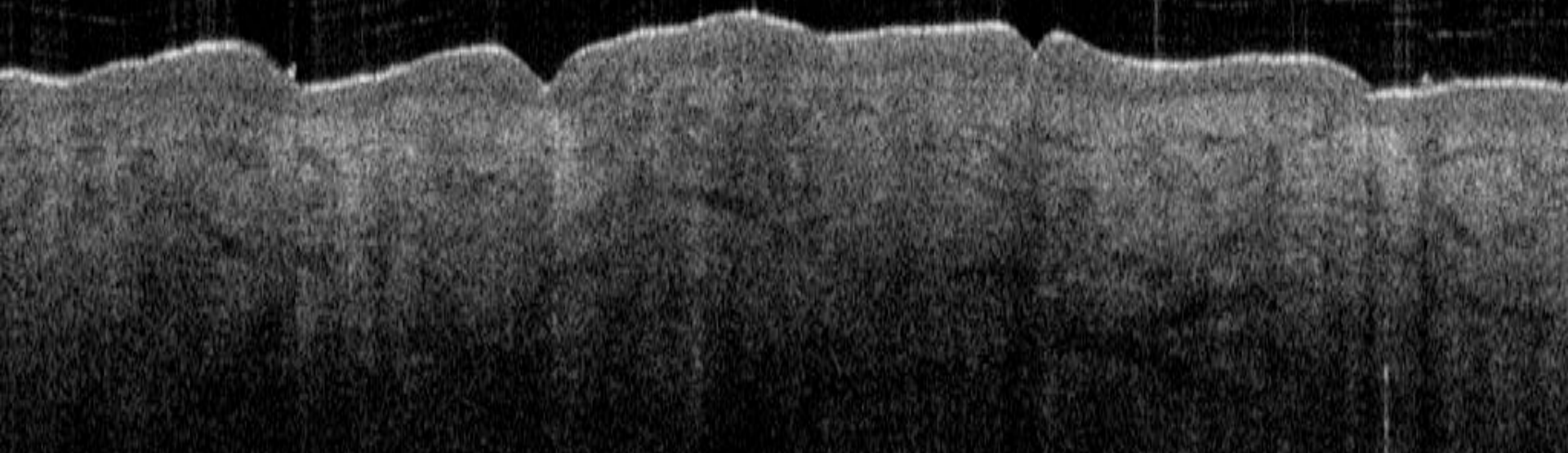


Optical Coherence Tomography Used for Monitoring of PDT Treatment of Superficial Basal Cell Carcinomas



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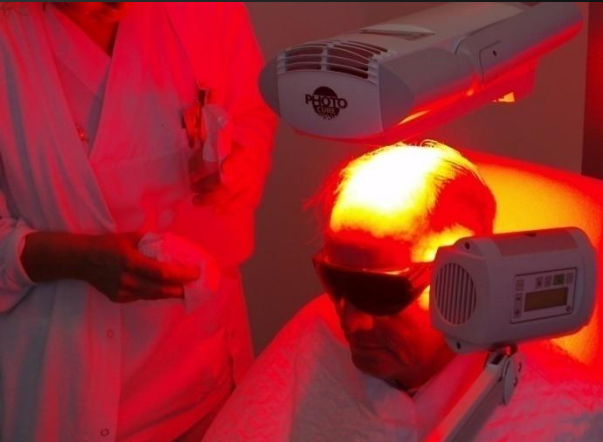
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Conflicts of interests: None declared

Introduction

- Non-invasive treatment of non-melanoma skin cancer (NMSC) with photodynamic therapy (PDT) implies pre-therapeutic tumor thickness and delineation assessments for optimal efficacy
- Optical coherence tomography (OCT) is an optical imaging technique
- OCT can potentially diagnose and estimate basal cell carcinoma (BCC) tumor thickness *in vivo*

Introduction



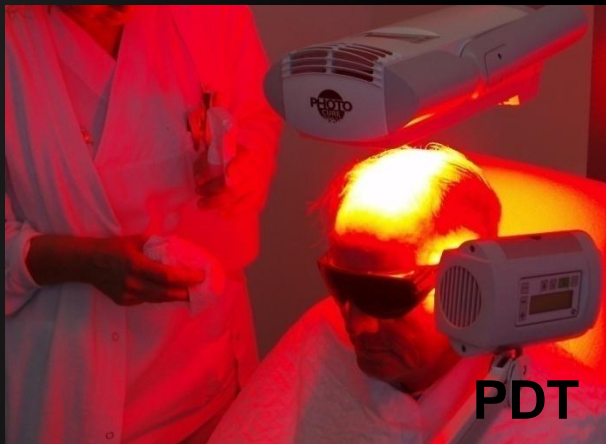
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Why study BCC with OCT?



- Sensitivity in clinical diagnosis of non-melanoma skin cancer ranges from 60%-91% and specificity 71-90%

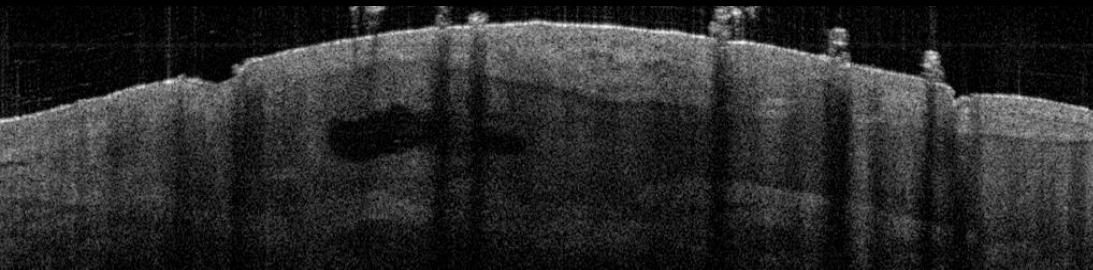
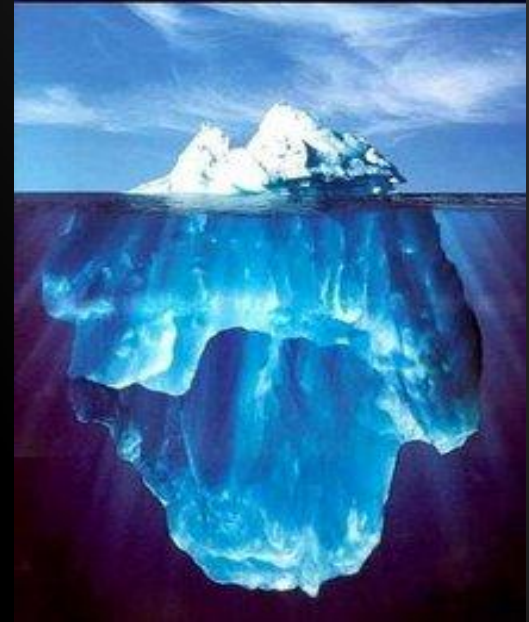
Mogensen M, Jemec GB. Diagnosis of nonmelanoma skin cancer/keratinocyte carcinoma: a review of diagnostic accuracy of nonmelanoma skin cancer diagnostic tests and technologies. *Dermatol Surg* 2007; **33**: 1158-74.



- Non-invasive diagnostic methods are warranted as non-invasive treatments are increasingly used for BCC

Aim of study

- To describe the OCT morphology in NMSC lesions during PDT treatment
- To assess how OCT morphology before, during and after treatment reflects the treatment out-come at 3 months follow-up



Methods

Patients:

- A total of 20 patients diagnosed with NMSC (BCC and AK) are being monitored by OCT during PDT treatment
- Images will be acquired at 4 time points during PDT treatment and once at 3-months follow-up
- BCC diagnosis is based on histopathology

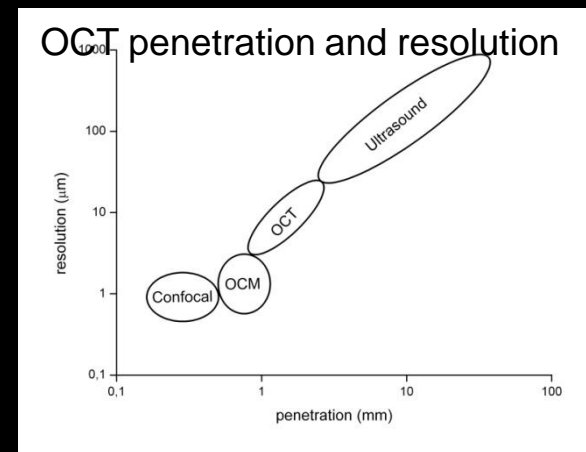
OCT system:

- Low intensity, 1310nm laser light
- Non-contact, non-invasive
- Real-time imaging
- 2D and 3D visualization



Optical Coherence Tomography (OCT)

- OCT provides cross-sectional, tomographic, real time imaging on a micrometer scale by infrared scanning of the skin
- OCT resolution 10 μm .
Penetration depth 2000 μm



Courtesy to Peter E. Andersen,
Risø, Denmark

Optical Coherence Tomography (OCT)



- OCT is analogue to ultrasound using infrared light instead of sound
- Variation of reflected infrared light is mapped as a function of depth

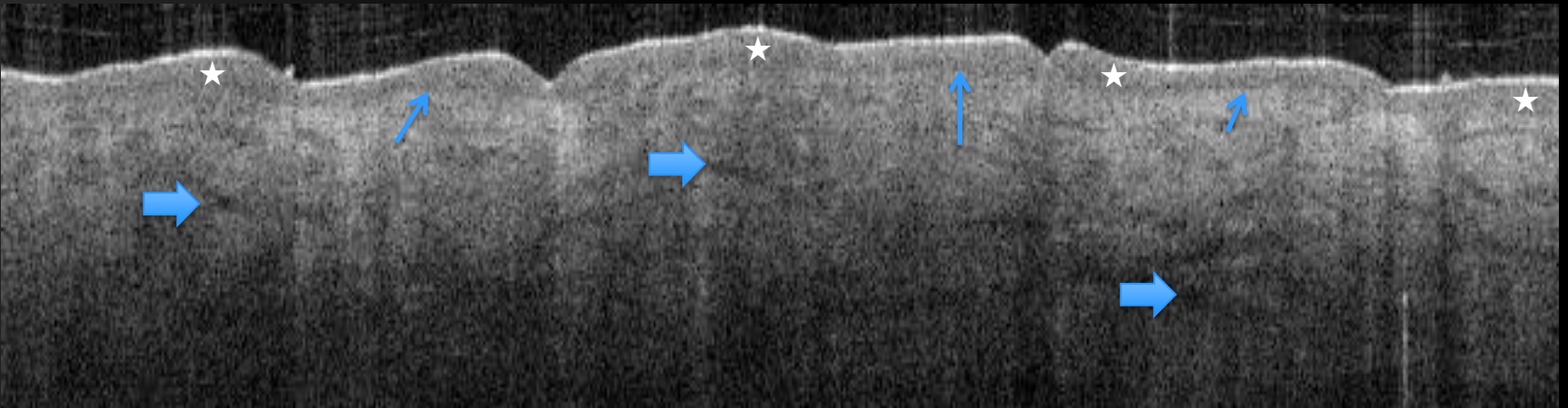
Outline of OCT system



- Speed of light is too rapid for direct measurement of pulse transit time
- Low coherence interferometric technique: only reflected light that interfere within the coherence length of light is detected

Results

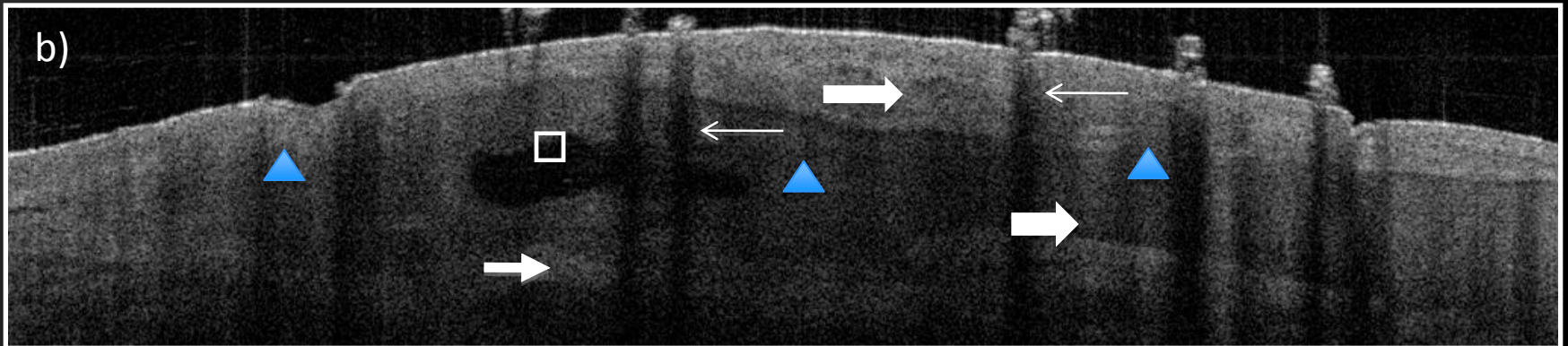
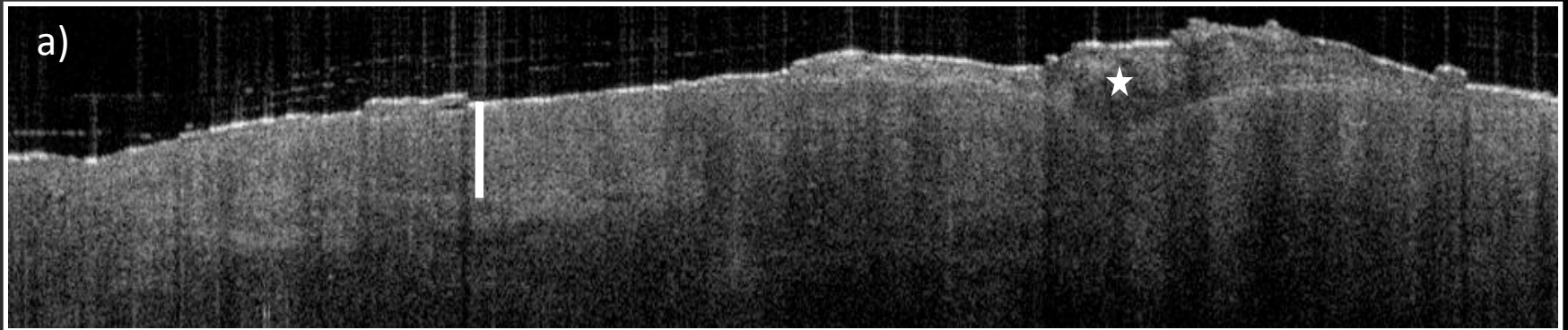
- Normal skin



OCT image of normal skin on the anterior lower arm.

Epidermis indicated by ★ ; dermo-epidermal junction (DEJ) indicated by blue arrows. Vessels indicated by fat arrows.

- Non melanoma skin cancer



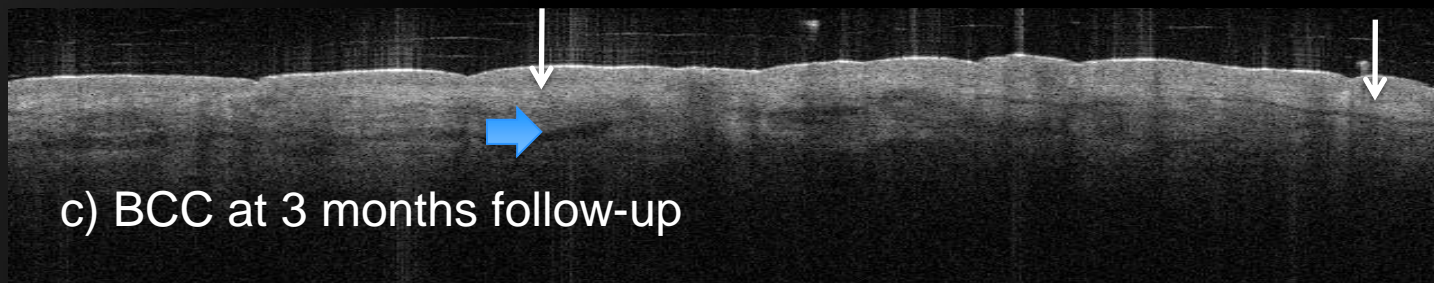
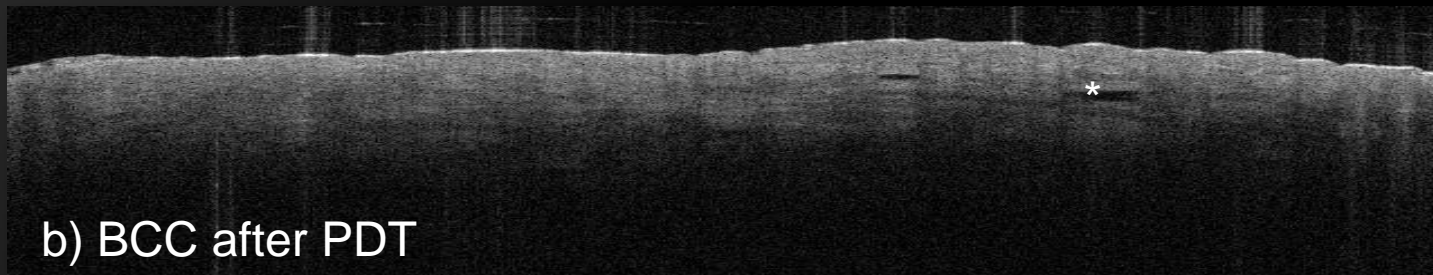
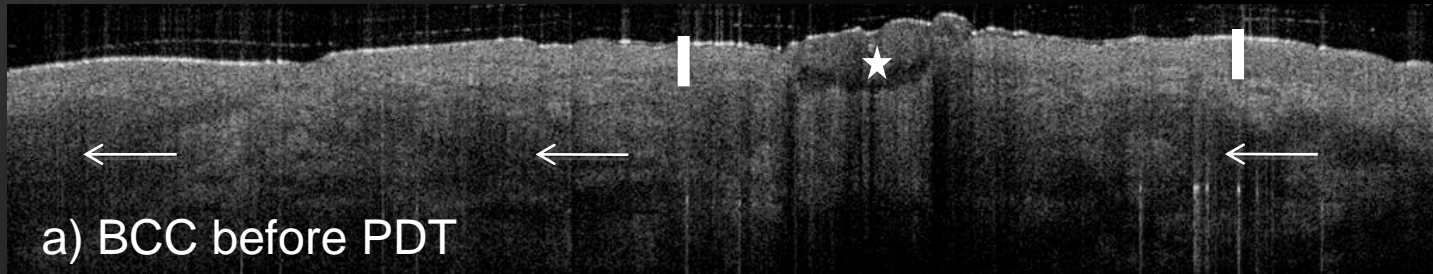
Characteristic OCT images of:

a) Actinic keratosis (AK)

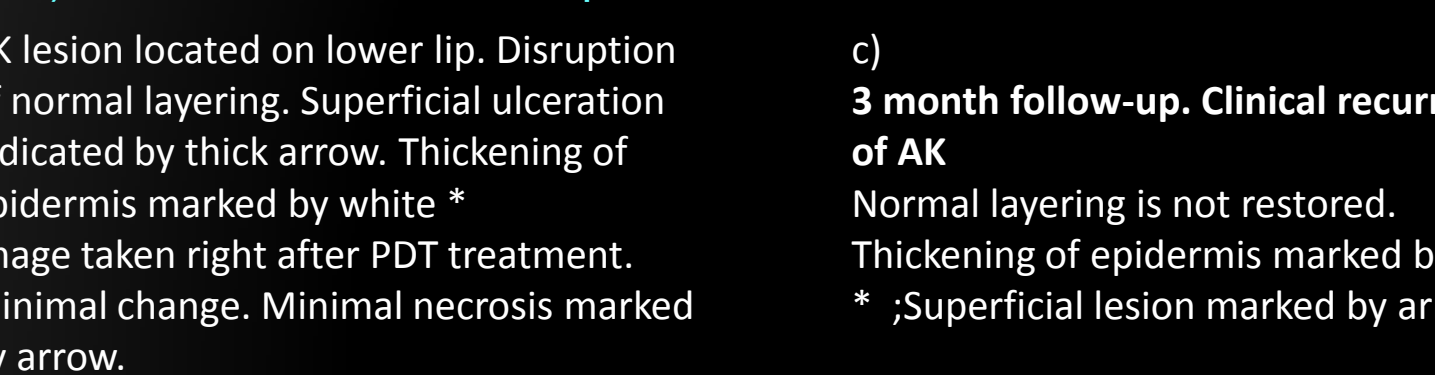
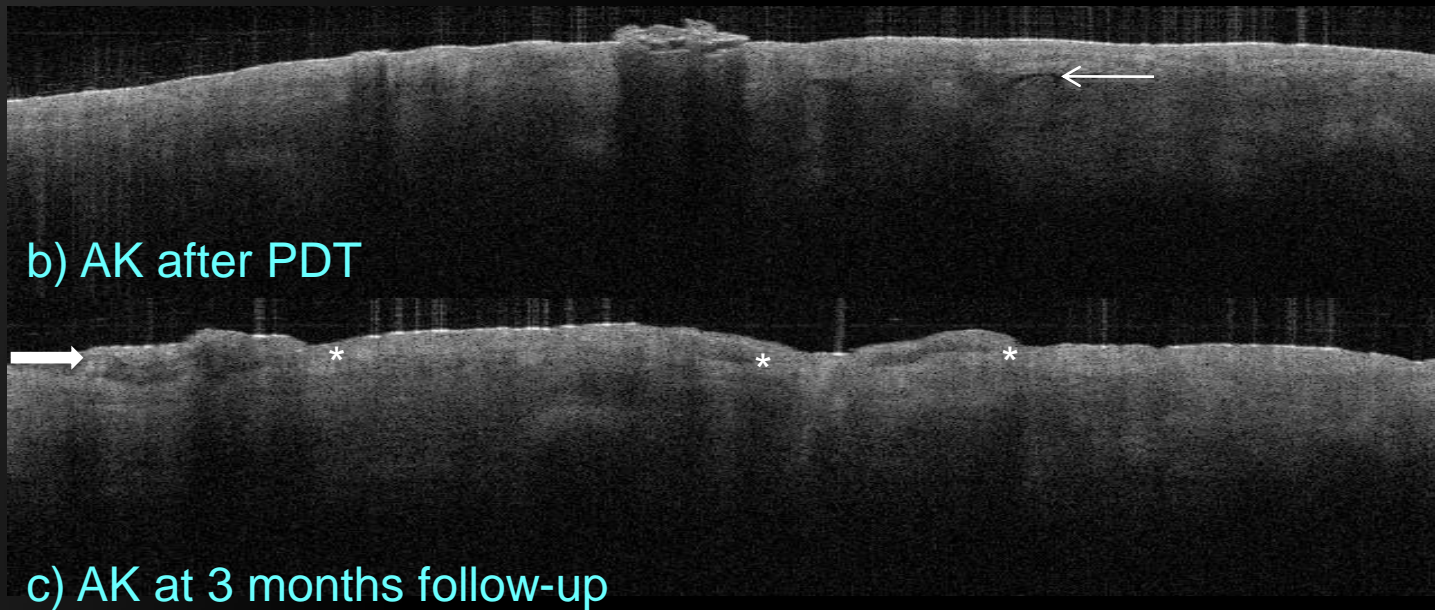
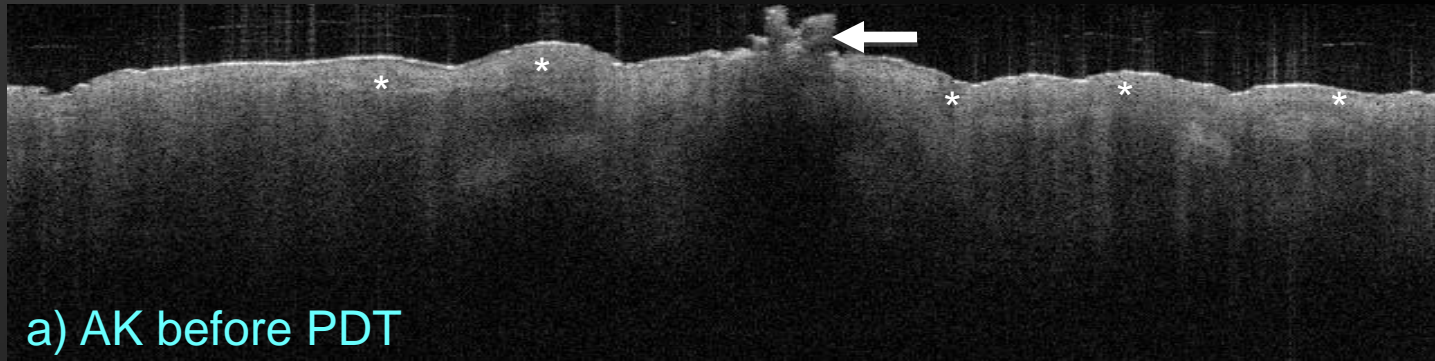
b) BCC

a) AK lesion on scalp. Shows disruption of normal skin layering. Thickening of epidermis indicated by white bar. Crusting and ulceration are indicated by ★

b) BCC lesion on scalp. Black necrotic centre indicated by □. Stroma indicated by thick white arrow. BCC islands indicated by triangles. Hairs casting shadows indicated by thin white arrow



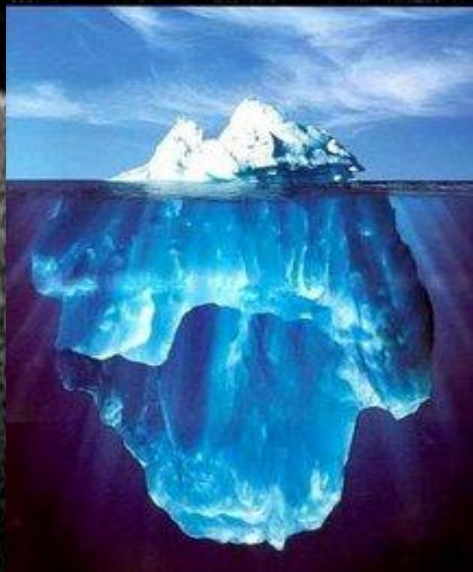
- a) BCC lesion located on back: Central ulceration indicated by Thickening of epidermis marked by white bar , BCC islands marked by thin arrows.
- b) Image taken shortly after curettage and PDT treatment: Signal is enhanced, image becomes more homogeneous. Necrosis marked by *.
- c) 3 months follow-up: Normal layering is restored. BCC lesion gone. DEJ marked by thin arrows. Vessel marked by blue arrow



- a) AK lesion located on lower lip. Disruption of normal layering. Superficial ulceration indicated by thick arrow. Thickening of epidermis marked by white *
- b) Image taken right after PDT treatment. Minimal change. Minimal necrosis marked by arrow.

- c) **3 month follow-up. Clinical recurrence of AK**
Normal layering is not restored. Thickening of epidermis marked by white * ;Superficial lesion marked by arrow.

Conclusion



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- OCT can visualize skin structures in BCC lesions *in vivo* to a depth of 2 mm
- OCT imaging of non-melanoma skin cancer may provide diagnostic and prognostic information
- Further evaluation of the potential of OCT as a monitoring device during NMSC treatment, as PDT, is warranted