Noninvasive imaging to improve diagnostic accuracy: A case report

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INTRODUCTION

Optical coherence tomography (OCT) is a noninvasive imaging modality that enables acquisition of 2-dimensional cross-sectional in vivo images of the skin.[1] The images are created by the backscatter of light and provide the reader with a real-time view of the anatomic microstructure of the skin.[2,3] Although it lacks cell-level resolution, OCT permits visualization of the architecture of the stratum corneum, epidermis, and papillary dermis, as well as the skin's vasculature. This, in turn, has provided a convenient in vivo means to evaluate both inflammatory cutaneous conditions and neoplasms of the skin.[4]

Basal cell carcinoma (BCC) is particularly amenable to OCT visualization, and OCT is, in fact, being used to assist in the diagnosis and management of this skin cancer.[5,6] At the time of publication, histology and more recently reflectance confocal microscopy (RCM) are considered gold standard for BCC diagnosis, and both have Current Procedural Terminology Category 1 code options. OCT currently has a category 3 code, which is used to track the utilization of emerging technology, and the device has demonstrated a sensitivity of 87% and a specificity of 80% for diagnosing BCC.[7] In addition, OCT can assist in determining the extent and depth of BCC tumors.

Abbreviations used:

BCC: basal cell carcinoma
OCT: optical coherence tomography
RCM: reflectance confocal microscopy

CASE

We present a case of a 69-year-old woman who was evaluated for a nonspecific flesh-colored papule on the right nasal ala that was bleeding intermittently (Fig 1, *A*). On dermoscopic examination, there seemed to be potential evidence of BCC, but there were also features of a benign-appearing crust (Fig 1, *B*). Because of this diagnostic uncertainty, the lesion was imaged with OCT. The OCT scan found ovoid hypoechogenic islands, a feature consistent with basal cell tumor nests (Fig 2, *D*). We also visualized atrophy of the overlying epidermis and hyperechogenic areas within the dermis consistent with dense collagen, surrounding hypoechogenic structures resembling cross-sections of hair follicles suggestive of angiofibroma (Fig 2, *C*). Consequently, a biopsy was performed. The dermatopathologist initially reviewed multiple sections and the report of "parallel lamella of collagen, which surround cells with prominent polygonal nuclei and are adjacent to ectatic dermal capillaries," was consistent with a diagnosis of an angiofibroma (Fig 2, *A*). Because of discordance between the OCT and histopathologic diagnosis, a request was made to further step section the tissue block. Upon further sectioning, a focus of BCC, nodular type, extending to the base of the specimen was confirmed to be present (Fig 2, *B*).

DISCUSSION

This case highlights a practical means of incorporating OCT into the workup of suspected skin cancers, as well as the improved diagnostic accuracy that OCT can provide in diagnosing BCC. In a study

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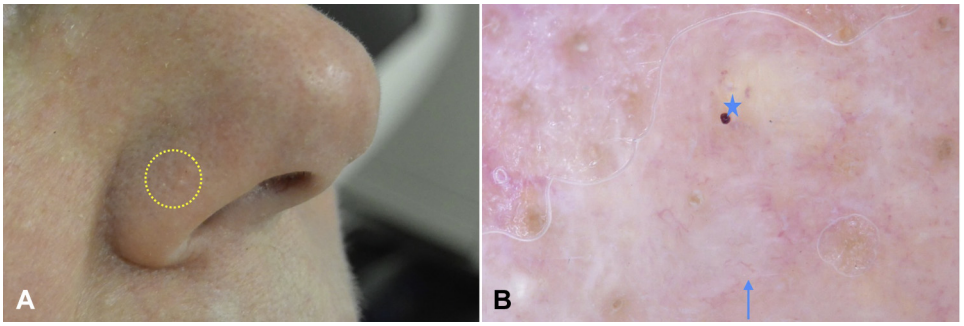

Fig 1. A, Clinical image of crusted papule located on the right nasal ala presenting with intermittent bleeding suggestive of BCC. **B**, Corresponding dermoscopic image shows 2 distinct adjacent areas. Diffuse yellow with pinpoint blood clot indicated with a blue star consistent with a benign growth, and a blue arrow highlights an arborizing vessel on a pearly background more in line with a BCC.

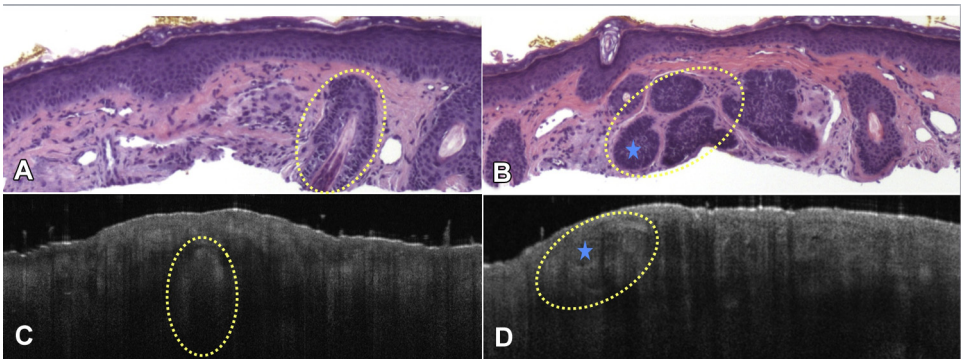

Fig 2. A, Histopathology of lesion shows parallel lamella of collagen surrounding cells with prominent polygonal nuclei (*yellow circle*) consistent with a diagnosis of angiofibroma. **B**, Histopathology after deeper sectioning portrays tumor islands (*blue star*) consistent with a diagnosis of BCC. **C**, Optical coherence tomography image of lesion shows atrophy of the overlying epidermis and hyperechogenic areas within the dermis consistent with dense collagen, which surround hypoechogenic structures resembling cross-sections of hair follicles. Features are consistent with angiofibroma. **D**, Optical coherence tomography image of lesion shows ovoid hypoechogenic islands consistent (*blue star*) with BCC.

by Markowitz et al[8] looking at lesions suspicious for BCC, OCT found an overall accuracy of 88% for the diagnosis of BCC compared with 70% and 57% accuracy with use of dermoscopy and clinical examination alone, respectively. Although the utility of OCT is user and image quality dependent, Holmes et al[6] provide evidence that even with poorer image quality, which can occur as a result of superficial scale/crusting and a thickened epidermis sometimes present in BCC, the specificity and negative predictive value for diagnosing BCC with OCT remained higher in comparison with either clinical examination alone, or clinical with dermoscopic examination.

This case highlights the technical limitations of the current gold standard methods for diagnosis of BCC. In this case, histopathology required further step sectioning to arrive at an accurate diagnosis. During the routine processing of tissue, specimens are embedded in paraffin, cut into blocks, from which thin cuts are acquired, and placed on glass slides for viewing. Less than 1% to 2% of the entire tissue is typically examined microscopically by the pathologist. Based on the location of the step sections, a small focus of skin cancer may remain in the block and thus go unexamined by the pathologist. Our case showed that this limitation of pathology can be overcome by using information obtained by the OCT examination. Compared with histology, OCT has the advantage of encompassing approximately 120 vertical sections that are visualized in a black and white animation versus the limited sections that are obtained in a standard tissue biopsy.

The alternate validated diagnostic modality for BCC is the 1500 RCM (Vivascope, Andover, MA). Positioning the larger probe of the diagnostic 1500 RCM on our patient's nasal ala proved to be challenging in this anatomic area. Although OCT or the handheld 3000 RCM (Vivascope) do not currently have Current Procedural Terminology Category 1 codes, both can be more easily placed in this difficult-to-reach area. We chose the 8.00-mm field of view OCT device over the 0.75-mm field of view hand-held RCM because of the very small size of the lesion being imaged. Although both the hand-held and large probe RCM have better cellular clarity, the limited field of view provided by the hand-held version may not have captured these adjacent lesions, helping guide pathology toward deeper sections and a more accurate diagnosis.

Clinicians continuously strive to improve their clinical diagnostic accuracy with the aim of avoiding unnecessary harm to the patient. At the same time, there is strong incentive to diagnose earlier disease as it may be amenable to less-aggressive treatments with improved cosmesis. Some of the limitations of naked eye examinations were initially overcome by the simple use of magnifying glasses and subsequently with the advent of dermoscopy. Although this action improved diagnostic accuracy significantly, there is still room for improvement, which may be achieved by leveraging emerging technology such as RCM and OCT. OCT is found to reduce the need for biopsy in more than 1 in 3 patients, and these improvements may be especially valuable in cosmetically sensitive areas such as the H zone, where misdiagnosis or incomplete excision can ultimately lead to recurrence of the tumor.[8] These recurrent BCCs then run a higher risk of secondary recurrence, even when treated by the preferred method of Mohs micrographic surgery (5.6% for recurrent BCC vs 1% for primary BCC), ultimately leading to the potential for further disfigurement.[9,10]

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