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INTRODUCTION

Refractive surgery involves any procedure that aims to improve the refractive state of the eye. Prior to the surgeries we are familiar with today such as LASIK or PRK, radial keratotomy (RK) was a popular procedure performed in the 1970s for the correction of myopia and astigmatism. RK was not always used as the first line refractive surgery and was sometimes used to correct residual astigmatism from previous refractive surgeries performed on an eye. RK is now obsolete due to superior alternatives and significant complications including aberrations, diurnal visual acuity fluctuations and hyperopic regression.¹ The Prospective Evaluation for Radial Keratotomy (PERK) study conveys that most patients post RK experienced from 0.50D to 4.25D regressions due to imprecise wound incisions and unaccountable patient variables such as wound healing/corneal scarring. The PERK study also demonstrated that 43% of patients post RK experienced hyperopic shifts and diurnal variation even 10 years after surgery.² This case discusses the use of scleral lenses in a patient with multiple refractive surgeries resulting in inadequate binocular function due to anisometropia and visual ghosting OD.

CASE DESCRIPTION

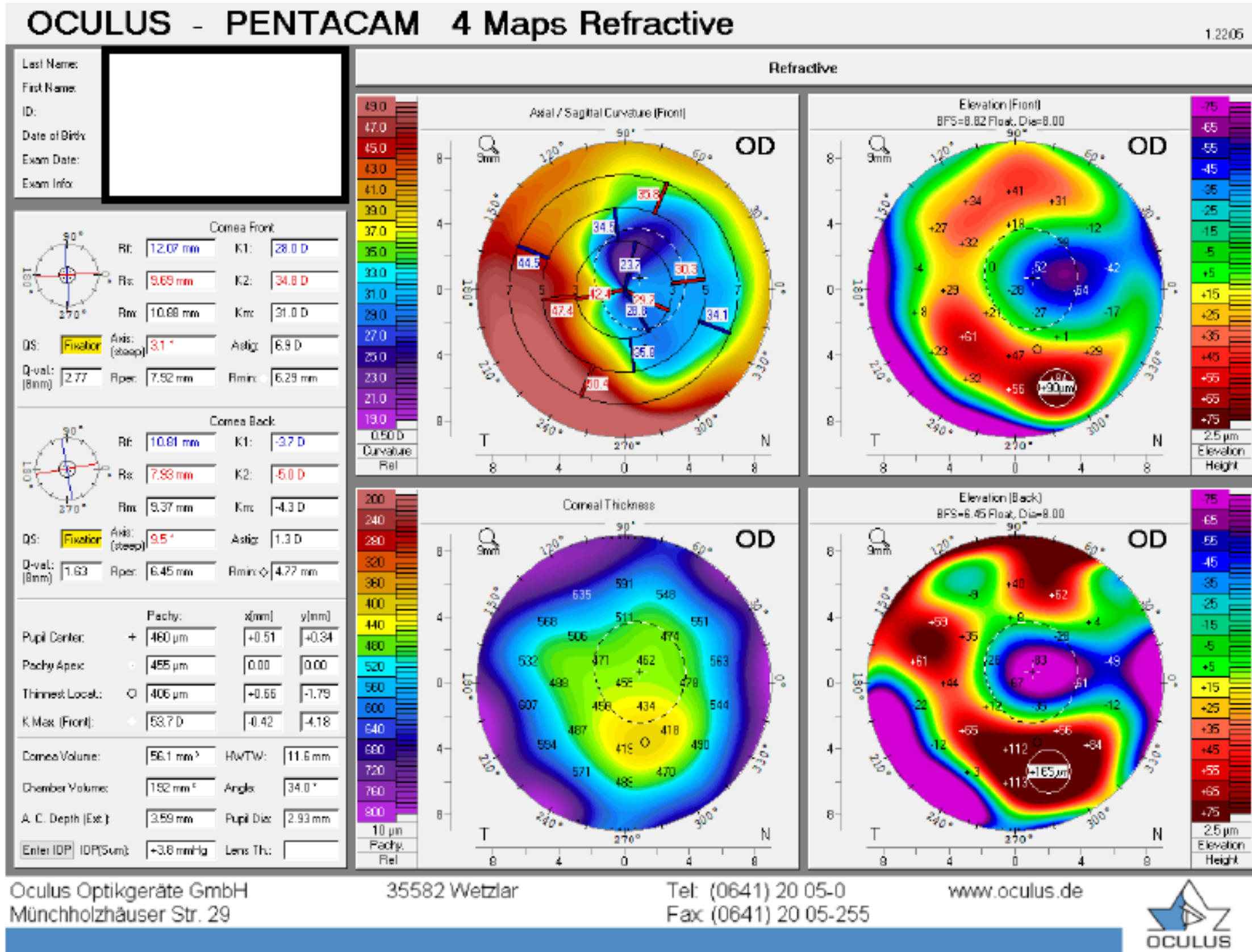
A 54-year-old white male with a history of degenerative myopia (-10D OU) and multiple refractive surgeries (PRK OU, RK OD and PTK OD) was referred for a contact lens evaluation to correct his anisometropia and subjective diplopia. He had PRK OU 30 years ago followed by RK in his right eye one month after to correct for residual astigmatism. The patient reported poor clarity and fluctuations in vision. Earlier this year, PTK was performed OD in attempt to improve visual acuity and minimize his monocular diplopia. The patient reported the PTK exacerbated the visual “ghosting” (which he described as a shadow adjacent to the object he was fixating on), especially for near tasks.

Manifest Refraction:	OD	Plano -3.00 x 43 +2.00ADD	20/50
	OS	-3.00 -1.25 x 55 +2.00ADD	20/30

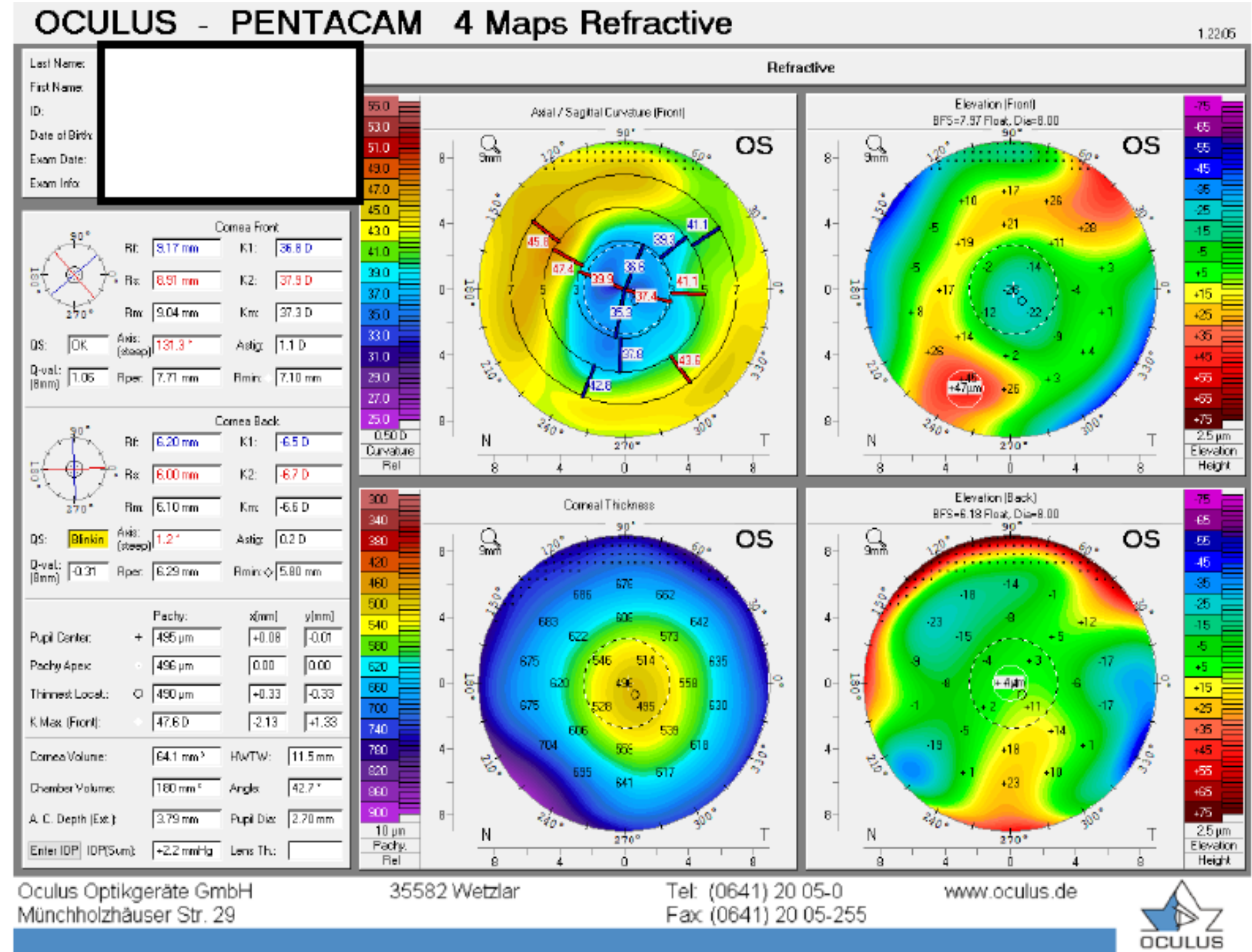
The patient experienced poor visual comfort due to significant anisometropia in spectacles. He felt he was suppressing his right eye when binocular and noticed prevalent diplopia OD when monocular. Improved visual comfort was achieved by reducing cylinder OD and sphere OS; however, the patient was not fully satisfied with the reduced clarity of vision.

Corneal tomography revealed central corneal thinning and flattening was consistent with refractive surgeries performed OS. The right eye scan revealed more severe thinning/steepening and irregular astigmatism which can be attributed to the additional RK procedure OD. A scleral lens fit was recommended to attempt to achieve clear, comfortable, binocular vision.

TOPOGRAPHY



OD topography post PRK, RK and PTK depicts irregular ectasia with nasal flattening and temporal steepening originating in the central visual axis. To ensure adequate vaulting 360°, a prolate lens design was selected.



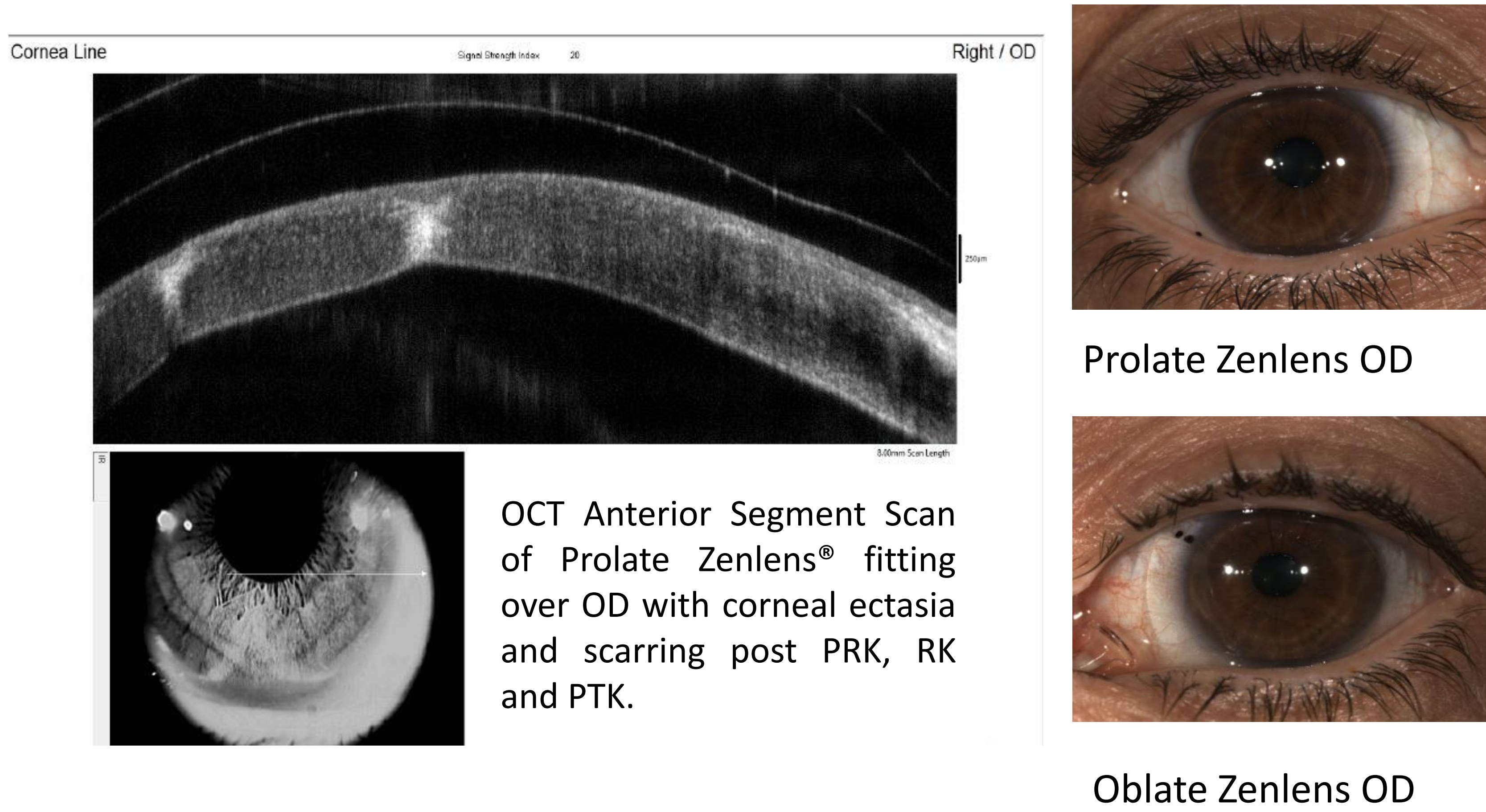
OS topography depicts a more typical post-refractive surgery (PRK) map with central corneal flattening and thinning with adjacent mild midperipheral steepening. An oblate lens design was chosen to fit this reverse-geometry profile.

MANAGEMENT

	Power	Lens	BC/Sag	Diameter	Edge
OD	-16.25 Sph	Zenlens® Prolate Z	7.10mm/ 4800 μm	16mm	FLAT3/STP3
OS	-5.25 Sph	enlens® Oblate	9.00mm/ 4500μm	16mm	FLAT4/STP2

Adequate vaulting was achieved in each eye and edges were modified for optimal alignment. Upon dispensing the final lens, the best corrected acuities were 20/25 OD and OS. The patient no longer reported ghosting with his right eye! At the follow-up examination, he reported clear, comfortable vision that did not fluctuate throughout the day.

LENS FITTING



OCT Anterior Segment Scan of Prolate Zenlens® fitting over OD with corneal ectasia and scarring post PRK, RK and PTK.

CONCLUSIONS

In patients with anisometropia and reduced quality of vision secondary to post refractive surgery complications, scleral lenses can help overcome symptoms such as fluctuating vision with "ghosting" and monocular diplopia that cannot be improved with a sphero-cylindrical spectacle refraction alone. Scleral lenses correct for irregular astigmatism and corneal surface abnormalities due to their unique capability to vault over the cornea utilizing a tear reservoir. The scleral lens forms a more uniform interface between air and the eye, and the fluid reservoir fills in the underlying corneal deformities to neutralize refractive error/fluctuations. Diurnal variation is a complication seen post RK years after surgery and may require multiple pairs of spectacles to overcome refractive shifts of more than 1D. The optical interface between the cornea and air is more prone to changes in refractive power because the incision wounds result in unpredictable corneal healing and shape/thickness alterations with changes in hydration, IOP and mechanical forces on the cornea³. As the cornea undergoes diurnal changes, the tear reservoir follows the change in corneal shape compensating for refractive changes. While PTK helps correct superficial corneal deformities that impact refractive error, further surgical intervention may not always be indicated/required. For our patient, symptoms worsened after the additional procedure. Contact lens correction should be explored as an option in cases of visual distortion caused by irregular astigmatism³. Scleral lenses specifically can further account for variations that result from deep RK incisions. Advancements in scleral lens design allow for increased customizability in highly irregular corneas to allow for optimal vision, corneal health, and comfort in post refractive surgery patients. For our patient, this scleral lens correction allowed him to feel he could function normally again, with both eyes, for the first time in many years.

REFERENCES

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3. Parminder, A. & Jacobs, D. S. (2015). Advances in scleral lenses for refractive surgery complications. Current Opinion in Ophthalmology, 26 (4), 243-248.