

Utilizing Pilocarpine in Adult Orthokeratology to Reduce Visual Aberrations

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Background

Modern Orthokeratology (OrthoK) incorporates overnight wear of reverse geometry gas permeable contact lenses to reduce refractive myopia by reshaping the anterior corneal surface. The relative peripheral myopic defocus caused by corneal reshaping can increase aberrations that negatively impact vision and quality of life, especially in the adult population.¹ Pupil size is a significant consideration for determining ideal adult candidates and appropriate OrthoK designs as most have limited capability for increasing optic zone diameter (OZD) and treatment area.² This case report evaluates the efficacy of pilocarpine as a miotic agent to control for OrthoK-associated aberrations secondary to use of a lens design with OZD smaller than the patient's pupil size under scotopic conditions.

Case Report

A 25 year old male presented for a contact lens fitting. The patient reported discomfort due to dry eye symptoms while wearing soft contact lens and was interested in OrthoK.

Manifest refraction: OD: -4.00 -0.50 x 180, OS: -4.00 -0.50 x 180

BCVA (with spectacles): 20/20 OD, 20/20 OS

Sim K's: regular WTR astigmatism; OD 43.50/44.75 @ 72, OS 44.00/45.00 @ 83.

HVID: 11.5 mm OD, OS

Pupil Size (measured with EyeLink 1000 Plus®): 3.7mm OD / 3.4mm OS in bright illumination; 7.0 mm OD / 6.6 mm OS in dim illumination

Contact Lens fitting

OrthoK lens design was ordered empirically utilizing data including: spherical Rx, flat K, steep K, horizontal visible iris diameter, and a Jessen factor of +0.50. The largest OAD offered with the OrthoK lens design chosen was 6.0 mm.

	Contact Lens Parameters
OD	Paragon CRT Dual Axis / +0.50 sph / 8.9 BC / 11.0 Diameter / 6.0 OZD / 550 RZD1 / 600 RZD2 / -33 LZA1 / -34 LZA2 / HDS 100 / Red
OS	Paragon CRT Dual Axis / +0.50 sph / 8.8 BC / 11.0 Diameter / 6.0 OZD / 550 RZD1 / 600 RZD2 / -33 LZA1 / -34 LZA2 / HDS 100 / Blue

The patient was seen back for follow up after one night, one week, one month, and three months post CL dispense with well centered treatment zones and ideal bull's eye patterns. A +0.50 refraction over the lens and a plano manifest refraction with 20/20 BCVA was noted OD, OS. Although an adequate fit was achieved, the patient reported symptoms of halos and visual blur during dim illumination attributed to the patient having a pupil size larger than the lens OZD.³ Since increasing the OZD was not achievable with the lens design, the use of miotic drops was initiated.

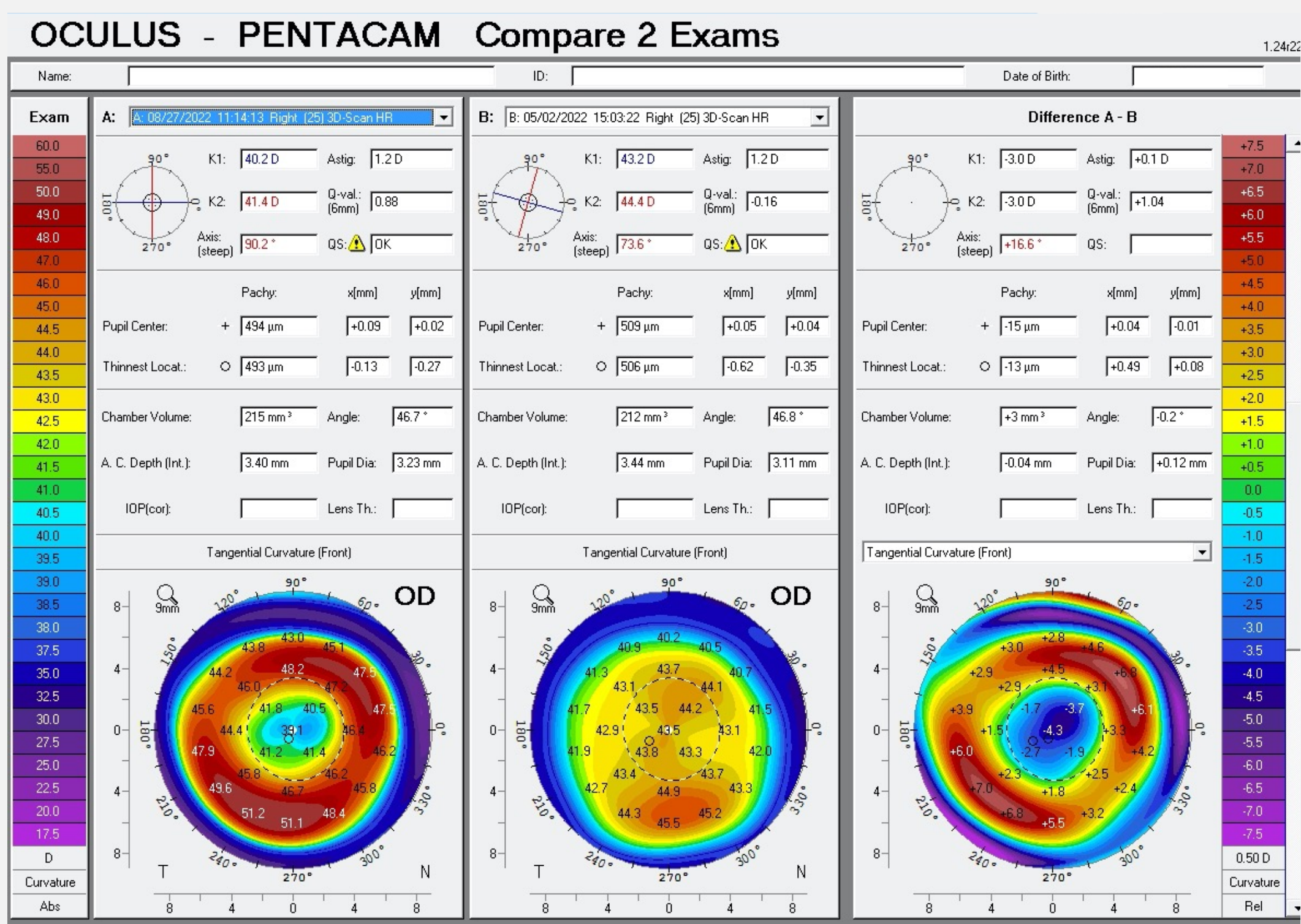


Figure 1: OD post 3 months of OrthoK (left), post 1 night of OrthoK (middle), topography difference between the two maps

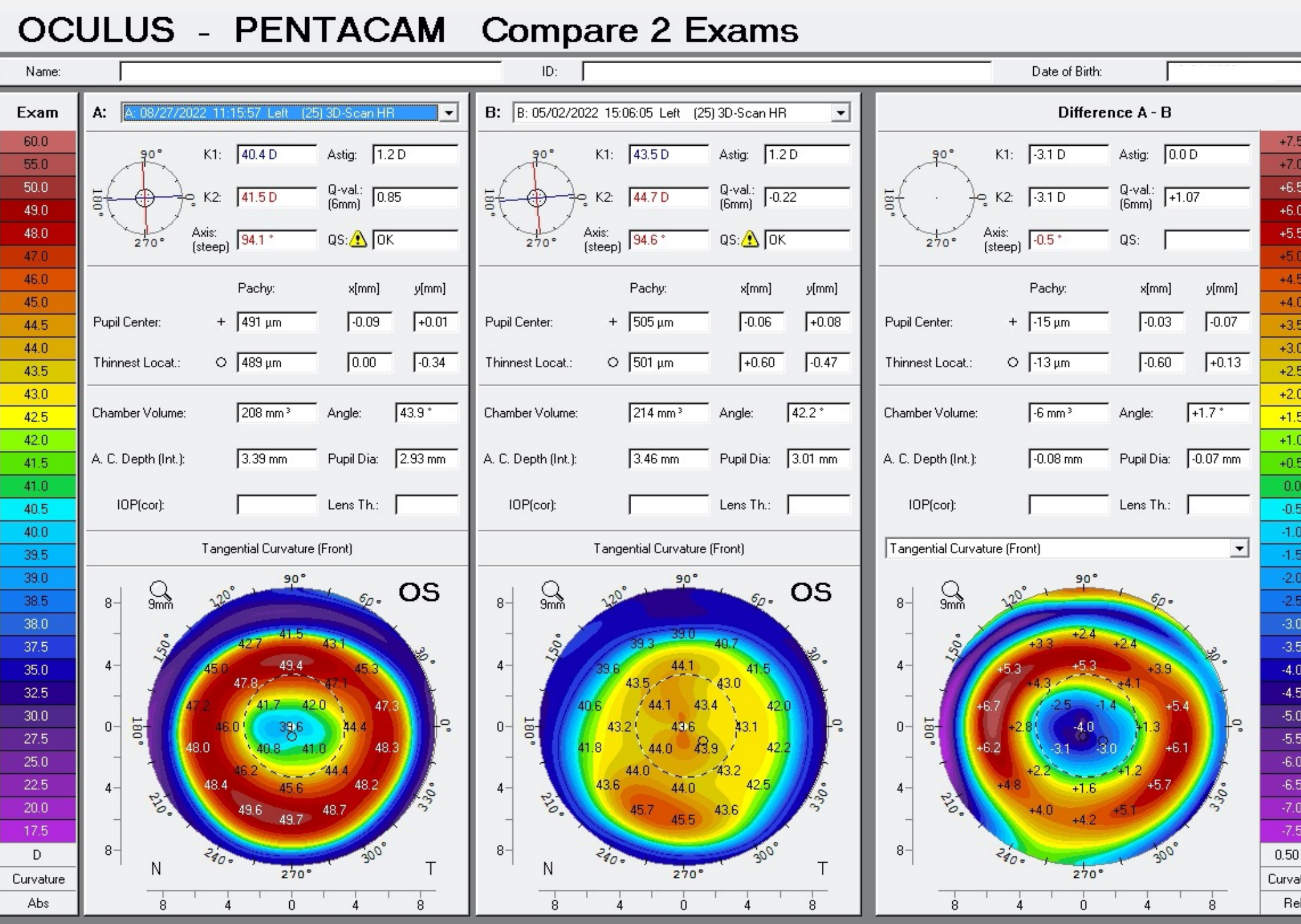
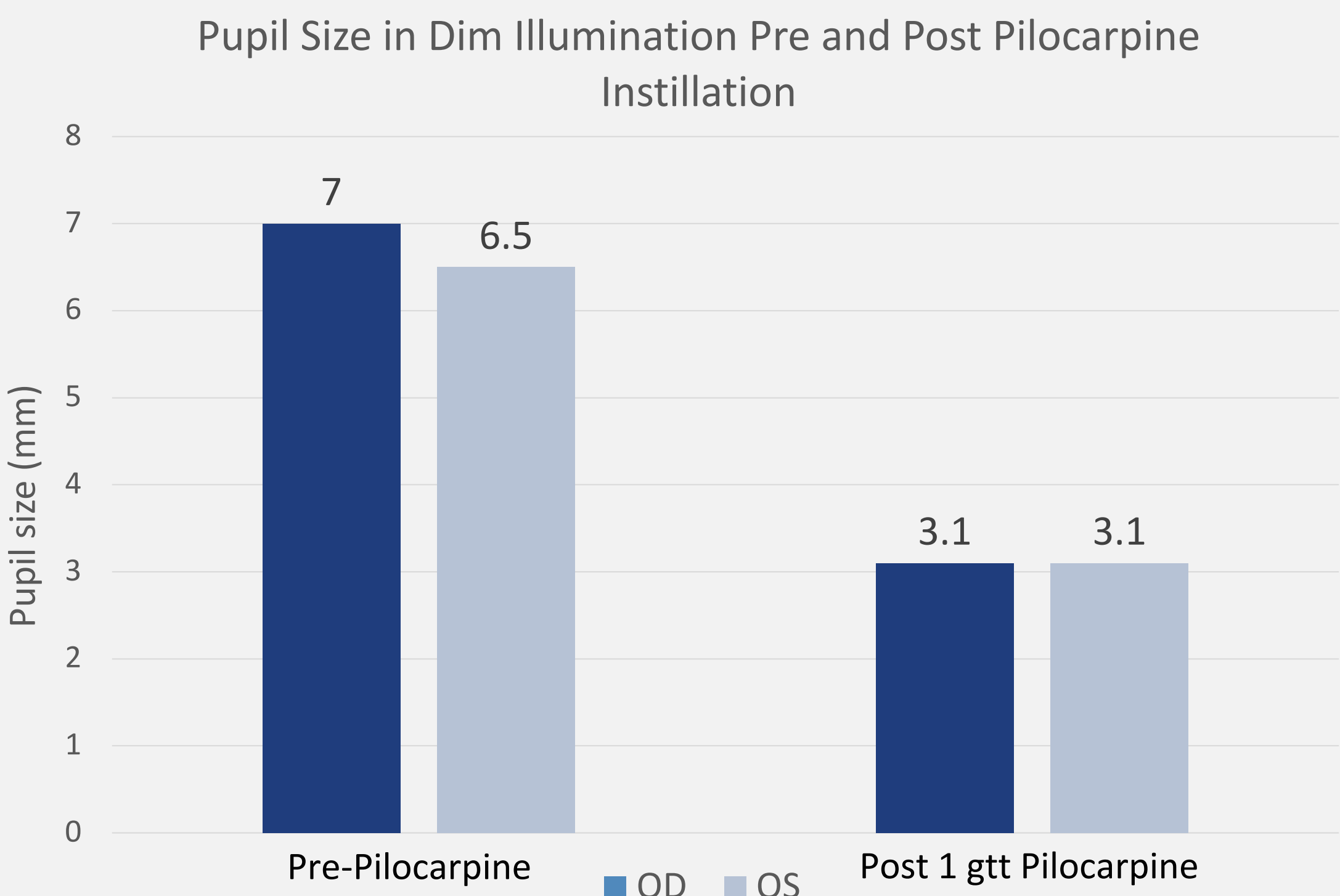


Figure 2: OS post 3 months of OrthoK (left), post 1 night of OrthoK (middle), topography difference between the two maps

Discussion

Pilocarpine 1.25% was prescribed for the patient to use during dusk to minimize symptoms attributed to having a pupil size larger than the lens OZD. The patient was informed of possible side effects with pilocarpine use and ocular health examination ruled out any pre-existing retinal risk factors. EyeLink 1000 Plus® software was used to precisely measure pupil size in dim illumination pre and post pilocarpine instillation to document the difference in relation to the OrthoK OZD. Fifteen minutes after in office instillation of pilocarpine, the pupil size in dim lighting was 3.1 mm OD, OS and symptoms of blur and halos were fully resolved.



Conclusions

Central corneal flattening and mid-peripheral steepening with overnight OrthoK lens wear is known to increase spherical aberrations leading to visual disturbances and degradation of visual acuity. The impact of these aberrations is dependent on the size of the OZD of the OrthoK lens and its relation to pupil size. Topical pilocarpine is proven to be an effective treatment to control for adverse visual symptoms in patients with a pupil size larger than a lens OZD.

References

1. Pauné J, Fonts S, Rodríguez L, et al. The Role of Back Optic Zone Diameter in Myopia Control with Orthokeratology Lenses. Journal of Clinical Medicine. 2021;10:336.
2. Jason KL, Stephen JV, Sin-Wan C, et al. Higher-Order Aberrations and Axial Elongation in Myopic Children Treated With Orthokeratology. Invest Ophthalmol Vis Sci. 2020;61:22.
3. Korszen E, Caroline P. The Anatomy of a Modern Orthokeratology Lens. Contact Lens Spectrum. 2017 Mar;32:30-32, 34, 35, 40.