Novel Use for Anterior Segment Optical Coherence Tomography in Diagnosing Foreign Body-Induced Chronic Conjunctivitis

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Abstract

Purpose: Intra-scleral foreign body is one of the causes of chronic red eye. Ultrasound biomicroscopy is the standard technique for localizing anterior segment foreign bodies. Recently, anterior segment optical coherence tomography (AS-OCT) has been utilized in the diagnosis and management of several anterior segment diseases.

Methods: We present two patients with chronic red eye not responding to medical therapy who were found to have intrascleral foreign bodies using Spectral Domain OCT (SD-OCT).

Results: The intrascleral foreign bodies were removed and the patients’ chronic conjunctivitis resolved.

Conclusion: In this case series, we describe the utilization of AS-OCT in the accurate localization of intra-scleral foreign bodies that were a cause of chronic malingering red eyes.

Keywords: SD-OCT; Intrascleral Foreign Body; Conjunctivitis

Introduction

Accurate localisation of anterior segment intra-ocular foreign bodies (IOFBs) is difficult using conventional techniques such as computed tomography (CT) and low-frequency (5 MHz to 10 MHz) ultrasonography [1]. High frequency ultrasound biomicroscopy (UBM) offers high resolution images which are able to reveal cross sectional cuts of the anterior segment up to a depth of 5 mm [2]. For this reason, it has been widely used to localize anterior chamber foreign bodies [3].

Fourier or spectral-domain optical coherence tomography (SD-OCT) is a non-contact, non-invasive diagnostic imaging device that provides high resolution, real-time visualization of tissue microstructures. The development of a corneal adaptor module (CAM) for SD-OCTs enabled imaging of the anterior segment structures. This provided images with a tissue resolution of 5 μm and an imaging depth of 2.3 mm [4]. SD-OCT with CAM has been used mostly to evaluate corneal thickness, LASIK flaps and anterior chamber angle structures [5-8]. We present a novel use of SD-OCT in localization of an intrascleral post-traumatic foreign body causing chronic conjunctivitis in 2 patients.

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Case Reports
Case #1

A 58 year old previously healthy male presented with left eye redness after a small foreign body hit his eye at work 6 weeks prior to presentation. He was diagnosed with a sub-conjunctival haemorrhage and was followed thereafter. However, the patient continued to have left eye redness and irritation without change in vision. On examination, his best corrected visual acuity (BCVA) was 20/20 and intraocular pressure (IOP) was 14 mmHg. He had a focal area of left temporal conjunctival injection and sub-conjunctival hemorrhage without a definite conjunctival laceration (Figure 1A). Focal point tenderness was noted above the central hemorrhagic area. Anterior segment exam was normal. Dilated fundus exam did not reveal inflammation or an intraocular foreign body. However, there was retinal whitening with an area of sub-retinal haemorrhage in the peripheral temporal retina. A CT-scan of the orbit was done which revealed a foreign body at the level of the anterior segment. SD-OCT done over the area of sub-conjunctival hemorrhage showed a hyperreflective signal located within the sclera (Figure 1B). Excision of the foreign body was done under topical anesthesia and was found to be embedded in the scleral bed without intraocular penetration as depicted by the SD-OCT.

**Figure 1:** (A) Slit lamp exam showing chronic conjunctival injection (B) SD-OCT showing a hyperreflective signal within sclera.
Case #2

58 year old male patient presented with a 3-weeks history of a painless right red eye and a whitish injected elevated lesion over the conjunctiva nasally. He was diagnosed with nodular episcleritis and was treated with topical steroids but without improvement. On further questioning, the patient recalled that he had a trauma to the right eye with a wood stick. On examination, his BCVA was 20/20 and IOP was 12 mmHg. He had a focal area of right nasal conjunctival injection with an elevated whitish injected nodular lesion that was slightly tender to touch (Figure 2A). Anterior segment and dilated fundus exam were normal. UBM was done that revealed the presence of a hyperechoic area inside the mass (Figure 2B). SD-OCT was done over the elevated lesion that revealed a hyperreflective signal (Figure 2C). Surgery was performed to excise the foreign body that was found to be embedded inside the sclera along with a small abscess without intraocular penetration.

Figure 2: (A) Slit lamp exam showing conjunctival granuloma (B) UBM showing hyperechoic signal (C) SD-OCT showing the hyperreflective signal.
Discussion

Time Domain Ocular Coherence Tomography (TD-OCT) imaging has been utilized to visualize conjunctival nevi and post trabeculectomy blebs [9]. Cystic structures using TD-OCT were more distinctly visible when compared to UBM [10]. SD-OCT on the other hand, is thought to provide a less detailed image of the episcleral/scleral margin due to scattering of short wavelength light through the vascularized or pigmented conjunctival tissue [11]. Reflections anterior and posterior to the intrascleral foreign body were observed in the SD-OCT images obtained in our cases. This might be from the constructive interference of the light waves, which penetrated or got reflected from its surface. These reflections are the same as the reverberations that occur with UBM in detecting glass foreign bodies, although most IOFBs diagnosed by UBM produce a high reflective echo that results in a complete shadowing of all structures behind them [12].

Siderosis is known to be a cause for vision loss from intraocular foreign bodies but has also been reported to occur secondary to intrascleral foreign bodies. Iron penetrates through the sclera adjacent to the foreign body site followed by diffusion in the anterior ciliary processes, and at the junction of the choroid and sclera in the posterior pole. Thus, it is important that an intrascleral foreign body be localized and removed [13].

Conclusion

In conclusion, UBM has become the standard technique used to detect anterior segment foreign bodies; however, it can cause discomfort to patients especially when the eye is tender. In our experience, we found that SD-OCT is a more comfortable, non-invasive and efficient method in detecting and localizing anterior intrascleral foreign bodies and we recommend using for identifying underlying foreign bodies in cases of focal chronic conjunctivitis that are not responding to treatment. It is a tool available in most ophthalmology clinics and can be used as a primary test for detecting anterior segment foreign bodies.

Conflict of Interest

None of the authors have any conflict of interest.

Bibliography


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