Scleral Lens Visual Rehabilitation of Sequential Bilateral Corneal Hydrops With Post-LASIK Ectasia

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Abstract: This case report describes a unique presentation of bilateral sequential acute corneal hydrops that manifested several years after laser in situ keratomileusis. Initial management included anterior chamber perfluoropropane gas injection and corneal suturing. Longer-term visual rehabilitation involved the use of scleral lenses which significantly reduced lower- and higher-order ocular aberrations.

Key Words: Scleral lens—Post-LASIK ectasia—Aberrations—Corneal hydrops.

CASE REPORT

Corneal hydrops occurs due to a break in the Descemet membrane that allows aqueous to enter the stroma resulting in acute corneal edema, vision loss, pain, and photophobia. Although corneal hydrops occurs in approximately 2% to 3% of patients with keratoconus, it is a rare complication of refractive surgery, typically occurring unilaterally due to post-LASIK ectasia. Depending on the severity, corneal hydrops can be managed conservatively with observation, or pharmacological and surgical interventions initially, followed by a contact lens correction to improve vision when the edema has resolved. This case report highlights the use of scleral lenses to correct refractive error and higher-order aberrations and improve visual acuity in a patient with post-LASIK ectasia who developed bilateral sequential corneal hydrops.

CASE REPORT

A 41-year-old woman presented with a sudden loss of vision in the right eye and had not been seen previously in this clinic. She had no history of ocular trauma but had undergone bilateral LASIK 15 years earlier at an external clinic. Unaided vision was counting fingers in the right eye and 20/400 in the left eye, which did not improve with subjective refraction. Slitlamp examination of the right eye revealed a break in the Descemet membrane with an overlying stromal cleft extending to the LASIK flap interface. The left cornea was ectatic with a visible LASIK flap interface. Perfluoropropane (C3F8) gas was injected into the right anterior chamber to treat the acute corneal hydrops.

One week later, the size of the gas bubble had reduced significantly, and best-corrected spectacle visual acuity had improved to 20/800. Seven weeks later, visual acuity had improved to 20/400, and the C3F8 gas had resolved completely (Fig. 1A). Three months after the onset of the right corneal hydrops, the patient returned because of a sudden loss of vision in her left eye (reduced to counting fingers). Slitlamp examination revealed corneal ectasia and stromal edema obscuring half the pupil (Fig. 1B). The following day, five oblique corneal sutures were placed in the left cornea and C3F8 gas was injected into the anterior chamber (Fig. 1C). After 1 month, best-corrected spectacle visual acuity had improved to 20/400 in the left eye (plano–6.00 x 70). After 6 months, the corneal edema had resolved and visual acuity remained 20/400 in each eye with significant central corneal scarring. A suture was removed from the left eye, and contact lenses were discussed as a potential option to improve vision.

One year later, after the removal of all remaining sutures, corneal rigid gas permeable lenses were trialed in both eyes but were rejected because of patient-reported discomfort. Non-fenestrated highly oxygen permeable (Dk 100, center thickness 250 µm) scleral lenses (Keracare, Acculens) were then trialed (Figs. 1D and 1E), which improved visual acuity to 20/40 in the right eye and 20/30 in the left eye. On slitlamp evaluation, the lens fit was acceptable, with adequate centration and limbal clearance, and an initial post-lens fluid reservoir thickness of approximately R 260 µm and L 275 µm (Figs. 1F and 1G). The specifications of the final scleral lenses dispensed (back optic zone radius, total diameter, sagittal height, and back vertex power) were 7.34 mm, 16.4 mm, 5.41 mm, and −9.50 D in the right eye and 6.50 mm, 18.2 mm, 6.40 mm, and −15.00 D in the left eye.

Ocular higher-order aberrations were also measured over a 4.5-mm pupil diameter before and during scleral lens wear as part of the contact lens assessment using the iTrace aberrometer (Tracey Technologies Corp, Houston, TX). Without refractive correction, considerable higher-order aberrations were noted: higher-order root-mean-squared (RMS) aberration: 1.252 in the right eye and 0.845 in the left eye, RMS coma: 0.600 in the right eye and 0.284 µm in the left eye, and RMS trefoil: 0.845 in the right eye and 0.503 µm in the left eye.

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Primary spherical aberration was 20.231 in the right eye and 20.063 mm in the left eye. There was a significant reduction in higher-order RMS aberrations after fitting the scleral lenses, by 20% in the right eye and 30% in the left eye with higher-order RMS aberrations: 1.099 in the right eye and 0.433 μm in the left eye, RMS coma: 0.424 in the right eye and 0.205 μm in the left eye, and RMS trefoil: 0.695 in the right eye and 0.349 μm in the left eye (Fig. 2). Primary spherical aberration during lens wear was 20.096 in the right eye and 20.054 μm in the left eye. After six months of scleral lens wear, the patient was asymptomatic with visual acuities of 20/30 in the right eye and 20/30 in the left eye.

DISCUSSION

This is the first case report to describe the use of scleral lenses in the visual rehabilitation of bilateral post-laser in situ keratomileusis (LASIK) ectasia with corneal hydrops. Scleral lenses significantly improved visual acuity because of a considerable reduction in both lower- and higher-order aberrations. In hydrops due to advanced keratoconus, Kreps et al.7 reported success with scleral lenses in 80% of eyes fitted 1 to 4 months after the hydrops, with 20% requiring surgical intervention because of suboptimal visual acuity with scleral lenses or persistent corneal edema. Scleral lens–wearing patients with compromised corneal endothelial function must be monitored regularly for clinically significant edema8 and should be fitted with a lens material of Dk 100 or greater without excessive fluid reservoir thickness to optimize oxygen delivery.9

The use of scleral lenses in the visual rehabilitation of corneal hydrops may delay the need for penetrating keratoplasty, as reported previously for patients with advanced keratoconus.5,10 Scleral lenses should be considered before a corneal graft since hydrops is a risk factor for endothelial graft rejection and reduced graft transparency in penetrating keratoplasty,11 and visual outcomes may be limited with DALK because of posterior-stromal scarring.12

In conclusion, this case report highlights the use of scleral lenses to improve visual acuity in the presence of irregular astigmatism, elevated higher-order aberrations, and central
corneal scarring after the resolution of bilateral corneal hydrops
due to post-LASIK ectasia, delaying the need for penetrating
keratoplasty.

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