Ampleye Scleral Lens Fitting in Keratoconus: A Case in Clinical Efficiency

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Abstract:

An established scleral lens wearer with keratoconus presented for initial Ampleye scleral fitting. Initial changes of power modification and central vault reduction yielded residual intermediate/distance blur. Further customization of additional central vault decrease, increased limbal clearance, and edge lifting in the scleral landing zone delivered optimal vision and comfort within only 2 visits. Visual acuity was greatly improved in the Ampleye scleral lens compared to both uncorrected and spectacle-corrected vision. This case illustrates Ampleye's customizable four-zone design (central vault, peripheral cornea, limbal lift, scleral landing), enabling rapid refinement of fit and vision with minimal trial iterations. Scleral lenses consistently improve keratoconic visual acuity and quality of life; further, the Ampleye system streamlines fitting and reduces follow-ups.

Introduction:

Keratoconus is a progressive ectasia of the cornea characterized by stromal thinning and irregular corneal steepening. The irregularity of the corneal surface results in higher irregular astigmatism, higher order aberrations, and reduced visual acuity. Spectacle correction often becomes insufficient as the disease advances, and even wearers of corneal rigid gas permeable lenses remain visually impaired due to poor lens tolerance and residual irregular optics. These factors show why scleral lenses have become the mainstay of treatment in managing keratoconus. Scleral lenses vault over the irregular cornea and provide a new, smooth refracting surface for the eye that substantially improves visual acuity and comfort.

Although scleral lenses offer dramatic improvements in vision, the fitting process can be time-consuming. Research shows that most patients require 2-6 visits and multiple lens trials before achieving an optimal fit and vision. This fitting burden emphasizes the need for lens designs that streamline customization and reduce the number of follow-ups. The Ampleye scleral lens incorporates a four-zone “Spline Science” design that allows independent adjustment of the central vault, limbal clearance, peripheral corneal alignment, and scleral landing zone. Additional features include toric haptics, quadrant-specific control, multifocal and front toric options, along with microvaults for scleral irregularities. This high degree of adjustability enables practitioners to refine scleral lens fits efficiently without repeated full lens re-designs.

The following case demonstrates how a long-time scleral lens wearer with keratoconus achieved best-corrected acuity of 20/30 with only two visits and minimal targeted lens modifications. This outcome illustrates both the necessity of scleral correction for keratoconus and the clinical efficiency afforded by the Ampleye system.

Case Presentation:

Initial Comprehensive Examination

38 y/o female with Keratoconus presents for comprehensive examination and scleral lens fitting. Patient has long h/o scleral lens wear. Patient denied any visual or ocular complaints at this examination.

Uncorrected VA:
OD 20/150
OS 20/150
OU 20/150

Manifest Refraction:
OD -1.00 -0.50 x 015
DVA 20/80
OS -0.75 -0.25 x 166
DVA 20/80

Slit Lamp Examination

	OD	OS
External	Normal	Normal
Lids/Lashes	Normal, no pathology	Normal, no pathology
Conjunctiva/Sclera	White and Quiet	White and Quiet
Cornea	Stromal thinning and haze noted	Stromal thinning and haze noted
Anterior Chamber	Deep and Quiet	Deep and Quiet
Iris	Normal, round and reactive	Normal, round and reactive
Lens	Clear	Clear
Anterior Vitreous	Clear	Clear

Dilated Fundus Examination

	OD	OS
Posterior Vitreous	Clear and fully attached	Clear and fully attached
Optic Disc	0.50H/0.50V Pink and healthy, distinct 360	0.50H/0.50V Pink and healthy, distinct 360
Macula	Flat, even pigment	Flat, even pigment
Vessels	AV 2/3; normal course	A/V 2/3; normal course
Periphery	Intact 360 ; no pathology	Intact 360 ; no pathology

<u>Contact Lens information:</u>
Ampleye Scleral Lens OD:
Sagittal depth 4600 um
Base curve 8.04 mm
Center thickness 0.30 mm
OAD 16.5 mm
Power -6.00
Over-Refraction: +6.50

OS:
Sagittal depth 4600 um
Base curve 8.04 mm
Center thickness 0.30 mm
OAD 16.5 mm
Power -6.00
Over-Refraction: +5.50 D

Plan:
OD – decrease central vault 200 um; change power to +1.75 DS
OS – decrease central vault 400 um; change power to +0.75 DS

Scleral Lens Follow-Up 1
Patient presents for 1 week scleral follow-up after new lenses dispensed. Complains of slightly blurry/ghosting of vision at intermediate and distance. Reports good comfort and near vision.

No changes to slit lamp findings.

Contact Lens information:

Ampleye Scleral Lens
OD:
Sagittal depth 4600 um
Base curve 8.04 mm
Center thickness 0.30 mm
OAD 16.5 mm
Power +1.75 DS
Over-Refraction: plano -1.00 x 085; DVA 20/30 OU

OS:
Sagittal depth 4600 um
Base curve 8.04 mm
Center thickness 0.30 mm
OAD 16.5 mm
Power +0.75 DS
Over-Refraction: plano -1.00 x 088; DVA 20/30 OU

Plan:
OD – decrease central vault 50 um; increase clearance in the limbal zone by 2 steps; lift the edge in the scleral landing zone by 1 step; change power to +1.75 -1.00 x 175
OS – decrease central vault 50 um; increase clearance in the limbal zone by 2 steps; lift the edge in the scleral landing zone by 1 step; change power to +0.75 -1.00 x 028

These changes were made due to limbal blanching seen on slit lamp evaluation of the lenses. By increasing limbal clearance and edge lift, the mechanical pressure and suction of the lens on the landing zone will be decreased, thereby improving limbal perfusion and minimizing vascular compression.

Scleral Lens Follow-Up 2
Patient presents for 2 week scleral lens pick-up and check. No new ocular/visual complaints.

No changes to slit lamp findings.

Contact Lens information:

Ampleye Scleral Lens
OD:
Sagittal depth 4600 um
Base curve 8.04 mm
Center thickness 0.30 mm
OAD 16.5 mm
Power +1.75 -1.00 x 175
Over-Refraction: plano; DVA 20/30 OU

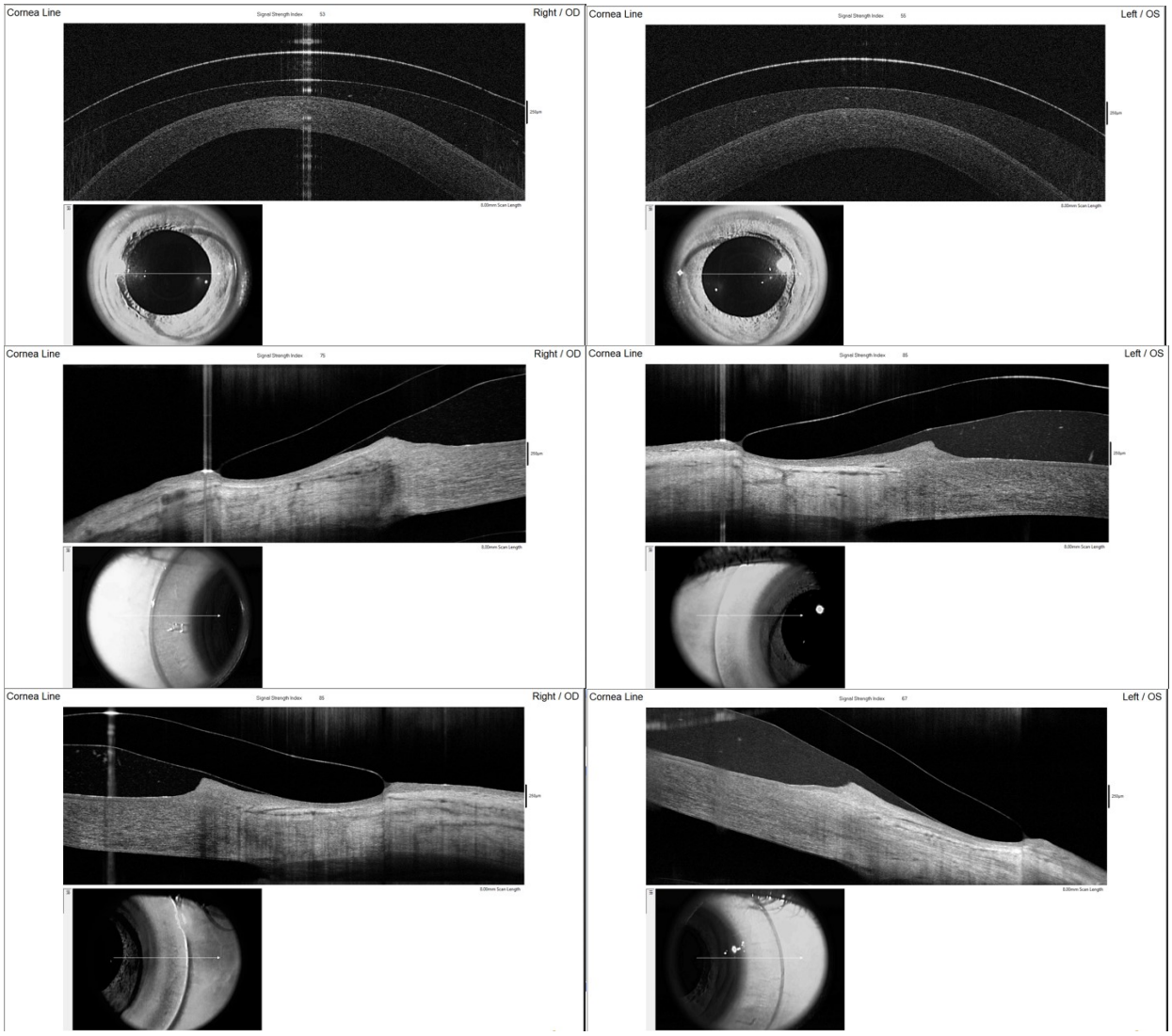
OS:
Sagittal depth 4400 um
Base curve 8.04 mm
Center thickness 0.30 mm
OAD 16.5 mm
Power +0.75 -1.00 x 028
Over-Refraction: plano; DVA 20/30 OU

Slit lamp evaluation of the lenses revealed adequate central and limbal clearance, no signs of limbal blanching or impingement, and sufficient lens wetting.

Plan:
No design or power modifications necessary.

Anterior Segment OCT:

OD OS



Anterior Segment OCT evaluation shows the finalized scleral lens fitting relationship with adequate central clearance, limbal clearance, and edge fit of both eyes. Note that the shadowing seen in the central clearance images is an artifact from the OCT rather than a central bubble under the lens. This is confirmed by assessing the cross-sectional images where there is no bubble seen.

Discussion/Conclusion:

Scleral lens fitting often requires multiple visits and trial iterations before achieving an optimal outcome. Studies have shown an average of 2-6 visits with approximately 4 trial lenses. The patient in this case was able to achieve a satisfactory fit in just 2 visits with 2 separate adjustments. Given that most scleral lens fits require substantially more visits and adjustments, the ability to finalize a keratoconic fit with minimal adjustments highlights the clinical efficacy of Ampleye. For both practitioners and patients, this translates into less chair time, lower cost, and faster access to stable vision.

Equally important are the visual gains demonstrated in this case. The patient's uncorrected acuity was 20/150, improving to 20/80 with spectacles, and reaching 20/30 with the final Ampleye scleral lenses. This progression highlights how scleral correction provides the best visual rehabilitation in keratoconus, outperforming spectacles by neutralizing irregular astigmatism and higher-order aberrations. Achieving this outcome efficiently in fewer visits than the averages reported in the literature reinforces the practical advantages of modern customizable lens designs like Ampleye.

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