Does it look like melanoma? A pilot study of the effect of sunless tanning on dermoscopy of pigmented skin lesions

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Summary

Background Dermoscopy has led to an improvement in diagnosing malignant melanoma (MM). Sunless tanning agents containing dihydroxyacetone (DHA) could lead to a decrease in ultraviolet exposure, decreasing the risk of MM. Importantly, DHA has been reported to change dermoscopic features and could thus endanger diagnostic improvement in dermoscopy.

Objectives To investigate whether the use of DHA can lead to changes that simulate a real, clinically relevant dermoscopic change, suggesting malignant transformation either in facial solar lentigo/initial seborrhoeic keratosis (SL/ISK) or in naevi on the body.

Methods Seven patients with 25 pigmented skin lesions (PSLs) were photographed, resulting in 38 dermoscopic images. Photographs were taken before, 1 week after and 1–2 months after the use of DHA. Two dermatologists separately evaluated the PSLs and their dermoscopic features. For lesions on the body Menzies’ method was used, and for facial lesions the criteria defined by Stolz et al. were used.

Results In facial PSLs equivocal lesions were registered by both evaluators significantly more often after DHA use than before (42% vs. 12%, \( P = 0.021 \) and 69% vs. 19%, \( P = 0.001 \)). Furthermore, follicular pigmentation that partly mimics that of lentigo maligna was also seen significantly more often after DHA use than before (81% vs. 12%, \( P < 0.001 \) and 69% vs. 15%, \( P < 0.001 \)) and in these instances the evaluators recommended a biopsy. Equivocal lesions in naevi on the body were not significantly increased after DHA use.

Conclusions Dermoscopists that come across unclear dermoscopic findings, especially in facial PSL, should ask patients about the use of DHA.

As the incidence of malignant melanoma (MM) is increasing globally, the use of dermoscopy is important to improve diagnostic accuracy.1–3 The most important external factor associated with MM is ultraviolet radiation (UVR).4,5 In skin areas such as the face, which are exposed to high, accumulated doses of UVR, development of lentigo maligna (LM) and LM melanoma (LMM) can occur.6 Differentiating earlier stages of these malignant lesions from benign solar lentigo/initial seborrhoeic keratosis (SL/ISK) often requires dermoscopy.7,8

The use of self-tanning products containing dihydroxyacetone (DHA) could potentially decrease UVR exposure in the population,9,10 which might lead to a decrease in MM.

One factor to resolve is whether the use of DHA interferes with dermoscopic investigation, simulating a change in a pigmented skin lesion (PSL) and mimicking an MM. An earlier case report has shown that new dermoscopic features can appear after the use of DHA, and more recently it was shown that DHA can cause pigmentation that simulates acral MM.11,12

To address this issue a pilot study was performed, using a product containing DHA and investigating whether its use could lead to changes in the dermoscopic features of facial SL/ISK or naevi on the body.

Patients and methods

This study was conducted in line with national laws and regulations concerning patient safety in health care. In 2008, seven patients were recruited from the dermatology department at the Skaraborg hospital in Skövde, Sweden. From them, a total of 25 PSLs were selected: 10 naevi on the body and 15 facial SL/ISks. No patients with lesions thought to be malignant...
were recruited. The PSLs were photographed [Dermaphot lens (Heine Optotechnik, Herrsching, Germany) and Canon EosD30 camera (Canon, Lake Success, NY, U.S.A.)], resulting in a total of 38 dermoscopic pictures. DHA was applied to a defined area on the body or face and the patients then continued applying DHA once daily for a total of 4 days. One week after the first application they returned, and new dermoscopic photographs were taken. Six of the seven patients came back after 1–2 months. During this session one lesion was not photographed due to unfortunate circumstances, and another photograph was of poor quality, so one evaluator chose not to consider that series of photographs. Therefore, the number of pictures evaluated by the two evaluators was 28 and 29, respectively.

The evaluation of the dermoscopic pictures was performed by two dermatologists experienced in dermoscopy-based diagnosis. Firstly they evaluated all the pictures in random order using dermoscopic algorithms (Menzies’ method\textsuperscript{13} for naevi on the body and the criteria defined by Stolz et al.\textsuperscript{14} for facial lesions) and scored them as benign, dysplastic, malignant or equivocal. They also specified the dermoscopic features seen and suggested the proper action to take (none, follow-up visit, biopsy or excision). In a second session they viewed the sequence of three pictures (for one patient only two pictures) taken of the same lesion, to evaluate changes in dermoscopic features, and whether the changes were temporary or permanent. In order to compare statistically the proportion of the pictures that were evaluated as equivocal or containing new dermoscopic features before vs. after DHA application, we used the McNemar test. The 95\% confidence intervals for proportions were calculated according to normality approximation. The significance level was generally set at 5\%.

## Results

The two evaluators saw changes in dermoscopic features between the first and second group of pictures in 36 and 34 of the 38 pictures, respectively. In the pictures taken during the third visit (after 1–2 months) these features remained in two pictures and one picture, respectively.

No PSLs in the study were considered dysplastic or malignant before or after DHA application, and the dermoscopic features in naevi were considered equivocal in slightly but not significantly more pictures taken after DHA application than before (data not shown). The new dermoscopic features in flat naevi presented as dots in two and four pictures, respectively, whereas elevated naevi blotches and/or globules were seen in all the pictures. In the equivocal cases both evaluators recommended a follow-up visit. It could not be clearly established that DHA application led to an altered dermoscopic diagnosis.

The dermoscopic features in facial SL/ISK were considered equivocal by the evaluators in significantly more pictures taken after DHA application than before (Table 1). An additional dermoscopic feature, follicular pigmentation (FP), was seen significantly more often in pictures taken after DHA application than before (Fig. 1, Table 1). The FP was mostly symmetrical, but partly asymmetrical, to some extent mimicking the FP seen in LM/LMM. In all of the equivocal cases both evaluators recommended a biopsy.

## Discussion

Previous reports have shown that DHA can affect dermoscopy and even simulate MM.\textsuperscript{11,12} The main finding of this study was that the use of DHA can lead to temporary changes in dermoscopic features in PSLs. For facial SL/ISK there may be a risk that the use of DHA can affect the dermoscopic diagnosis and clinical management, because FP was seen after application of DHA. The shape of the FP showed some similarity to the types of FP described by Stolz et al.\textsuperscript{14} Fine circles, double circles, semicircles and signet-ring-like circles could be seen in some of the photographs (Fig. 2). A recent study found FP, not always asymmetrical, to be among the most common features in LM/LMM.\textsuperscript{15} In naevi the dermoscopic changes did not clearly affect the dermoscopic diagnosis, but the smaller number of lesions in this group could have affected this result.

We could not demonstrate that the use of DHA made the lesions appear dysplastic or malignant. This might be explained by the lack of other malignant dermoscopic features and the fact that the FP was mostly symmetrical and yellow–brown after DHA application, and not grey as often seen in LM/LMM (Figure S1, see Supporting Information).

In many cases it might be easy to detect the use of DHA by evaluating the surrounding skin to see if the same pigmenta-

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**Table 1** Facial solar lentigo/initial seborrhoeic keratosis (SL/ISK) evaluated as equivocal, and follicular pigmentation (FP) found before and 1 week after application of dihydroxyacetone (DHA)

<table>
<thead>
<tr>
<th></th>
<th>Equivocal SL/ISK, n (%)</th>
<th>FP, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Evaluator 1</td>
<td>Evaluator 2</td>
</tr>
<tr>
<td>Before DHA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3* (12)</td>
<td>5* (19)</td>
<td>24 (92)</td>
</tr>
<tr>
<td>After DHA</td>
<td>11* (42)</td>
<td>18* (69)</td>
</tr>
<tr>
<td>P-value</td>
<td>0.021</td>
<td>0.001</td>
</tr>
</tbody>
</table>

*Biopsy recommended. The total number of photographs was 52, 26 taken before and 26 taken after DHA application.
tion is seen outside the lesion. However, in teledermatology, where these precautions are not always possible, the use of DHA may lead to an increased risk of unnecessary biopsies or excisions.

In conclusion, it is important to be aware of the effects that DHA products can have on dermoscopy when examining patients with PSL, especially those with facial lesions. This was a small, pilot study; to fully understand how DHA affects dermoscopy a larger study is needed, possibly using more investigators and a mix of benign and malignant lesions.

**What’s already known about this topic?**

- Little is known about the effect of sunless tanning products on dermoscopy, but two earlier case reports showed that they can cause new dermoscopic features.

**What does this study add?**

- We show that sunless tanning products containing dihydroxyacetone can cause new dermoscopic features in facial pigmented skin lesions that imitate early lentigo maligna, as follicular pigmentation temporarily appears.

**Acknowledgments**

The authors would like to thank Salmir Nasic for the statistical analysis of our data, and Charlotte Sparring for taking part in the evaluation and scoring of the photographs in the study.

**References**


10 Sahn RE, McIlwain MJ, Magee KH et al. A cross-sectional study examining the correlation between sunless tanning product use and tanning beliefs and behaviors. *Arch Dermatol* 2012; **148**:448–54.


**Supporting Information**

Additional Supporting Information may be found in the online version of this article at the publisher’s website:

**Figure S1.** Dermoscopic image of a lesion where histopathology showed lentigo maligna. Follicular pigmentation is seen mostly on the left side of the image.