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ORIGINAL ARTICLE

Comparison of visual effects of immersion fluids for dermoscopic examination of acral volar melanocytic lesions

Tzu-Hsiu Chen [1], Shu-Hui Wang [1], Lin-Hui Su [1], Yu-Ling Hsu [1], Tsung-Hua Tsai [1], Ya-Jing Hsu [1], Ying-Jui Chang [1,2,*]

[1] Department of Dermatology, Far Eastern Memorial Hospital, Banciao District, New Taipei City, Taiwan
[2] New Taipei Institute of Dermatology, Banciao District, New Taipei City, Taiwan

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ABSTRACT

Background: Acral volar melanocytic lesions have a high potential for malignancy. Dermoscopy is a useful, noninvasive tool for the diagnosis of such malignancies. The use of immersion fluids can provide better visual effects and improve the diagnostic accuracy of dermoscopic examinations.
Methods: Fifteen volar melanocytic lesions, including two palmar and 13 plantar lesions, were included in our study. We compared the visual effects of two different immersion fluids as an interface for dermoscopy. Four combinations of immersion fluid (ultrasound jelly or mineral oil) and observation mode (polarized or nonpolarized light) were compared for visual effects during the dermoscopic examination of lesions based on air bubble inclusion and microstructure visibility.
Results: Both the mineral oil and the ultrasound jelly allowed at least one microstructure to be clearly visible in each image of the acral volar melanocytic lesions examined. All modes of observation achieved acceptable visual effects. The use of mineral oil and the polarized light mode resulted in the formation of fewer bubbles than the use of mineral oil and the nonpolarized light mode ($p < 0.05$). The use of ultrasound jelly and the polarized light mode resulted in significantly better visual effects ($p < 0.05$) than that of ultrasound jelly or mineral oil and the nonpolarized light mode.
Conclusion: The use of either mineral oil or ultrasound jelly as interface provides acceptable visual effects for the dermoscopic examination of acral volar melanocytic lesions. The use of the polarized light mode reduced the reflection and scattering of light, resulting in better visual effect than that achieved using the nonpolarized light mode. In the early diagnosis of acral melanoma, choosing the appropriate application of immersion fluid and observation mode yields the optimal visual effect.

Introduction

Acral volar skin is the most prevalent site of malignant melanoma in Asian populations. The palmar and plantar melanomas are usually diagnosed at an advanced tumor stage, conferring a poor prognosis.[1] Early acral melanoma is seen as a brownish macule, which is clinically similar to acral nevus. Screening techniques include skin self-examination, clinical skin examination, and biopsy. Dermoscopy can increase both specificity and sensitivity in the diagnosis of melanoma.[2,3]

The use of conventional contact nonpolarized light dermoscopy (NPD), contact, or noncontact polarized light dermoscopy (PD) impact clinical diagnosis differently. Currently, contact and noncontact PD are widely used. In contact PD and NPD, choosing an appropriate immersion fluid as an interface provides better visual effects during the dermoscopic examination of lesions.

The purpose of our study was to compare the use of polarized and nonpolarized light observation modes using mineral oil and ultrasound jelly for the dermoscopic examination of acral volar melanocytic lesions.

Methods

PD is currently widely used. In PD, the polarized light is obtained using filters that achieve a cross polarization. In both contact and noncontact PD, the scattering of light by the deep tissues is selectively limited, which reduces the reflectivity of the skin surface.

Conflicts of interest: The authors declare that they have no financial or non-financial conflicts of interest related to the subject matter or materials discussed in this article.

* Corresponding author. New Taipei Institute of Dermatology, Number 118, Section 1, Wenhua Road, Banciao District, New Taipei City 220, Taiwan.
E-mail address: drdeung@ms7.hinet.net (Y.-J. Chang).

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Either PD or NPD with the contact mode uses an immersion fluid that functions as a liquid interface between the skin and the instrument. The immersion fluid has a refraction index that is approximately equal to that of the skin, which reduces the reflectivity of the skin and enhances the transparency of the stratum corneum, allowing the observation of the subsurface structures and the location and distribution of the melanin. To aid clinicians in the efficient diagnosis of acral volar pigmented lesions, immersion fluids with specific viscosities and optical characteristics are used to optimize the visualization of structures beneath the stratum corneum. Various types of immersion fluids, such as alcohols, ultrasound gel, water, and mineral oil, have been evaluated for the visualization of a range of different types of lesions. Ultrasound jelly and mineral (paraffin) oil were used as the immersion fluids (Figure 1B) in our study due to the adequate viscosity and low volatility for acral volar skin applications.

Two palmar and 13 plantar melanocytic lesions were included in our study. Thirteen patients (2 men and 11 women) were enrolled in our study. A dermatoscope (DermLite II hybrid; 3Gen LLC, California, USA) with polarized and nonpolarized observation functions was used for visualization in our study (Figure 1A). The images were recorded using a digital camera with 1360 megapixels image resolution (DSC-W300; SONY, Tokyo, Japan) that was attached to the dermatoscope using an adaptor ring (VAD-WF; SONY).

The immersion fluid was applied over the lesion covered by a plastic wrap (Figure 1C), which was used to maintain hygiene and ease of clean-up, and the dermatoscope lens was placed on the lesion at a 90° angle (Figure 1D). The plastic wrap was stretched with slight tension to ensure contact with the skin surface. To obtain the best visual effect by dermoscopy, the following observation mode/immersion fluid combinations were evaluated: Group 1, ultrasound jelly with nonpolarized light; Group 2, ultrasound jelly with polarized light; Group 3, mineral oil with nonpolarized light; and Group 4, mineral oil with polarized light. Four digital images of each lesion at 10× magnification were recorded. A blinded dermoscopic expert evaluated the visual effects using a pattern analysis that is unique to acral volar surfaces.[4]

Evaluation of air bubble inclusion

Because air bubbles can be introduced into the immersion fluids during image acquisition, the numbers of air bubbles were evaluated as a parameter for image quality assessment. The images collected were classified into three categories based on the number of bubbles as follows: Category 1, no air bubbles; Category 2, one to 15 bubbles; and Category 3, more than 15 bubbles.

Evaluation of microstructures and pattern analysis

The structural analysis parameters included parallel ridge, irregular diffuse pigmentation, parallel furrow, lattice-like patterns, fibrillar patterns, blotch with regular or irregular distribution, regression, regular network, dots, blue-whitish veil, and unclassified patterns because they are widely used for the diagnosis of melanocytic lesions.[5–9] Based on the number of structural components, the collected images were classified into three categories as follows: Category 1, no distinct structural components; Category 2, one distinct structural component; and Category 3, more than one distinct structural component.

Statistical analysis

The frequencies and percentages of the categorical variables were determined, and the Chi-square test was used to evaluate the statistical relationship between the visual effects for each combination. The level of statistical significance was defined as $p < 0.05$. The MedCalc for Microsoft Windows, version 10.2.0.0 (MedCalc Software, Meriakerke, Belgium) computer software was used for the statistical analysis.

Results

Two palmar lesions and 13 plantar lesions, including two toe lesions and one heel lesion, were included in our study. A representative image of the types of bubbles observed is shown in Figure 2 (white arrow). Air bubbles were observed in most of the

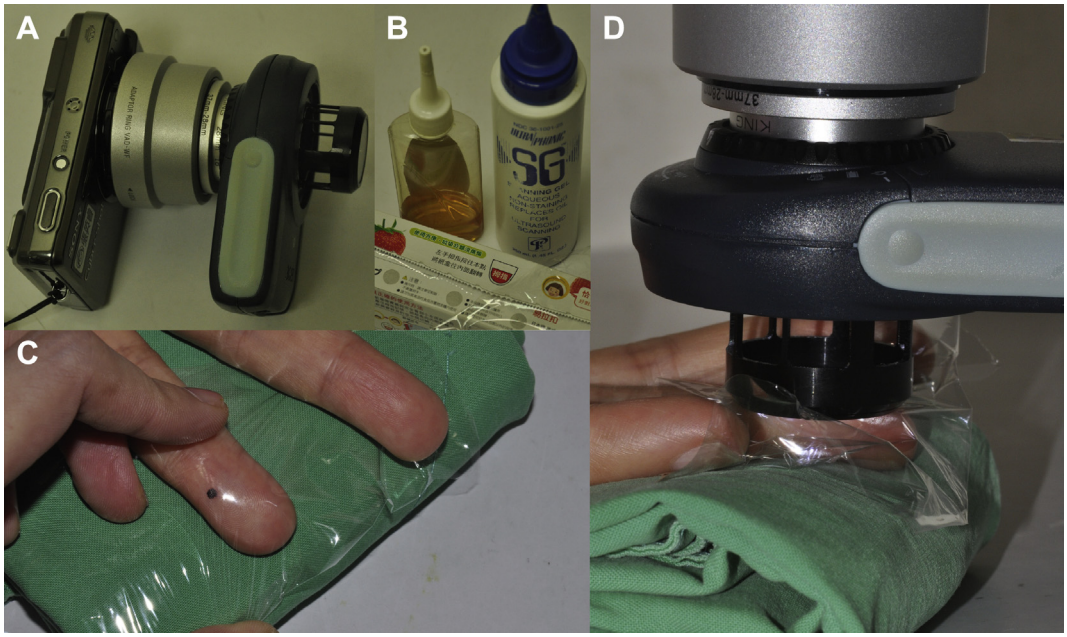

Figure 1 (A) The dermatoscope device attached to the digital camera by an adaptor ring for photography. (B) Immersion fluids and plastic wrap. (C) After adding immersion fluids, the lesion was covered by the plastic wrap. (D) Before taking the picture, as many air bubbles were removed as possible.