dermoscopically difficult lesions).

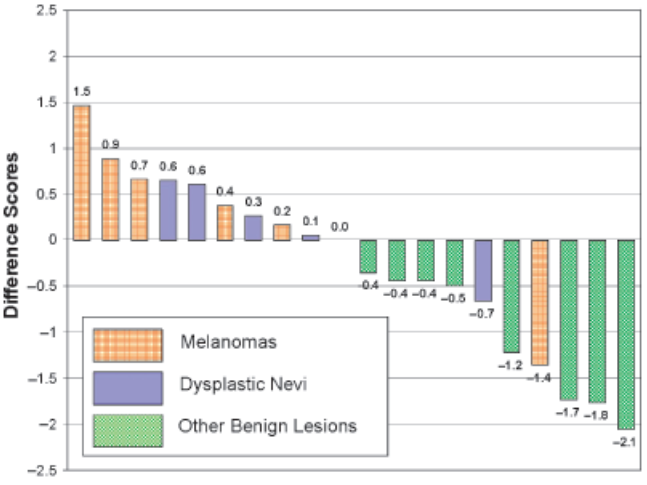

Figure 2. Mean differences in individual lesion clinical and dermoscopic scores. Lesions are distributed as melanomas, dysplastic nevi, and other benign lesions, with positive scores indicating increasing confidence that the lesion was truly malignant, and negative scores indicating increasing confidence that the lesion was truly benign.

Discussion

Confidence is commonly associated with knowledge in medical decision making. However, there are many other factors that can affect the levels of confidence, such as: amount of training or expertise, time allocated to decision making, levels of self-confidence, and even cultural differences.[1,2,11] In addition, individuals bring to any decision an internal mental process influenced by memory and emotions that interact with the external environment and problem context.[1] The complexity of these individual factors and their interactions makes quantifying confidence and its individual components very difficult. Typically, studies quantify physicians' self-reported confidence by questionnaire, asking respondents questions like, "How confident are you in your ability to identify early melanoma?" These questions are typically asked before and after some educational intervention to determine changes in overall confidence. In this study, we applied a method to evaluate the changes in physician confidence with the use of dermoscopy during the clinical exam, in a dynamic way, simulating the clinical environment and controlling for other possible influences, such as clinical history and expertise.

Our study showed that the addition of dermoscopic images in the evaluation of skin lesions reduces initial clinical uncertainty, and improves diagnostic confidence. We do not know for certain whether the short course added to confidence, or whether dermoscopy alone would have had the same effect. Regardless, our metric of confidence improved with the use of dermoscopy after the short-course intervention. This finding has the most clinical significance in the group of "clinically difficult but clearly dermoscopically benign lesions," as unnecessary biopsies can be prevented. In the clinical setting, this can be seen as physicians "voting with their scalpel" as reflected by a reduction in the number of benign "suspect" lesions excised for diagnostic verification. As expected, in those lesions with obvious clinical features, the addition of dermoscopic images had little or no impact on confidence. These lesions possessed all the elements necessary to raise confidence in the diagnosis; so consequently, dermoscopy added little or nothing to the final decision.

On the other hand, for the clinically and dermoscopically atypical dysplastic nevi, the confidence of physicians in the malignant or benign diagnoses of the lesions did not significantly change and tended to fluctuate from uncertain to malignant in all lesions but one after seeing the dermoscopic image (Figure 2). Dysplastic nevi are particularly challenging lesions to evaluate because they share similar clinical and histopathologic features with melanoma, and their morphology is difficult to analyze.[12,13] Dermoscopy of challenging lesions requires a high level of expertise.[10] Binder and collegues.[10] found that, in a group of Austrian dermatologists not formally trained or experienced in dermoscopy, their diagnostic sensitivity for melanoma actually decreased when dermoscopy was utilized. After 9 hours of formal training in dermoscopy, however, the diagnostic performance of participants was significantly enhanced.[8] Experienced dermoscopists are usually alert to specific characteristics of dysplastic nevi that differentiate them from true malignancies. In this study, we did not expect our participants to achieve this level of expertise, and our results confirm this. Indeed, no net improvement in diagnostic confidence was seen in our evaluators for the dysplastic nevi, but the tendency was to increase the confidence that the lesion was malignant, and this could result in unnecessary biopsies. With more time and expertise, however, we expect that these physicians would be able to distinguish more confidently dysplastic nevi that would not require immediate biopsies.

As with any new skill, it is important to exercise prudence and good medical reasoning in the application of dermoscopy to facilitate diagnoses. Confidence and accuracy are two separate things. One can be very confident about a diagnosis and yet be completely wrong. In the clinical setting, this can have very dire consequences, such as overlooked malignancies and a negative impact on patient-physician relation. In our study, with the clinically and dermoscopically atypical dysplastic nevi and with one melanoma in situ, participants tended to shift their scores from "doubtful" to "more confident" that the lesion was benign after seeing the dermoscopic image. The melanoma in situ (Figure 3) was an enlarging mole in a person older than 60 years. However, participants were not given this additional information, and based their decision solely on the clinical and dermoscopic images presented. If the study dermatologists were aware of the complete patient history, their confidence that the lesion was benign might not have been the same. Even with the benign dermoscopic general appearance, the fact that this was a changing lesion in an elderly person could have altered their confidence in their diagnosis. Gachon and colleagues.[14] showed that physicians most skilled at detecting melanoma "seem to unconsciously rely on cognitive (overall pattern) and comparative ("ugly duckling sign") processes rather than an algorithm of morphologic criteria (ABCD)." Thus, skilled physicians appear to instantly and simultaneously process divergent sources of information such as patient history, overall physical

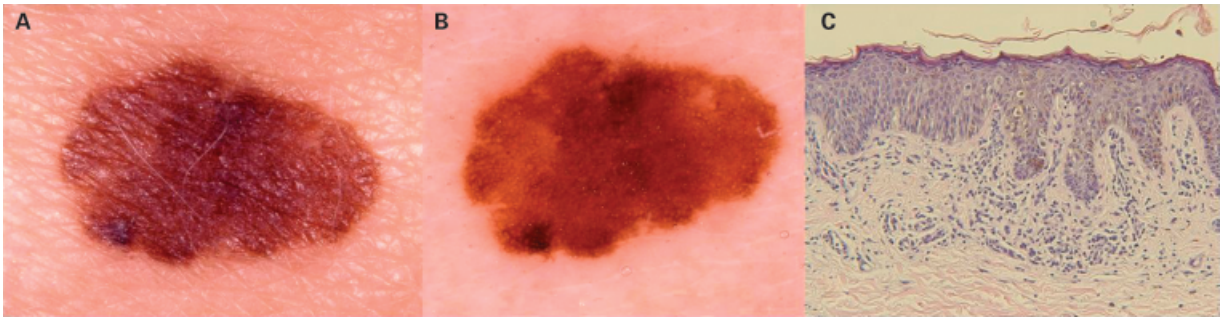

Figure 3. Clinical (A) and dermoscopic (B) images of a melanoma in situ, confirmed by pathology. (C) Dermoscopy made the study participants more confident that this lesion was benign, while the addition of clinical history (changing lesion in an elderly person) could have raised concern.

findings, close-up viewing of multiple lesions, and dermoscopy to arrive at a diagnosis.[15]

Although widely used in Europe, lack of formal training remains a significant barrier to widespread use of dermoscopy in the United States.[15,16] In a survey of American Academy of Dermatology members, only 23% reported using dermoscopy regularly, and another study suggested that only 51% of US dermatology residency programs train their resident physicians in the use of dermoscopy.[15,17] Often, training is in the form of a cursory introduction with very few hours of formal didactic training. As shown here, dermoscopy can improve confidence when used by naïve people, but that does not mean that accuracy was improved. Training and experience are important, especially for those lesions with challenging clinical and dermoscopic characteristics, such as clinically and dermoscopically atypical nevi.

Certainly, dermoscopy is not a diagnostic tool to discriminate benign from malignant lesions. Dermoscopy is but one of many available tools that physicians have at their disposal. A patient's history and other clinical findings provide important clues to the diagnosis and must be considered during interpretation of a specific lesion. This was clearly shown when the mean confidence score of one of the melanomas in our study decreased (i.e., tended toward the benign end of the spectrum). In clinical practice, clinical history and all available clinical information must coalesce in the physician's mind to generate a confident and, hopefully, accurate diagnosis.

One of the major limitations of this study was sample size. Our sample may not be representative of all nonusers of dermoscopy. Although this might be the case, we feel that these results are intriguing and future studies with other cohorts are planned. We have designed a larger Internet-based study to address all these issues and provide us with a better understanding of the role of dermoscopy for both the naïve and the experienced dermoscopist. An important aspect that was not considered in this study is the effect of dermoscopy on actual physician behaviors or health outcomes. In our future studies, we intend to evaluate influences in management. These practical changes are more crucial to the medical system than perceived confidence alone.

Conclusions

Short-training-based dermoscopy improved dermatology residents' confidence in diagnosing skin lesions. However, confidence did not significantly improve for clinically obvious or clinically and dermoscopically challenging lesions. Greater experience may be required to improve confidence in differentiating atypical nevi from melanomas, or dermoscopy may be of less use for these lesions. Ultimately, although increasing confidence, dermoscopy alone does not correlate with an increased likelihood of correct diagnoses for lesions exhibiting equivocal clinical and dermoscopic features.

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