

# Optical coherence tomography in the diagnosis of basal cell carcinoma

## Tomografia de coerência óptica no diagnóstico do carcinoma basocelular

### ABSTRACT

Early diagnosis of basal cell carcinoma—a cutaneous neoplasia with high incidence—can bring great benefits to the patient. Often, slightly pigmented lesions, small initial lesions, and superficial lesions can represent a clinical and dermoscopic diagnostic challenge for not having the typical findings of this neoplasia. In such cases, optical coherence tomography—a promising technology in dermatology—is an auxiliary, non-invasive resource that can be incorporated into the clinical practice.

**Keywords:** basal cell carcinoma; diagnostic imaging; optical coherence tomography.

### RESUMO

*O diagnóstico precoce do carcinoma basocelular, neoplasia cutânea de alta incidência, pode trazer grandes benefícios ao paciente. Muitas vezes lesões pouco pigmentadas, lesões iniciais pequenas e lesões superficiais podem representar um desafio diagnóstico clínico e dermatoscópico por não apresentar os achados típicos dessa neoplasia. Nessa situação, a tomografia de coerência óptica, tecnologia promissora na dermatologia, é recurso auxiliar não invasivo que pode ser incorporado à prática clínica.*

**Palavras-chave:** carcinoma basocelular; diagnóstico por imagem; tomografia de coerência óptica.

### INTRODUCTION

Basal cell carcinoma (BCC) is the most common malignancy in the fair-skinned Caucasian population. Its morbidity results from the invasion and destruction of local tissues, rarely causing metastases. Epidemiological data show increasing incidence, even affecting young people.<sup>1</sup> The importance of early diagnosis is in its value for targeting the best treatment option, leading to less operative morbidity, lower costs, lower recurrence rates, and better patient prognosis. Often easy to identify at a clinical examination, BCC is difficult to diagnose—especially in early, small, and superficial lesions.

In the last two decades there has been a progressive increase in the number of non-invasive techniques to assist in the early diagnosis of skin lesions, such as dermoscopy, *in vivo* confocal microscopy, and optical coherence tomography (OCT),<sup>2</sup> a promising imaging diagnostic technique, which provides images of the morphology of biological tissues *in vivo* and in real time with micro-resolution power. It was first described

## Diagnostic imaging

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in dermatology by Welzer et al. (1997) and has since been offering advances in technical and image resolution.<sup>3</sup> This technology is based on the physical principle of interferometry, and its functionality is analogous to that of the ultrasound. However, with this technology the ultrasound pulses are replaced by a low-coherence source of light, with a wavelength of 1,300nm (close to infrared frequency). An optical system allows for the acquisition of images—in black and white, in two or three dimensions, and perpendicular to the skin’s surface—similar to those obtained by histology, and without causing harm to the patient.<sup>3,4</sup>

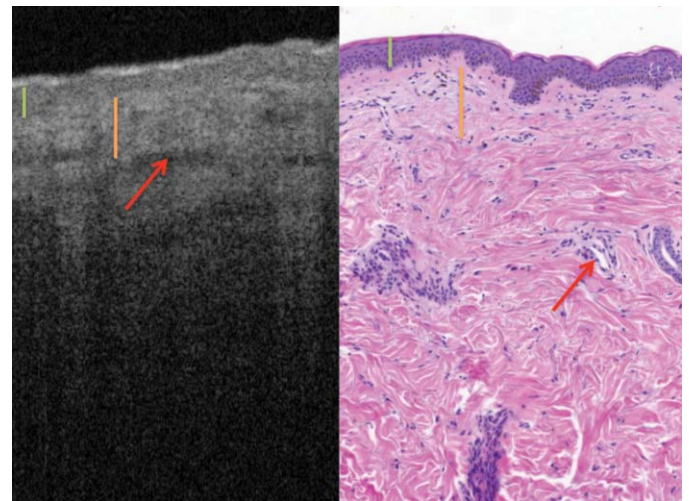
**CASE REPORT**

A thirty-eight-year-old female patient, phototype 3, complained of an erythematous lesion in the right sternum region, which had arisen six months before. At the examination, she showed an erythematous, shiny scaly plaque, roughly 7.0 mm in diameter. Through dermoscopy, a lesion with rosy background, no evident pigmentation, and the presence of short linear vessels distributed throughout the lesion could be observed (Figure 1). Based on the clinical and dermoscopic aspects, the main diagnosis was that of a superficial BCC. In the absence of conclusive dermoscopic criteria for the diagnosis of BCC, the differential diagnoses of actinic keratosis, squamous cell carcinoma in situ, and dermatosis of inflammatory character could not be discarded. In an attempt to elucidate the case, the authors decided to carry out an optical coherence tomography using the OCT Vivosight® device (Michelson Diagnostics, Orpington, England, UK). During this examination, unlike the normal structure of the skin shown in Figure 2, they observed a complete disorganization of the dermal-epidermal junction (Figure 3). In some areas it was possible to observe hyporeflective blocks (darker) contiguous with the epidermis and projecting towards the superficial dermis (Figures 4 and 5). It was still possible to identify hyporeflective areas modifying the structure of the

papillary dermis, which can correspond to inflammatory infiltrate. It was also possible to identify dark linear areas in the reticular dermis that correspond to vascular proliferation (Figure 5). In light of these findings, which were consistent with the description of BCC already published in the literature, the patient underwent surgical excision of the lesion with safety margins. The anatomical pathological examination confirmed the superficial BCC diagnosis, free of neoplastic involvement of resection margins.

**DISCUSSION**

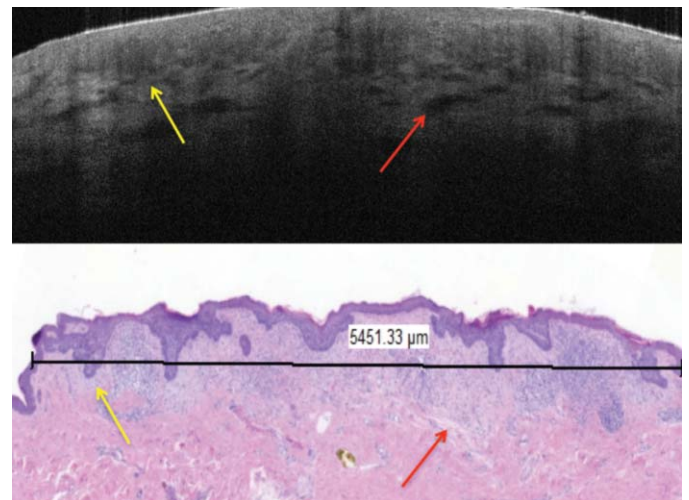
Inexpensive, easy to perform, and widely disseminated, dermoscopy has become an indispensable tool for dermatologi-



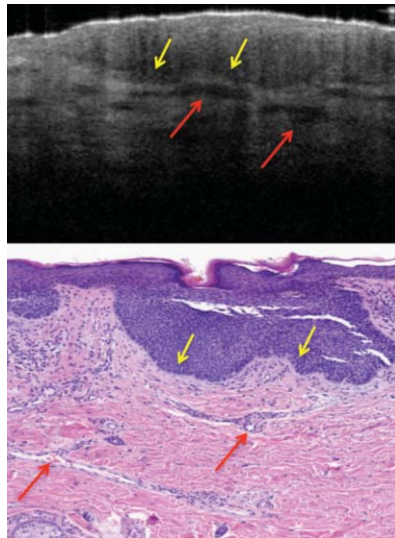
**Figure 2:** Normal skin adjacent to the lesion. Comparative images of optical coherence tomography (left) with histology. The green line represents the thickness of the epidermis, and the orange line delimits the area corresponding to the papillary dermis (hyperreflective by the collagen bundles). In the tomography image, the red arrow indicates a linear hyporeflective area corresponding to a blood vessel.



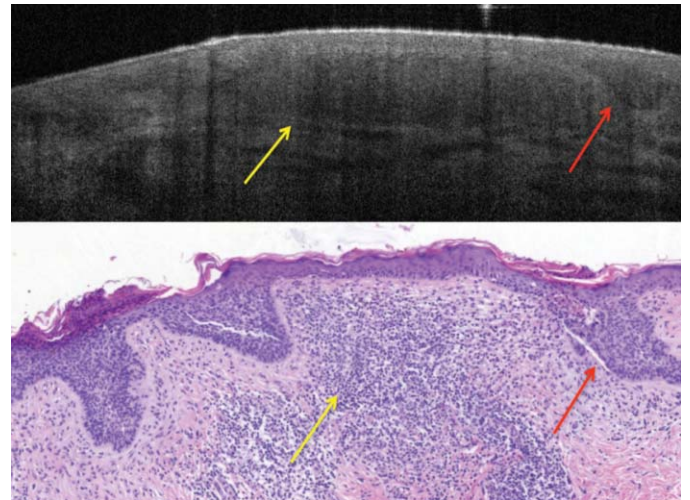
**FIGURE 1:** Clinical photograph and dermoscopy (polarized light dermatoscope with contact—Dermlite II Pro-HD 3Gen).



**FIGURE 3:** Superficial BCC—panoramic view comparing optical coherence tomography and histology images. The yellow arrow shows the loss of definition of the dermal-epidermal junction. The red arrow shows blood vessels in the reticular dermis.



**FIGURE 4:** Superficial BCC. Histologically, it is possible to observe the proliferation of basaloid cells in more detail—observed in the optical coherence tomography as a darkened (hyporeflective) well-defined area, starting from the corresponding area of the epidermis and invading the papillary dermis. In the histology, yellow arrows show the peripheral palisade typical of this tumor and the evident delimitation of the normal epidermis and tumor block. Red arrows show a blood vessel in the reticular dermis.



**FIGURE 5:** Superficial BCC. The proliferation of basaloid cells is observed in greater detail in the optical coherence tomography and histology images (red arrows). Yellow arrows show inflammatory infiltrate seen as a granulated hyporeflective area (darker when compared to the epidermis) separated from the epidermis by a band of collagen (hyperreflexive, white area) from the papillary dermis.

cal evaluation, promoting a significant increase in the sensitivity of the clinical examination for early detection of various cutaneous neoplasias.<sup>2</sup>

In 2000, Menzies et al. developed a model for the dermoscopic diagnosis of pigmented BCC that showed a sensitivity of 97% and a specificity of 93%.<sup>5</sup> This model was based on the absence of a pigmentary network and the presence of at least one of the following dermoscopic features: ulceration, large blue-grayish ovoid nests, multiple blue-grayish globules, leaf-shaped areas, wheel spokes areas and arboriform telangiectasia. In 2010, Altamura et al. retrospectively studied 609 cases of various histological subtypes of BCC, pigmented or not, and assessed the variability and diagnostic relevance of diverse dermoscopic findings.<sup>6</sup> In that study, the findings reported by Menzies were deemed classic BCC dermoscopic patterns, with other dermoscopic findings, called non-classic, having been included.<sup>5,6</sup> The findings described as non-classic were very short, superficial telangiectasias, small multiple erosions, concentric structures, and nests of multiple blue-grayish dots.<sup>6</sup> In this context, lightly pigmented, initial and superficial BCC lesions may represent a clinical and dermoscopic diagnostic challenge due to the fact that they do not present dermoscopic findings typical of BCCs.

The OCT is a non-invasive, quick, and easy to perform examination. Images obtained are perpendicular to the skin, similar to the standard histological specimens, which facilitates interpretation. Widely used in other medical areas such as ophth-

almology, cardiology, and gastroenterology, this new technology has only recently been introduced in dermatology. Nevertheless it has already yielded promising results in the differential diagnosis of non-melanoma cutaneous tumors.<sup>3,4</sup>

The first studies on the pattern of BCC images in optical coherence tomography are recent and show a loss of the normal architecture of the different skin layers and structures resembling hyporeflective tumor blocks (darker when compared to epidermal tissue) surrounded by dark silhouettes (linear areas close to the black color). These findings were correlated with histology, corresponding to basaloid tumor cells blocks, characteristic of this neoplasm. The dark silhouettes correspond to the slit surrounding the tumor blocks, and the presence of a white band encircling the darkened lobes corresponds to the tumoral stroma.<sup>4,7-9</sup>

In a study carried out by Mogensen et al., the main features observed in tomography's images of BCC were the loss of lamellar structure in the epidermis (mainly in the superficial BCCs), focal alterations of the epidermis with white striae and dots in some lesions, and lobular grayish or darkened structures surrounded by whitish borders.<sup>10</sup>

In the present case, the OCT showed findings consistent with those described in the literature for this new technology. This fact indicates the reproducibility of the examination, the good histological correlation and, more importantly, it has brought benefits to the patient since it avoids incisional biopsy, reducing costs and streamlining the definitive treatment. ●

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