Enhancement of International Dermatologists' Pigmented Skin Lesion Biopsy Decisions Following Dermoscopy with Subsequent Integration of Multispectral Digital Skin Lesion Analysis

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ABSTRACT

Background: Early detection and subsequent management of melanoma are critical for patient survival. New technologies have been developed to augment clinician analysis of suspicious pigmented skin lesions. **Objective:** To determine how information provided by a multispectral digital skin lesion analysis device affects the biopsy decisions of international dermatologists following clinical and dermoscopic pigmented skin lesion evaluation. **Methods:** Participants at a dermoscopy conference in Vienna, Austria, were shown 12 clinical and dermoscopic images of pigmented skin lesions (2 melanomas *in situ*, 3 invasive melanomas, and 7 low-grade dysplastic nevi) previously analyzed by multispectral digital skin lesion analysis. Participants were asked if they would biopsy the lesion based on clinical images, again after observing high-resolution dermoscopy images, and again when subsequently shown multispectral digital skin lesion analysis information. **Results:** Data were analyzed from a total of 70 international dermatologists. Overall, sensitivity was 58 percent after clinical evaluation (C) and 59 percent post-dermoscopy (D), but 74 percent after multispectral digital skin lesion analysis. Participant specificity was 56 percent (C) decreasing to 51 percent (D), but increasing to 61 percent with multispectral digital skin lesion analysis. Diagnostic accuracy was 57 percent (C) decreasing to 54 percent (D), but increasing to 67 percent for dermatologists after integrating the multispectral digital skin lesion analysis data into the biopsy decision. The overall number of lesions biopsied increased from 50 percent (C) to 53 percent (D), rising to 54 percent after multispectral digital skin lesion analysis. **Conclusion:** Decisions to biopsy melanocytic lesions were more sensitive and specific when multispectral digital skin lesion analysis information was provided with no significant increase in the number of biopsies recommended. Providing multispectral digital skin lesion analysis data may lead to additional improvement in biopsy accuracy with a concomitant decrease in the number of nonessential biopsies for pigmented skin lesions even after dermoscopic evaluation. (*J Clin Aesthet Dermatol.* 2016;9(7):53–55.)

Incidence of melanoma has continued to rise over the last century.[1] The poor prognosis associated with advanced metastatic disease necessitates efforts to enhance the early detection and subsequent management of melanoma.[2] In addition to traditional clinical assessment measures, such as full skin examination and dermoscopy, new technologies have been developed to augment clinician analysis of suspicious pigmented skin lesions (PSLs).[3,4]

This study was designed to determine how information

DISCLOSURE: This study was funded in part by a grant from STRATA Skin Sciences, Inc. Drs. Winkelmann and Farberg's clinical research fellowship was funded, in part, by STRATA Skin Sciences, Inc. Ms. Tucker is employed by STRATA Skin Sciences, Inc. Mr. White received compensation to collect testing results. Dr. Rigel is a consultant to STRATA Skin Sciences, Inc.

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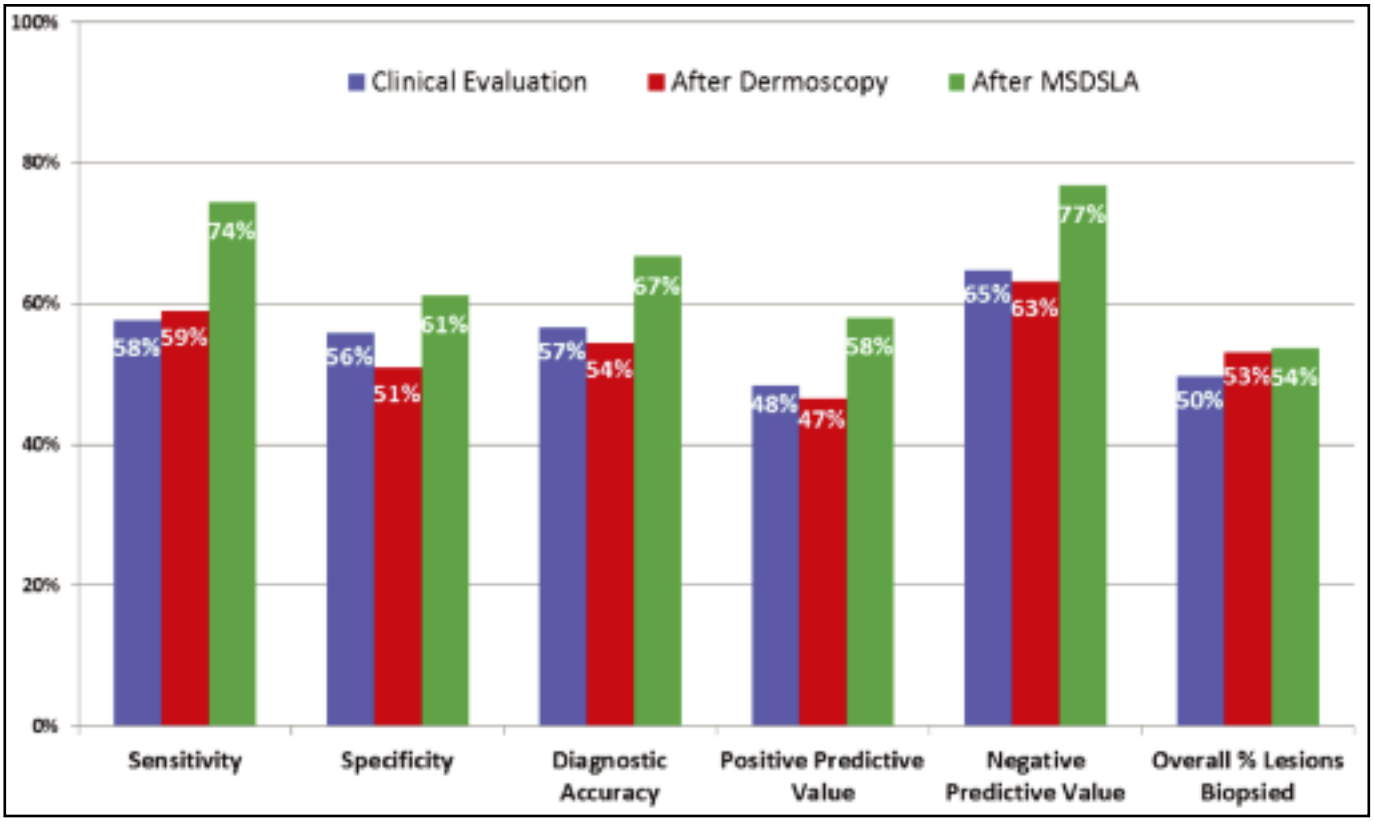

Figure 1. Pigmented lesion biopsy decision analysis comparing clinical evaluation, followed by dermoscopy evaluation, and after providing MSDSLA information

provided by a multispectral digital skin lesion analysis (MSDSLA) device (MelaFind, STRATA Skin Sciences Inc, Horsham, Pennsylvania) affects the biopsy decisions of dermatologists following clinical and dermoscopic PSL evaluation.

MSDSLA uses 10 bands of visible and near-infrared light (430–950nm) to image and evaluate PSLs to 2.5mm beneath the skin surface.[5] Using 75 unique computerized analytical algorithms, MSDSLA measures the distribution of melanin within a PSL and determines the degree of morphological disorder. Using a logical regression model previously validated on a set of 1632 PSLs, the probability of melanoma or pigmented lesion of high-risk malignant potential are then provided to the clinician.[6] This additional objective probability information is then integrated into the clinician's biopsy decision of a clinically ambiguous PSL.

METHODS

Dermatologists at a dermoscopy conference in Vienna, Austria, were shown 12 clinical (distant and close-up) and dermoscopic images of PSLs (2 melanomas *in situ*, 3 invasive melanomas, and 7 low-grade dysplastic nevi) previously analyzed by MSDSLA.[1] Participants were first asked if they would biopsy the lesion based on clinical images (C), again after observing high-resolution dermoscopy images (D), and again when subsequently shown MSDSLA information. Each response was input using a wireless keypad. Answers were withheld from participants until all data had been collected to avoid bias. Biopsy decisions were evaluated for all three time points, including clinical evaluation, after dermoscopy, and then after MSDSLA using chi square analysis.

RESULTS

Data were analyzed from a total of 70 primarily European participants and is summarized in Figure 1. Overall, sensitivity was 58 percent after clinical evaluation (C) and 59 percent post-dermoscopy (D), but 74 percent after MSDSLA ($P<0.0001$). Participant specificity was 56 percent (C) decreasing to 51 percent (D), but increasing to 61 percent with MSDSLA ($P<0.005$). Diagnostic accuracy was 57 percent (C) decreasing to 54 percent (D), but increasing to 67 percent after integrating the MSDSLA data into the biopsy decision ($P<0.0001$). Positive predictive value was 48 percent (C) decreasing to 47 percent (D), but increasing to 58 percent with MSDSLA ($P<0.001$). Negative predictive value decreased from 65 percent (C) to 63 percent (D), increasing to 77 percent ($P<0.0005$) with MSDSLA. The overall number of lesions biopsied increased from 50 percent (C) to 53 percent (D), rising to 54 percent after MSDSLA (P=not significant).

Given the improvement in sensitivity and specificity along with the nonsignificant change in total number of PSLs chosen for biopsy after MSDSLA, the overall biopsy ratio (ratio of total lesions chosen for biopsy to melanomas found) also improved, which led to fewer potentially unneeded biopsies. Therefore, more melanomas and fewer lower risk PSLs were subsequently selected for biopsy.

DISCUSSION

Dermatologists' decisions to biopsy atypical melanocytic lesions were more sensitive and specific with the MSDSLA objective information provided to physicians. Participants were also less likely to biopsy nonmelanomas after MSDSLA evaluation. The authors' results suggest providing practitioners with MSDSLA data leads to improved biopsy accuracy decreasing the number of nonessential biopsies for PSLs even after dermoscopic evaluation.

A potential limitation of the study is selection bias, as practitioners with a particular interest in skin cancer or technology may have chosen to attend this conference and/or self-selected to take part in the study. An additional limitation may potentially be the lack of tactile examination of the PSLs.

Healthcare delivery systems are rapidly changing across the world. A commonly shared trend is the increasing emphasis on providing efficient, evidence-based care. Within the field of dermatology, optimizing biopsy decisions through technological diagnostic enhancements, such as MSDSLA, may provide an opportunity to increase biopsy yield. Additionally, data from this study demonstrated enhanced sensitivity for the detection of melanoma using MSDSLA leading to a potential role for the device in reducing mortality from melanoma in the future.

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