



Presbyopia Utopia: Decentered Optics in Multifocal Scleral Lenses

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Background

Optics in scleral GP lenses assume that the geometric center aligns with the patient's visual axis. Scleral lenses commonly decenter inferior and temporal due to scleral elevation asymmetry, gravity, and eyelid forces.¹ Lens decentration and angle kappa can affect visual performance with multifocal scleral lenses that have smaller optic zones for center-near designs compared to single vision scleral lenses.² Simultaneous design of multifocal scleral lenses introduce spherical aberrations affecting quality of vision.³ Misalignment of spherical aberration can induce higher order aberrations like coma.³ Optics in scleral lenses can be decentered to align with the patient's visual axis to promote optical alignment to improve VA and reduce higher order aberrations. Scleral lenses can offer relief from dry eye symptoms⁴, prevalent in the presbyopic population⁵.

Case Details

A 64-year-old Caucasian female presented with complaints of dry eye OU leading to discontinuation of soft multifocal contact lens wear. Ocular history was positive for mixed mechanism dry eye, ocular allergies, narrow angles, and trace nuclear sclerotic cataract OU. The patient's medical history was positive for asthma, hypothyroidism, and hypertension. Ocular medications were Pataday. Systemic medications were Synthroid, Claritin D, QVAR inhaler, omeprazole, and amlodipine.

Initial Assessment	OD	OS
Pupils	3.5mm bright 4.5mm dim	3.5mm bright 4.5mm dim
Subjective	+1.75/-0.50x012 20/15- +2.50 ADD	+2.00/-0.75x178 20/15- +2.50 ADD
Anterior segment	Inspissated meibomian glands Cornea clear	Inspissated meibomian glands Cornea clear

Treatment and Management

Multifocal scleral lenses with front surface, center near simultaneous vision were initially ordered. Hydra-PEG was included to increase lens wettability and minimize discomfort due to dry eye.

Art Ampleye scleral multifocal 15.5 diameter 2.5mm center near zone, Hydra-PEG, **no optical decentration**

	Optical Decentration	Power	Distance VA	Near VA	Over refraction	O/R VA
OD	None	+7.25/-1.00x030 +2.50 ADD	20/20-1	OU 20/40- with ghosting	-0.25 SPH	20/20
OS	None	+7.00/-1.00x145 +2.50 ADD	20/20		+0.25 SPH	20/20

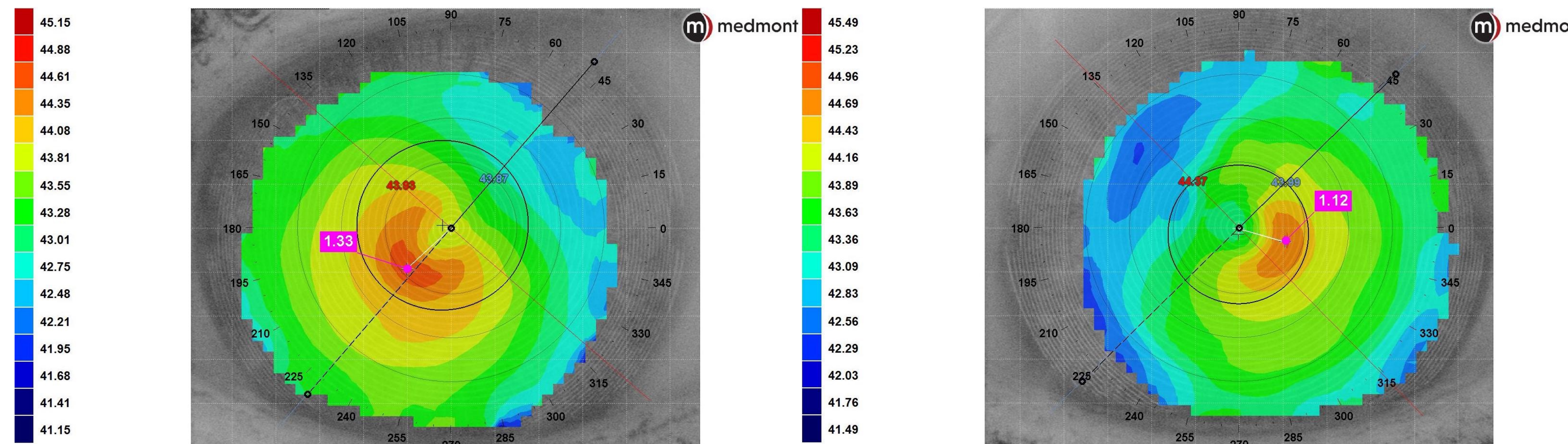


Figure 1. Topography over contact lens showing inferior temporal decentration of center near optics from visual axis

Art Ampleye scleral multifocal 15.0 diameter 2.5mm center near zone, Hydra-PEG, Custom Aligned Optics using **standard decentration**

	Optical Decentration	Power	Distance VA	Near VA	Over refraction	O/R VA
OD	0.75mm toward 45°	+4.25 SPH +2.50 ADD	20/60+	20/20	+1.00/-0.25x052	20/30+
OS	0.75mm toward 135°	+5.50 SPH +2.50 ADD	20/30-	20/20	+0.75/-1.00x142	20/25+

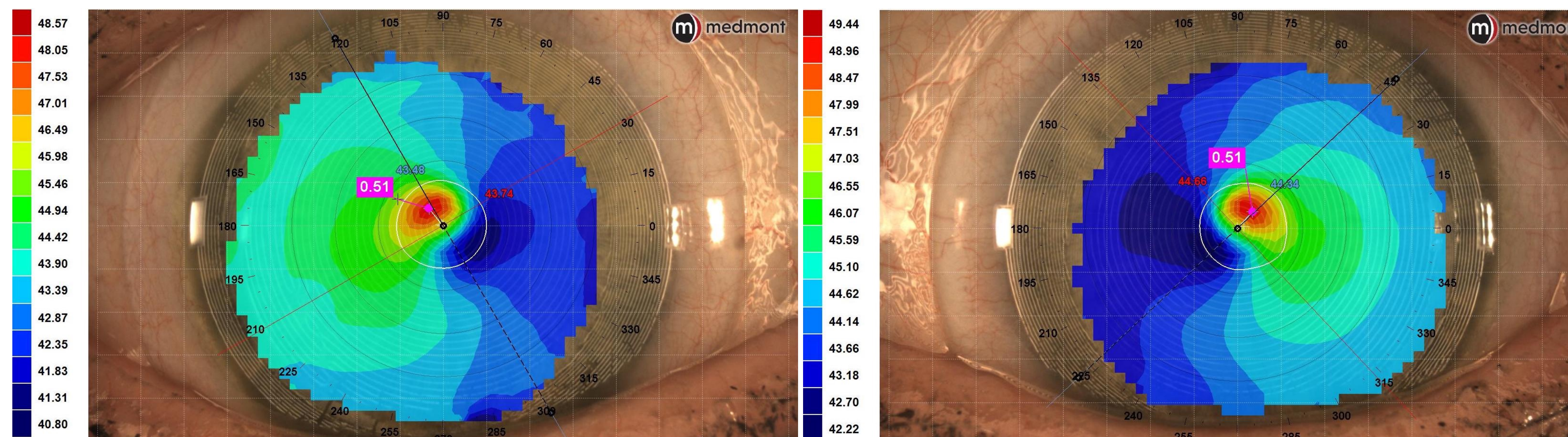


Figure 2. Topography over contact lens showing slight superior temporal decentration of center near optics from visual axis

Discussion

Excessive inferior temporal decentration of the optics was found on topography over the contact lenses (Figure 1). The lens diameter was decreased to improve overall lens centration and the center near optics were decentered superior nasal the standard amount (Figure 2). To further align the optics with the visual axis the center of the near optics can be measured (Figure 2) and decentered along the appropriate axis. Options to consider to improve distance VA include decreasing the center near zone and decreasing the ADD power for both eyes or the dominant eye only.

Conclusion

- Decentered optics in multifocal scleral lenses have the potential to:
 - Increase success of multifocal fits
 - Improve visual quality for presbyopes
 - Alleviate dry eye symptoms experienced at high rates in the presbyopic population
- Tips for fitting:
 - Incorporate MF decentered optics once the fit of a single vision lens is finalized
 - Use standard decentration for the specific lens design
 - For excessive optical decentration on topography or lens decentration on examination, decrease lens diameter
 - For moderate optical decentration further adjust MF optics by measuring on topography

References

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