GSLS 2024 Rapid Fire Poster Session

Moderators: Pat Caroline; Eef van der Worp, BOptom, PhD

Speakers: Javier Rojas-Viñuela, OD, MSc.; Simmy Chaudhary, MBBS, MS, Fellowship (Cornea and Anterior segment); Calisandra Larson, OD; Mark Bullimore, PhD, MCOptom; Nina Wang,OD; Becky Su, OD; Jina Chong, OD; Jimmy Sung Hei Tse, MSc in Optometry, BSc (Hons) Optom; Sheila Morrison, OD

Outline:

OC-SAG values in 360 degrees

Purpose: To analyze the differences of ocular sagittal height values in different meridians and in 360 degrees with a profilometer based ocular surface topographer, and to compare this to historical data with optical coherence tomography (OCT) based data measuring the ocular surface over the same chord diameters.

Methods: OC-SAG values of 50 right eyes of healthy patients were obtained using profilometry (ESP, Eye Surface Profiler, Eaglet Eye, The Netherlands). Values of OC-SAG were automatically obtained for 15 mm and 12.8 mm chord diameters in 360-degrees around the clock in 1-degree steps. Absolute differences between the horizontal, vertical, and mean values were obtained and compared to a historical databased with manual measurements with optical coherence tomography (Zeiss Visante AS-OCT) in another group of 39 healthy patients.5 A three-dimensional model of mean OC-SAG values in the 360 degrees was also built and compared with the two methods (ESP and AS-OCT).

Results: Absolute differences in OC-SAG at 15 mm chord diameter between the horizontal and vertical meridians were 103±92 μm (range 0-430 μm) with the current automated profilometry method. The historical manual method based on AS-OCT showed a 109±79 μm (range 0-255 μm). If compared to the mean value in 360-degrees, then the absolute differences with the horizontal meridian were 58±52μm (range 0-260 μm) with profilometry and 79±49 μm (range 8-190 μm) with AS-OCT. The mean maximum difference between any two meridians on the ocular surface was 171±90 μm (range 40-450 μm) using the profilometer. With the AS-OCT it was 227±74 μm (range 90-390 μm). The mean profilometry values found where on average 106 μm lower than the OCT values. Three-dimensional models were also very similar, both showing a less elevated nasal area, a bit deeper superior and inferior area and the deepest OC-SAG values at the temporal side.

Conclusion: Different meridians on the ocular surface show different OC-SAG values, which may affect soft lens behavior on-eye. By measuring the H-OC-SAG only, the differences are not substantial, and may potentially prove to be clinically less significant (as the overall OC-SAG value is typically in the 3500-4000 µm range), but this needs further investigation.

Impact of Symblepharon Management on Scleral Lens Fitting in Eyes with Chronic Cicatrizing Conjunctivitis and Keratopathy

Purpose: To describe the importance of symblepharon release with ocular surface reconstruction (OSR) for optimal fitting of scleral contact lenses (SCL) in eyes with chronic cicatrizing conjunctivitis (CCC) and keratopathy.

Methods: This retrospective study included 32 eyes of CCC and visually significant keratopathy with symblepharon which underwent symblepharon release with OSR and were fitted with SCL. The primary outcome measure was the improvement in best corrected visual acuity (BCVA) with SCL wear.

Results: A total of 32 eyes of 29 patients (66% males) with a median age of 30.5 years were included. The common causes of CCC were Stevens-Johnson syndrome (66%) and ocular burns (16%). The most common location of symblepharon was superior (59%) with limbal involvement in most eyes (94%). Symblepharon release was combined with either mucous membrane grafting (MMG, 63%), amniotic membrane grafting (AMG, 31%) or conjunctival autografting (CAG, 6%) for the reconstruction of ocular surface. The median interval between surgical management of symblepharon and SCL trial was 15 weeks [interquartile range (IQR): 6-24]. The median BCVA improved from logMAR 1.5 (IQR: 1.2-1.8) to logMAR 1.2 (IQR: 0.6-1.4) with SCL after the symblepharon release ($p<0.001$). The median diameter of the SCL used was 15 mm (IQR: 15-16) with a median base curve of 7.9 mm (IQR: 7.9-8). Symblepharon recurrence was noted in 70% of eyes that underwent AMG; no recurrence was seen with MMG or CAG.

Conclusion: In eyes with CCC with advanced corneal scarring and symblepharon, visual rehabilitation is possible with SCL after surgically managing the symblepharon without having to resort to a penetrating corneal procedure.

Welcome to the Hybrid Club: Fitting Hybrid Lenses on Eyes with Keratoprosthesis

Background:When trauma, infection, disease or chemical injury opacifies the cornea, a cornea transplant can restore sight. However, if graft failure occurs and a repeat graft is not an option, the patient may once again be blind unless a different approach is utilized. The transplantation of an artificial transparent cornea, known as a keratoprosthesis or KPro, may be indicated.

Case Description: A 38 year old female with Type 1 diabetes mellitus suffered an ocular globe injury at age 11 in the left eye. Subsequent scarring led to a left eye penetrating keratoplasty and cataract extraction with intraocular lens implantation in 2017. Following recovery, the patient was successfully fit with a corneal GP OS and underwent SMILE OD. Six years later, graft failure and chronic angle-closure glaucoma led to another procedure in the left eye: KPro with IOL removal, pars plana vitrectomy, Ahmed valved glaucoma drainage device implantation with overlying corneal patch. The patient wore a Kontur 16.0/ 8.9 soft bandage lens with well-centered fit, appropriate movement, and good retention although the lens was in close proximity to the Ahmed shunt. A few months later, the patient contracted staph-cultured endophthalmitis in her left eye which was treated successfully with vitrectomy and fortified antibiotics. After resolution of endophthalmitis, the patient was unhappy with visual quality and the diameter of the Kontur lens required for lid retention overlapped slightly with the glaucoma drainage device implanted superiorly. Over-refraction failed to improve patient vision better than 20/40 OS. Thus, after consultation with the patient's corneal specialist, the patient was refit into a Ultrahealth FC hybrid lens design. Parameters of the finalized lens include BC 8.1, power +0.50 DS, vault 55, diameter 14.5mm. She was able to improve vision to 20/25 and had marked subjective improvement in comfortable binocular viewing. One month later, the hybrid lens demonstrates good fit, good patient comfort, and is free of debris.

Conclusion:The use of extended-wear soft bandage contact lenses, while not without risks, are advocated by most as a method to prevent corneal desiccation and the subsequent tissue melting. In cases with poor soft bandage lens retention, repeated vision-impeding lens deposit build-up, or poor visual quality a hybrid lens should be considered.

The Relation Between Overnight Orthokeratology Lens Decentration and Axial Elongation

Purpose: Natural decentration of up to 1 mm of both rigid and soft lenses is common. The same is true of overnight orthokeratology lenses, in spite of their reverse geometry back surface design. This paper comprehensively reviews data from published studies of the relation between Euclid Emerald lens decentration and axial elongation.

Methods: A comprehensive systematic search was performed in March 2023 using Medline, EMBase, and Google Scholar with the following search terms: orthokeratology AND myopi* AND (axial or elong*) NOT (review or meta).

Results: Of the 526 articles screened, 40 included axial elongation data for children fitted with the Euclid Emerald design, with seven examining the relation between lens decentration and elongation. The seven studies report data on 1,484 patients, with all

but one being one year studies and all but one retrospective. All calculated decentration from corneal topography maps referenced to the pupil center. Mean reported lens decentration ranged from 0.52 to 0.84 mm. When reported (n = 5), most lenses decentered in the inferotemporal direction, accounting for between 51% and 67% of cases. All seven studies report that increased lens decentration was associated with slower axial elongation. When reported (n = 4), the correlation between decentration and elongation was between –0.23 and –0.29.

Conclusions: While overnight orthokeratology lens decentration has the potential to influence vision, it is consistently associated with the slower axial elongation in myopic children.

Customizing Multifocal Scleral Lenses Into a Myopia Treatment Option

Background: A 14 year old female started myopia management treatment at the clinic when she was 7 years old. Her baseline refraction was -2.25-1.00x175 in the right eye and -2.75-0.75x10 in the left eye. Over the years she has tried multifocal soft lenses, orthokeratology, and multifocal RGP lenses all designed to slow the progression of her myopia. Over the years the patient has struggled to wear her lenses due to either comfort or reduced vision. Earlier this year, the patient was successfully fit into multifocal scleral lenses in an effort to continue to reduce her myopia progression. She reports optimal distance vision and comfort. At the most recent encounter in September, the patient showed an increase in her myopia progression, leading us to make changes to her lenses and atropine concentration.

Case Description: Starting earlier this year in February, she was fitted into a distance centered multifocal scleral lens design with a 2.0 mm center zone and +2.00 add. Her prescription in the right eye is -4.50-4.00x008 and the left eye is -5.25-3.50x005. Patient was satisfied with the comfort and vision in her scleral lenses. In addition to the scleral lenses, she was also on 0.05% atropine qhs OU. At her most recent follow-up in September, her axial length has increased 0.10 mm OD and 0.35 mm OS over the course of 6 months, even though she was seeing 20/20 OU. Since her axial lengths were progressing rapidly, lenses were ordered with an add power of +3.00 and an increase in the atropine concentration of 0.1%. Patient is being monitored monthly to check vision, axial lengths, and her adaptation to the increase in peripheral plus and pupillary dilation.

Conclusion: There are several advantages of using scleral lenses over the other treatment options for myopia management. Scleral lenses can be more comfortable, have good optics, protect the cornea, and may better compensate for high corneal astigmatism. In addition to improving the comfort and distance vision for the patient,

fitting her in scleral lenses allows her to be monitored for keratoconus. For patients who have failed the other myopia management treatment options because of vision and comfort, multifocal scleral lenses can be the next best option. It is important that the patient receives proper training on scleral lenses and consistent monitoring for myopia management. Scleral lenses are customizable lenses that can be modified to achieve myopia treatment and for better myopia control effect.

Split Prism Wavefront Guided Scleral Lenses to Resolve Vertical Diplopia and Improve Aniseikonia-like Symptoms

Background: Wavefront-guided scleral lenses (wfgSLs) can lead to improvements in visual acuity (VA) and reduce residual higher-order aberrations (HOAs). This case report discusses the use of prism-incorporated wfgSLs (pwfgSL) to resolve vertical diplopia and aniseikonia-like symptoms.

Case Report: A 56-year-old male with myopia and a right hypertropia secondary to a scleral buckle after repair of a retinal detachment reported a distinct imbalance between the two eyes and experienced an aniseikonia-like “coke-bottle” visual distortion in the right eye with prism-incorporated spectacles.

He was fit with a prism-incorporated scleral lens (pSL) (EyeFitPro, EyePrint Prosthetics, Lakewood, CO) with 4pd of vertical prism split between both eyes for distance correction only. After the tSL was finalized, he was 20/20-2 OD and 20/20 OS, with a resolution of double vision, but minimal improvement to aniseikonia-like symptoms. Subsequent aberrometry over the pSL revealed a total higher-order root mean square (HORMS) of 0.72μm OD and 0.13μm OS.

A pwfgSL was created for the right eye only, using a comprehensive system (Ovitz, xWave, Rochester NY) that included a dot matrix on the pSL and a wavefront aberrometer with iris and dot registration with direct data transfer. Best contact lens visual acuity (BCLVA), and total higher-order root mean square (HORMS) was measured. Data was collected after 2 weeks of lens wear and a minimum of 3 hours of wear prior to examination.

BCLVA with the pwfgSL in the right eye was 20/20, and the left eye was stable, with 20/20 in the pSL. HORMS in the right eye was 0.30μm, a 58% reduction in HOAs relative to the pSL. The patient reported a significant improvement in the aniseikonia-like symptoms with visual quality more balanced between the two eyes.

Conclusions: The implementation of pwfgSLs is effective in managing both diplopia and aniseikonia-like symptoms.

Sweet dreams dry eyes, a case of overnight scleral lens wear

Background: Treatments for dry eye have become increasingly important in practice. Dry eyes can be caused by a number of systemic conditions. Graft versus host disease (GVHD) has ocular involvement that affects the cornea, conjunctiva, meibomian glands, lacrimal glands and eyelids. We present a case of corneal rehabilitation of a patient with GVHD using overnight scleral lenses.

Case description: PV is a 33 year old male with a history of radiation therapy for leukemia. He had an extensive history of mixed aqueous deficient and evaporative dry eye and exposure keratopathy due to nocturnal lagophthalmos. PV underwent extensive dry eye treatments but found no relief. PV was initially fitted for daily wear scleral lenses and had good relief during the day time, however he experienced repeated overnight corneal erosions post-lens removal. As a result, therapeutic overnight scleral lens wear was initiated in June 2023. He was instructed to cycle between two different pairs of scleral lenses and replace the reservoir every 12 hours.

PV had best corrected VAs of 20/20 OU with the scleral lenses. He tried different intervals of overnight lens wear and was followed closely during the overnight treatment. He wore the lenses overnight almost daily for a month with weekly follow ups and demonstrated improvement of epithelial integrity. PV noted that his dry eyes had significantly improved since starting the scleral lens wear both during day and night time. Overnight wear was tapered to three nights a week, but was not as successful as nightly wear. Despite the overall improved appearance of PV’s corneas, he was referred to a cornea specialist to determine if other treatments could alleviate his symptoms without relying solely on long-term overnight scleral lens wear.

The cornea specialist suspected PV had chronic ocular GVHD and recommended continuing with day time scleral lens wear. No other treatments were initiated as they expect the ocular surface to proceed to stabilize. PV will return in three months for ocular surface check.

Conclusion: Scleral lenses can be used to correct difficult refractive errors and rehabilitate the epithelium when traditional dry eye therapies are ineffective. While overnight lens wear is controversial, it can provide relief and a solution to concerns that were unmet with conventional treatments.

Innovating Optometric Education: A Comprehensive Approach to RGP Contact Lens Teaching and Learning.

Purpose: Optometry students acquire their rigid lens knowledge mainly through lectures and clinical practices. This heavily peer-dependent model lacks flexibility and limits the learning experiences of students as they can't try out an excessive number of lenses on a single subject's eye. Fitting simulation through corneal topographers could potentially reduce peer dependency, but discrepancies between simulated fitting and actual lens in-situ performance are often noted, due to factors like eyelid position and tension, blinking, and tear quality.

An interactive web-based rigid lens learning platform has been developed accordingly, allowing students to interactively explore the in-situ performance of an RGP lens with varying lens parameters, and learn from fitting advice offered by experienced contact lens practitioners.

Methods: Three healthy myopic eyes, with 1.06D, 3.20D, and 6.33D WTR corneal astigmatisms respectively were selected for fitting with RGP lenses of different designs and parameters. If spherical lenses fail to achieve an optimal fit, subjects will be fitted with bi-toric lenses. All fittings were documented using video and photography. These real-life dynamic and static fits were graded and commented by five experienced RGP practitioners, and this data was integrated into the platform.

To assess the platform's efficacy in improving students' learning compared to traditional teaching alone, two quizzes on lens-fitting grading using recorded videos were administered to students following didactic teaching, with and without platform use. Student feedback was also collected via questionnaires.

Results: A total of 126 dynamic fitting videos and 372 static fitting photos were incorporated into the platform. 26 students participated in the quizzes, and 65.4% of them improved their lens fitting grading accuracy upon platform use, with a mean 19.8±26.5% accuracy increase among all students ($P<0.05$). The evaluation was overwhelmingly positive; most of the students preferred the platform over conventional teaching alone and all of them felt the platform was valuable to their learning.

Conclusions: The developed platform is an effective tool in rigid lens teaching and will be demonstrated during the presentation sessions. This Open Educational Resource offers the versatility to be adapted as a useful RGP learning tool for other institutions.

Two curves is better than one: Management of post-refractive myopia with a novel custom-soft dual base curve lens design

Background: LASIK is a common corneal refractive surgery for myopia that can potentially regress post-operatively. Due to the nature of ablation, the resultant oblate-shaped cornea often leads to an unstable fit with conventional soft contact lenses, thus inadequate vision and discomfort. Additionally, other post-LASIK complications such as

dry eyes and post-refractive ectasia can render unique challenges to contact lens fitting options for patients who may be reluctant to return to vision correction after refractive surgery.

Post-surgical corneas are oblate with a flatter central curvature relative to peripheral curvature. Modern mass-produced soft contact lenses have a constant base curve that is prolate. Specialty lens modalities such as post-LASIK GP and scleral lenses incorporate oblate designs to better contour this corneal shape; however, these options require more adaptation to handling and comfort. A novel custom soft contact lens design has been augmented with a flatter central BC and steeper peripheral BC to provide a more optimal fit for individuals with post-refractive corneal shape while remaining in a more common contact lens modality.

Case Description: 35yo female; CC: regression to -1.0DS OU after LASIK, strong preference for soft lens wear

Contact Lens History:

- Conventional soft lenses with BC of 8.4, 8.6, 9.0; unstable fluctuating vision with blink, not stable on-eye

- Hybrid/scleral; difficulty with application and removal, non-tolerant to comfort compared to soft

- Custom soft (prolate) for irregular cornea; better than prior lenses but still fluctuates with blink

*note: 3 patient case series

A novel dual BC soft CL design was able to fit the cornea without excessive central clearance and land adequately in the periphery for acceptable lens movement. This provided an optimal fit that resulted in stable vision correction and all-day comfort.

Conclusion: Patients undergo refractive surgeries to seek freedom from spectacles; regression is not uncommon and many require the use of correction again down the road. Understanding a patient's corneal shape and how to customize soft contact lenses to better contour the unique eye can achieve an optimized contact lens fit. This novel custom soft, oblate, dual base curve lens design was successful for a post-refractive contact lens fittings and should be considered in the future. Offering a more personalized contact lens option can help satisfy the needs of our patients and enhance their quality of life.