



# DOUBLE TROUBLE: Manipulation of vertical heterophoria with non-prism gas permeable lenses

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## Background

Vertical heterophoria is a form of binocular vision dysfunction in which the line of sight from one eye is higher than the other at physiological rest, leading to diplopia. Common etiologies of vertical heterophoria include congenital or acquired brain injury. Patients experiencing vertical heterophoria may present with a head tilt and may be experiencing headaches or neck aches, dizziness, difficulty reading, double or overlapping vision, and psychological symptoms such as anxiety [1].

Scleral lenses are known to decenter inferiorly, in most cases, potentially causing a base-down prism effect. The potential of creating greater decentration over the eye requiring base-down prism may be used to correct for low-level vertical heterophorias.

## Case Summary

### Case History:

**Patient Demographics:** 25 year-old Caucasian Male

**Chief Complaint:** Vertical diplopia at near

**HPI:** Constant vertical diplopia at near, first noticed 9 months ago with difficulty judging cup-to-disc ratio with fundus biomicroscopy in his third year of optometry school. Diplopia resolved with habitual 0.5BU OD, 0.5BD OS in spectacles. Expressed interest in contact lens use due to constant debris and fogging of glasses; no success with soft contact lens fit.

### Medical history:

Traumatic Brain Injury – 8 concussions total: 5 diagnosed and 3 self-diagnosed x 9 years ago, with associated intermittent ptosis OS, constant dull headache, irritability, fatigue, light sensitivity, absent seizures. Diagnosed classic migraines x 17 years ago

**No medications reported and no known drug allergies**

### Pertinent Findings:

**Visual Acuities (cc):** OD: 20/20  
OS: 20/20

**Pupils:** PERRLA, No APD, bright 4mm, dim 6mm

**EOM:** SAFE OD/OS

**Visual Fields:** FTFC OD/OS

**Cover Test:** 2XP @ D, 2XP @ N

**Refraction:** OD +1.75 DS, 0.5 BU  
OS +3.25 DS, 0.5 BD

**Vertical Vergence Range:** 3/1

**Maddox Rod:** sc: 1.5 p.d. left hypertropia  
cc: no hyper deviation

**Intraocular Pressures (IOP):** OD: 20 mmHg  
OS: 21 mmHg

### Slit Lamp Exam:

**Adnexa:** Unremarkable OD/OS

**Conjunctiva:** White and Quiet OD/OS

**Cornea:** Clear x 3 OD/OS

**Anterior Chamber:** Deep and Quiet, VH angles 3+ OD/OS

### Diagnosis:

1. Vertical Heterophoria OU
2. Hypermetropia, bilateral, OU
3. Anisometropia, OS

### Treatment:

Patient elected to be fit in scleral lenses, OU, with the goal to manipulate prismatic effect with decentration of the tear layer, OS.

## Treatment

### Evaluation of Contact Lens Fit:

GP parameters of DIA/SAG/BC/POWER

**OD:** SoClear®, Art Optical: 14.0mm/ - /7.76mm/+1.50 with standard curves, Tangible Hydra-PEG coating

Central approximately 50um, adequate limbal clearance, aligned landing zone 360, VA: 20/15 +2

**OS:** Ampleye, Art Optical: 15.6mm/3.60mm/8.45mm/+6.00 with standard curves, Tangible Hydra-PEG coating

Central vault 310um, adequate limbal clearance, aligned landing zone 360, VA: 20/15

**85um measured vault difference between superior/inferior**

**Maddox Rod (cc CL):** no hyper deviation

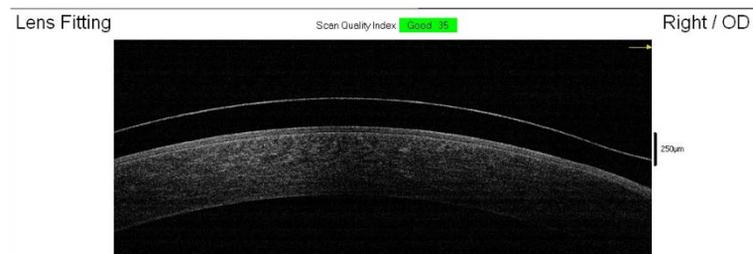


Image 1: Optovue lens fitting software showing minimal central vault with SoClear corneal scleral lens OD

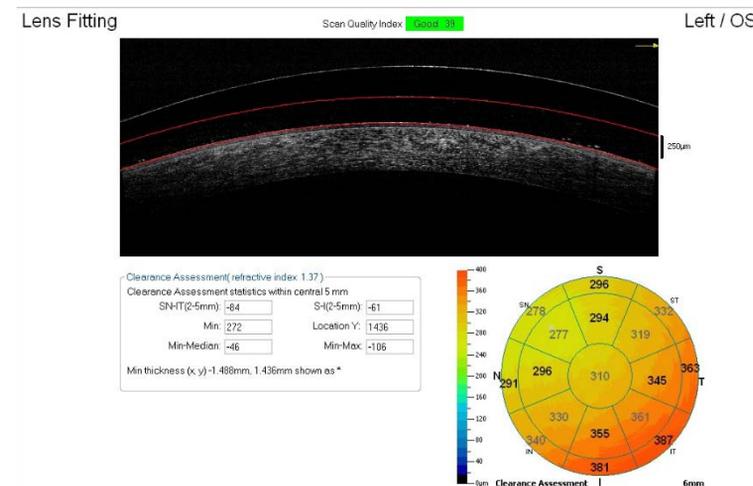


Image 2: Optovue lens fitting software showing inferior decentration with Ampleye scleral lens OS



Image 3: SoClear corneal scleral lens OD



Image 4: Ampleye scleral lens OS

## Results

- Patient was successfully fit in a corneal scleral lens OD and a scleral lens OS to manipulate and eliminate vertical heterophoria.
- Use of gas permeable lenses has allowed patient constant single vision throughout the day while performing habitual activities: use of biomicroscope, and other near work.
- Comfort of lenses, with additional Tangible Hydra-PEG coating, allowed patient to successfully wear lenses for an average of 14 hours per day

## Discussion

### Vertical Heterophoria:

- Patients with vertical heterophoria often have associated symptoms that are debilitating and highly affect quality of life.
- Spectacle prismatic correction is sufficient and often utilized for a majority of the population, however, patient occupation and hobbies are key factors in determining the best modality of treatment [2].

### Challenges Encountered:

- Attempts of fitting bilateral scleral lenses, with the same design in both eyes, did not allow for enough decentration; minimal prismatic effect was induced, and was not sufficient for significant outcome.
- Having greater hypermetropic power in the left lens implied a greater central thickness. Although beneficial for increased decentration, oxygen permeability and comfort was of concern.

## Conclusion

- Patients with vertical heterophoria may present with symptoms that greatly affect habitual activities. In patients where spectacle lenses pose an inconvenience, non-prism gas permeable lenses can be an option.
- Manipulation of the tear layer with two different designs of lenses allowed for a greater difference in decentration to create a sufficient prismatic effect to correct for symptoms of vertical heterophoria, and improve patients' quality of life.
- As compared to prism gas permeable lenses, a natural prismatic effect created by the tear layer through decentration may eliminate side effects such as corneal desiccation and be more cost efficient for the patient [3].

## References

1. Friedbert, Mark A. Rapuano, Christopher J. The Wills Eye Manual, 6th edition. Philadelphia: Lippincott Williams and Wilkins, 2012.
2. Friedman, Niel J. Kaiser, Peter K. The Massachusetts Eye and Ear Infirmary. 4th edition, Elsevier, 2014.
3. Johns, Lynette K. Scleral Lenses 601: Advanced Applications. Contact Lens Spectrum, Volume 31, Issue: Scleral Lenses: Understanding Applications and Maximizing Success October 2016, pg: 28-30.