

Myopia Management Performance Comparing Spherical versus Toric Orthokeratology Lenses in a Set of Twins

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BACKGROUND

Spherical and toric orthokeratology (ortho-k) lenses have both been shown to be effective in myopia management by slowing axial elongation.^{1,2} However, spherical ortho-k lenses tend to decenter more than toric ortho-k lenses when fit on patients with moderate to high corneal astigmatism ($\geq 1.50\text{D}$).³ Many companies use corneal astigmatism and elevation data to determine when to fit toric ortho-k lenses to achieve a better centered treatment zone. There is a strong correlation between corneal toricity and elevation difference, with 1D of corneal astigmatism corresponding to 25um of elevation difference at an 8mm chord.⁴

The purpose of this case series was to compare clinical performance and myopia management efficacy between spherical and toric ortho-k lenses on a set of twins with similar initial corneal astigmatism and elevation difference.

CASE DESCRIPTION

Two 11-year-old twin males were referred for ortho-k myopia management. Their refractive errors OU were moderately myopic with with-the-rule (WTR) astigmatism $\leq 1.00\text{DC}$ on cycloplegic refraction. Corneal topography revealed regular WTR astigmatism OU. Baseline axial lengths were measured and Patients 1 and 2 were empirically fit into toric ortho-k and spherical ortho-k lenses, respectively.

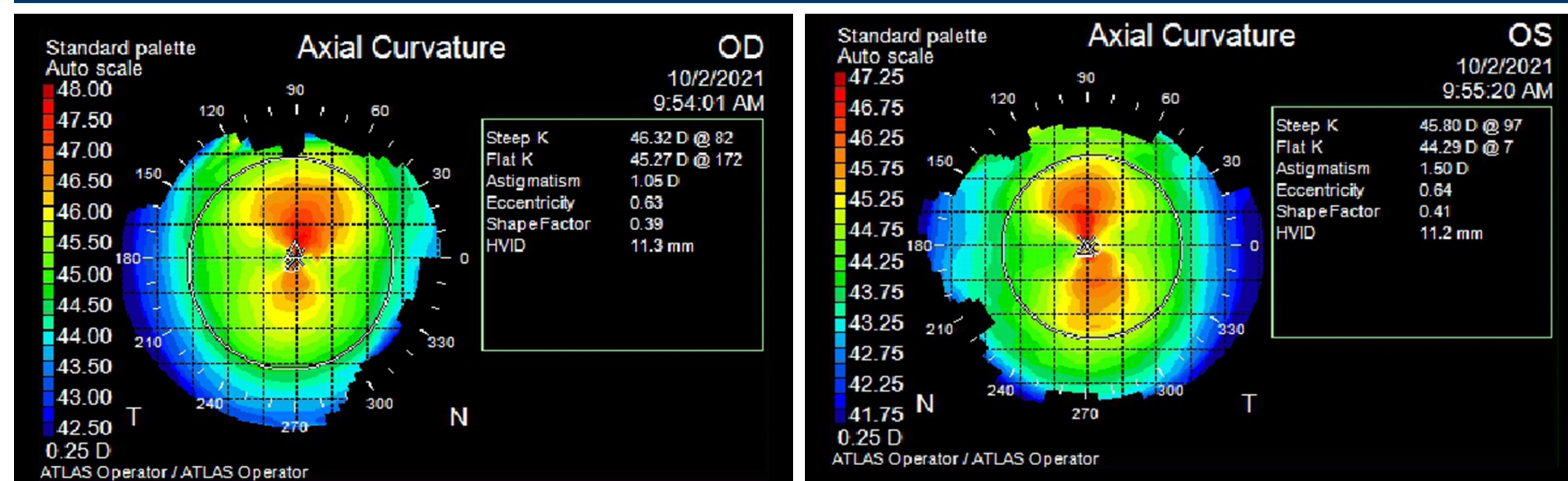
PATIENT 1

Cycloplegic manifest refraction
OD: -4.00 -0.25 x135 VA 20/20 • OS: -3.50 -0.75 x180 VA 20/20

TABLE 1: Patient 1 Pre-treatment Data

	Right Eye (OD)	Left Eye (OS)
Corneal astigmatism (D)	1.05	1.50
Elevation difference (um)	26	33
Axial length (mm)	24.77	24.78

FIGURE 1: Pre-treatment axial topography maps for Patient 1 show mild WTR astigmatism OD and moderate WTR astigmatism OS



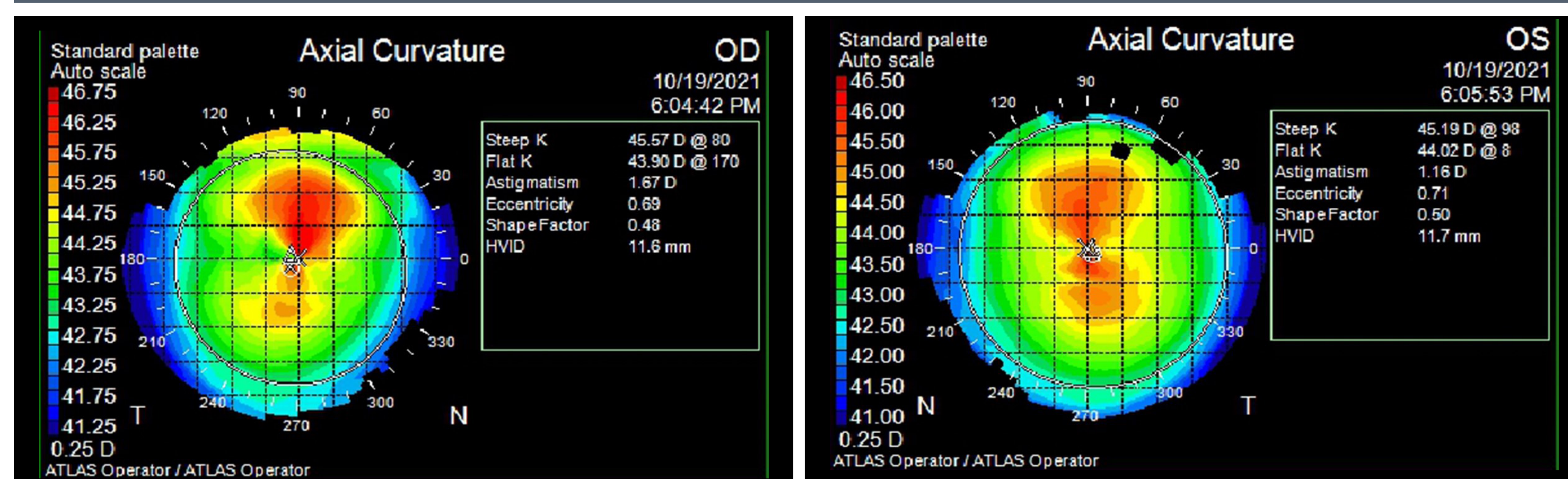
PATIENT 2

Cycloplegic manifest refraction
OD: -2.00 -1.00 x180 VA 20/20 • OS: -2.75 -0.50 x165 VA 20/20

TABLE 2: Patient 2 Pre-treatment Data

	Right Eye (OD)	Left Eye (OS)
Corneal astigmatism (D)	1.67	1.16
Elevation difference (um)	28	22
Axial length (mm)	24.60	24.83

FIGURE 2: Pre-treatment axial topography maps for Patient 2 show moderate WTR astigmatism OD and mild WTR astigmatism OS



RESULTS

PATIENT 1

Follow-up at 9 months and 2 weeks after dispensing toric ortho-k lenses OU, with an 8 hour nightly wear time, resulted in good uncorrected VAs and well-centered treatment zones OU. Axial length change was stable OD (-0.10mm difference) and OS (-0.11mm difference), showing adequate myopia management.

TABLE 3: Patient 1 toric ortho-k lens parameters and results at 9 months, 2 weeks of nightly wear

	Design	Power	BC	Dia	OZ	Uncorrected VA	Axial length
OD	Euclid MAX Toric (0.75D)	+0.75	8.33	10.6	6.2	20/20-2	24.67 (Δ -0.10)
OS	Euclid MAX Toric (0.75D)	+0.75	8.43	10.6	6.2	20/20-1	24.67 (Δ -0.11)

FIGURE 3A: Patient 1 toric ortho-k lens evaluation

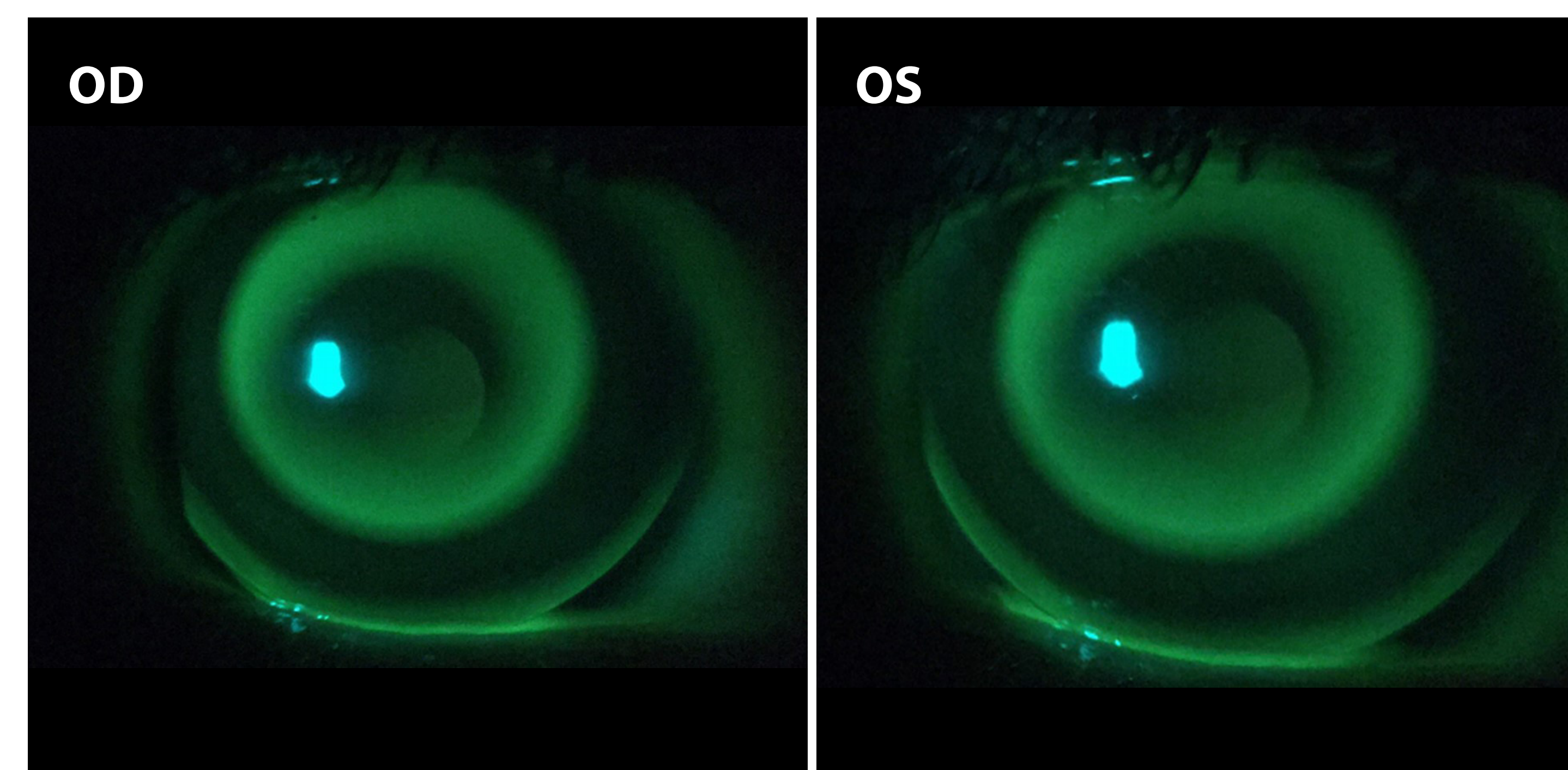
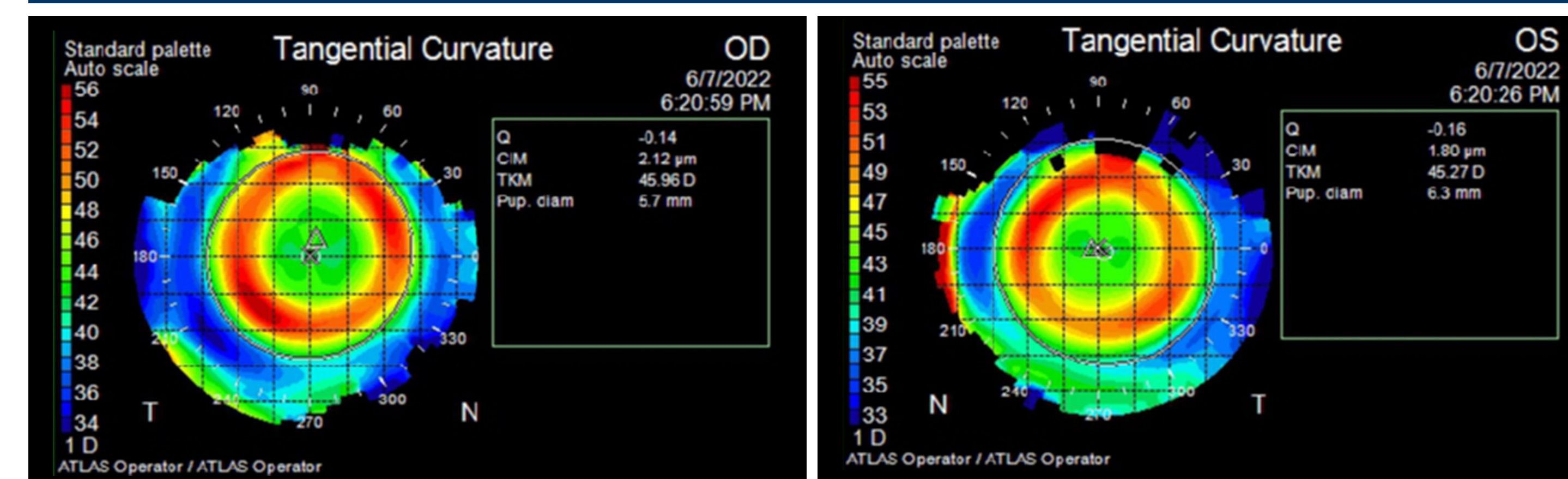


FIGURE 3B: Patient 1 toric ortho-k tangential topography maps show well-centered treatment zones OU at 9 months, 2 weeks of nightly wear



PATIENT 2

Follow-up at 10 months after dispensing spherical ortho-k lenses OU, with an 8 hour nightly wear time, resulted in good uncorrected VAs and well-centered treatment zones. Axial length change was within age norms OD (0.11mm difference) and OS (-0.13mm difference), showing adequate myopia management.

TABLE 4: Patient 2 spherical ortho-k lens parameters and results at 10 months of nightly wear

	Design	Power	BC	Dia	OZ	Uncorrected VA	Axial length
OD	Euclid MAX (sphere)	+0.75	8.25	10.6	6.2	20/20-1	24.71 (Δ +0.11)
OS	Euclid MAX (sphere)	+0.75	8.38	10.6	6.2	20/20-2	24.70 (Δ -0.13)

FIGURE 4A: Patient 2 spherical ortho-k lens evaluation

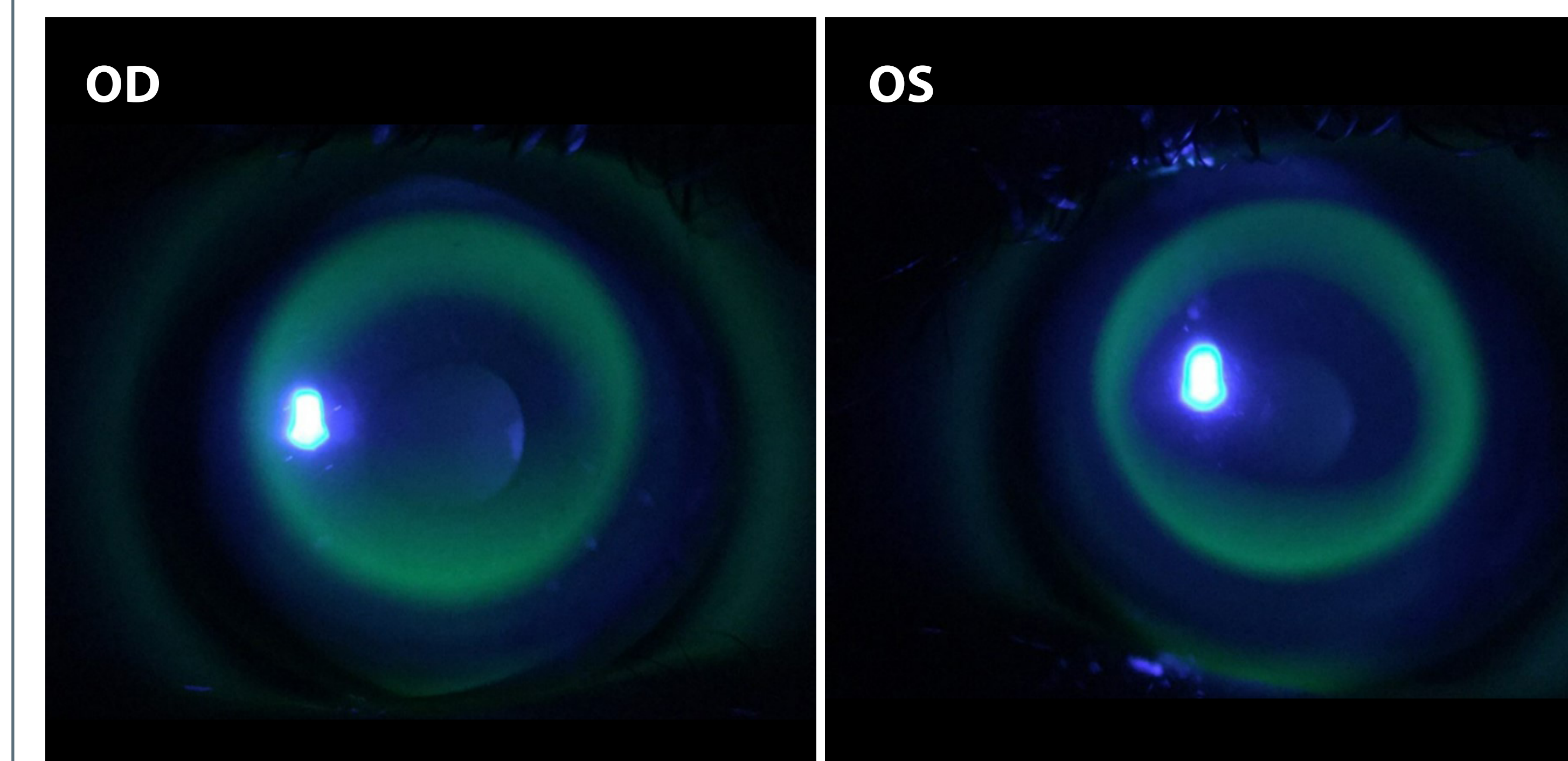
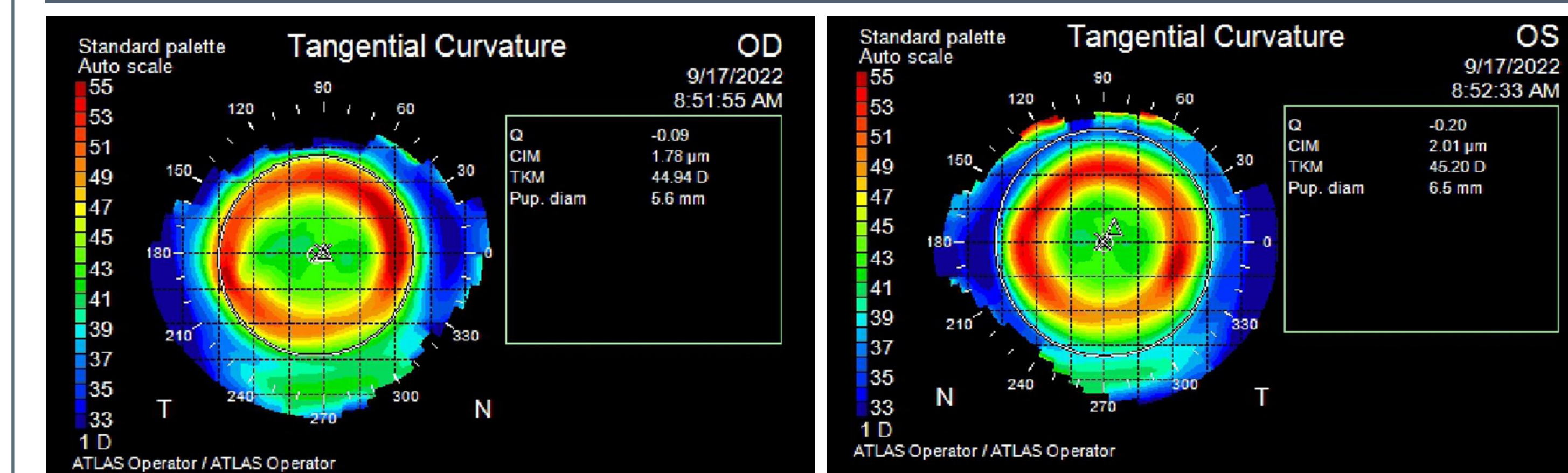


FIGURE 4B: Patient 2 spherical ortho-k tangential topography maps show well-centered treatment zones OU at 10 months of nightly wear



CONCLUSION

Toric ortho-k lenses result in improved centration versus spherical ortho-k lenses when fit on corneas with moderate to high astigmatism.³ This limited case series compared spherical and toric ortho-k results on a set of twins with mild to moderate WTR astigmatism. The lens manufacturer used in this report applies the criteria of elevation difference $>25\text{um}$, which both patients met, to consider a toric ortho-k design. Both the spherical and toric ortho-k lenses showed similar clinical performance, with acceptable uncorrected VAs and well-centered treatment zones, and similar myopia management efficacy, with stable axial length measurements or growth within age norms. Future studies would be useful to determine industry standards for how much corneal toricity or elevation difference requires toric ortho-k lenses.

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