Case Report:

Next-generation sclerals for bilateral corneal transplant

Aitana Munguia Conejero

Aitana Munguia has a degree in Optics and Optometry from the University of Santiago de Compostela and a Master's degree in Vision Sciences from the Polytechnic University of Catalonia (UPC). She is a specialist in advanced contact lenses and myopia control, a member of EurOK and Aecso, is part of the board of directors of Optofem, and is the CEO of Óptica Conejero. In addition, Aitana gives presentations for different brands and companies, standing out as an influential leader in the field of optics and optometry.

Introduction

Penetrating keratoplasty offers excellent results in terms of graft clarity and graft survival in cases of advanced keratoconus. However, visual recovery can be slow due to high post-surgical astigmatism and anisometropia. Fitting contact lenses under these conditions is a professional challenge, aiming to preserve tissue health while enhancing vision.

Background

A 28-year-old female patient presents with diagnosed advanced keratoconus and a history of corneal transplant in both eyes. In addition, she has undergone cataract surgery in her right eye. Her uncorrected visual acuity is 0.6 in the right eye and 0.5 in the left. Ophthalmic lenses cannot adequately improve her visual acuity, so she does not wear specs. Higher-order aberrations associated with corneal irregularity severely affect visual quality, especially in low-light conditions. Additionally, the patient experiences significant dry eye symptoms, which she treats with prescription antihistamines and artificial tears.

Corneo-scleral profilometry

The Eye Surface Profiler (ESP) (Eaglet Eye, The Netherlands) was used to measure corneo-scleral shape. The ESP Bi-sphere elevation maps revealed an asymmetric scleral pattern according to the SSSG (Scleral Shape Study Group) classification in both eyes (Figure 1). The topography also showed a large difference in sagittal height between the nasal and temporal areas, a factor that may cause lens decentration.

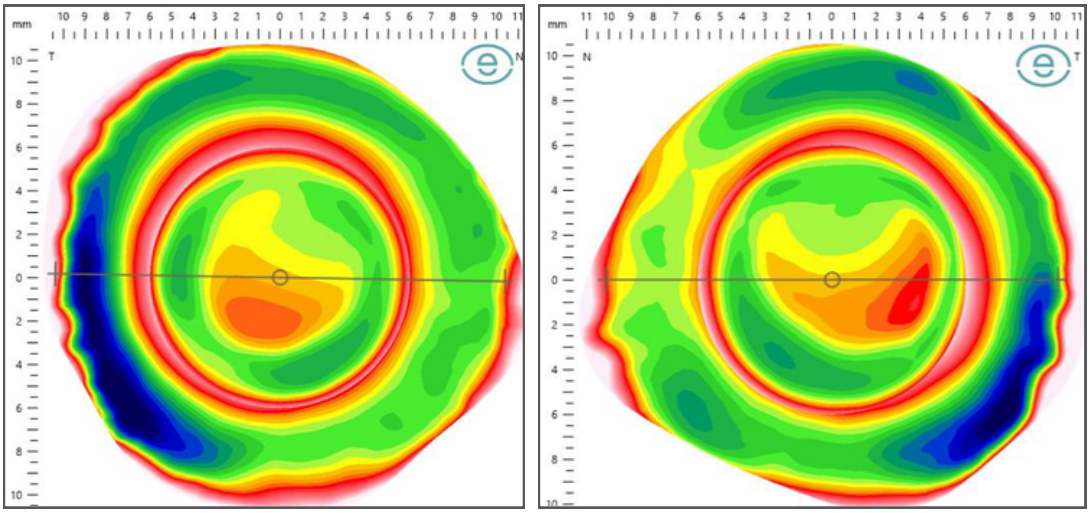

Fig. 1 Bi-sphere elevation maps of the ESP for both eyes used for empirical calculation of the freeform scleral lens.

From the first lens to the final lens

Initially, a scleral lens with a quadrant-based periphery was fitted, but the high ocular asymmetry resulted in peripheral alignment problems and irregular vault with incorrect limbal clearance. This, together with an insufficient diameter, resulted decentration and failure of the fitting.

A custom SLC Adapta lens (MedLac, Italy) was subsequently designed by empirical calculation based on corneoscleral profilometry, which improved centering, but the central vault was excessive and the refraction not ideal (Figure 2).

A final pair of lenses was manufactured after adjusting the central vault and applying the change suggested by the overrefraction. Peripheral channels were also cut to decrease lens indentation and suction (Figure 3). Visual acuity with the final lenses was 1.0 monocular and 1.2 binocular. The patient reported significant improvement in vision and comfort compared to previous lenses.

Controlling ocular response is essential to achieve a successful fitting. Therefore, proper patient education on the use of eye drops, insertion, removal, cleaning, storage and length of use of lenses is implicitly necessary.

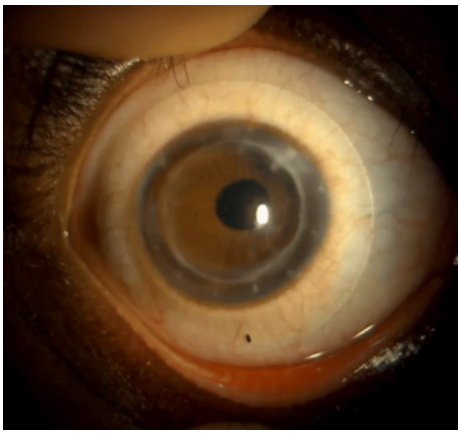

Fig. 2 Image of the first Adapta freeform lens.

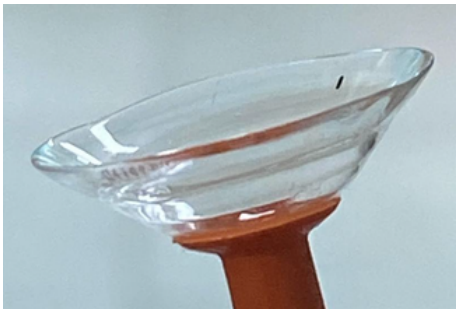

Fig. 3 Final freeform lens Adapted with canal.

Conclusion

Scleral lenses designed using image-guided algorithms can be very beneficial, especially in solving complex cases. Ocular surface measurement and lens manufacturing technologies developed in the last decade play a critical role in the management of these patients. Customized scleral lenses can be a life-changing solution for people who would otherwise have no functional vision.