

RISING OVER THE REBOUND

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Introduction

Channels, or non-penetrating grooves on the back surface of a lens, have been described in scleral lenses since the 1960s¹. Like fenestrations, channels were attempts to increase tear exchange to avoid hypoxic ocular conditions with scleral lens wear, when lenses were available in only low DK or PMMA materials².

Today, with the availability of high and hyper-DK materials as well as the capacity to adjust and customize haptics to fit scleral shape, the need for fenestrations and channels have decreased. Several sources have mentioned that with advent of higher DK materials and less concern for hypoxia with lens wear, fenestrations and channels are no longer necessary in modern scleral lens designs^{3,4}.

This case highlights how back surface channels allowed a means to prevent contact between lens haptics and the conjunctiva to help eliminate rebound injection.

Initial Scleral Lens Consultation

37-year-old Hispanic male was referred to the Therapeutic Contact Lens Clinic at the Kensington Vision and Research Centre in November 2017 for a consultation to help improve and balance vision between his right eye (OD) and left eye (OS) with contact lenses.

Ocular history:

- Post-LASIK ectasia in both eyes (OU), diagnosed shortly after his LASIK procedure in 2015
- History of corneal crosslinking OU in 2015
- Repeat corneal crosslinking procedure in 2017 OU when further progression detected
- Decreased vision OD > OS, with best corrected visual acuity (BCVA) with spectacles: OD 20/200 and OS 20/30

Initial 17mm diameter scleral lens fit provided BCVA of 20/20- OD and 20/20 OS

- Over the following 6 months, increasing sectoral conjunctival injection was seen with wear of his scleral lenses – most pronounced nasally and temporally with removal of his lenses at the end of day, and with increased wear.
- Lens evaluation revealed an acceptable and aligned lens fit on the sclera.
- Change of lens solution, from non-buffered preservative-free Addipack to buffered preservative-free saline Purilens, also provided no change.

Making Use of PROSE Capabilities

Scleral lens wear was discontinued by both patient and optometrist after 6 months of use due to the severity of the conjunctival injection.

This patient was refit into a 18.5mm Prosthetic Replacement of the Ocular Surface Ecosystem (PROSE) device design for increased customizability and increased lens diameter to distribute lens landing weight over area. Despite further customization and aligned scleral landing of the device, this patient continued to experience severe temporal and nasal conjunctival injection with lens wear over the course of the day. (Fig 1a,b)

Channels were added to the landing haptics of his PROSE devices temporally and nasally. These channels were designed to completely remove contact of the lens landing in the temporal and nasal conjunctival area in these areas. (Fig 2a-d)

After a few adjustments to customize the channel designs, final device customization included channels of 350 microns in height with 4.5mm in depth temporally of 42 degrees and 55 degrees and nasally 41 degrees 55 degrees, OD and OS respectively. With incorporation of channels into his scleral lenses, this patient was able to wear his PROSE devices for a full day with minimal injection. (Fig 3a,b)

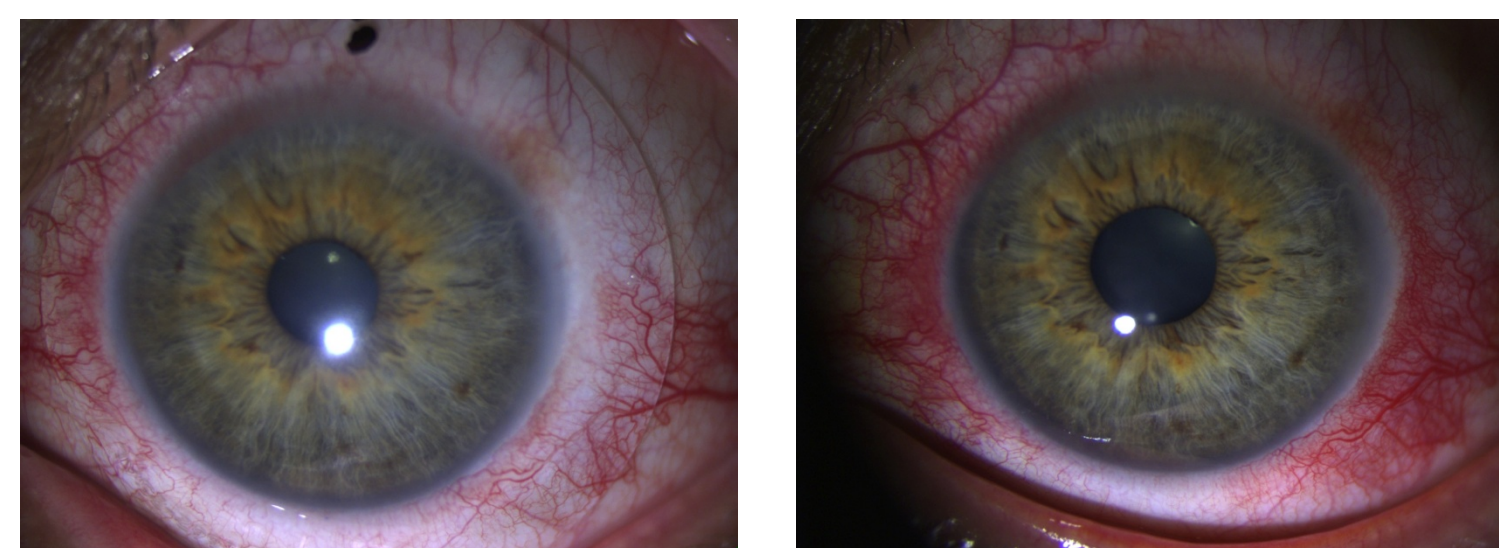


Fig 1a,b: With 18.5mm PROSE devices, injection of right eye after 3 hours of PROSE wear despite acceptable fit (1a) and rebound conjunctiva injection with PROSE removal (1b)

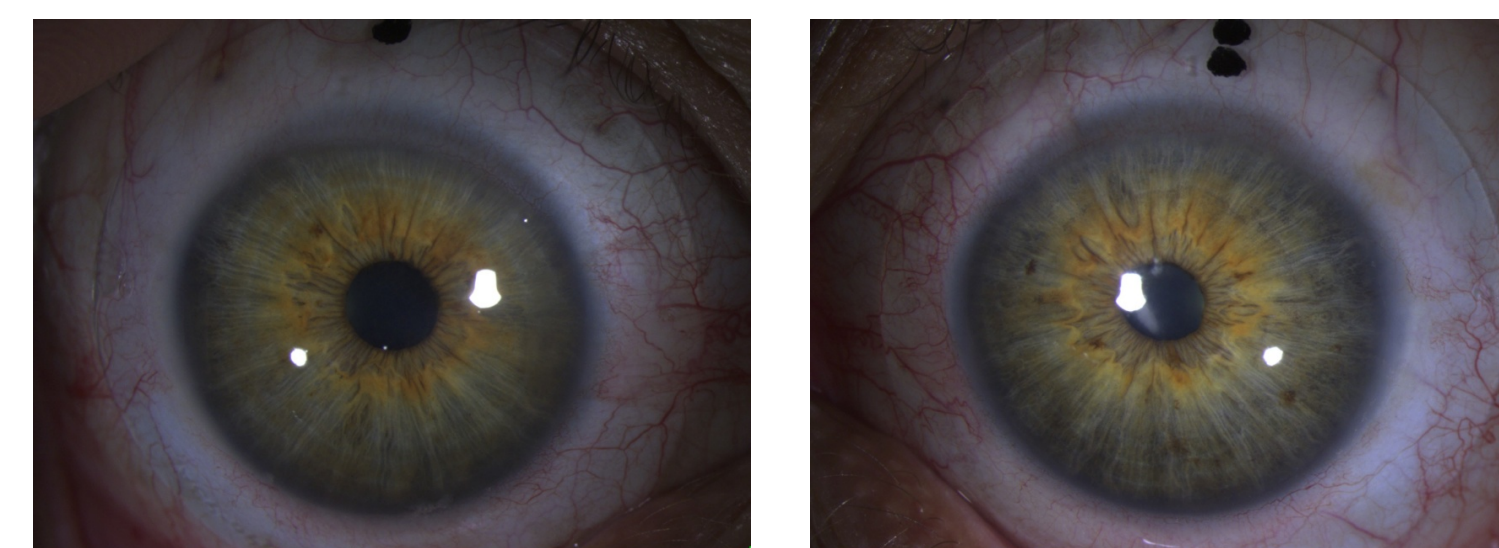


Fig 3a,b: Resolution of conjunctival injection with scleral lens wear by using channels in PROSE devices. Notice small bubble temporally in haptic zone of OD PROSE device from channel

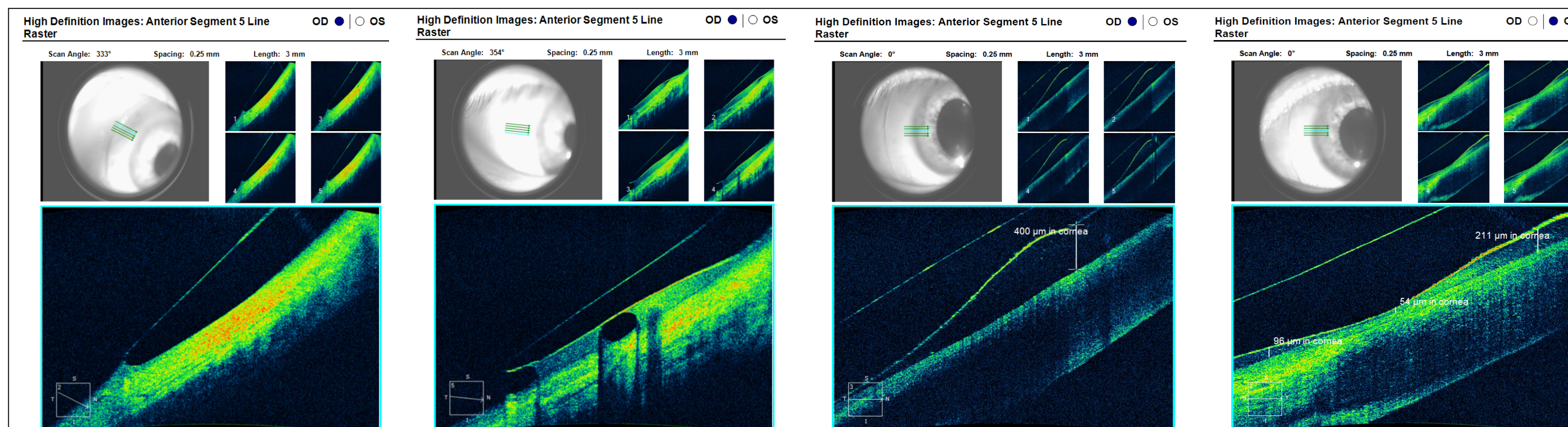


Fig 2a-d: Anterior segment OCT of PROSE devices on eye illustrating channel design. Notice alignment of PROSE haptics immediately adjacent to channel location (2a) and various OCT cross-sections highlighting lack of physical contact of lens landing on conjunctiva along specific areas of channels. Notice edge lift on temporal edge of OD lens (2b).

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Clinical Pearls & Further Research

This case highlights the benefit of using channels, or non-penetrating grooves carved on the back surface landing zones of PROSE devices, when rebound conjunctival injection manifested despite acceptable and aligned lens fit on the sclera.

Channels removed physical contact of lens from specific area of the sclera: This helped eliminate signs of rebound conjunctival injection for this patient.

Channels increased tear-exchange passageway without issues of fogging in the lens reservoir: In this case, despite channels creating a large tear-exchange passageway between external and internal lens environments which commonly promotes complications of midday fogging, this patient was able to tolerate wearing his PROSE devices throughout the day without symptoms of fogging or need for lens re-application.

Channels increased ease of lens removal / suspect reduced suction of lens on eye: This patient no longer required tools for PROSE removal when channels were added to the lens design. He instead was able to remove the devices with his fingers with ease. We suspect this is because suction of the lens on eye is reduced when space is created between the lens and eye with channels.

Channels carved on the back surface of scleral lens landing zones are a helpful technique when fits require less physical lens contact on ocular tissue. We suspect this patient responded well to the addition of channels in his PROSE design because it removed physical contact of the lens from sensitive areas of his eyes, as well as reduced suction of the lens fit on his eye.

There currently are no discussions measuring scleral lens suction or the pressure a scleral lens exerts on eye. This case highlights the benefit of using channels to aid a scleral lens fit, but also demonstrate how the further study of scleral lens suction and pressure on the eye can help understand scleral lens interaction with the eye, especially when signs of ocular stress remain despite acceptable lens fit.

References:

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