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Case report

Anterior Segment Optical Coherence Tomography Angiography Findings in Intraepithelial Ocular Surface Squamous Neoplasia

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ABSTRACT

***Background.** Ocular surface squamous neoplasia (OSSN) is the most common non-pigmented tumor of the ocular surface. Anterior segment optical coherence tomography (AS-OCT) and AS-OCT angiography (OCTA) are innovative and non-invasive imaging tools. However, their application in OSSN is still uncommon and not well described in the literature. We aim to describe the imaging characteristics of AS-OCT and AS-OCTA in a case of intraepithelial ocular surface squamous neoplasia.* ***Observation.** A 56-year-old female patient was presented to our department because of redness and foreign body sensation in both eyes. Eyelid malposition and superficial punctate keratitis were noted in both eyes. Examination of the left eye revealed a temporal conjunctival gelatinous lesion covering the cornea. AS-OCT of the LE's showed a hyperreflective superficial lesion and a sharp demarcation hyporeflective line between the lesion and the underlying normal cornea. OCTA confirmed the vascularised but not extensive nature of the lesion.* ***Conclusion.** AS-OCT and AS-OCTA are promising tools to aid in the identification and characterization of OSSN and its vascular network, and further studies should investigate their clinical utility.*

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INTRODUCTION

Ocular surface squamous neoplasia (OSSN) is the most common non-pigmented tumor of the ocular surface. It is a broad spectrum of dysplastic disorders of the corneal and conjunctival epithelium, including corneal intraepithelial neoplasia (CIN) and squamous cell carcinoma (SCC). Intraepithelial OSSN is differentiated from invasive OSSN on the basis of the stromal infiltration that is observed on histopathological examination [1]. Anterior segment Optical Coherence Tomography (AS-OCT) has been used as optical biopsy and clearly demonstrated high correlation with histology [2].Anterior segment optical coherence tomography angiography (OCTA) is a rapid, non-invasive imaging modality that can detect the microvascular network in the conjunctiva, cornea, sclera and iris. The combination of these two imaging modalities in OSSN has not been previously investigated.

Objective: To describe the imaging characteristics of anterior segment optical coherence tomography and anterior segment optical coherence tomography angiography in a case of ocular intraepithelial surface squamous neoplasia.

Case report

A 56-year-old woman with no significant pathological history was presented to our department for redness and foreign body sensation in both eyes that had been evolving for several years. Examination of the surface of the right eye found entropion of the upper eyelid associated with superficial punctate keratitis. Examination of the left eye (OS) showed

superior and inferior entropion associated with a temporal conjunctival gelatinous lesion covering the cornea (Figure 1).

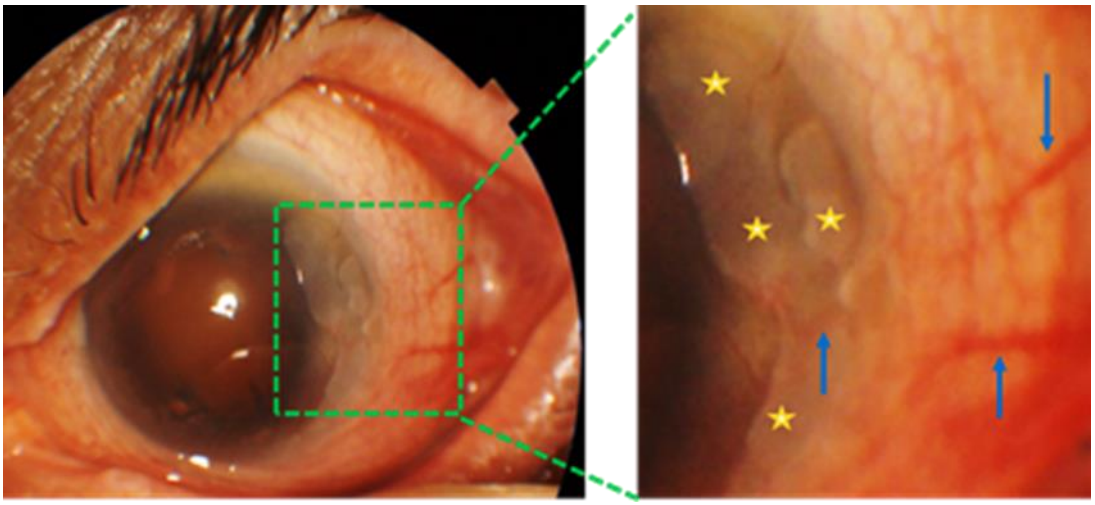

Figure 1. Slit-lamp anterior segment photography of the left eye showing temporal subtle elevated gelatinous lesion, better demonstrated on magnification (yellow stars) associated with feeding vessels (blue arrows).

AS-OCT of the OS showed a hyperreflective superficial lesion and a sharp demarcation hyporeflective line between the lesion and the underlying normal cornea (Figure 2).

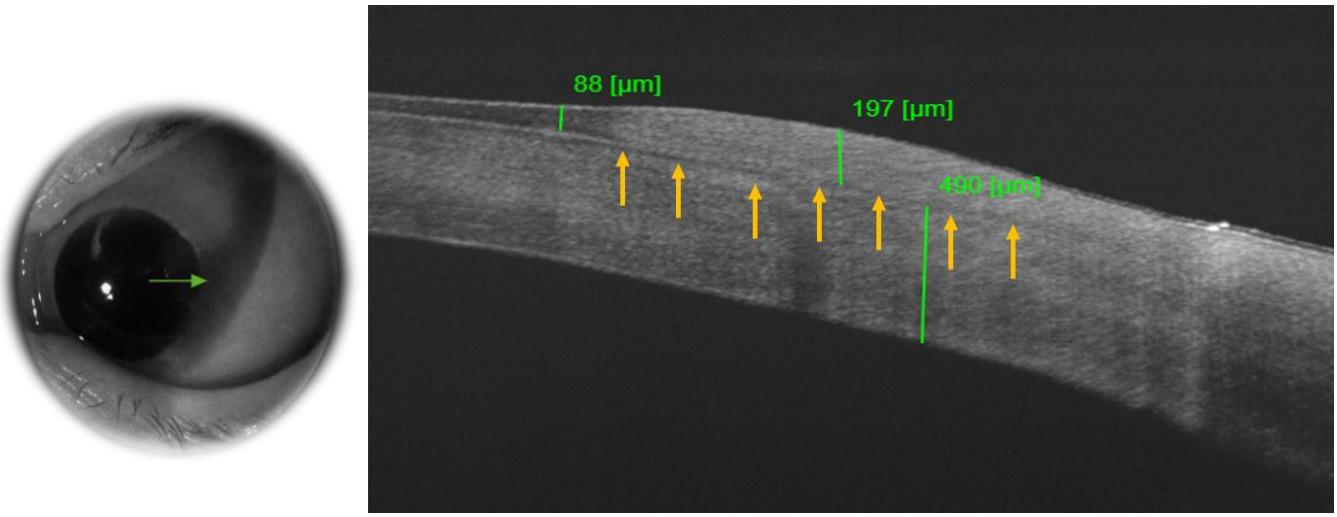

Figure 2. AS-OCT of the left eye showing a 197 µm hyperreflective superficial lesion with an abrupt transition between normal and abnormal epithelium and a sharp demarcation hyporeflective line between the lesion and the underlying normal cornea (yellow arrows).

AS-OCTA confirmed the vascularized but not extensive nature of the lesion (Figure 3). The diagnosis of non-invasive ocular surface squamous neoplasia was then made based on the multimodal imaging and confirmed after simple resection of the tumor. Our course of action was to treat both the ocular surface and trichiasis and closely monitor the patient, but she was lost to follow-up after an improvement in her symptoms.

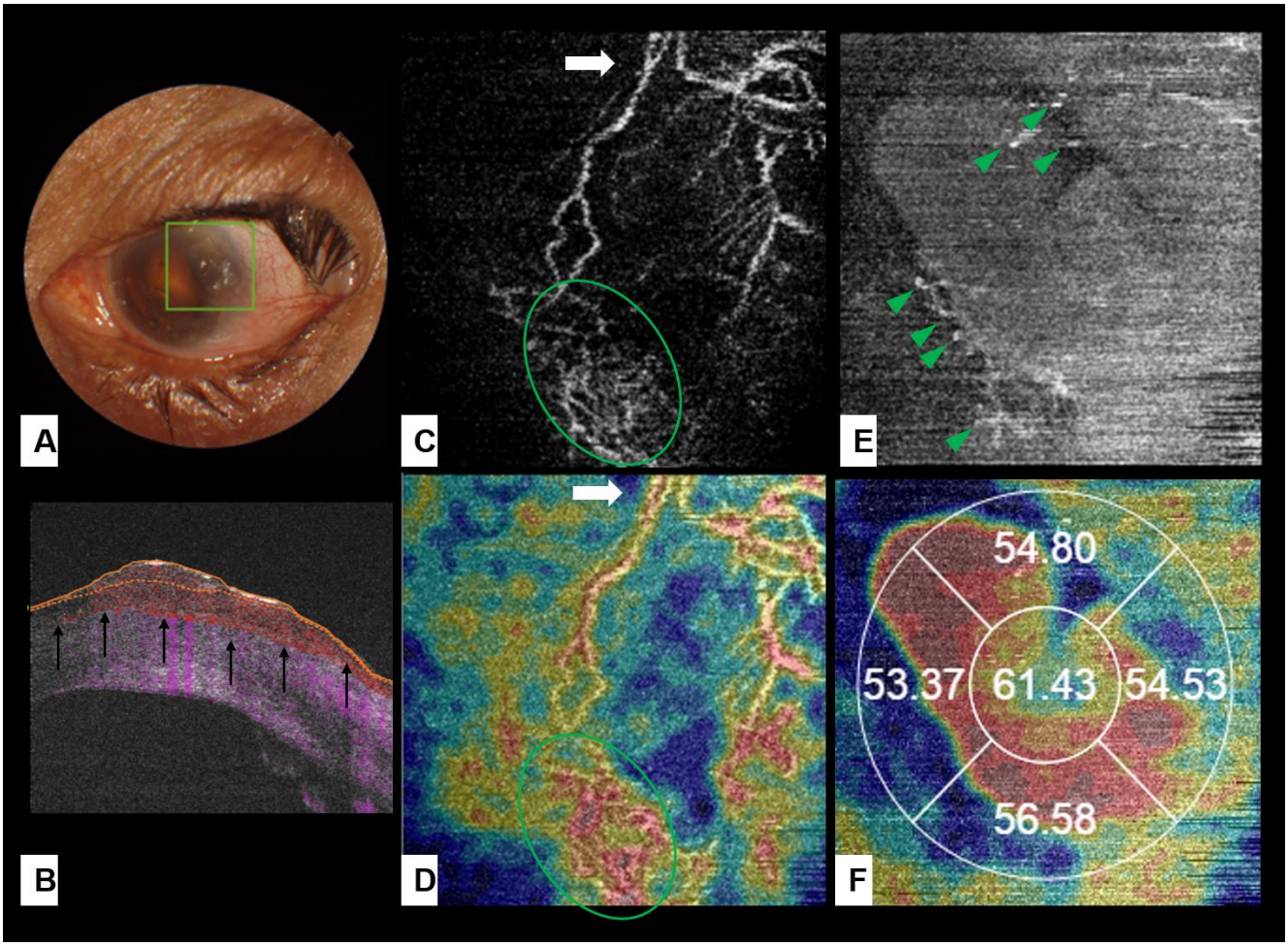

Figure 3. A. Anterior segment photograph showing the level of the imaging. B. Structural OCT with vascular flow showing the non-invasive nature of the lesion. C. OCTA of the anterior segment of the superficial plexus showing the presence of a feeder vessel (white arrow) associated with a tangled vascular network (green circle). D. Density map of the superficial plexus revealing the presence of the feeder vessel (white arrow) and the entangled network (green circle). E. Deeper OCTA showing the presence of telangiectasias (green triangles). F. Density map of the deep plexus showing a vascularized lesion with warm colors.

DISCUSSION

Ocular surface squamous neoplasia (OSSN) can be very similar to common pathologies of the conjunctival and corneal surfaces, such as pinguecula and pterygium. On slit lamp examination, OSSN appears as a gelatinous or plaque-like interpalpebral conjunctival grey or white lesion [1]. Clinical misdiagnosis of invasive conjunctival squamous cell carcinoma as pterygium has been reported in the literature [3]. Anterior segment optical coherence tomography (AS-OCT) provides non-invasive assessment of the conjunctiva and cornea with high axial tissue resolution. It allows in vivo examination of morphological and histological tissue characteristics. It has been shown to have high sensitivity and specificity for the diagnosis of OSSN compared to biopsy [2], making AS-OCT a critical element in the diagnosis and differentiation of OSSN [4]. Hyperreflective thickened epithelium and abrupt transition between normal and abnormal epithelium were clearly demonstrated in the presented case and have been previously reported as characteristic features of OSSN [2]. Invasive OSSN is distinguished from intraepithelial OSSN by stromal infiltration, which is only seen on histopathological examination [1]. However, Swati Singh et al have recently described findings on AS-OCT that can differentiate between intraepithelial and invasive OSSN. The most distinguishing feature described is the presence of a clear hyporeflective plane of separation, with or without hyperreflective basal membrane, which was present in almost all (90%) of intraepithelial cases and absent in invasive OSSN. The authors also report that the thickness of the lesion is an important parameter to consider, as they found that the mean thickness values of intraepithelial and invasive OSSN were significantly different. The mean thickness was 924 and 1662 µm for intraepithelial and invasive OSSN, respectively. These findings on AS-OCT have been proposed as a potential discriminator between invasive and intraepithelial OSSN [5]. In our case, the hyporeflective line was well defined and the thickness of the lesion was 196µm.

Not much is known about the tumor vasculature in and around OSSN. Previous studies using fluorescein angiography and ICG have shown abnormal vascular leakage and focal or sea-fan-shaped intra-tumoral vessels and feeding vessels in the non-involved conjunctiva. OCTA is a rapid, non-invasive imaging modality that detects the vasculature by motion contrast imaging of erythrocyte movement over successive B-scans. Previous studies have shown that OCTA can provide reproducible imaging of blood vessels in the conjunctiva, cornea, sclera and iris. Despite its widespread use in the assessment of the posterior segment vasculature, OCTA has been less commonly used to study anterior segment disease.

A recent report by Liu Z et al. [4] on the use of AS-OCTA for the visualization and characterization of the vascular pattern in patients with OSSN demonstrates its ability to visualize and quantify vessel area density and vascular features. They note that the most impressive vascular network was found in the sub-epithelial tissue adjacent to the OSSN, followed by the vascular density in the conjunctival part of the tumor.

This report suggests that AS-OCT A could be a potential aid in diagnosing and subtyping OSSN, guiding treatment and monitoring treatment response. A recent study on the role of AS-OCT in the evaluation of ocular surface pathology by Binotti WW et al. [6] suggests that the identification of feeder vessels is a key sign and often a defining feature of malignancy. In addition, invasive OSSN shows deep and dilated episcleral vessels with high intralesional vascularity. In our case, AS-OCTA allowed clear identification of the feeder vessel associated with a tangled vascular network.

CONCLUSION

AS-OCT provides characteristic features of OSSN such as hyperreflectivity, thickened epithelium and abrupt transition from normal to abnormal tissue but lacks the ability to image the vascular network.

AS-OCTA is able to overcome these limitations by providing imaging of the vascular structures within and around the OSSN. The combination of these two non-invasive imaging modalities could provide a superior feature that allows easy identification of the tumor, characterization of its vascular network and assessment of the involvement of the underlying ocular tissue.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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