Utilizing Multifocal Design in a Scleral Contact Lens for a Keratoconic Patient

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INTRODUCTION

Keratoconus is a disease characterized by corneal thinning and ectasia resulting in high refractive error, irregular astigmatism, and poor visual acuity in spectacles. Various contact lens designs exist to help restore visual function in Keratoconic patients, but studies have shown that rigid and scleral lenses provide higher improvement in visual acuity compared to spectacles and soft lenses.[1] Presbyopia is an age-expected process that requires the use of additional correction for near work due to the gradual loss of accommodation after the age of 40. Unfortunately, keratoconic patients are not immune to this aging process. keratoconic patients who turn presbyopic, typically will wear their medically necessary contact lenses full time and invest in additional spectacles to wear over for correcting near vision. However, similarly to non-keratoconic patients, some patients may experience frustration with an additional pair of spectacles and their work or lifestyle may not accommodate spectacles for near work easily. With the gradual development of cataracts, non-keratoconic patients may consider a multifocal IOL as a possibility following cataract extraction surgery, however, this is typically not considered for keratoconic patients.[2] As an alternative to correct a keratoconic patient's presbyopia, incorporating multifocal (MF) optics into scleral contact lenses can be considered for some keratoconic patients.

CASE REPORT

A 42-year-old female with a history of keratoconus was referred for contact lens evaluation. She reported history of soft contact lens wear with inadequate vision, as well as poor comfort. Her visual acuity in spectacles was 20/25-2 OD and 20/60-1 OS. Slit lamp examination and corneal tomography confirmed Keratoconus OS > OD. An initial attempt was made to fit corneal gas permeable contact lenses but was ultimately unsuccessful due to discomfort and the patient's inability to adapt, however the patient did appreciate the visual clarity through the rigid contact lenses. To improve comfort, the patient was successfully fit into 16.0 diameter scleral contact lenses providing good distance vision. However, with improved distance vision, the patient began to experience reduced near vision due to presbyopia. The patient expressed difficulty with using reading glasses over contact lenses and felt uncomfortable while working multiple hours daily on a computer. As a result, multifocal optics have been incorporated into scleral lenses resulting in binocular vision 20/20 at distance and 20/25 at near allowing this keratoconic patient freedom for spectacles over contact lenses for near tasks.

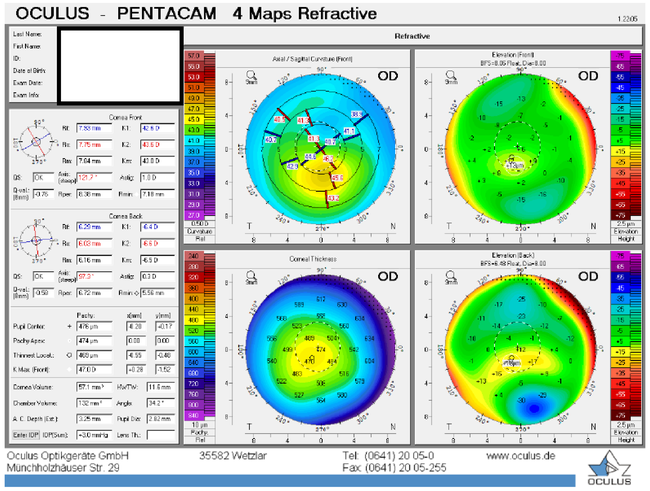

Figure 1: Tomography of the patient's right eye.

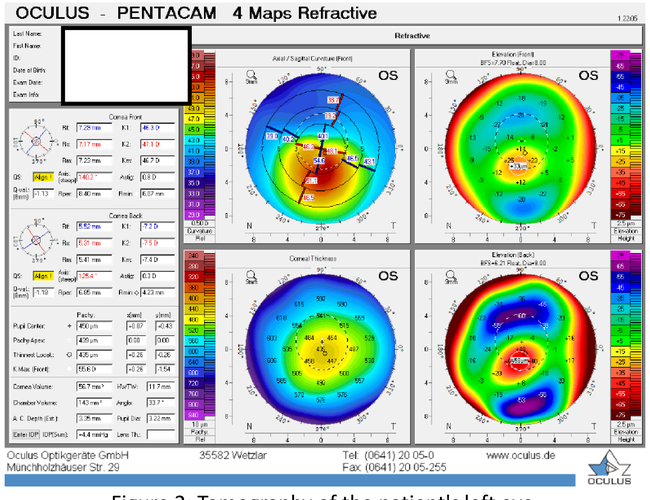

Figure 2: Tomography of the patient's left eye.

	Lens	Power	BC/Sag/Diameter	Edges
OD	Scleral single vision	-4.50 Sph	8.2/4100/16.00	Toric
OS	Scleral single vision	-3.75-0.75x155	8.2/4200/16.00	Toric

	Lens	Power	BC/Sag/Diameter	Edges
OD	Scleral Multifocal	-4.50 Sph/+1.00add	8.2/4100/16.00	Toric
OS	Scleral Multifocal	-2.87 Sph/+1.50add	8.2/4200/16.00	Toric

DISCUSSION

Multifocal optics in soft contact lenses have been growing in popularity over the past two decades, and with improved fitting guides and custom technologies, more presbyopic patients are able to function at both distance and near. A common complaint for presbyopes has to do with near work and a lack of clear vision without near correction. Plainis et al., conducted a study that evaluated the average reading speed in a presbyopic population which was found improved with MF compared to single vision CL correction. MF optics allow for presbyopic patients to function well at both distance and near and as Plainis' study revealed, may even decrease symptoms of eyestrain and headaches.[3] A soft MF lens will rarely be an option for keratoconic patients; however, some manufacturers of scleral lenses allow for the addition of MF optics. It is important to remember when selecting potential candidates for MF scleral lenses, practitioners must consider the location of the cone as well as anterior corneal elevation over pupil. Both factors can contribute to the distortion of vision and potentially exclude patients. In the face of a stable lens fit that may be mildly decentered, multifocal optics will need to be decentered as well to allow for optimal correction. There is limited information available on utilizing MF optics in scleral contact lens fitting for keratoconic patients. With the growing popularity of scleral lenses and the aging population, practitioners should expect a rise in utilization of scleral lens multifocal designs for both regular and irregular corneas.

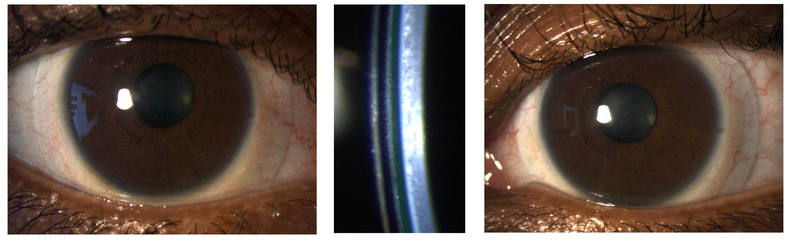

Figure 3: Anterior segment photo of scleral contact lens on both eyes

CONCLUSION

To maximize success during a multifocal scleral contact lens fitting, a stable and comfortable lens fit with the patient's best-corrected refraction for distance vision must first be established. Any lens rotation, under vaulting, or overvaulting, may complicate the stability of the MF contact lens and result in reduced visual acuities if multifocal optics are introduced prior to a finalized fit. The near ADD power will be chosen off age expected norms and confirmed with a trial lenses in office for the patient's near work requirements. This case demonstrates that in the setting of a stable, comfortable scleral contact lens fit, the addition of multifocal optics is possible for presbyopic patients with keratoconus located inferior to visual axis.

REFERENCES

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