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CASE REPORT

Line-field confocal optical coherence tomography and optical coherence tomography for distinguishing basal cell carcinoma from dermal nevus: A case report

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Abstract

Basal cell carcinoma (BCC) is the most frequent skin cancer with a rising incidence. It can imitate benign lesions for example, dermal nevus clinically and dermoscopically. Both entities show specific morphologic features in line-field confocal optical coherence tomography (LC-OCT) and optical coherence tomography (OCT). The aim was to differentiate both lesions via noninvasive imaging to prevent unnecessary surgery. A 63-year-old woman presented with a light brownish nodule on the left cheek and a brownish nodule on the right nasal slope/cheek, which were both evident since a few months. The clinical and dermoscopic appearance of both lesions was very similar including the differential diagnosis of a dermal nevus or BCC. Dynamic OCT of the lesion on the left cheek showed multiple hyporeflective nodules in the dermis with hypervascularization. Using LC-OCT several hyporeflective round to ovoid nodules with hyporeflective clefting embedded in a hyperreflective surrounding connective tissue could be observed. These specific morphological criteria called millefeuille pattern led to the diagnosis of a nodular BCC. The lesion of the right cheek presented with a thickened epidermis and elongated rete ridges in dynamic OCT. Upon LC-OCT examination a so-called large wave like pattern presenting as undulating hyporeflective and hyperreflective lobular structures could be identified. Therefore, the diagnosis of a dermal nevus was made. Both lesions were identified correctly as confirmed histopathologically after shave excision. Since BCC can imitate benign lesions for example, dermal nevi, the use of OCT and LC-OCT can facilitate the identification of BCC and its imitators. Noninvasive imaging can help to avoid unnecessary biopsy especially in areas where the skin is vulnerable to punch biopsy.

KEYWORDS
basal cell carcinoma, dermal nevus, dermoscopy, histology, line-field confocal OCT, optical coherence tomography

INTRODUCTION

Line-field confocal optical coherence tomography (LC-OCT) combines the technical principles of OCT and reflectance confocal microscopy (RCM). It offers a closely high signal penetration like OCT paired with a high resolution like RCM. LC-OCT represents a non-invasive method which allows the visualisation of epidermal and dermal structures at cellular resolution in vivo in horizontal and vertical views.[1] Characteristic morphologic features have been described for several malignant and benign skin lesions in skin imaging via LC-OCT, helping to diagnose a lesion without the need of a biopsy.[2–11]

Basal cell carcinoma (BCC) is the most frequent skin cancer with a rising incidence.[12] It can imitate benign lesions for example, dermal nevus clinically and dermoscopically.[4] Since BCC tend to grow destructively a reliable diagnosis with an appropriate treatment is required.[12]

CASE REPORT

Here we report a case of a patient with a BCC and a dermal nevus mimicking each other in their clinical and dermoscopic appearance, depicting the ability of LC-OCT to distinguish two resembling lesions before biopsy.

A 63-year-old woman presented with a 2 mm skin-coloured to light brownish nodule on the left cheek and a 2 mm light brownish nodule on the right nasal slope, which were both evident since a few months (Figure 1b,g).

Both lesions were examined using dermoscopy (DermLite® Foto II Pro), OCT (VivoSight Dx®, Michelson Diagnostics Ltd; lateral and axial resolution: 7.5×10 μm) and LC-OCT (deepLive™®, DAMAE Medical; lateral and axial resolution: 1.1×1.3 μm). Dermoscopy of the lesion on the left cheek (Figure 1b) revealed a skin-coloured lesion with a central yellowish-brown white globule surrounded by few linear and branching vessels and a blue-greyish clod at the top (Figure 1a). The lesion on the right nasal slope (Figure 1g) presented with grouped brown globules and dots, on a yellowish background and a few branched comma-shaped vessels. Underneath the right lesion is an angioma located, characterised by dark reddish clods observed in dermoscopy (Figure 1h). The clinical and dermoscopic appearance of both lesions was very similar including the differential diagnosis of a dermal nevus, BCC or solar lentigo as depicted in Figure 1b,g. Dynamic OCT on the lesion of the left cheek visualised multiple hyporeflective nodules in the dermis with hypervascularization. Using LC-OCT several hyporeflective round to ovoid nodules with hyporeflective clefting embedded in a hyperreflective surrounding connective tissue and prominent vessels could be observed. These specific morphological criteria called *millefeuille pattern* led to the diagnosis of a nodular BCC as confirmed histopathologically after shave excision.[2] The lesion on the right nasal slope presented with a thickened epidermis and elongated rete ridges in dynamic OCT. Upon LC-OCT examination undulating hyporeflective and hyperreflective lobular structures could be identified corresponding to big melanocytic nests/cords/strands on histopathology. This so called *large wave like pattern* has been described as a typical finding in dermal nevi before.[13] Further LC-OCT criteria for a dermal melanocytic lesion could be seen including for example, a well demarcated dermal-epidermal junction. An atypical honeycomb pattern or large, pleomorphic, hyperreflective cells suggesting a malignant melanocytic lesion were absent in this case. Remarkably the pending CE-marked integrated artificial intelligence (AI) algorithm of the LC-OCT (deepLive™® DAMAE Medical) predicted both lesions correctly as shown in Figure 1d,e,j,k. The AI algorithm is based on a deep learning architecture, ConvNext Tiny model, which performed superior in the cross-validation framework compared to other architectures.

DISCUSSION

BCC and dermal nevus both often grow on the face and might get confused due to their similar clinical and dermoscopic appearance of early lesions. (LC)-OCT provides a fast in vivo and noninvasive approach to distinguish these lesions without the need of a biopsy. The real-time study of skin lesions using LC-OCT or OCT takes approximately 5−10 min with instant live displayed results from AI analysis upon examination.

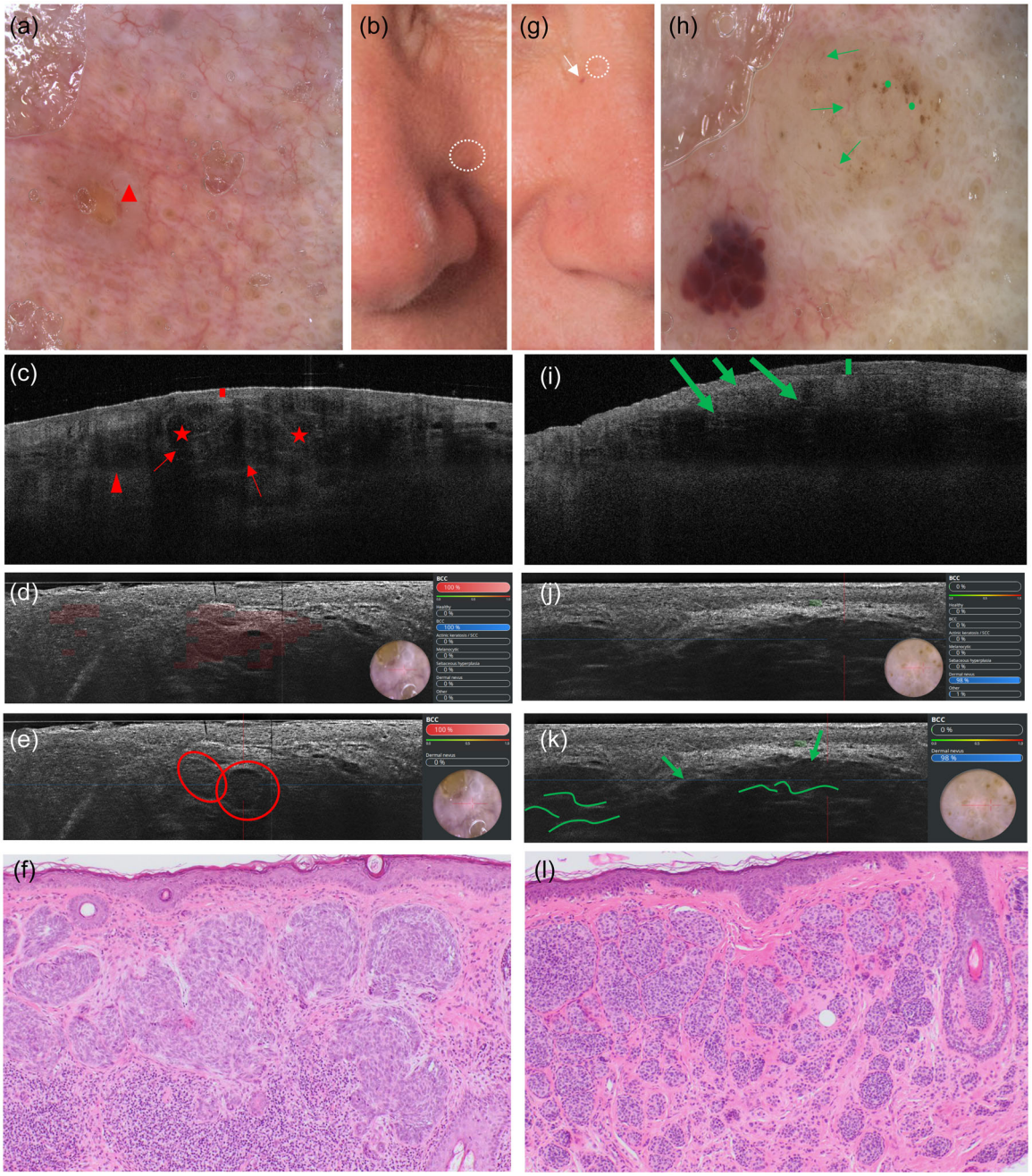

FIGURE 1 Presentation of the basal cell carcinoma (BCC) and dermal nevus macroscopically, by contact dermoscopy, optical coherence tomography (OCT, [image size: $6 \times 1\ mm^2$], vertical view of line-field confocal OCT [LC-OCT] [image size: $1.2 \times 0.5\ mm^2$]) LC-OCT with artificial intelligence and histopathology (haematoxylin–eosin stain; original magnification: ×10). Macroscopically the BCC on the left cheek presents as a skin-coloured papule (white circle in b). Dermoscopy reveals a skin-coloured papule with a central yellowish-brown white globule (red triangle) and few branched vessels in the surrounding (a). OCT of the BCC illustrates hyporeflective ovoid nodules (red asterisk) in the dermis with a darker border (red arrow) and a hyperreflective surrounding stroma (red triangle) (c). The vertical LC-OCT view of the BCC shows dark ovoid nodules with a dark rim surrounded by a bright stroma (red circles in d, e) corresponding to the BCC nests in histopathology (f). Macroscopically the dermal nevus on the right nasal slope presented as a light brownish papule (white circle in g). Below the dermal nevus is an incidental angioma presenting as a dark red papule (white arrow in g). Dermoscopy of the dermal nevus shows brown globules (evidence of nevus, green dot) and small telangiectasias (comma-shaped, green arrows) (h). Underneath the nevus are dark reddish clods characteristic of the angioma mentioned above. OCT of the dermal nevus reveals a thickened epidermis (green bar) with elongated rete ridges, elongated elliptic structures (green arrows) and small evenly distributed vessels (i). The vertical LC-OCT view of the dermal nevus shows a *large wave like pattern* (j, green waves in k) defined by undulating hyporeflective and hyperreflective elliptic structures corresponding histopathogically to the melanocytic nests (l). Artificial intelligence also shows the correct diagnosis, green = is benign and a dermal nevus with 98% and only 1% chance of other diagnoses (in j, k), red corresponds to malignant and so there is a 100% chance of a BCC (in d, e).

This case clearly demonstrates how the differentiation between a malignant and a benign lesion can be facilitated using LC-OCT. The improved distinction between these lesions helps to avoid unnecessary surgery which is of interest especially in cases of medium-large lesions in vulnerable regions as the face. Referral of patients to centres equipped with this technology is recommended.

Additionally, this study shows the potential of an AI-based algorithm to identify and classify a skin lesion fast and accurate.

AUTHOR CONTRIBUTIONS

All authors fulfilled criteria for authorship. The specific contributions to the study and manuscript of each of the authors were: Sandra Schuh and Julia Welzel had the idea of the case report and concept. Anna Desch contributed essential images for the study and acquired the data. Deborah Winkler and Sandra Schuh analysed images. Deborah Winkler wrote the case report, Anna Desch, Paola Mireles, Julia Welzel and Sandra Schuh critically revised the manuscript. All authors have read and approved the final manuscript. They agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of the work are appropriately investigated and resolved.

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CONFLICTS OF INTEREST STATEMENT

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request

ETHICS STATEMENT

All patients in this manuscript have given written informed consent for participation in the study and the use of their deidentified, anonymized, aggregated data and their case details (including photographs) for publication. Ethical Approval: not applicable.

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