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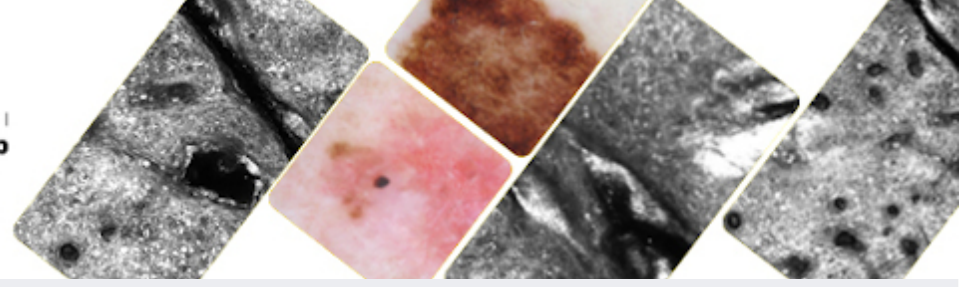

Characterization of 10 cutaneous tumors with ex vivo LC-OCT: A novel tool in dermato-oncological surgery with margin control?

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INTRODUCTION

Currently, we have numerous imaging techniques for skin evaluation, such as in vivo and ex vivo reflectance confocal microscopy (RCM), optical coherence tomography (OCT), and Linefield Confocal OCT (LC-OCT). With LC-OCT technology, a vertical image similar to histology, a horizontal image similar to RCM, and a three-dimensional image can be obtained. A new prototype that allows obtaining ex vivo images with LC-OCT has been developed. This not only facilitates a more comprehensive understanding of the histology of cutaneous tumors but also holds promise for advancing surgical margin detection in the future.

OBJECTIVES

The aim of this project is to evaluate the quality of images obtained with ex vivo LC-OCT in different cutaneous tumors, describe the morphological characteristics of the evaluated lesions and correlate them with dermoscopy, in vivo RCM, in vivo LC-OCT and histology.

METHODOLOGY

We prospectively evaluated patients with diverse cutaneous tumors between June 2022 and July 2023, with the following inclusion criteria: 18 years and a cutaneous tumor on the trunk and limbs. We collected clinical, dermoscopic, RCM, in vivo LC-OCT, ex vivo LC-OCT (Fig 1.), and histopathological images of different types of cutaneous tumors.

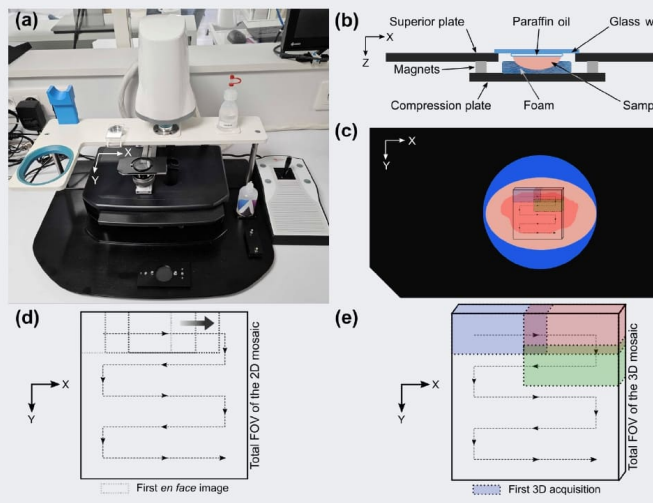

Fig. 1: Description of the ex vivo LC-OCT system and its modularity (a) Design of the platform (b) Design of the sample-holder and the positioning of the sample in it (cross-section view) (c) Top view of the sample-holder containing a sample, a visualisation of the mosaic process is shown (d) 2D horizontal mosaic imaging pattern (e) 3D mosaic imaging pattern. FOV: Field-of-view. Axes: representing the movement of the XY motorized stage.

RESULTS AND CONCLUSIONS

In total, 10 cutaneous tumours from 10 patients were evaluated using this new technology: 3 melanomas, 2 seborrheic keratoses, 2 basal cell carcinomas, and 3 melanocytic nevi. For the first time, we have been able to visualize excised cutaneous tumours in three dimensions. The images obtained are equivalent to those acquired with in vivo devices. We have appreciated cellular resolution and conducted cellular correlation with confocal microscopy, in vivo LC-OCT, and histology (Figs 2-4). These promising results may initiate further investigations into the assessment of this technology in dermato-oncological surgery with margin control.

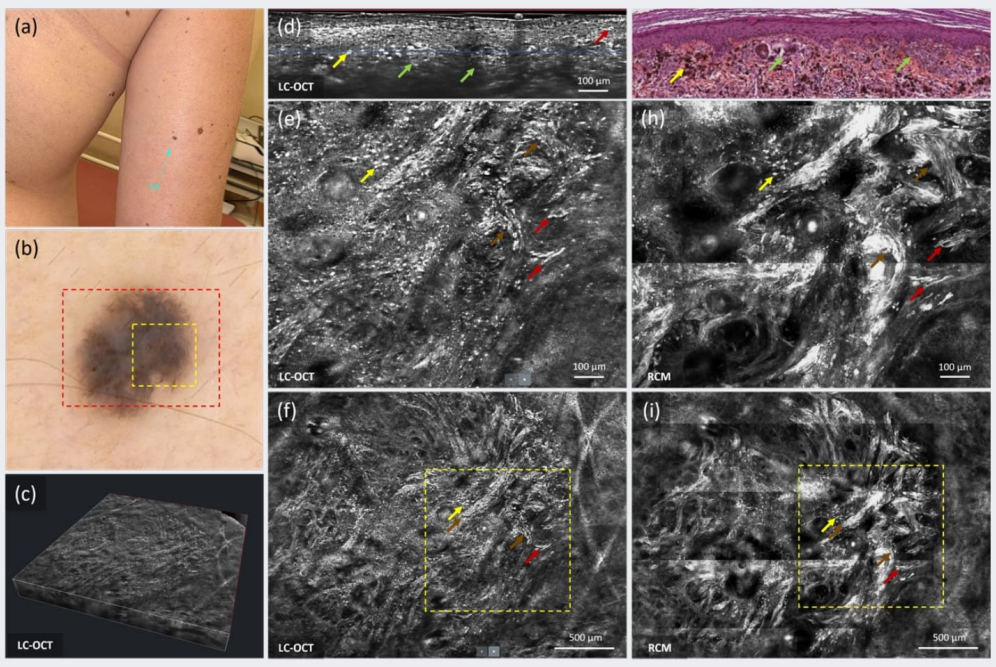

Figure 2. A) Clinical image of a brown-black macule. **B)** Dermoscopy image showing blue and black structureless areas, pigmented parakeratosis and atypical network pattern at the periphery. **C)** LC-OCT *ex vivo* 3D mosaic. **D)** LC-OCT *ex vivo* vertical view: Atypical melanocytes (red arrow), disrupted DEJ, atypical nests (green arrow) and melanophages (yellow arrows). **E)** LC-OCT *ex vivo horizontal view:* Atypical meshwork pattern (brown arrows) with thickening junctions, inflammatory cells (yellow arrow) and atypical dendritic cells (red arrows). It is noticeable that cell details are less saturated compared to RCM in H image. **F)** LC-OCT *ex vivo:* Atypical meshwork pattern (brown arrows) with thickening junctions, inflammatory cells (yellow arrow) and atypical dendritic cells (red arrows). **G)** Histology image: Disrupted DEJ, abundant melanophages and inflammatory cells (yellow arrows) and atypical melanocytic nests (green arrow). **H)** RCM *ex vivo* image: Atypical meshwork pattern (brown arrow) with thickening junctions, inflammatory cells (yellow arrow) and atypical dendritic cells (red arrows). It is noticeable that cell details are saturated compared to LC-OCT *ex vivo* image E. **I)** RCM *ex vivo* image: Atypical meshwork pattern (brown arrow) with thickening junctions, inflammatory cells (yellow arrow) and atypical dendritic cells (red arrows).

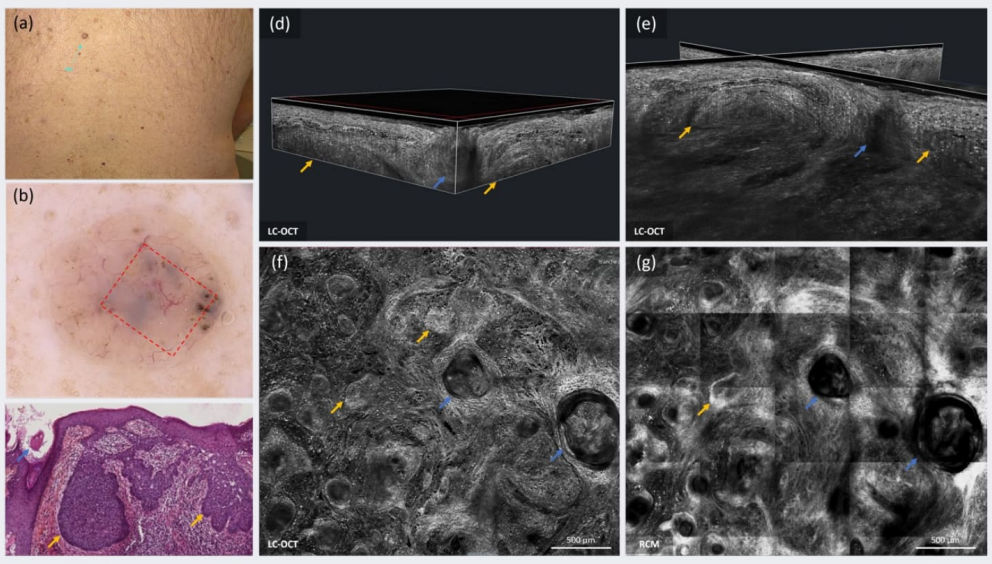

Figure 3. A) Clinical image of a pink-brownish papule. **B)** Dermoscopy: arborizing vessels, pseydocyts, blue-grey ovoid nests and spoke-wheel structures. **C)** Histology image: Basal cell carcinoma lobules (orange arrows) with palisading and a keratin plug (blue arrow) can be observed. **D)** LC-OCT *ex vivo* 3D mosaic. **E)** LC-OCT *ex vivo* vertical view: BCC lobules (orange arrow) and keratin plugs can be seen (blue arrow). **F)** *ex vivo* RCM: hyporrefractile lobules (orange arrows), hyporrefractile cysts, clefting and keratin plugs (blue arrows). **G)** *ex vivo* LC-OCT*:* hyporrefractile lobules (orange arrow), hyporrefractile cysts, clefting and keratin plugs (blue arrows)

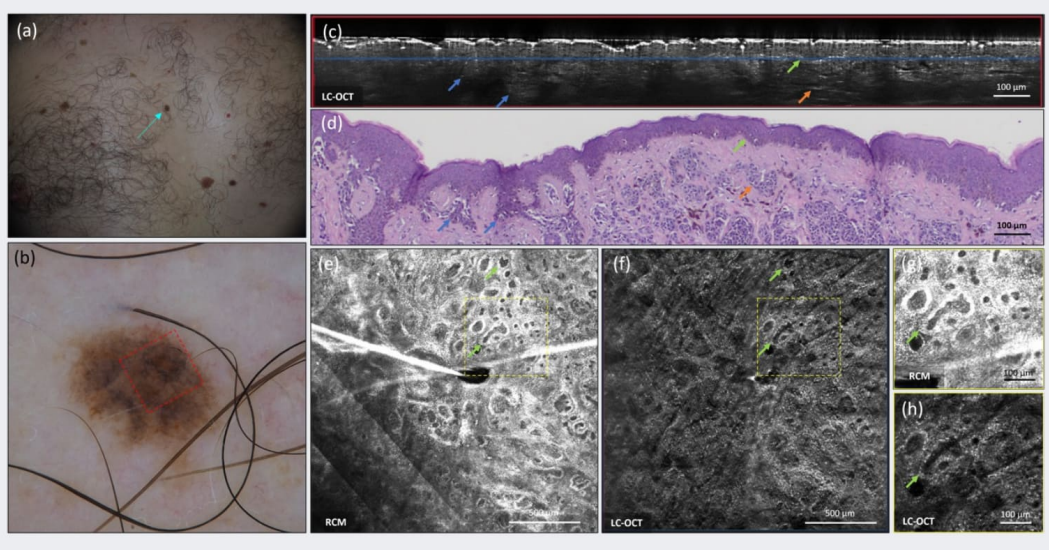

Figure 4. A) Clinical image. **B)** Dermoscopy: Atypical brown network pattern and loss of central structures. **C)** LC-OCT *ex vivo* vertical view: Lentiginous melanocytic proliferation with a pigmented basal layer (green arrows), junctional nests of melanocytes (blue arrows) and wave-like pattern that corresponds to collagen fibers around hypopigmented nests (orange arrows).. **D)** Histology image: Lentiginous melanocytic proliferation with a pigmented basal layer (green arrows), junctional nests of melanocytes (blue arrows) and hypopigmented nests (orange arrows). **E)** *In vivo* RCM horizontal view: Ringged pattern (green arrows). **F)** *Ex vivo* LC-OCT horizontal view: Ringged pattern (green arrows). **G)** *In vivo* RCM*:* ringed pattern detail (green arrow). **H)** LC-OCT *ex vivo* Ringged pattern detail (green arrow).

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