OCULUS Pentacam®
Optometry Cases

OCULUS®

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Optometry / Ortho-K

Myopia management with Ortho-K

Kevin Chan OD, MS, FAAO

A 10-year-old boy was referred to us by his ophthalmologist for an initial myopia management consultation in October 2018. The ophthalmologist reported that his patient's myopia had become remarkably worse over the last year. His prior correction now only gave him a visual acuity of 20/25 in his right eye and 20/40 in his left eye. Further examination revealed that over the course of one year his myopia had worsened by - 0.5 D in his right eye and by - 0.75 D in his left eye. His current lens power was - 4.25 D on the right and - 4.75 D on the left. Clinical analysis yielded an indication for Ortho-K lenses for managing his myopia.

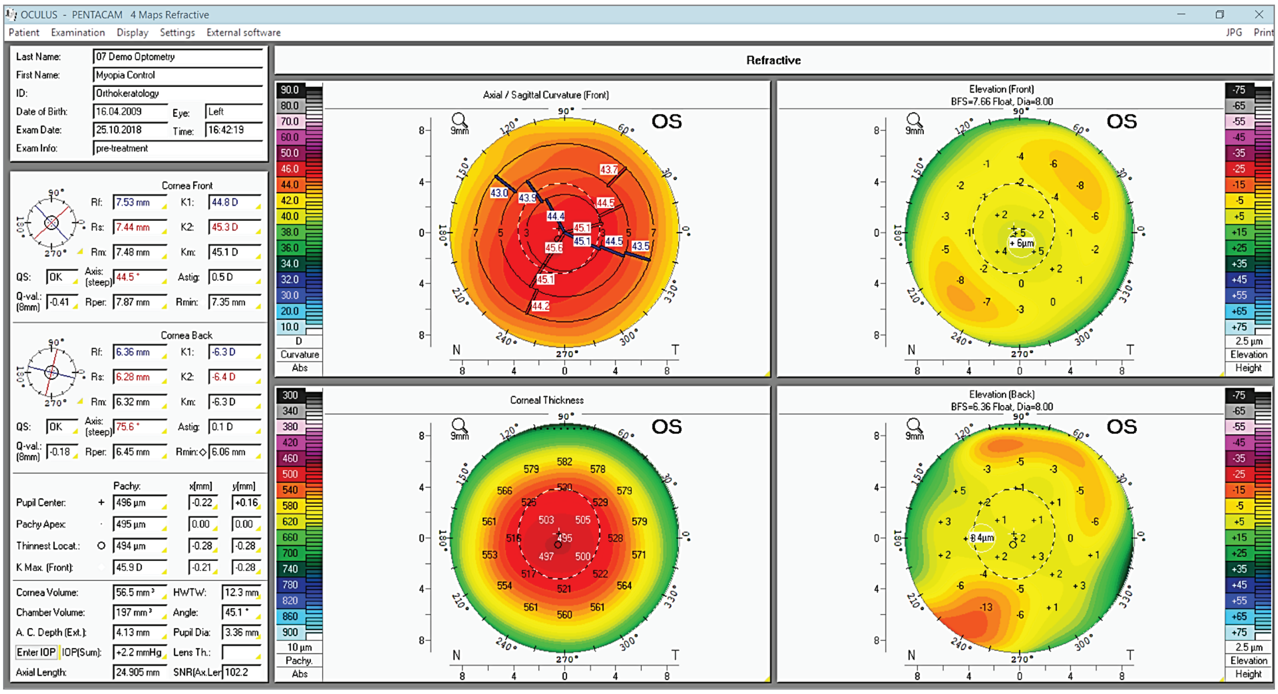

Figure 1: The Pentacam® "4 Maps Refractive" display provides 4 types of corneal topography analysis as a basis for identifying candidates for Ortho-K lenses: axial / sagittal curvature of the anterior surface, elevation data (anterior surface), corneal thickness, elevation data (posterior surface).

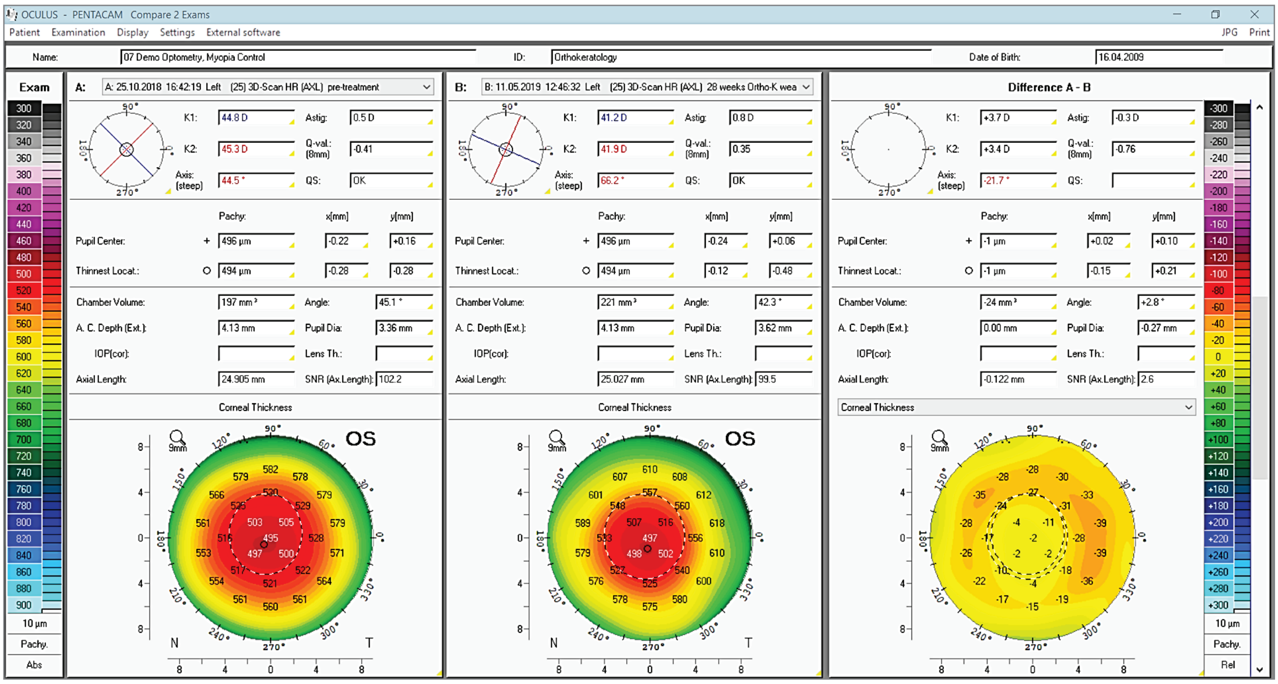

Figure 2: The Pentacam® "Compare 2 Exams" display provides an analysis comparing the topography before and after Ortho-K lens fitting with an intervening period of 6 months.

Optometry / Myopia Management

Myopia management with atropine

Kevin Chan OD, MS, FAAO

A 6-year-old girl failed her school vision screening test. At the time of her first eye examination at an ophthalmologist one year earlier neither she nor her parents had been aware of her having any vision problems. She was referred to our clinic with a diagnosis of myopia and scheduled for counselling on myopia management. Her uncorrected visual acuity was 20/70 in both eyes. Her first prescription for corrective lenses, to be worn as spectacles throughout the day, gave her a visual acuity of 20/20 in both eyes.

Taking her clinical data into account she was initially treated with a low dose of atropine, given at 0.01% concentration, every evening before going to bed. This served as a pharmacological adjunct to her lens prescription in managing her myopia. Over a treatment course of six months we obtained accurate, reproducible axial length data from Pentacam® scans which indicated a steady progression. These scans provided us with very useful guidance in modifying the treatment by increasing the atropine dose to 0.02%. Since then the progression of axial length has stopped in both eyes, and she has been doing well with her myopia management regime.

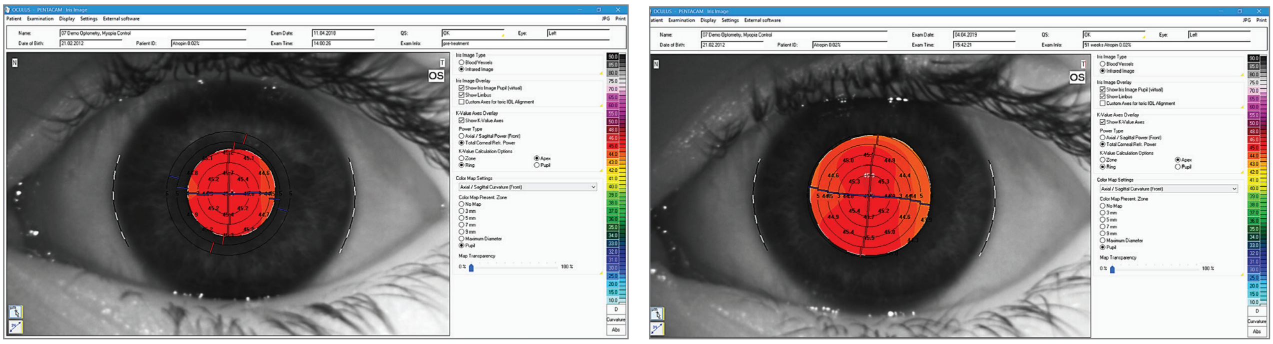

Figure 3: The Pentacam® "Iris Image" display shows the pupil size before and after treatment with atropine. Before the start of treatment the pupil diameter was 2.31 mm (left image) and after one year it was 4.08 mm (right image).

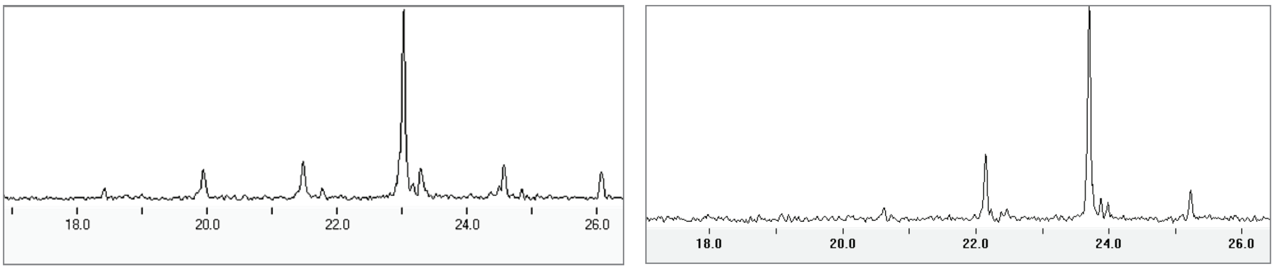

Figure 4: Section from the Pentacam® "AXL-Scan" display showing a quantitative comparison between axial length before the start of treatment, at 23.03 mm (right image), and after one year of atropine treatment, at 23.71 mm (left image).

Optometry / Scleral Lenses

Fitting of WAVE CAD scleral lenses in PMD (pellucid marginal degeneration) using the Pentacam® CSP Reports

Dr. David Grosswald und Dr. Brian Healey

A 58-year-old female presented for a comprehensive eye examination. She had received a diagnosis of PMD 25 years earlier.

In other contact lens practices she had repeatedly been told that contact lenses were not suitable for her. Her current spectacles were 15 years old, but she rarely wore them because, as she said, "the world looks warped with my spectacles on".

Spectacle glasses	OD sph. +2.0	cyl. -4.0 axis 83°	far visual acuity 20/50	near visual acuity 20/70	
	OS sph. +1.5	cyl. -6.0 axis 108°	far visual acuity 20/70	near visual acuity 20/70	
Manifest refraction	OD sph. +4.0	cyl. -7.0 axis 83°	add. 2.0	far visual acuity 20/25	
	OS sph. +3.5	cyl. -7.25 axis 115°	add. 2.0	far visual acuity 20/25	

She reported that she hadn't updated her spectacles for a long time because they always made her feel dizzy.

The elevation data displays showed the following picture:

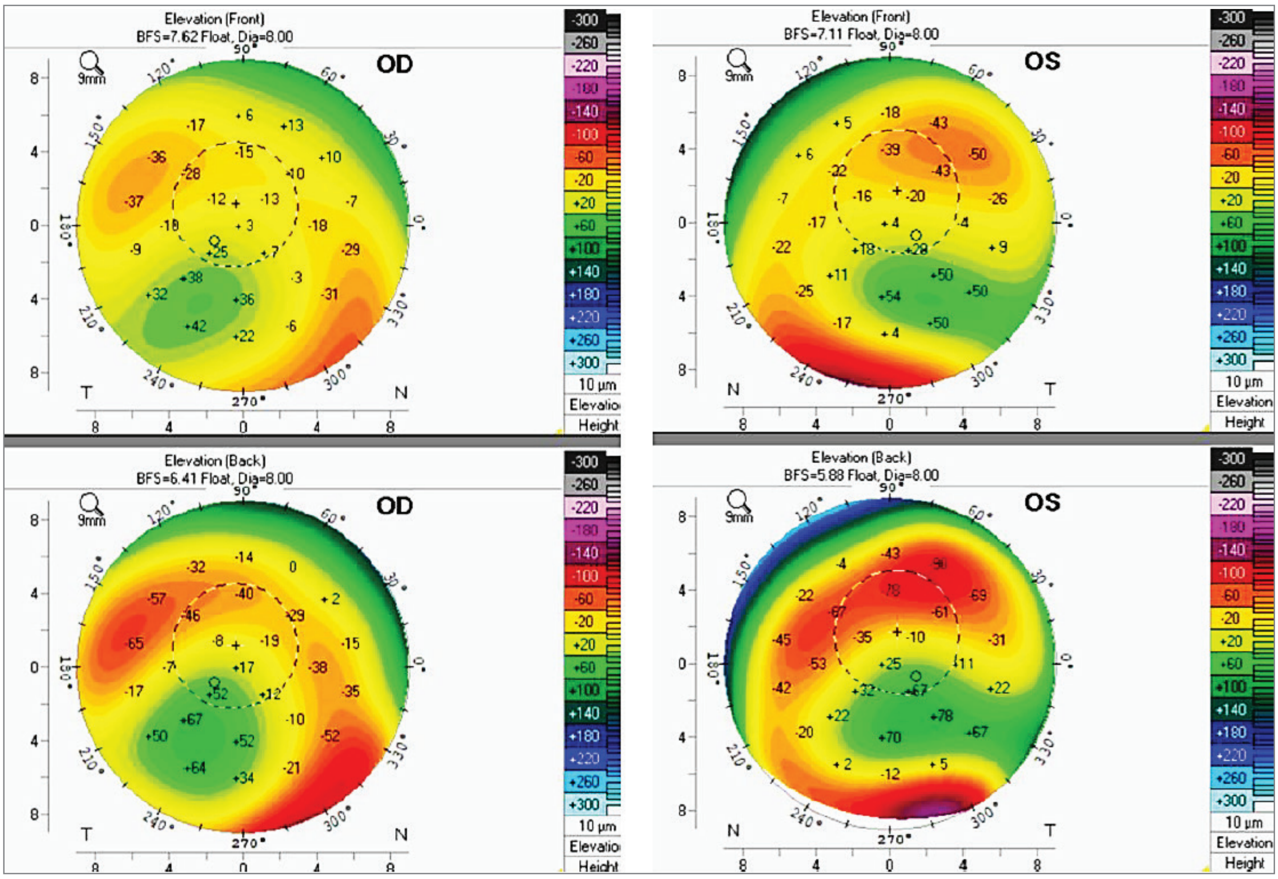

Figure 5: Elevation maps of the anterior and posterior corneal surface of the right and left eye

The examination was unremarkable except for the corneal topography, which showed pellucid marginal degeneration in both eyes (Figures 6 and 7).

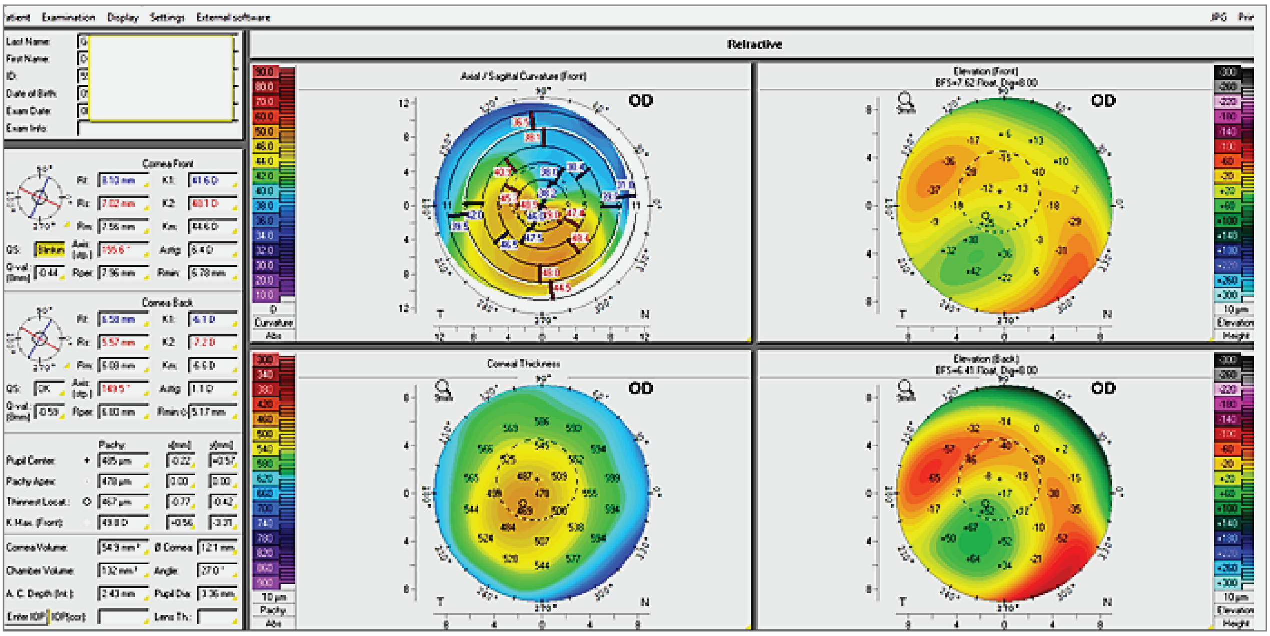

Figure 6: "4 Maps Refractive" display for the right eye showing anterior surface curvature, elevation data and pachymetry

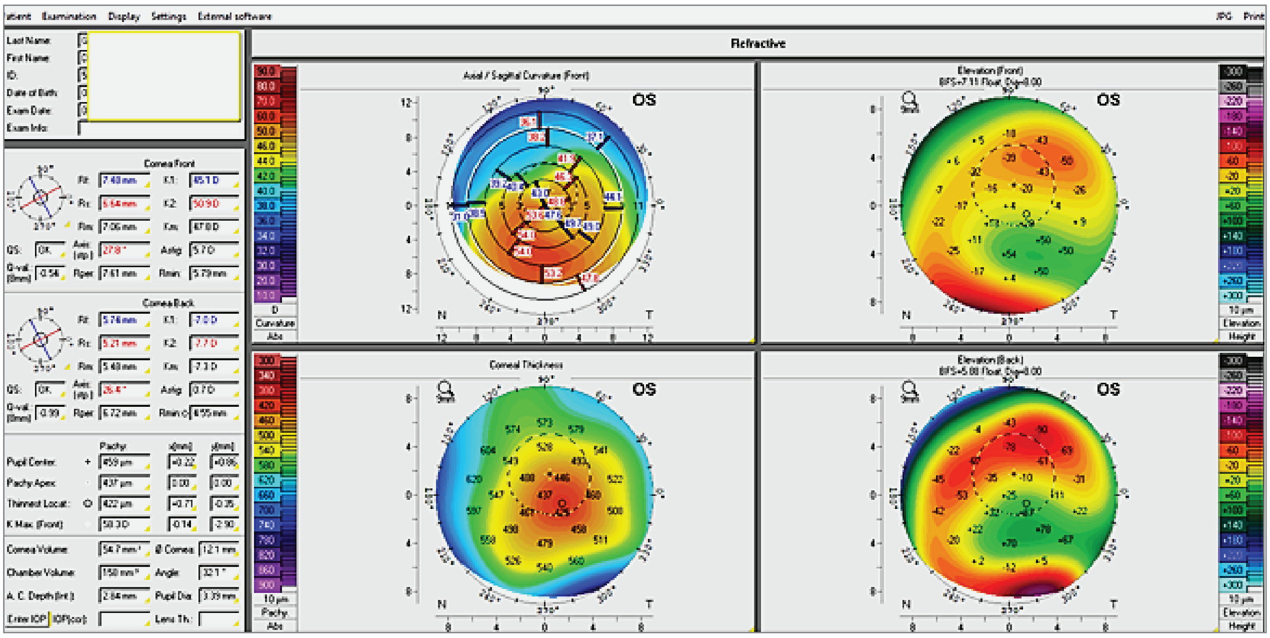

Figure 7: "4 Maps Refractive" display for the left eye showing anterior surface curvature, elevation data and pachymetry

Various options for improving her visual acuity were discussed: progressive spectacle lenses combined with "Shaw" contact lenses in order to improve her aniseikonia symptoms, rigid corneal or multifocal or monofocal scleral lenses.

She had had to care for her special needs child until recently and was now working full-time as a teacher again, where visual tasks posed a challenge to her.

Fitting her with Wave scleral lenses based on the Pentacam® CSP Report was indicated because of her spectacle intolerance and her asymmetric cornea and sclera (see Figure 8).

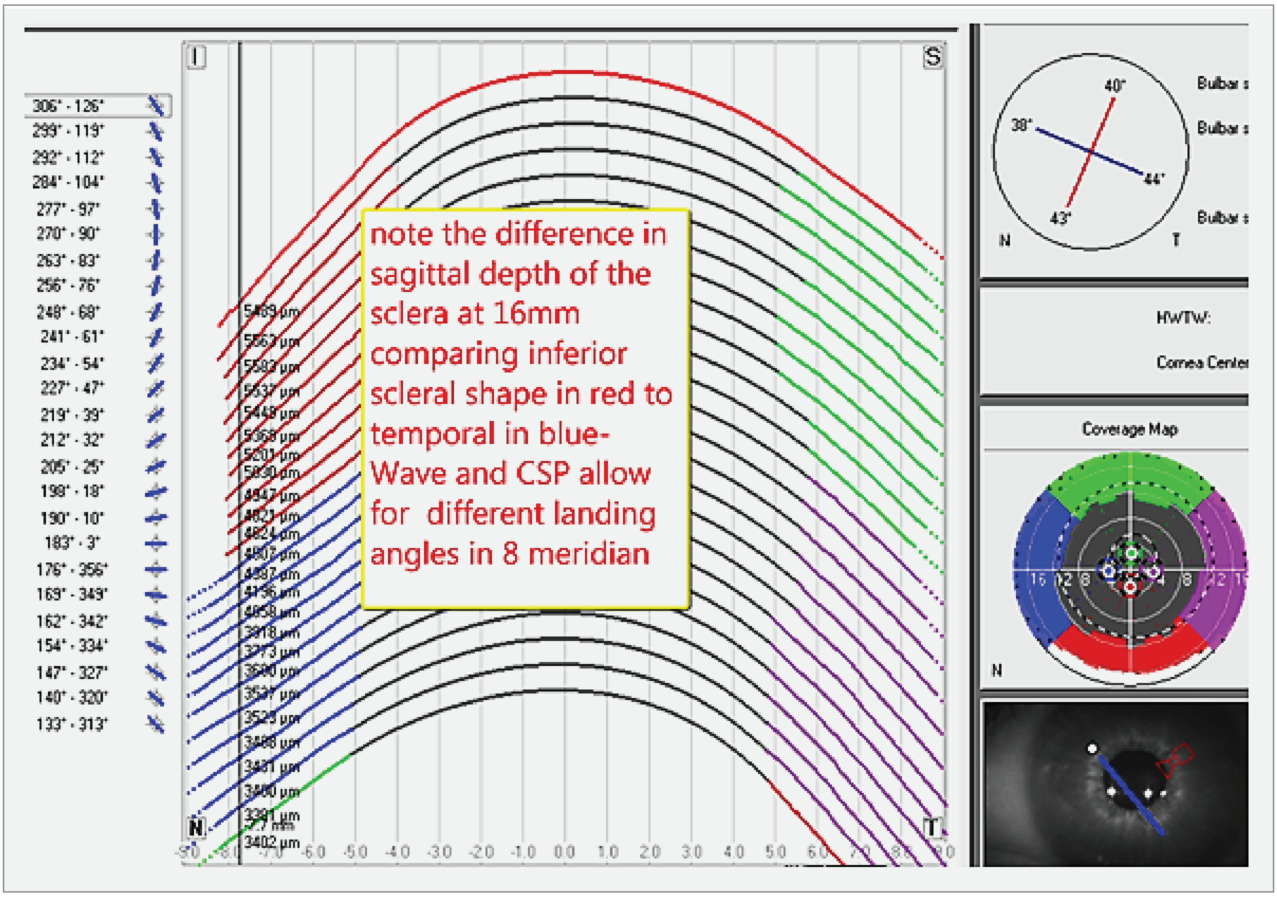

Figure 8: The corneoscleral profile generated by the Pentacam® software

She was fitted with monovision contact lenses designed using the Wave software, with her non-dominant left eye corrected for near vision. The choice of material fell on Optimum Extreme on account of its high centre thickness, and Hydra-peg was used for improved wetting of the contact lens surface.

The patient was immediately delighted by the good visual acuity and wearing comfort of her new lenses. She was instructed on contact lens handling and care and scheduled for a follow-up appointment 2 weeks later. At follow-up she had been wearing her lenses 11 hours every day, and the central vault was approximately 250 microns. No conjunctival or corneal changes were found. She reported excellent wearing comfort and a significant improvement of her visual acuity. This was found to be 20/20 for far vision on the right and 20/40 for far vision and 20/25 for near vision on the left. The right eye showed no residual error, and she requested another +0.5 D for her left eye to help her with her reading. Her satisfaction also revived her confidence to the point that she now wanted to try progressive spectacle glasses!

Combining the CSP profile with the Wave software for contact lenses opens up possibilities for complex solutions in both contact and scleral lens fitting. The resulting lens fit is excellent, allowing front-surface toric or multifocal designs, for example. This case demonstrates that even patients with complex prescriptions and asymmetric corneal and scleral geometries can be provided with reasonably priced vision correction for a modest investment in consultation time.

Optometry / Contact Lenses

Toric peripheral scleral lenses

Christine W. Sindt, OD, FAAO

This young female athlete requested scleral lenses to help her improve her performance. Soft contact lenses gave her poor vision, and she couldn't tolerate the feeling of wearing rigid contact lenses. Scleral lenses left a reddened eyeball with a ring-shaped impression after removal.

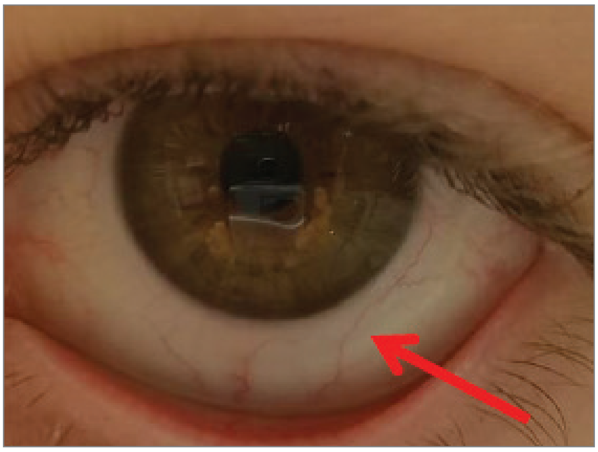

Figure 9: Ring-shaped impression after removing a peripherally spherical lens

Der Pentacam® CSP Report showed a significant scleral astigmatism against the rule.

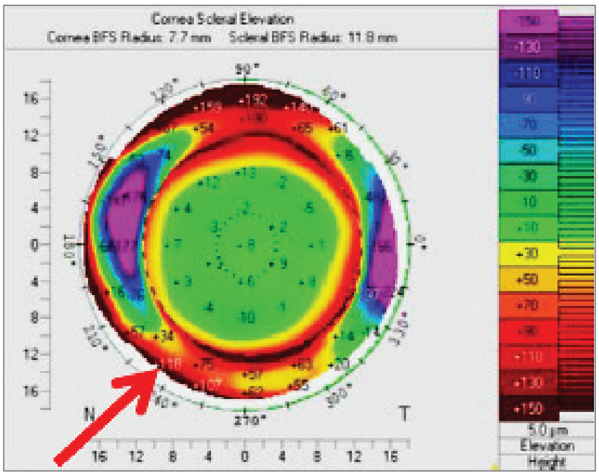

Figure 10: On this elevation map the flattest or highest deviation appears red, while the steepest or lowest deviation appears violet.

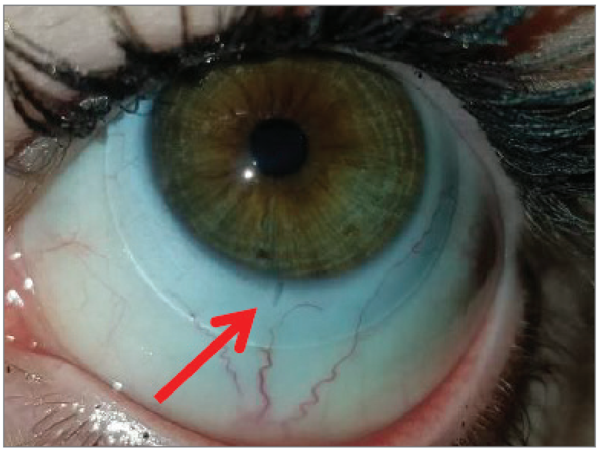

Figure 11: Eye fitted with a peripherally toric scleral lens

Optometry / Contact Lenses

Scleral lenses in keratoconus

Christine W. Sindt, OD, FAAO

A 16-year-old boy presented with manifest keratoconus. Coming to the consulting hours in the clinic was difficult for this very active student and his parents. To speed up the fitting process, it was decided to perform measurements with the Pentacam® CSP Scan and design scleral lenses with the EyePrintPRO® software. The lens design and the optical zone were determined based on the horizontal and vertical measures of the iris, and the elevation data of the CSP Report were used to determine the landing zone of the lens. The scleral sagittal elevation data revealed a torus of remarkable asymmetry (see Figure 12).

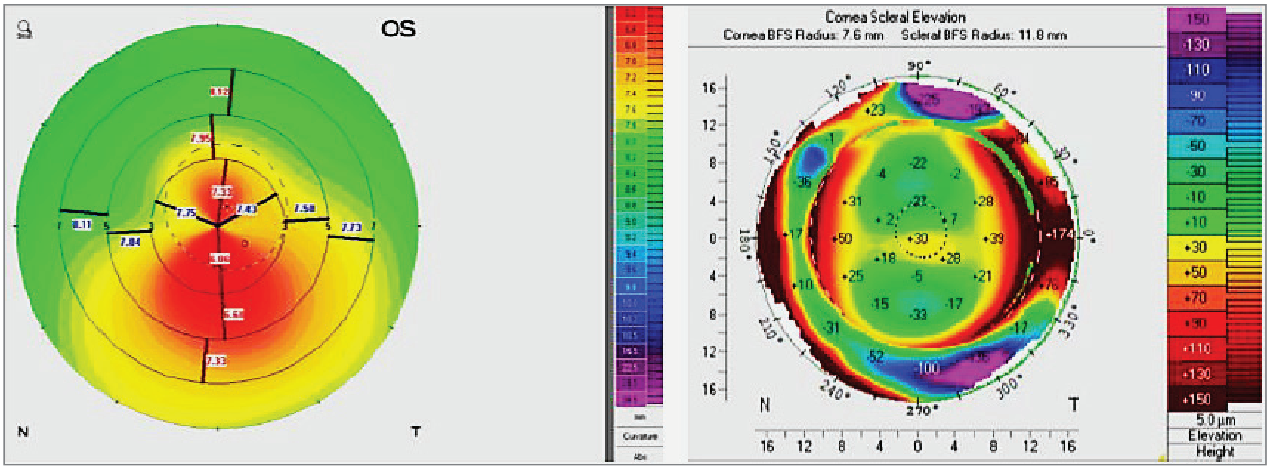

Figure 12: Sagittal radii of curvature of a left keratoconic eye and elevation data from the CSP profile

The first lens to be tried gave a good fit through 360° and provided a good vault (see Figure 13).

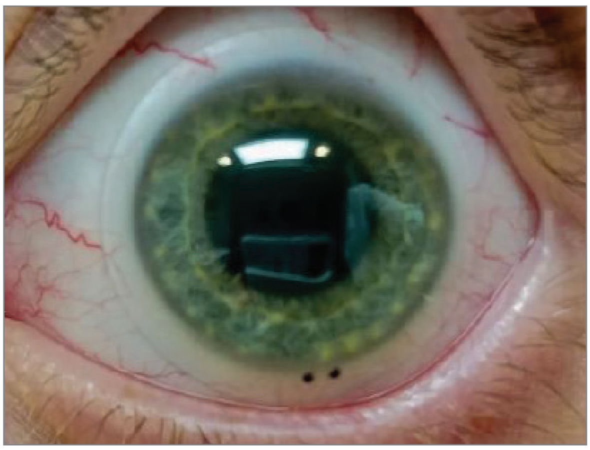

Figure 13: Successful scleral lens fit at first trial

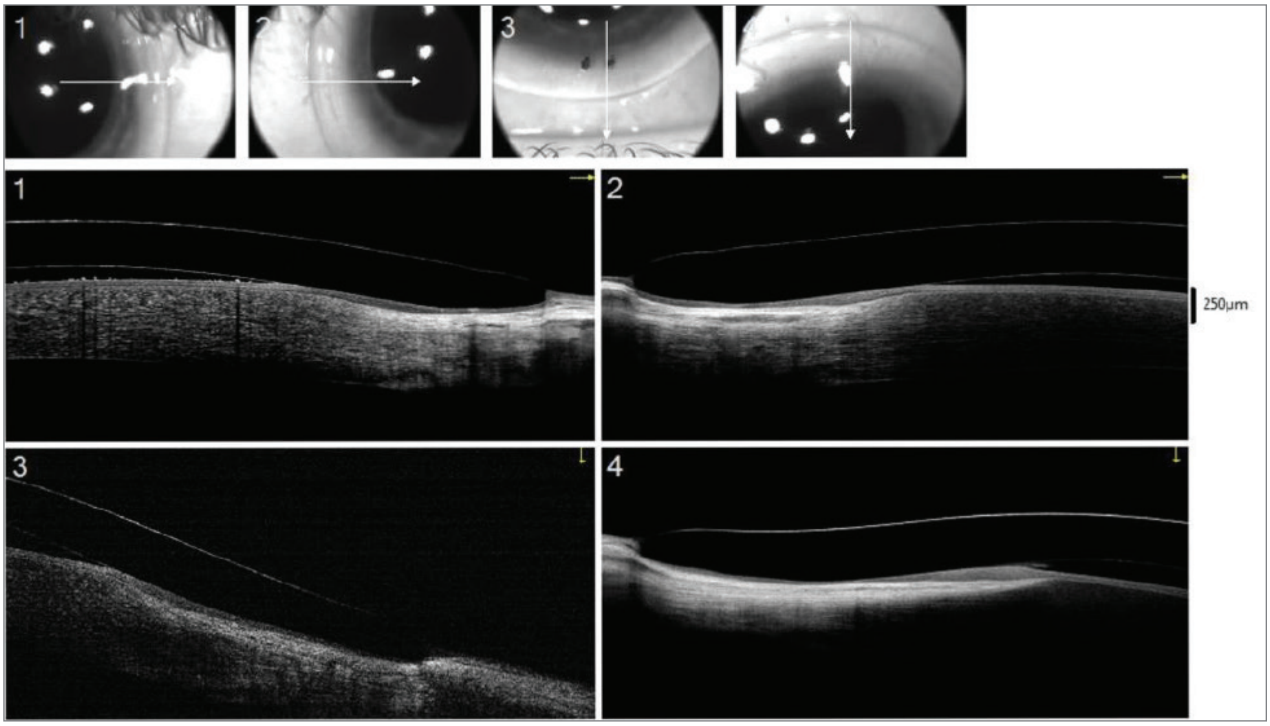

Figure 14: The fit of the lens along the irregular scleral profile was verified by OCT.

Optometry / Keratoconus

Fitting of contact lenses in keratoconus

Frank Widmer, Dipl.-Ing. (FH) Augenoptik (engineer of ophthalmic optics)

Mario Rehnert, Dipl.-Ing. (FH) Augenoptik,M.Sc. Optometry, applications engineering

A 28-year-old patient was first diagnosed with keratoconus in 2017.

He had previously worn prescription glasses, and his visual acuity was 0.6 OD and 0.1 OS. The keratoconus of the right eye was classified as grade 1 and that of the left as grade 3.

Topography scans of the anterior corneal surface (see Figures 15 and 16)

Central corneal radii	OD	7.86 / 7.56 mm	axis	16°
	OS	6.64 / 6.40 mm	axis	129°

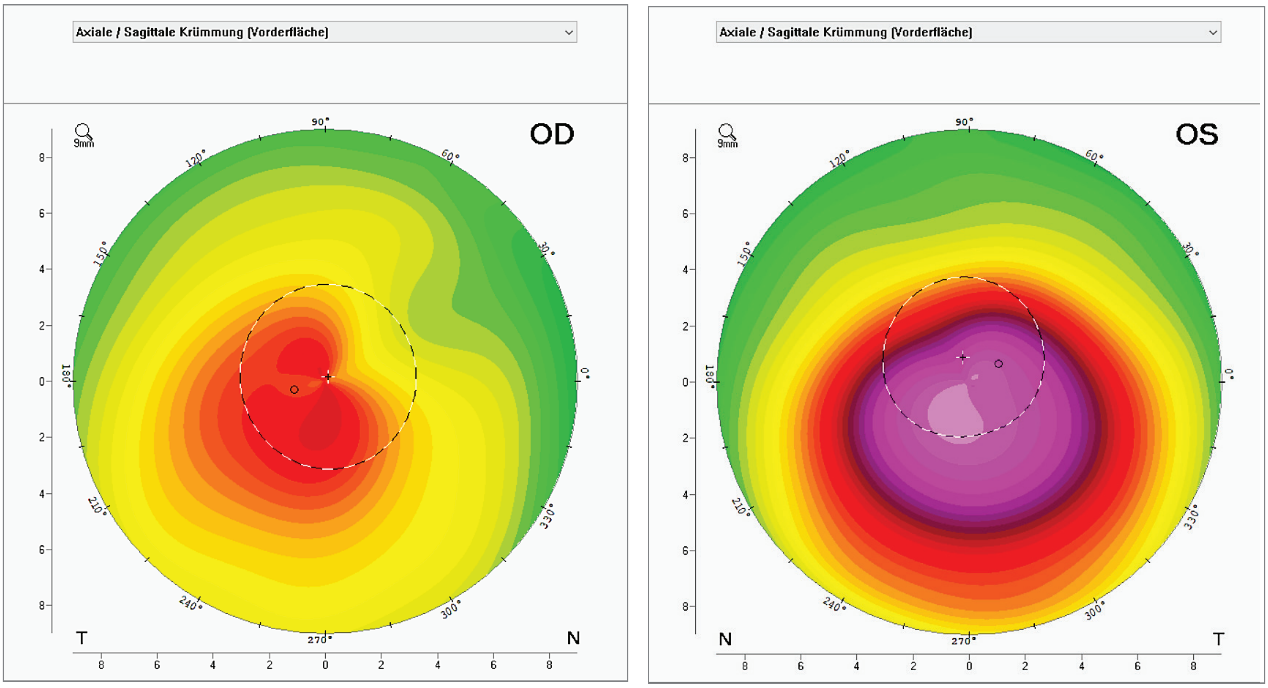

Figure 15: Subsection of the display “Large Color Map”, axial/sagittal curvature maps of the anterior surface of the right and left eye

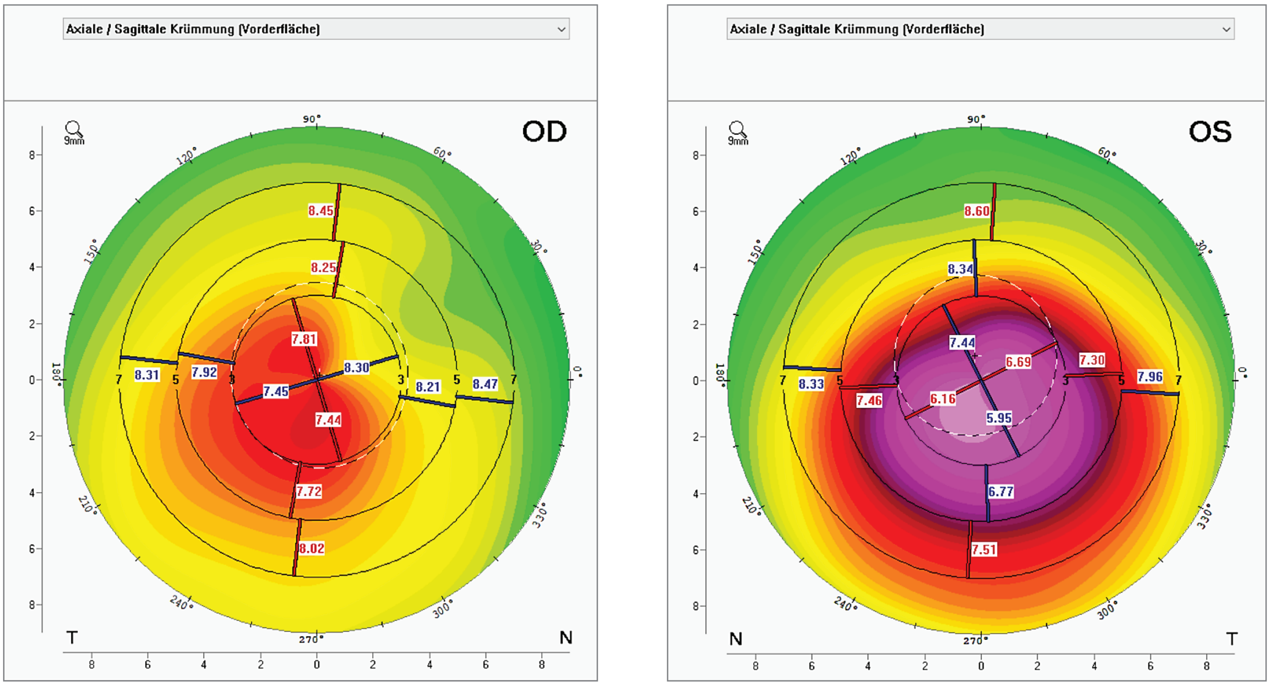

Figure 16: Subsection of the display “Large Color Map”, axial/sagittal curvature maps and radius values of the anterior surface of the right and left eye

The patient was fitted with rigid corneal contact lenses with a view to improving his visual acuity over his prior spectacle correction.

He also had a residual astigmatism worthy of correction and was therefore prescribed lenses with a front-surface prism and a toric back surface.

Thus corrected with KAKC keratoconus lenses his visual acuity was 0.8 OD and 0.6 OS.

The geometry of the contact lens back surface was calculated on the basis of the measured Scheimpflug tomography data using the APEX software of Hecht Contactlinsen GmbH, resulting in the proposal shown in Figure 17.

In view of the distinctly flat topography of the anterior corneal surface of both eyes it was decided to deviate from the proposed basic KAKC F lens designs. The individually selected back surface regions of the right contact lens were optimized for tear fluid exchange, while the back surface of the left contact lens was individualized completely. At 10.2 and 10.0 mm, the lens diameters were designed larger than standard, allowing for the patient’s large corneal diameters, both measuring 12.3 mm, and his initially high foreign body sensitivity.

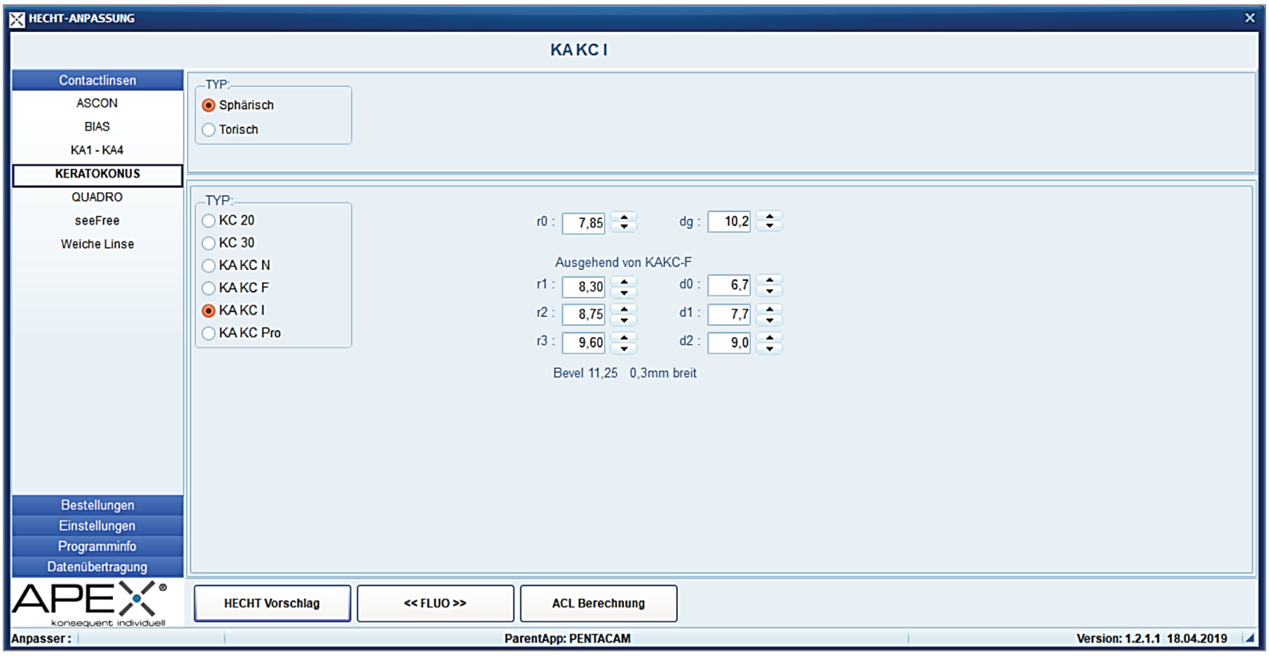

Figure 17: Right-eye lens as proposed by the Hecht contact lens fitting module

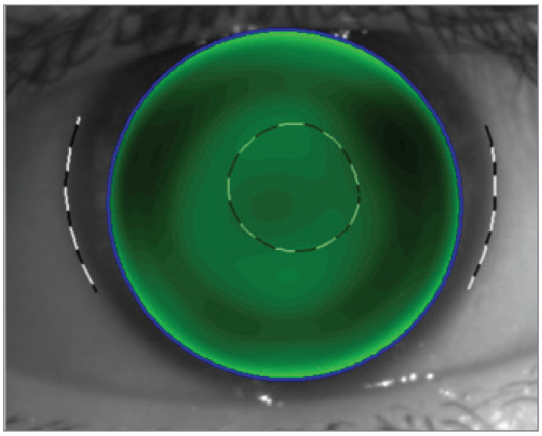

Figure 18: Fluo image simulated by the software for the right eye

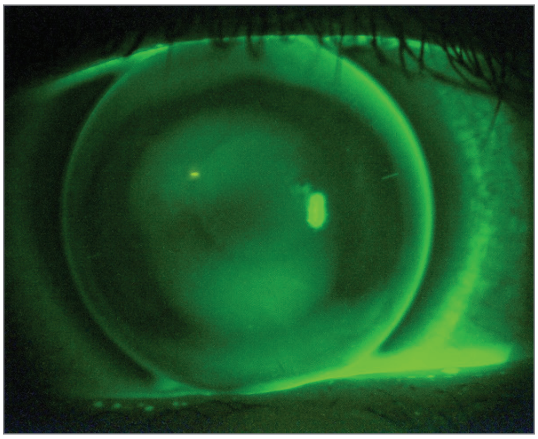

Figure 19: Real fluo image of the patient's right eye

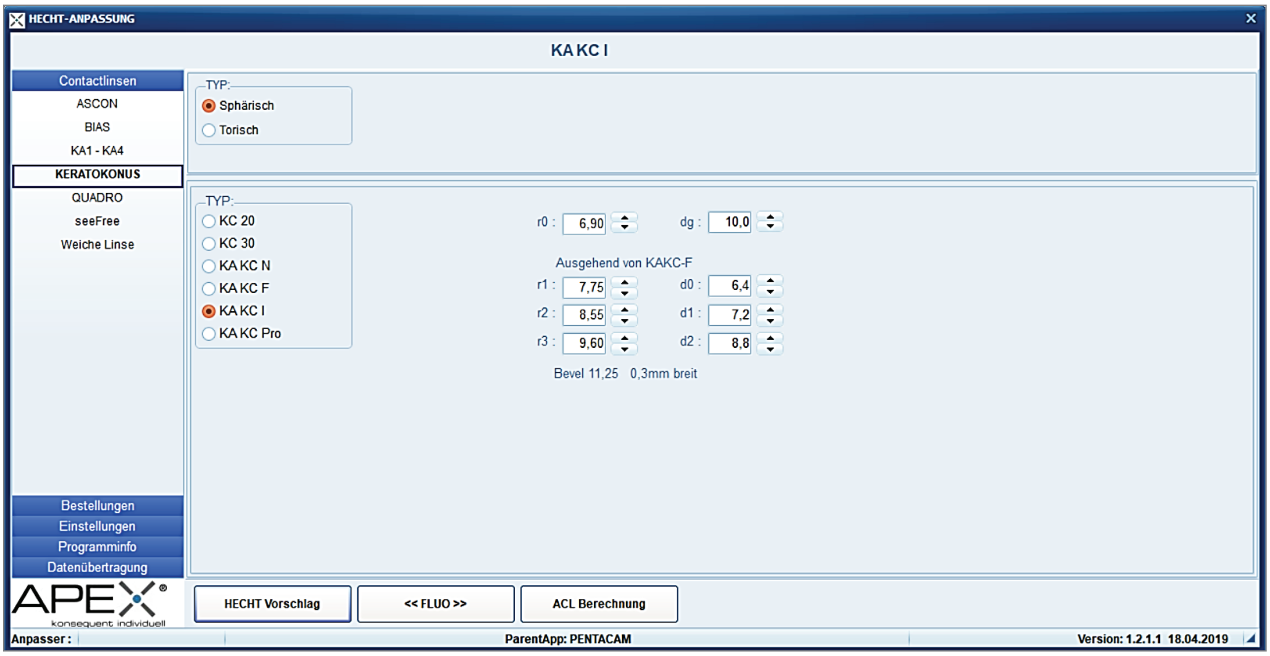

Figure 20: Left-eye lens as proposed by the Hecht contact lens fitting module

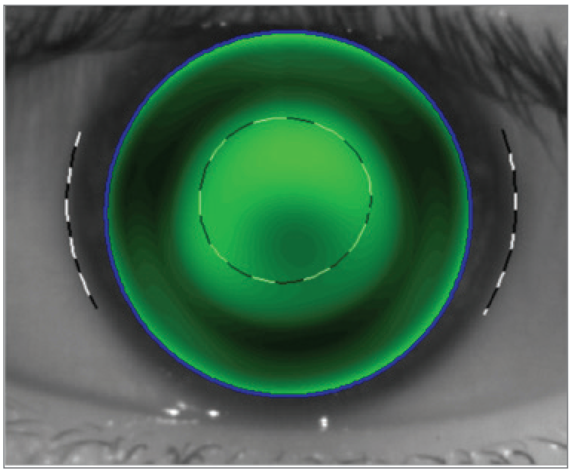

Figure 21: Fluo image simulated by the software for the left eye

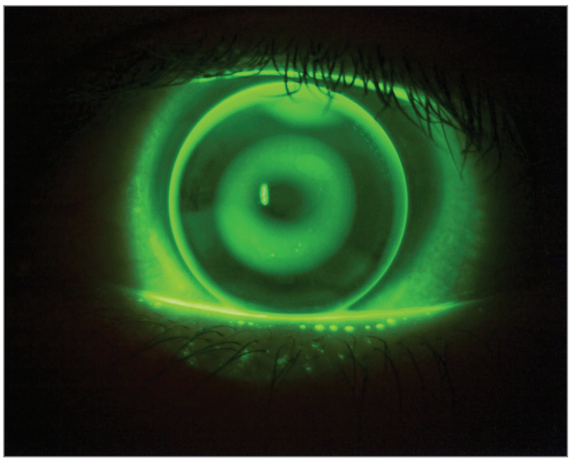

Figure 22: Real fluo image of the patient's left eye

Optometry / Contact Lenses

Fitting of contact lenses in advanced keratoconus

Frank Widmer, Dipl.-Ing. (FH) Augenoptik (engineer of ophthalmic optics)

Mario Rehnert, Dipl.-Ing. (FH) Augenoptik,M.Sc. Optometry, applications engineering

A 52-year-old male patient with advanced keratoconus underwent a follow-up exam after being initially fitted with rigid contact lenses. Earlier fitting trials using different approaches had all led to the problem that his contact lenses tended to drop out as soon as he moved his eyes.

This was found to be due to the extreme topography of the cornea, which showed advanced keratoconus of grade 4 with a very low apex. This is particularly well illustrated by Scheimpflug images taken with a Pentacam®. Whereas along the horizontal meridian the cornea is more or less symmetrical towards the periphery, along the vertical meridian it shows a marked downward displacement of the apex, with a correspondingly steep curvature in the inferior and flat curvature in the superior region (see Figures 23 and 24).

With rotationally symmetric or toric contact lenses this type of condition normally causes marked lift-off inferiorly and an excessively tight fit superiorly. Inferior lift-off often makes the contact lens descend onto the lower eyelid. Then blinking can easily produce air bubbles, which may accumulate underneath the contact lens or cause it to drop out in some cases.

This problem is currently approached by using corneal contact lenses of quadrant-specific geometry, in which each quadrant has its own specific shape.

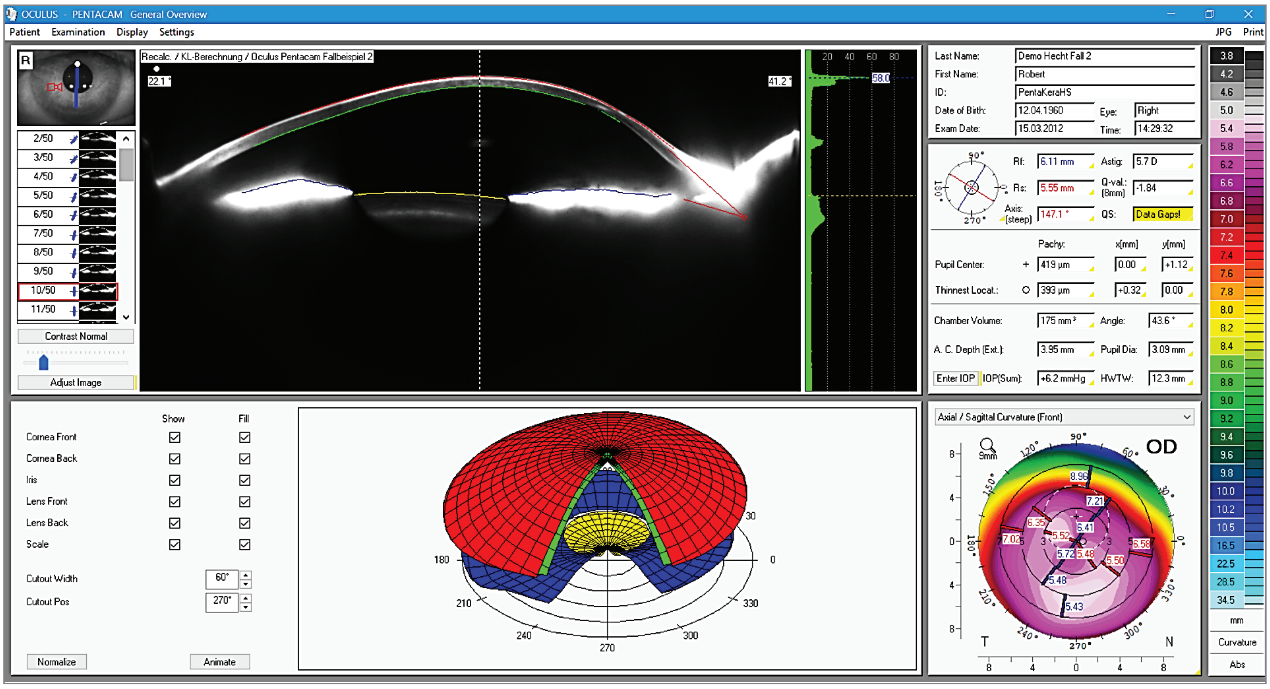

Figure 23: The General Overview shows a Scheimpflug image of the right eye at 180°.

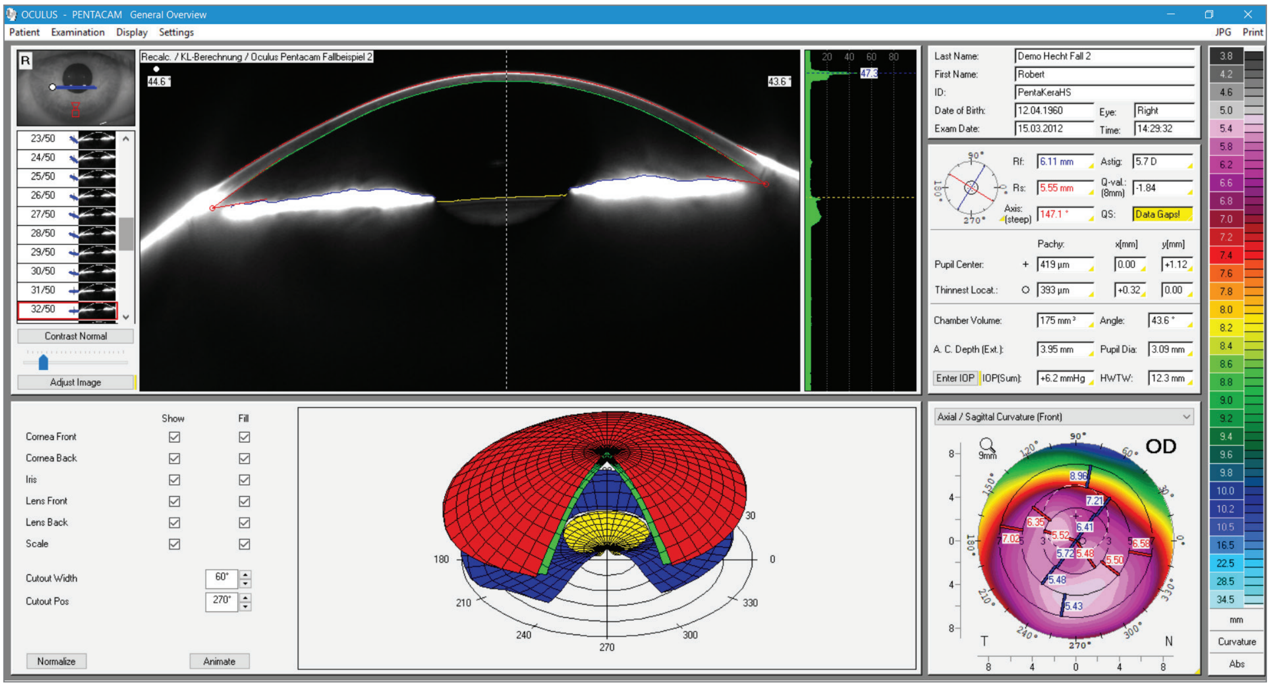

Figure 24: The General Overview shows a Scheimpflug image of the right eye at 180°.

Topographies of the anterior corneal surface (see Figure 25)

Central corneal radii OD 6.11 / 5.55 mm axis 57°

Scheimpflug images are excellently suited for mapping differences in topography, covering the entire cornea from limbus to limbus in the ideal case. The white ring represents the 9 mm diameter. With a Placido-based topography system it would only be possible to cover an area of up to approx. 6 mm at most in this type of case .

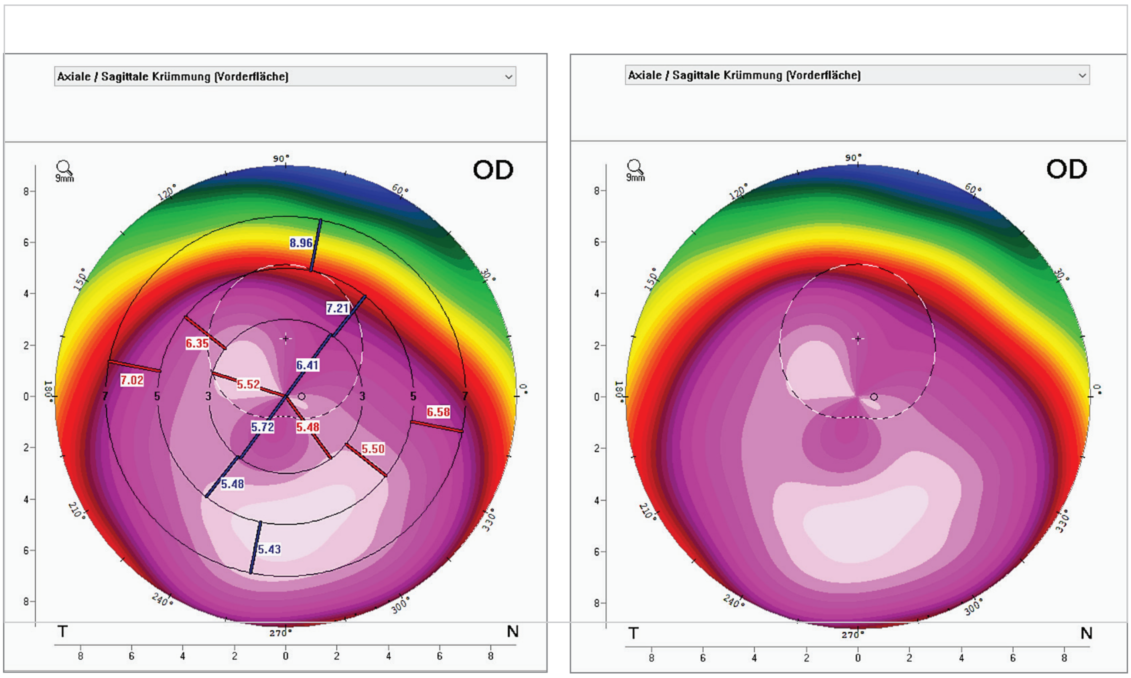

Figure 25: Subsection of the General Overview showing the axial / sagittal curvature of the right eye with and without radius values.

The patient was fitted with quadrant-specific contact lenses reaching close to the limbus and designed, as far as possible, to assume a well-centred position and not drop out (see Figure 26). The contact lenses selected had the following bitoric design:

Quadro KA 4 I BTC 5.95/5.50 dg 11.2

d_0 6.0 d_1 7.3 d_2 9.6

Bevel 11.25 / 0,3

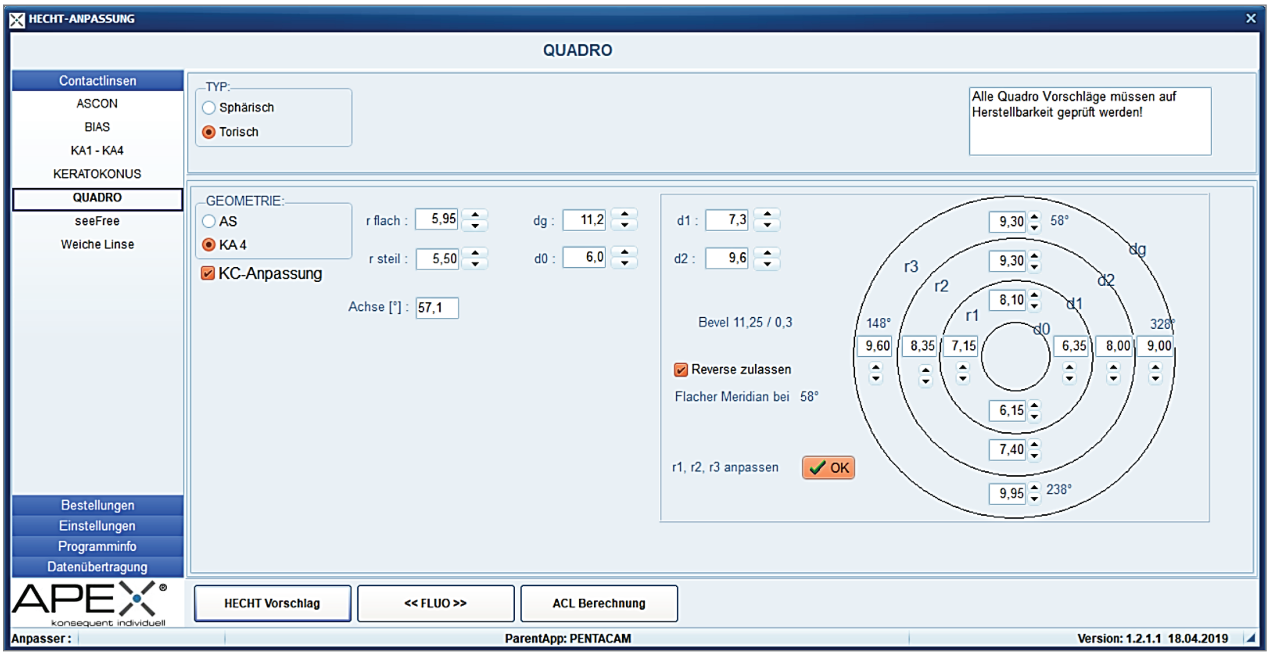

Figure 26: APEX module (Hecht Contactlinsen GmbH) showing the individual parameters selected for a quadrant-specific bitoric contact lens.

The real fluo image and the simulated image are not identical, but the close match between them is readily visible (see Figures 27 and 28). This check for congruence can be done in advance using a simple rotationally symmetrical or toric diagnostic lens. If there is congruence, then it is feasible to use APEX to create quadrant-specific contact lens geometries of the required complexity. If there is no basic congruence between the measurement-derived and the real fluo image, any attempt to create a contact lens in the APEX module will produce unreliable results, and the final geometry must instead be determined by real fluo imaging and estimation.

After fitting two rigid bitoric quadrant-specific Quadro KA4 keratoconus lenses the patient's visual acuity measured 0.8 in the right eye and 0.7 in the left.

The geometry of the posterior contact lens surface was calculated and determined on the basis of the measured Scheimpflug images using the APEX software of Hecht Contactlinsen GmbH.

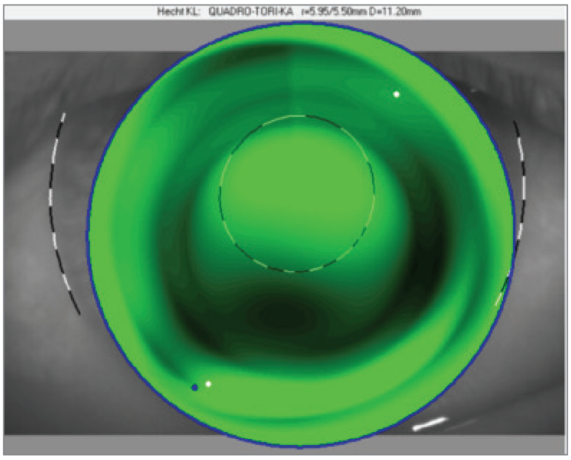

Figure 27: Fluo image simulation of a quadrant-specific lens specified using the APEX Module by Hecht

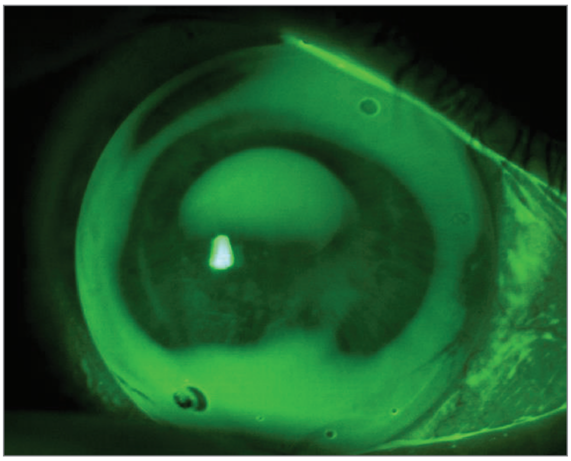

Figure 28: The real fluo image

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