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Case report

Oral cancer from the perspective of wide-field optical fluorescence: Diagnosis, tumor evolution and post-treatment follow up

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ABSTRACT

In this communication, we present that wide-field optical fluorescence might be useful for: the screening of oral lesions that are imperceptible to the naked eye, determination of biopsy area, better definition of treatment, and previous and post-treatment follow-up.

1. Background

Early diagnosis of oral squamous cell carcinoma (OSCC) has been advocated as a valuable tool capable of positively impacting the entire process related to this pathology, increasing the possibility of success in treatment, reducing the associated morbidity and mortality. However, despite the significant advances in the treatment of OSCC, most patients are diagnosed in advanced stage, perpetuating for decades, a drastic picture, concerning immutability of the 5-year survival rate, stagnated around 50% [1–5]. Based on this prospect, in which, standard clinical examination alone has not provided adequate rates of early OSCC screening, it is evident the real necessity to adopt an adjunct exam by professionals to change this unfortunate reality [2,6].

Preliminarily, studies using fluorescence spectroscopy, such as performed by Alfano and Schantz et al., had already suggested that the analysis of tissue native fluorescence may be useful to discriminate between different tissue condition [7]. These authors introduced the term “optical biopsy” for cancer detection using fluorescence spectroscopy. Additionally, the same authors suggest that a better understanding of the clinical course of an oral cancer may be derived from an improved comprehension, of the relationship between endogenous tissue fluorescence and biological characteristics [7].

In this context, the wide-field optical fluorescence is an equivalent examination that has been described with advantages over the other types of screening exam for OSCC: immediate, real-time response, non-invasive and without the use of dyes [8].

Recently, wide-field optical fluorescence devices have been approved by the US Food and Drug Administration (FDA) as an adjunct exam to clinical examination to enhance the visualization of oral mucosal abnormalities that may not be apparent or visible to the naked eye, such as oral cancer or potentially malignant lesion and, to help and the surgeon in determining the appropriate margin for surgical excision of the lesion [2].

2. Aims

We present the use of wide-field optical fluorescence for: screening, determination of the best site for biopsy, determination of the actual extent of the tumor for a better treatment proposition, previous and post-treatment follow-up; correlating clinical and by fluorescence data.

3. Methods

A 54-year-old, melanodermic man, who was referred by a clinical dentist to the Dental Specialties Department of the Divinopolis Health Department (Minas Gerais – Brazil), on free demand, because to suspicion of OSCC, no previous history of OSCC. The patient underwent a protocol that consisted of a clinical examination associated with the wide-field optical fluorescence examination.

The images referring to the clinical examination were obtained with an intraoral camera model: DP6 Scope® (RF System Lab., Almere, Netherlands) connected to a computer. The wide-field optical fluorescence equivalent examination was performed with the device EVINCE® (*MMOptics, São Carlos, São Paulo, Brazil*), which has a high-power LED

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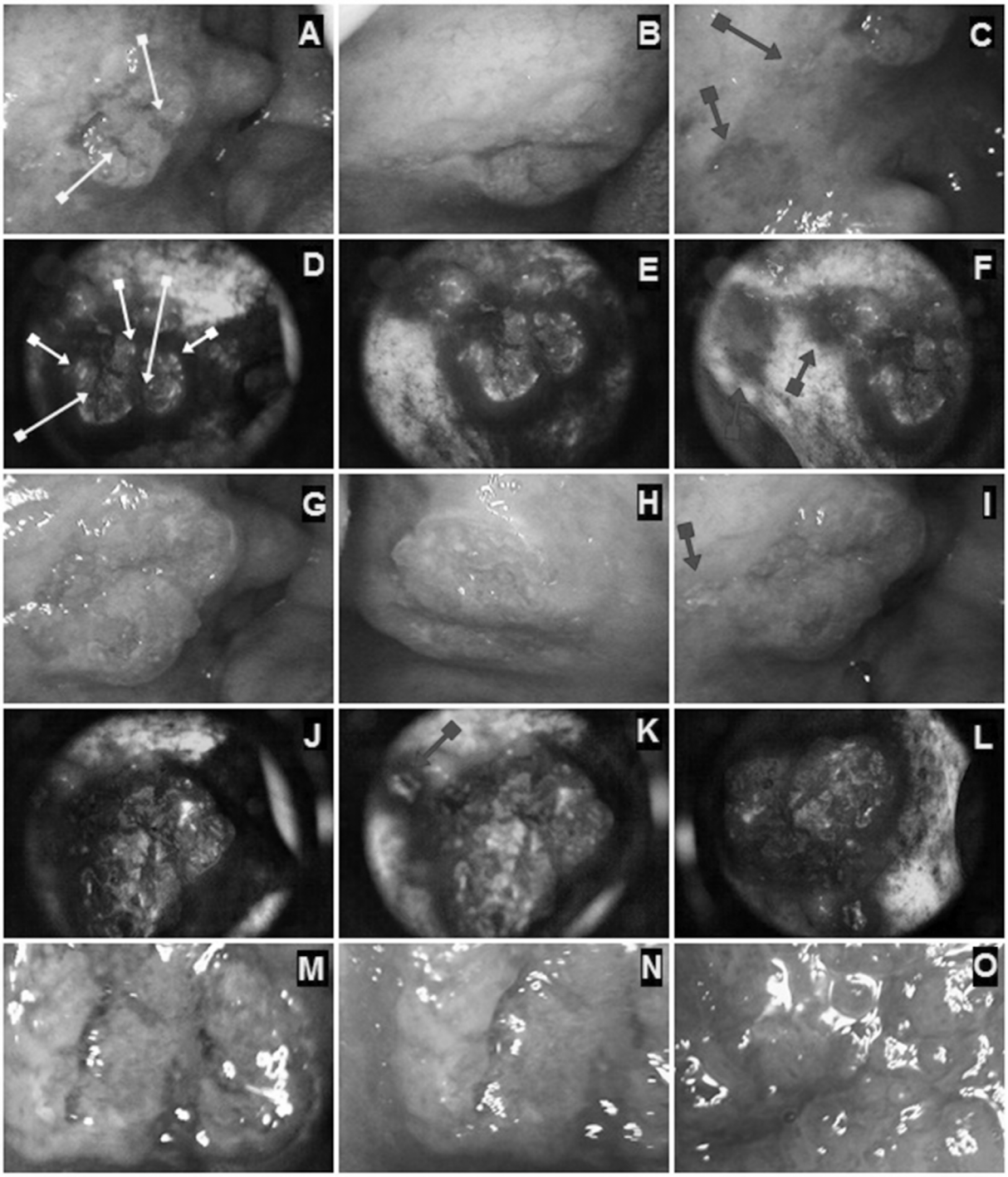

Fig. 1. (A) Oral squamous cell carcinoma (OSCC) on the soft palate with reddish edges and center of the lesion with a whitish appearance (due to hyperkeratinization) with diffuse reddish branches corresponding to vascular proliferation (yellow arrows). (B) Shows the exophytic aspect of the lesion. (C) The presence of two other lesions (blue arrows) practically imperceptible to the naked eye (image is increased in 40×). (D) and (E) Appearance under fluorescence where the edges of the lesion are darkened (loss of fluorescence), center of the lesion predominantly pale green interrupted by loss of fluorescence (darkened appearance) caused by diffuse vascular branch (yellow arrows) and 3 intense reddish spots corresponding to the presence of porphyrins (white arrows). It is observed that there is a perfect correspondence between clinical image and fluorescence image (yellow arrows), in this case, indicating vascular proliferation that contains hemoglobin, which absorbs light and the presence of hyperkeratinization in the regions of intense green fluorescence. (F) Fluorescence image of the two minor lesions (blue arrows) is observed. (G)–(I) Shows clinical images of squamous cell carcinoma after 120 days of initial diagnosis. The reddish aspect, which in the original image (A) was more restricted to the borders and to some vascular proliferative projection to the center, now becomes generalized, due to a great increase of the vascular proliferation. (H) An exophytic aspect of the lesion becomes more evident; (I) It is perceived that the main lesion practically incorporated the two smaller lesions due to the growth, only one of the smaller lesions (blue arrow) is visualized but already contiguous to the primary lesion. (J)–(L) Fluorescence images are obtained after 120 days of the initial diagnosis, where the dark aspect of the lesion edges continues, and the center of the lesion appears pale green, but with exacerbation of the appearance of darkened diffuse branches corresponding to the intense vascular neoformation. (K) It is observed the continuity established between the primary lesion and a minor lesion (blue arrow). (M) In 100× image enhancement, the whitish aspect of the lesion center and the reddish aspect of the reddish branches of the vascular neoformation can be visualized. (N) With 140× image enhancement, the intense red edge of the lesion with vascular proliferation reaching the center of the lesion become very pronounced. (O) At 140× magnification, 120 days after the initial diagnosis, the aspect of the lesion center presents an, even more intense, vascular neoformation.