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Scleral Lens With Vertical Prism Resolves Long Standing Visual Complaints

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Abstract

Vertical prism ground into a scleral lens is a novel approach to treating long standing mild diplopia in patients with anterior segment disease. Available prism powers vary by manufacturer and may present comfort or handling complications.^{1,2,3,4}

Background

72 year old WF, NR, was referred to our clinic by a corneal ophthalmologist for a medical contact lens fitting for exposure keratitis. She also had long standing complaints of distance and near vision being “off.” NR had been evaluated extensively by ophthalmology from cornea to macula without any significant findings exposure dry eye.

A scleral lens was fit for diagnostic purposes to treat the exposure keratitis and to evaluate vision. Vision was noted to be better, but still “off.” Upon further evaluation a two prism diopter left hypertropia was found during binocular vision exam.

Case Report / Past Ocular History

Chief Complaint: Filmy vision

Personal Ocular History: Cataract surgery (2015), YAG (2015), Blepharoplasty (2016), Dry eye

Personal Medical History: Atrial Fibrillation, Pacemaker, Hypothyroid

Ocular medication: Restasis, Refresh, Celluvisc

Best Corrected Visual Acuity: 20/15 right, 20/15 left

Pupils: Correctopia in the right eye, Equal Round Reactive left, (-) Afferent Pupillary Defect

Tonometry: 17 right, 17 left

Manifest Refraction: Right +0.75-1.50x097 20/15
Left +1.25-1.25x050 20/15
+2.50 ADD 20/20 Near

Binocular workup:

Distance Von Graefe: 3 eso and 3 left hyper deviation

Distance vergence ranges

Base In: x/6/0 // Base Out: x/12/12 // Supra: 3/-1 // Infra: 3/0

Near Von Graefe: 7 exo and 2 left hyper deviation

Near vergence ranges

Base In: x/18/8 // Base Out: x/32/5 // Supra: 4/2 // Infra: 6/3

Maddox rod: horizontal ortho, vertical 2 left hyper

Worth 4 dot: 3 Green dots low, 2 Red dots high

Stable vertical deviation with no fatigue, torsion, head tilt, proptosis, or other signs. Brain imaging shows no lesions.

Clinical Exam Findings

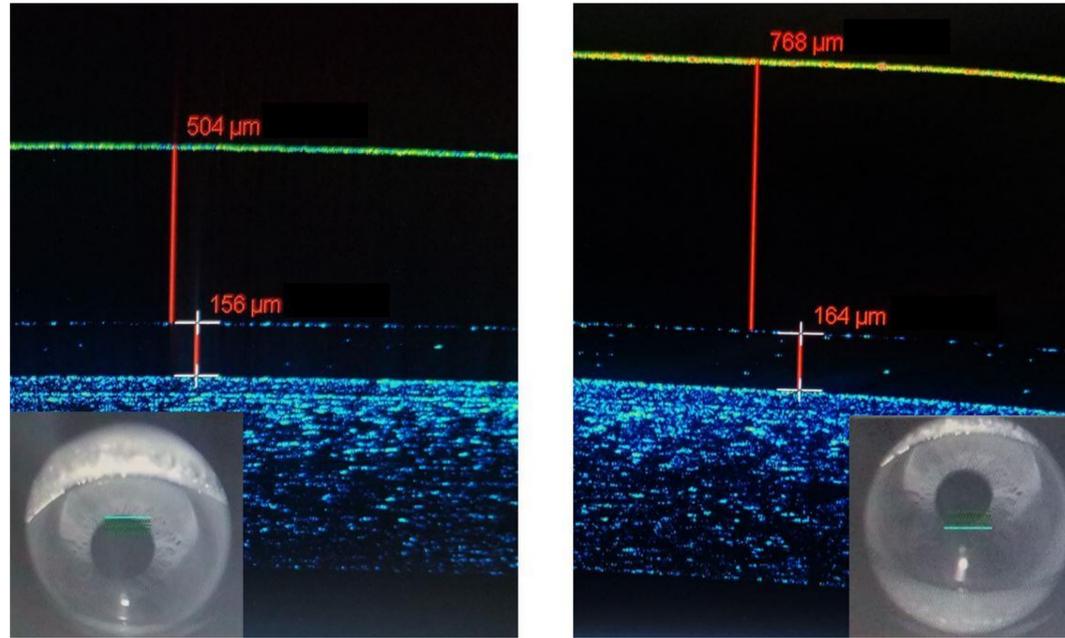


Figure 1. Anterior segment OCT shows increased lens thickness inferior compared to superior scans.

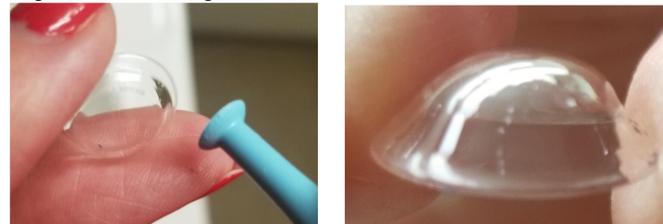


Figure 2. shows difficulty attaining suction at inferior lens edge.

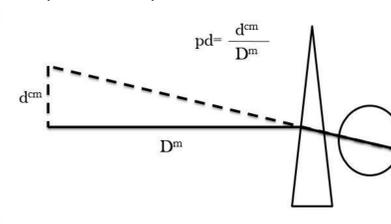


Figure 3. Optics of vertexing prism diopters

Treatment / Management

Vertex distance of a prism at the spectacle plane increases the needed power of the prism when placed on the eye. The increased lens width inferiorly causes slight discomfort, and less oxygen permeability which requires the highest possible dk material and careful monitoring of corneal health.⁵

NR was taught insertion using the Dalsey Adaptives See Green™ inserter with a stand due to hand tremors. Removal continues to be difficult due to lens geometry. Breaking suction with pressure on inferior temporal sclera seems to be the most successful.

NR has continued follow-up every 6-months for medical contact lens evaluations.

Discussion

Small binocular vision misalignment can confuse diagnosis. New vertical heterotropias should always be evaluated for serious emergent conditions.

The most common causes of adult onset vertical tropias are: 4th nerve palsy, thyroid eye disease, surgery, fracture, skew deviation, 3rd nerve palsy, myasthenia gravis, and decompensation of a hyperphoria.⁶

Decompensation of a previous phoria is usually caused by a change in the visual system that makes fusion difficult.

Use of scleral impression technology, such as the EyePrintPRO™, offers the ability to add even horizontal prism to scleral lens designs as the lens stability prevents its rotation.⁷

Scleral Lens Fitting

Trial lens: Zenlens™ (Alden Optical), Regular Cornea design, 15.4 Diameter 4500 SAG, 7.42 BC.

Lens assessment: Excessive movement right eye and mild movement left eye. Increase vault 200 um both eyes. Loosen fit right eye due to subjective tight feeling with and increase +25 sag to compensate edge sinking.

Trial lens ordered: Boston XO2
ZenRC 15.4/7.42/-0.50-0.75x105/4725/flat 2 APS/Limbal Clearance standard
ZenRC 15.4/7.42/+0.25-0.50x080/4700/standard APS/Limbal Clearance standard

F/U lens assessment: 150 μm central clearance both eyes, good limbal clearance, no edge lift. NR still complains of distance “doubling” Von Graefe, worth 4 dot, and Maddox rod show 2 prism diopter left hypertropia. Trial frame confirmed comfortable with reversing image upon prism flip. 3pd Base Down prism ground into left lens

Final lens assessment: Good vision, comfort, and fit. Double vision resolved. Patient having some trouble with removal of lens due to lens front surface geometry

Conclusion

Visual complaints must be carefully elucidated. Small corrections can have a larger impact in a patient's quality of life. In this case a scleral lens was an elegant solution for the patient's group of eye complaints. Exposure to the ocular surface, aberrations induced by ocular surgery, and vertical misalignment were all solved by the use of one set of scleral lenses.

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