

BACKGROUND

Duane Retraction Syndrome (DRS) is a congenital anomaly of the abducens nucleus with aberrant innervation of the lateral rectus by the oculomotor nerve. DRS is characterized by difficulty with abduction, adduction, or both, in the affected eye¹. In addition, because of the faulty innervation by the oculomotor nerve, patients may manifest other vertical or horizontal deviations. Although refractive error in these patients is managed primarily with spectacles, vertical prism can now be incorporated into scleral lenses predictably by aligning toric peripheral curves with the astigmatic sclera.

Scleral lenses are large-diameter, rigid contact lenses that vault over the cornea, allowing for comfortable, clear vision for both healthy and diseased eyes. The minimal movement and high stability that comes with a properly fitted scleral lens allows for more nuanced customizations, such as the addition of a multifocal design or prism correction.

CASE

A 31-year-old white male with Type 1 DRS OD presented for a scleral contact lens fitting following poor success with custom soft contact lenses with prism due to discomfort and lens awareness. His current spectacles have 4 prism diopters (PD) base down (BD) ground-in to alleviate a 6 PD right hyperphoria. His binocular status is significant for convergence excess as his accommodative convergence-to-accommodation ratio is abnormally high, 9:1. Currently, the patient prefers multifocal lenses to alleviate asthenopia during prolonged nearwork. The patient's motivation for pursuing scleral lenses was to achieve comfortable prism correction without spectacles.

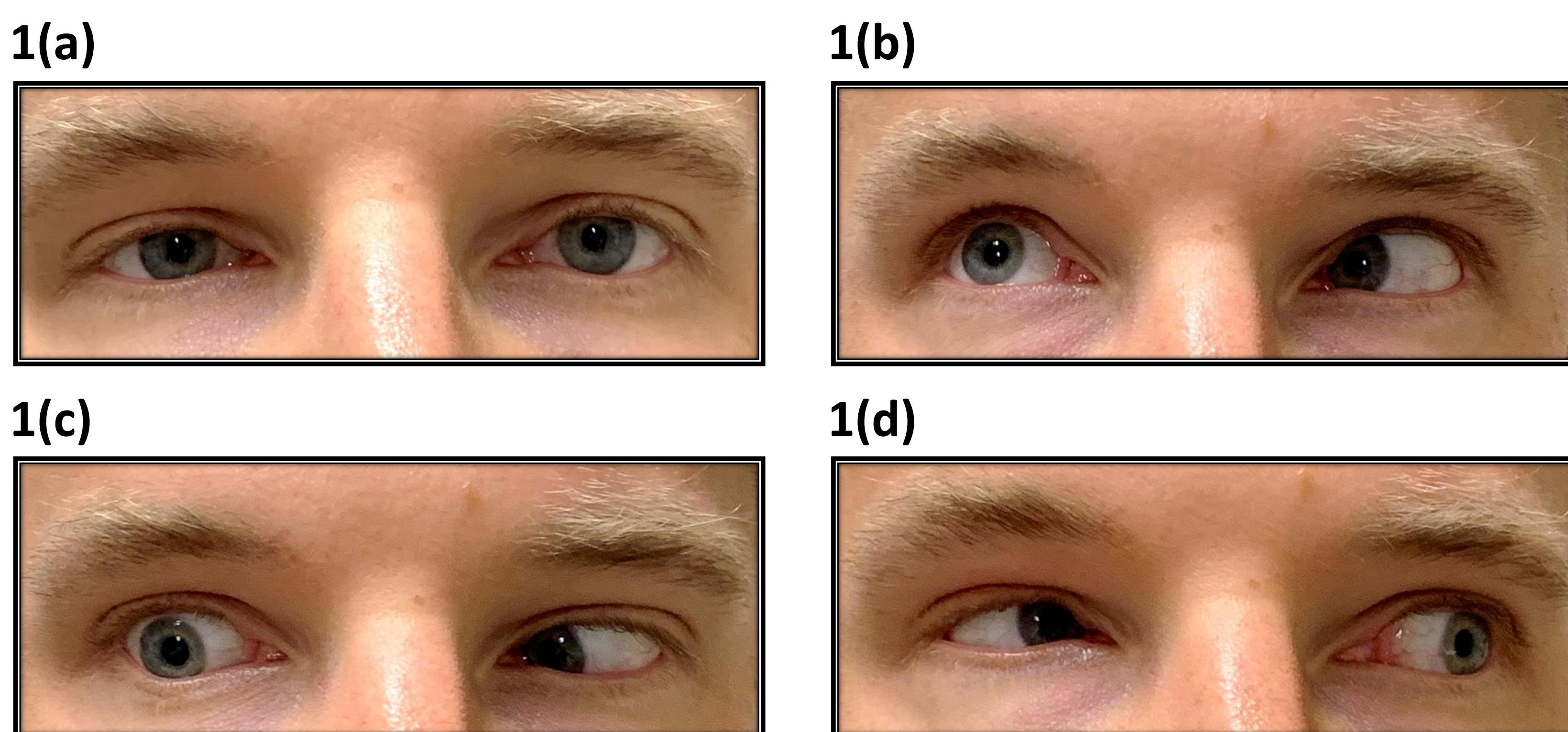


Figure 1: The patient's eyes are aligned in primary gaze (a). Abduction of the affected right eye is limited and is accompanied by slight elevation and widening of the palpebral fissure (b, c). Adduction is accompanied by narrowing of the palpebral fissure (d).

EXAMINATION FINDINGS AND RESULTS

Initial Examination

At initial presentation, his entering acuity and best-corrected visual acuity were 20/15 OD, OS. Distance vertical and horizontal phorias were measured as 2 right hyperphoria and 4 esophoria, respectively. See Figure 1 for the patient's extraocular motility findings. He had normal, healthy anterior segments OU in slit lamp examination.

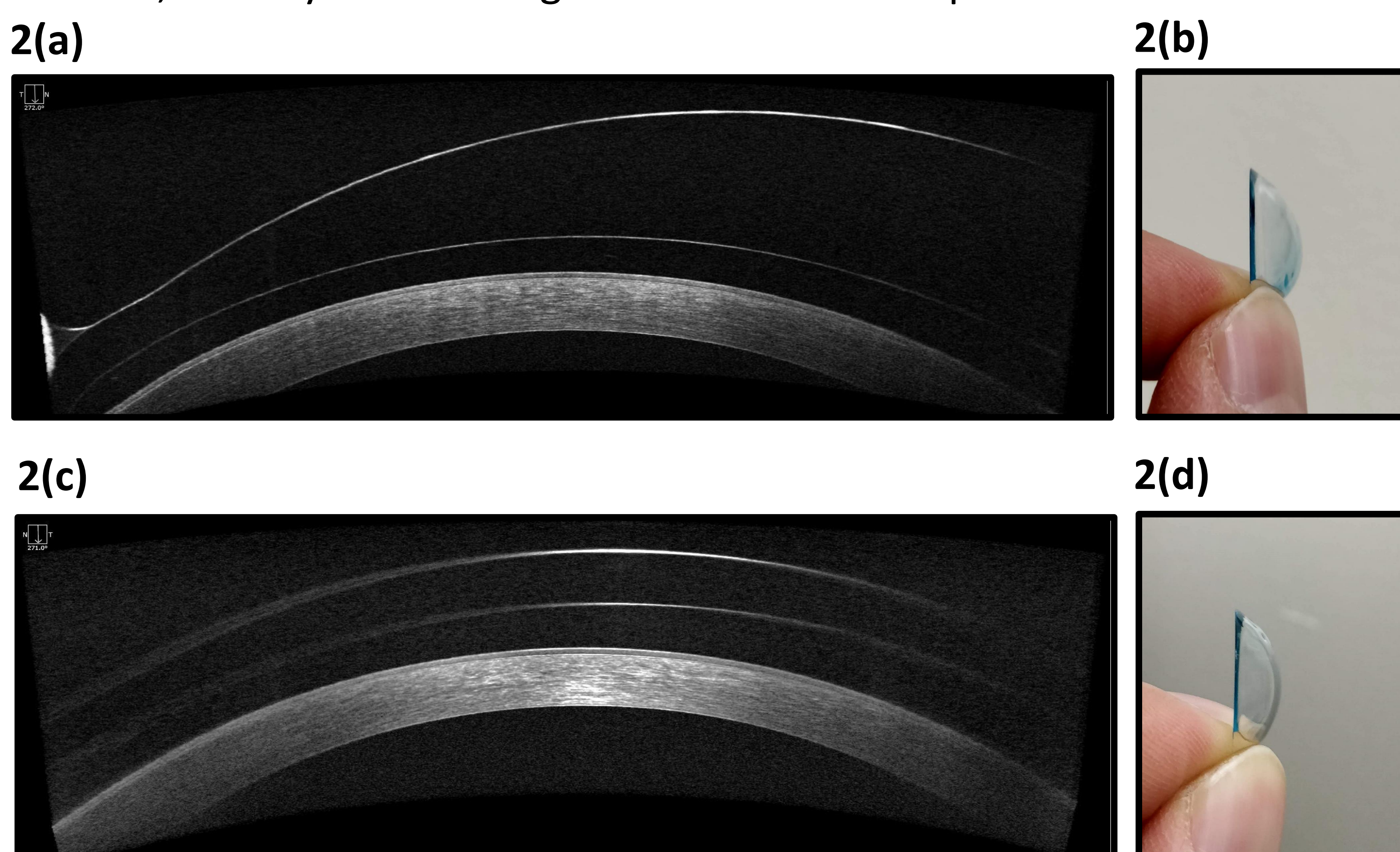


Figure 2: A side-by-side comparison of the patient's right (a, b) and left (c, d) scleral lenses. The portion of the lens corresponding to the inferior cornea is noticeably thicker than the lens without prism.

Scleral Lens Fitting

A step-wise diagnostic fitting was performed using the Valley Contax Custom Stable Elite lenses. With the assistance of the consultation department, four pairs of lenses were designed:

1. Single vision lenses without prism to achieve optimal fit and vision
2. Single vision lenses with vertical prism to achieve optimal fit, vision and binocular comfort
3. Single vision lenses with increased vertical prism to achieve optimal fit, vision and increased binocular comfort
4. Center-distance multifocal lenses with vertical prism to achieve optimal fit, vision, binocular comfort, and to address convergence excess

Incorporation and Assessment of Prism in Scleral Lenses

The patient's distance vertical phorias and ranges were as follows:

Prism	Distance VPhoria	RSupra Range	RInfra Range
Pre-prism correction	6 RH	4/1	1/0
2 BD OD	4 RH	2/2	4/1
4 BD OD	4 RH	4/1	3/1

Table 1: Vertical phoria and ranges measured through scleral lenses with increasing amounts of prism.

In our case, increasing the vertical prism in the scleral lenses did not lead to a proportional change in the patient's phoria. After eliminating confounding factors such as decentration of the lens (and inability of the patient to access the prism), we believe that this is largely attributable to the patient's long-time wear of spectacle lenses with prism correction. Similar to horizontal phorias, it has been found that prolonged exposure to vertical binocular disparity can lead to prism adaptation².

Addition lenses are used to treat convergence excess caused by a high AC/A ratio³. With the combination of the vertical prism and multifocal design, the patient was ecstatic about the quality and comfort of his vision and felt it was superior to spectacle correction with prism.

CONCLUSION

This case demonstrates the viability of scleral lenses as an alternative to other forms of prism correction in patients with binocular disorders. Especially in cases where patients have concurrent corneal disease, scleral lenses with prism can help patients achieve optimum vision while simultaneously addressing their binocularity issues. Because a successful scleral lens fit intrinsically strives for rotational stability, the additional legwork of adding other parameters such as prism and a multifocal design into a scleral is minimal.

	OD	OS
Base Curve	7.85	7.85
Sagittal Depth	4568 microns	4670 microns
Diameter	15.80	15.80
Power	-1.25	-2.25
Add	+0.75	+0.75
Prism	4.0 BD	No prism
Material	Optimum Extra	Optimum Extra
Limbal clearance	0.50	0.00
Peripheral curves	-3.00 (Steep) / +1.00 (Flat)	-5.00 (Steep) / +4.00 (Flat)

Table 2: Final lens parameters.

REFERENCES

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2. R. Kono, S. Hasebe, H. Ohtsuki, T. Furuse, T. Tanaka. Characteristics and variability of vertical phoria adaptation in normal adults. *Japanese Journal of Ophthalmology*, 42 (5) (1998), pp. 363-367
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