Dermatology Practical & Conceptual

Line-field Confocal Optical Coherence Tomography Image Markers of Basal Cell Carcinoma in Excised Mohs Micrographic Surgery Tissue: A Case Series

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Introduction

Line-field confocal optical coherence tomography (LC-OCT) is an evolving tool for in vivo skin cancer diagnostics [1]. As reviewed by Jacobsen et al. [2], studies have shown that LC-OCT improves the detection of clinically challenging basal cell carcinoma (BCC) lesions compared to dermoscopy alone [3]. LC-OCT is also expanding into other domains of skin cancer management; for instance, we recently published a case report using LC-OCT to visualize infiltrative BCC for precise margin adjustment during surgical planning [4]. While perioperative use of LC-OCT for in vivo BCC imaging is evolving, its applications in ex vivo Mohs micrographic surgery (MMS) remains unexplored. As a starting point for its potential integration in the context of MMS, we present a case series describing the use of LC-OCT to detect the presence of three key BCC image markers—lobules, clefting, and collagen alterations—in excised MMS tissue specimens from six patients with BCC.

Case Presentation

Cases were selected from six different MMS patients with confirmed BCC. Of these, six were nodular BCCs, one of which had an infiltrative BCC component. Tissue samples were excised from the nasal tip, nasal alae, or lower eyelid during the first stage of MMS and had sizes ranging from 8 mm to 15 mm in diameter (Table 1). Prior to LC-OCT examination, specimens were stored at -80°C and thawed at room temperature.

For LC-OCT examination, we used the handheld probe (deepLive, DAMAE Medical, Paris, France) to acquire images from the subcutaneous surface of each tissue specimen with the skin surface facing downwards. On the subcutaneous tissue surface, targeted regions corresponding to areas of BCC identified in H&E histopathological sections were imaged (white boxes in Figure 1A-F). An experienced LC-OCT user (K.J.), who was blinded to the histopathological results, assessed the images and deemed them to be of sufficient quality for evaluation.

Table 1. Tumor Characteristics and Number of Mohs Micrographic Surgery (MMS) Stages of Included Tissue Specimens.

Patient #	BCC Subtype	Anatomical Site	Size, mm	# of MMS Stages
1	Nodular	Scalp	15x15mm	1 stage
2	Nodular	Nose, left ala	15x6 mm	2 stages
3	Nodular	Right lower eyelid	10x6 mm	4 stages
4	Nodular	Nose, left ala	11x13 mm	2 stages
5	Nodular	Nasal tip	8x8 mm	2 stages
6	Nodular and infiltrative	Nose, right ala	13x10 mm	2 stages

Abbreviation: BCC: basal cell carcinoma.

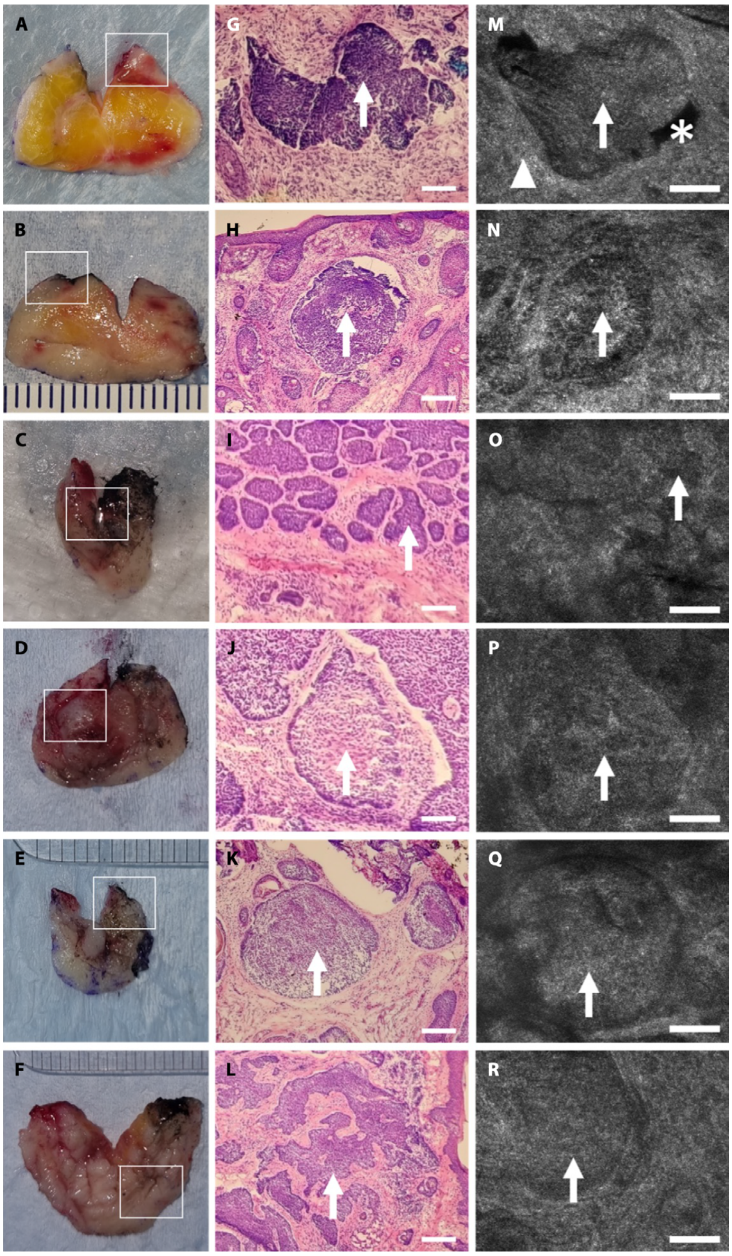

Figure 1. Key basal cell carcinoma (BCC) image markers in line-field confocal optical coherence tomography (LC-OCT) from six ex vivo Mohs micrographic surgery (MMS) tissue specimens of confirmed BCC. (A-F) Clinical, (G-L) corresponding H&E histopathology, and (M-R) en face LC-OCT images from the same targeted area (white boxes in clinical images) are presented on the same horizontal plane in the figure. Lobules (arrows) are shown in (G-L) and (M-R). Clefting (star) and collagen alterations (triangle) are prominent in (M). Scale bar in H&E histopathology and LC-OCT images: 100 microns.

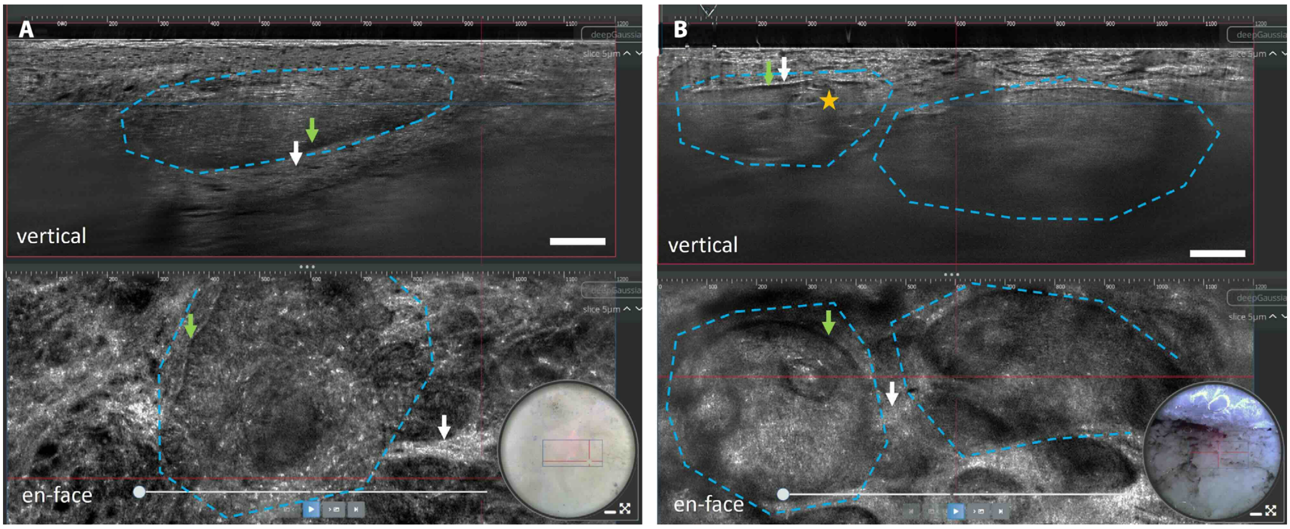

Figure 2. Line-field confocal optical coherence tomography (LC-OCT) images of basal cell carcinoma (BCC), comparing (A) in vivo skin surface and (B) an ex vivo subcutaneous tissue images (B) from Mohs micrographic surgery tissue. Both images (A) and (B) reveal key LC-OCT BCC markers: lobules (blue circle), clefting (green arrow), and collagen alterations (white arrow) in the vertical (top) and en face views (bottom). Intralobular cystic structure (orange star) is also observed in (B). Scale bar in LC-OCT images: 100 microns.

Overall, our ex vivo findings align with previously identified key in vivo LC-OCT markers for BCC (Figure 2) [2]. In all six MMS tissue specimens, LC-OCT examination—confirmed by H&E histopathology (Figure 1G-L)—consistently revealed the presence of lobules, clefting, and collagen alterations (Figure 1M-R). Assessment of images (N=13) showed that lobules were the most prominent marker, appearing in 100% of vertical images and in 92.3% of en face images. Clefting and collagen alterations were evenly distributed in vertical images and en face images (84.6% and 92.3%, respectively). For reference, Figure 2 illustrates a side-by-side comparison of the LC-OCT ex vivo BCC images collected in the present study with previously obtained LC-OCT in vivo BCC images from other patients.

Conclusion

LC-OCT was able to visualize key BCC image markers in six MMS tissue specimens, suggesting there is potential for LC-OCT in an ex vivo context. The described method of subcutaneous imaging with LC-OCT may be valuable in a perioperative context to visualize deeper BCC regions that are currently beyond LC-OCT's dermal scan depth. Further studies are warranted to validate the findings from this case series in a larger cohort.

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