Case Report: Advanced considerations in the therapeutic use of scleral lenses for severe ocular surface disease in an immunocompromised host

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Introduction

Neurotrophic keratopathy is characterized by an impairment of the fifth cranial nerve (trigeminal nerve) which impacts the pathway between the trigeminal nucleus to the corneal nerve endings.[1,2] Consequently, corneal sensitivity decreases which leads to ocular dryness.

It is estimated that the prevalence of neurotrophic keratopathy affects 5/10,000 individuals. This condition develops in approximately 6% of herpetic keratitis cases, which has a prevalence of 149/100,000 and in 12.8% of herpetic zoster keratitis cases, which has a prevalence of 26/100,000.[3]

Ocular symptoms generally experienced with neurotrophic keratopathy include blurred vision due to persistent epithelial defects, corneal stromal scarring and swelling[2,4]. However, patients rarely report ocular surface discomfort due to corneal anesthesia.

Previous literature has documented various treatment options to manage neurotrophic keratopathy[5-7]. This case report explores a novel approach to manage this ocular surface disease.

Case Report

A 50 year old Caucasian male presented to our contact lens clinic for a specialty lens fitting to manage his ocular dryness secondary to neurotrophic keratopathy. Patient reports chronic ocular discomfort despite the use of various topical eye drops including Hylo™ Gel (Candorvision) 10 times per day and Lotemax ointment (loteprednol etabonate ophthalmic ointment) 3 times per day. He was previously managed by his local corneal specialist for the past year, however, the patient and ophthalmologist would like to explore the option of using specialty contact lenses to treat the ocular surface disease.

The patient's ocular history includes a previous tarsorrhaphy procedure (2015) in his right eye that lasted for 9 months before being removed a month ago as it provided no relief for his dryness symptoms. In 2014 and 2015, he had cataract extraction surgery OU. The patient is a diabetic and has a history of diabetic retinopathy. He also has a history of dry age-related macular degeneration (AMD) OD and wet AMD OS. The patient has a retinal specialist that follows him every 6 months. Furthermore, the patient's medical history was positive for E.coli infection in 2000, a pancreatic transplant in 2005, a series of surgeries to remove his bowel in 2011 and a heart attack in 2014. At the time, the patient was taking anti-rejection medications (Tacrolimus and Sirolimus), which he started after his pancreatic transplant.

Clinical findings and Management

Uncorrected distance visual acuity was 20/100 OD and 20/400 OS (eccentric fixation with OS). Subjective refraction revealed the following:

OD: -0.75 -0.50 x 090 20/80
OS: -0.50 -0.50 x 090 20/200

Slit lamp biomicroscopy revealed telangiectasia at the lid margins OU and grade 1+ hyperemia of the bulbar conjunctiva OU. Corneas in both eyes displayed irregular surfaces, with OD having negative NaFl staining centrally and areas of NaFl pooling in the mid peripheral cornea. OS had corneal scarring just outside the visual axis (See Figure 1). No active ulcer was present in both eyes. Posterior capsular intraocular lenses were centered and clear. Topography maps of both eyes were taken with the Pentacam HR™ (Oculus, Germany), and results revealed areas of elevation and depression on the corneal surfaces (Figure 2).

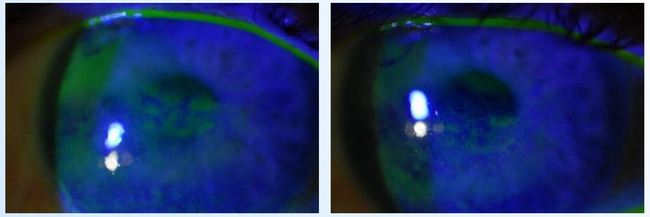

Figure 1. Slit lamp presentation of OD and OS corneas with NaFl staining, under blue filter light.

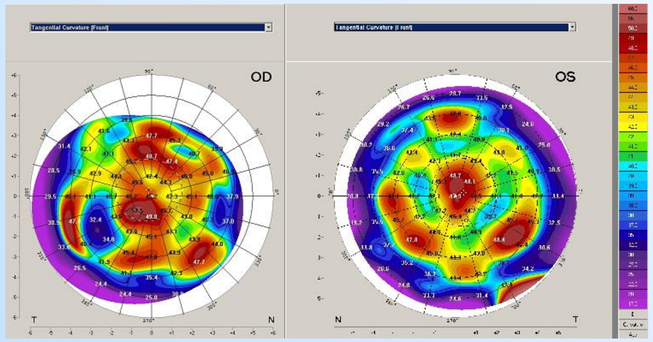

Figure 2. Tangential curvature maps of OD and OS using Pentacam tomographer revealing irregular corneal surfaces OU

We decided to fit the patient with scleral lenses (Blanchard OneFit 2.0) in order to provide and maintain a chamber of fluid on the front surface of the eyes to alleviate dryness symptoms. In addition, autologous serum eye drops (ASED) was used to fill the scleral lenses prior to lens insertion. ASED contain similar anti-inflammatory (inhibitors of cytokines and MMP) and anti-microbial (lysozyme, IgG) components found in natural human tears and has been shown to improve dry eye symptoms, as well as increase tear break up time and corneal surface healing.[8]

Table 1. Osmolarity and pH measurements of the unpreserved saline solution and autologous serum eye drops. Results were compared with healthy human tears.[9,10]

	Addipack Saline Solution	Autologous Serum Eye Drops	Human Tears
Osmolarity	273.5 mmol/kg	287 mmol/kg	302 mmol/kg
pH reading	6.0-6.4	6.8-7.0	7.0 (ranges from 6.5-7.6)

After 6 hours of wearing the ASED + scleral lens system, slit lamp examination revealed significant improvement in the corneal surface after lens removal. The central defects OD were less confluent and the paracentral SPK OS had improved (See Figure 3). However, post lens removal pachymetry readings revealed an increase of 83 microns OD and 25 microns OS at the thinnest point on the cornea. Despite the increase in corneal thickness, the vision remained stable (20/80 OD and 20/200 OS).

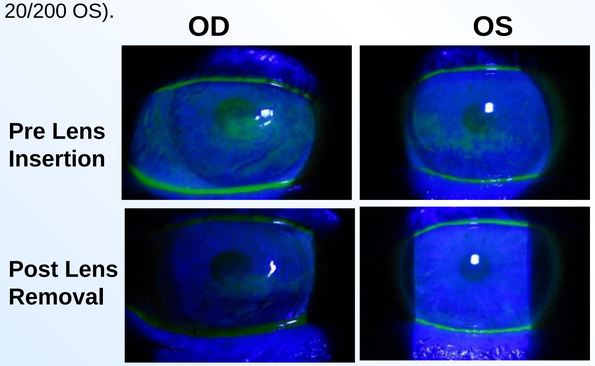

Figure 3. Slit lamp images of OD and OS before lens insertion and after lens removal. Images show improvement and corneal surface defects after 6 hours of lens wear

Discussion

Scleral lenses would be a great option to act as a therapeutic device to encase the ASED on the surface of the eye for longer periods of time. The space between the cornea and the back surface of the lens is filled with the ASED that helps maintain a moisture environment over the cornea to alleviate dry eyes and promote healing of epithelial defects. In addition, the scleral lens also acts as a refractive surface to correct any refractive error. The combination of scleral lenses and autologous serum eye drops in our current case showed to have a positive effect on corneal epithelium healing without reducing visual acuity.

Scleral lenses create a semi-sealed environment around the cornea, tear exchange and consequently oxygen delivery to the cornea can be limited. In the current case, our patient's corneal thickness significantly increased by 14.5% OD and by 4% OS following 6 hours of scleral lens wear. It was suspected that the increase in corneal thickness may be 1) associated with hypoxia to the cornea from scleral lens wear, and/or 2) potentially be related to a reactivation of the herpes virus causing stromal keratitis. Nevertheless, it is highly recommended to utilize the highest Dk/t lens materials and to minimize the thickness of the tear reservoir in order to maximize the amount of oxygen delivery to the cornea during scleral lens wear.[11]

Conclusion

- This case report illustrates the potential of combining ASED with scleral lens wear to promote healing of corneal surface defects from neurotrophic keratopathy, without compromising vision
- Caution should be taken when attempting to fit scleral lenses on patients with a history of or active herpetic viral infections

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Disclosures

The authors have no financial interests in the subject matter of this poster.