Contact Lens Considerations in Fitting a Patient with the Rare Genetic Condition of Nanophthalmos

Veronia Abadeer OD, Stacy Zubkousky OD, FAAO, FSLS, Crystal Victor OD, Thuy-Lan Nguyen OD, FAAO, FSLS

Nova Southeastern University College of Optometry, Fort Lauderdale, Florida

INTRODUCTION

Nanophthalmos is a rare subtype of microphthalmia, in which the eye presents with an overall small axial length but unaffected functionality and organization of internal components[1].

CASE DESCRIPTION

A 16-year-old Caucasian male presented for a contact lens fitting for sports related activities.

Past ocular history:
- Nanophthalmos OU
- Amblyopia OU
- Macular Edema OU
- Glaucoma OU: managed with 2% Dorzolamide® BID

Manifest spectacle prescription and visual acuities:
OD: +12.00-1.75x012 ADD +3.00 DVA 20/60 NVA 20/40
OS: +12.25-1.00x008 ADD +3.00 DVA 20/60 NVA 20/40

Overall evaluation findings:
- HVID: 11.8mm OD, OS
- Narrow interpalpebral aperture: IPA 8.0mm OD, OS
- K Values: OD 49.30/50.50@107.4, OS49.00/50.60@100.4
- 2+ lash debris superior>inferior OD, OS
- Minimal visualization of the sclera 360 degrees OU

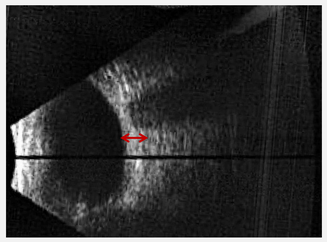
CONTACT LENS SELECTION

Extended parameter soft contact lenses were first trialed, but a good fit and vision were not achieved, due to the steep corneal keratometry values and sagittal depth. Scleral lenses were considered, however, given his concurrent glaucoma and anticipated thick hyperopic lens, they were not an ideal choice. With improved fit, vision and easy handling, corneal GP lenses were fit with a higher Dk lens material for increased oxygen permeability.

Eye	BC (mm)	DIA (mm)	Power (D)	CT (mm)	Material	DVA	DVA OU
OD	6.78	9.3	+15.25	0.61	Boston XO2	$20/70^{+1}$	$20/50^{-1}$
OS	6.80	9.3	+15.00	0.58		$20/50^{-2}$	

Table 1: Initial GP lens parameters. Upon evaluation, excessive inferior decentration was found. Modifications to the diameter and center thickness were made to the proceeding lenses.

Figure 1a & 1b: Image of physical findings. Left image without spectacles shows narrow interpalpebral aperture with deep set, small eyes. Image on the right shows optically induced an eso posture due to prismatic effect of high hyperopic correction with bifocal spectacles.



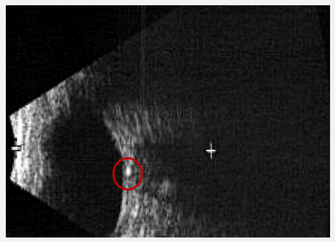


Figure 2a & 2b: B-scan of OD (left) and OS (right) demonstrating decreased posterior chamber depth and small axial length – OD 16mm, OS 17mm. The red arrow on OD shows a thickened sclera. The red circle on OS shows a focal point of hyperfluorescence - a rare nanophthalmos findings of optic nerve head drusen.

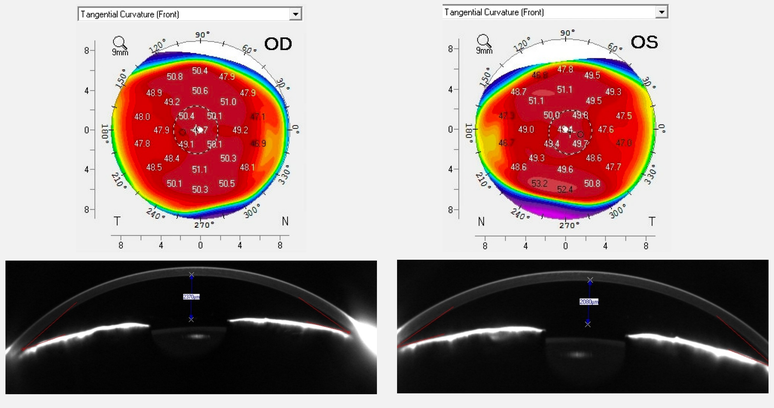
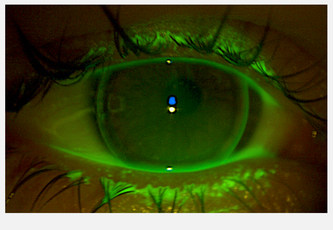


Figure 3a & 3b: Oculus Pentacam® 4 shows the Tangential Map (top) and the Anterior Chamber Depth (ACD) (bottom). Results reveals a with the rule astigmatism with steeper than average corneas. OD 49.30/50.50@107.4 OS49.00/50.60@100.4 with pachymetry values of 611um and 601um, respectively. The ACD OD 2370um and OS 2080um.



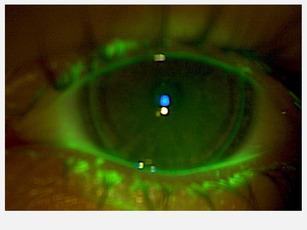


Figure 4: Anterior segment photos of the final GP lens fit with sodium fluorescein pattern – denoting an alignment fit on OD (left) and OS (right).

Eye	BC (mm)	DIA (mm)	Power (D)	CT (mm)	Material	DVA	DVA OU
OD	6.78	9.6	+15.25	0.56	Boston XO2	20/50	20/40
OS	6.73	9.6	+15.00	0.56		$20/40^{-1}$	

Table 2: Final GP lens parameters allowing for alignment fit and optimum visual acuity.

DISCUSSION

Studies have shown that patients with nanophthalmos present with an axial length smaller than 21 mm, narrow palpebral fissures and steep corneas with irregular astigmatism. Aside from the small axial length, nanophthalmos additionally differs from other forms of microphthalmia in that it presents with a small anterior chamber, posterior segment and thickened scleral and choroid[2]. Given the small globe, the optic nerve tends to be crowded and in rare cases, optic nerve head drusen can be found. The shallow anterior chamber and thicker lens increases the risk of developing secondary angle-closure glaucoma[2]. ACD was examined in normal, open angle eyes and found the average to be 3.33±0.27 mm[3].

A complication that arises from nanophthalmos, among others, is the high hyperopic refractive correction. Management options include spectacles and contact lenses. Both pose a challenge given the high plus power and thick lenses. In extreme cases, IOL implantation with the power ranging from +45D to +60D will provide optimum correction[4]. Given the lack of IOL availability in the required range, a piggyback implant may be used. A consideration may be to correct to the highest capabilities with an IOL in order to reduce the required contact lens prescription. This will allow for a reduction in power and concurrently the center thickness, allowing for increased oxygen delivery and centration.

CONCLUSION

Nanophthalmos presents with a variety of clinical findings that requires specific consideration during contact lens fitting. Small palpebral apertures, steeper than average corneas, irregular astigmatism, high hyperopia, and concurrent glaucoma make for specific challenges while fitting contact lenses. This case illustrates those specific challenges and ultimately demonstrates an ideal outcome.

REFERENCES

1. Yang, N., Zhao, L.-L., Liu, J., Ma, L.-L., & Zhao, J.-S. (2021). Nanophthalmos: An update on the biological parameters and fundus abnormalities. *Journal of Ophthalmology*, *2021*, 1–6.
2. Carricondo PC, Andrade T, Prasov L, Ayres BM, Moroi SE. Nanophthalmos: A Review of the Clinical Spectrum and Genetics. J Ophthalmol. 2018 May 9;2018:2735465.
3. Yi, J.-H., Lee, H., Hong, S., Seong, G. J., Kang, S. Y., Ma, K. T., & Kim, C. Y. (2008). Anterior Chamber measurements by Pentacam and as-Oct in eyes with normal open angles. *Korean Journal of Ophthalmology*, *22*(4), 242.
4. Yang, N., Jin, S., Ma, L., Liu, J., Shan, C., & Zhao, J. (2020). The pathogenesis and treatment of complications in nanophthalmos. *Journal of Ophthalmology*, *2020*, 1–8