

Bitoric Lens Design and Fitting

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Abstract

Purpose/Background.

Bitoric contact lenses are a type of gas permeable (GP) contact lens with two different curves. One curve is on the front surface and the other curve is on the back surface. It is best utilized when corneal cylinder is equal to or exceeds 2.50 diopters. The two curves allow the “saddle principle” to provide an alignment fitting relationship in both meridians.

Case Report.

A 20-year-old Caucasian female presented to the clinic noting blurry vision from the dispensed soft toric trial lenses. Upon slit lamp examination, excessive rotation of the lenses was noted OU. We utilized the “left add right subtract” (LARS) principle with different soft toric lenses, but vision remained suboptimal with the patient noting a ghosting effect of the target. After discussing the possible options with the patient, we made the decision to order a trial pair of Art Optical® bitoric contact lenses. Despite some initial discomfort, the patient’s vision had improved, remained stable, and no rotation was noted during follow-up appointments.

Conclusions.

Bitoric lenses are a great option for optical correction in patients with the appropriate amount of astigmatism. The lenses can drastically reduce the amount of rotation seen with soft torics to provide stable vision for the patient. It is important to educate a new GP patient on the transition period for adjusting to lens awareness, wearing and disinfecting schedule, and proper insertion and removal techniques.

Key Words: astigmatism, bitoric, contact lens, gas permeable

GP contact lenses make up 10% of the contact wearing population and bitoric lenses comprise an even smaller percentage of that population, but still they serve an important purpose for a particular patient base with high amounts of astigmatism.^{1,2} Toric lenses have two powers in the lens, so keeping the lens stable is imperative for clear vision. Some toric lenses accomplish this with prism ballasting inferiorly or truncation in the lens. Bitoric lenses use the “saddle principle” to maintain stability on the eye.^{1,3} A saddle fit will establish full alignment to the two principle meridians eliminating any corneal cylinder. GP contact lenses have many advantages

over soft lenses. They preserve their shape on the cornea, offer better tear exchange, are more durable, are more resistant to deposit build up, and offer crisper vision.¹⁻⁴ There are three types of toric GP contact lenses that include front torics, back torics, and bitorics. In most cases of high corneal astigmatism, a bitoric lens design should be used. The primary reason for new GP wearers to discontinue the use of their lenses is due to the initial discomfort experienced.²

Case Report

On August 29th 2012, a 20-year-old Caucasian female presented to the eye clinic with a chief complaint of blurry vision OU. This blurry vision had been present shortly after she began wearing the dispensed trial lenses three weeks prior. Her past ocular history was unremarkable. There was family history of glaucoma with her maternal grandmother, diabetes with her mother, cancer with her sister and maternal grandmother, and hypertension with her father, mother, and maternal grandmother. Hypoglycemia was noted in her review of systems. Her current medications included Tri-Sprintec® and Celexa®, and she had no known drug allergies. The lenses in which blur was noted were Vistakon Oasys Toric®, and the contact lens prescription was -5.50 -2.25X020 OD and -5.50 -2.25X170 OS. The base curve radius was 8.6 mm, and the diameter was 14.5 mm. At that appointment on August 9th, 2012 she reported 20/20 vision OU with the lenses, Slit lamp examination revealed a central fit, 1 mm of movement, ten degree temporal rotation of the lens OD, and no rotation OS. The over-refraction was plano. All other health exam elements were unremarkable. In reviewing her initial exam, we also noted her spectacle prescription to be -5.75 -2.75X008 OD and -5.75 -3.00X175 OS. This spectacle prescription gave her visual acuities of 20/25+1 OD and 20/20-2 OS. Upon taking initial visual acuities on August 29th, 2012 with the Vistakon Oasys Toric® lenses in she reported acuities of 20/100 OD, 20/80-2 OS, and 20/60+1 OU with a ghosting effect. Rotation or instability of the lens was suspected, and slit lamp evaluation confirmed that notion with 25 degrees of rotation temporally OD and 15-20 degrees of rotation temporally OS. The lenses were removed and slit lamp examination showed clear corneas and adnexa, no vascularization, no staining, no scarring, and the anterior chamber was clear. We applied the “LARS principle”, and selected a CIBA Air Optix® torics lens of the same sphere and cylinder powers to attempt to improve the patient’s vision. After allowing time to settle, she still reported suboptimal vision and slit lamp

examination showed unstable axis location. We then educated the patient on her refractive correction options. We discussed the use of custom soft toric (ex. Art Optical Intelliwave®), GP (standard or sclera), or trying various brands of soft toric contact lenses. The decision was made to try standard diameter GP lenses. We then discussed the benefits of bitoric GP lenses such as crisper, more stable vision and that they would be more economical long-term due to the ease of maintenance and longer wearing life. We also made her aware that there would be a period necessary to adapt to the increased lens awareness. Topography was then done and showed keratometry readings to be 46.1/48.5 @098 OD and 45.9/ 48.5 @080 OS.

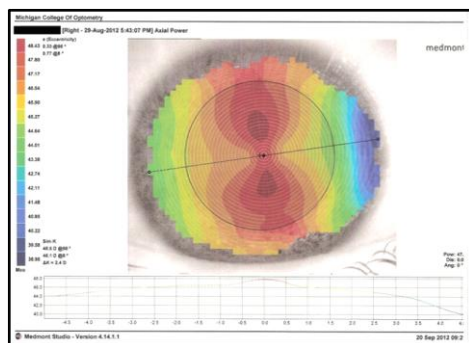


Figure 1. Right Eye axial map depicting limbus-to-limbus With-the-Rule astigmatism.

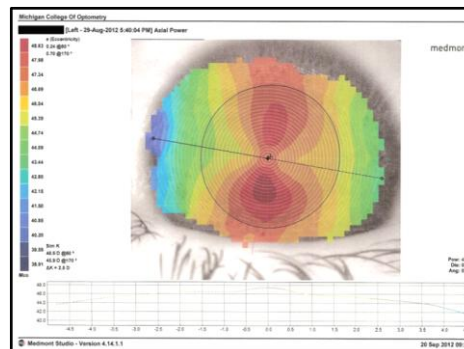


Figure 2. Left Eye axial map depicting limbus-to-limbus With-the-Rule astigmatism.

The axial topographical map revealed with-the-rule astigmatism and it was calculated that nearly all of the patient's refractive cylinder was corneal, so we opted for a spherical power effect fit. This finding along with the amount of cylinder present made her a great candidate for bitoric GP lenses. We empirically fit these lenses using the Mandell-Moore Bitoric Lens Guide rather than using a diagnostic set. Using this method, we ordered an Art Optical bitoric of -5.25/-7.25 BC: 7.37/7.03 OD and -5.25/-7.50 BC:7.4/7.03 OS. The diameter was 9.5 and the optic zone was 8.1 OU with Boston EO material. The patient was instructed to return to the clinic to have the lenses dispensed and evaluated in two weeks.

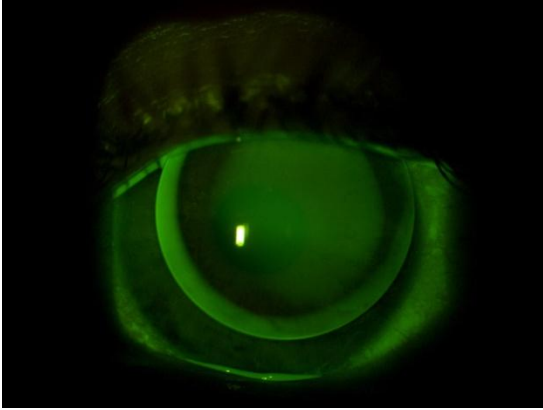


Figure 3. Left Eye slit map photograph using fluorescein to assess the lens-to-cornea fitting pattern.

The patient returned to the eye clinic September 20th, 2012 to have the ordered bitoric lenses fit and assessed. The lenses were rinsed, inserted, and allowed to settle. Initial visual acuities with the lenses were 20/20-2 OD and 20/20-1 OS. The slit lamp exam findings showed center alignment, movement to be about 1 mm, fluorescein pattern was aligned, good edge lift, and excellent surface quality. The over-refraction was plano OU. The patient was educated that the lenses were to be worn daily and disinfected with Clear Care® solution. The GP bitoric lenses were dispensed, and she was instructed to return to the clinic in 1-2 weeks for a contact lens follow-up.

The patient returned October 4th, 2012 after wearing the GP bitoric lenses for two weeks. The patient noted lens awareness, but that the awareness had gradually decreased while wearing the lenses 8 hours a day over the two weeks. She also noted a marked improvement in her vision with the GP bitorics in comparison to her previous soft toric lenses. Her initial visual acuities were 20/20 OD and 20/15-1 OS at distance, and at near her visual acuities were 20/25-2 OD and 20/15-1 OS. During the slit lamp evaluation, the lenses were noted to be sitting slightly superior to center. Good movement, edge lift, surface quality, and an aligned fluorescein pattern were also observed. Further biomicroscopy was done and revealed normal lids, lashes, and cornea. The patient was made aware the comfort of GP lenses should continue to improve over the coming weeks and that if the comfort doesn't improve or she notes a decrease in vision to return to the clinic to be assessed for mini scleral or scleral lenses.

Discussion

The objective in fitting a bitoric lens is to achieve a close alignment of the contact lens on the eye and create an appearance in the fluorescein pattern as if the fit were a spherical lens on a mildly astigmatic eye. Making the lenses slightly flatter in the vertical meridian will promote more vertical lens movement and increase tear flow beneath the lens. This will likely provide an upper lid attached fit, which will be a more comfortable fit. The diameter used for these contact lenses was determined to ensure complete pupil coverage in both bright and dim conditions. Most lens designs range from 9.2 to 9.8mm in diameter.^{1,5} In designing and ordering the patient's lenses, we used the Mandell-Moore Bitoric Lens guide to input her refraction and keratometry values. We then determined the base curve by fitting 0.25 diopters flatter than her flat "K" measurement and 0.50 diopters flatter than her steep "K" measurement, which we obtained via the Medmont® topographer.¹⁻⁴

For this patient, we discussed many treatment options. The use of GP toric lenses was deemed best for initial use in this case. The three GP torics considered were front torics, back torics, and bitorics. Front torics are useful for patients with spherical corneas and astigmatism. The spherical correction is on the back of the lens, while the astigmatic correction is on the front.^{1,2} Back torics have spherical correction on the front of the lens with the astigmatic correction on the back. The back toric lens can induce additional astigmatism in the flatter meridian of the eye, so use of these lenses should be confined to patients who follow the "two-thirds principle". The "two-thirds principle" is determined by dividing the refractive cylinder at the cornea by 1.5 and then adding that value to your flat "K" measurement. This will give you an appropriate steep "K" value.¹ Back torics are best utilized in cases of against-the-rule astigmatism.^{1,2} Finally, a bitoric lens has a toric anterior surface that compensates for any residual astigmatism created by the toric posterior surface. There are two type of fits with the bitoric lenses. There is a spherical power effect fit where the lens acts optically as a spherical lens because the difference in base curves between the front and back surfaces cancel out any toricity regardless of the rotation of the lens. There is also a cylinder power effect fit where the front and back base curves do not completely equal the difference in the lens powers, so rotation does have an effect on vision. This type of lens design must be prism ballasted to maintain the

proper axis although the saddle principle with these lenses decreases the chance the lens will rotate.^{1,2,4,5} Custom soft toric lenses were also an option for this patient, but due the high cost and possibility of rotation still occurring, this alternative was not used. Scleral and corneoscleral lenses were discussed as an option for this patient if lens awareness was still noticeable in the weeks after the follow-up exam. Due to their larger diameter, these lenses rest almost exclusively on the conjunctiva which is much less sensitive than the cornea. These lenses are also less likely to become decentered or dislocated.^{1,6}

Bitoric lenses show limited success when the keratometric axis differs 15 degrees or more from the spectacle cylinder axis.¹⁻³ Spherical GP lenses would be a more practical option of treatment in these circumstances. Corneal topography that exhibits a symmetric pattern and astigmatism that is limbus-to-limbus is a good indicator for success in using a bitoric lens design.^{1,2}

Conclusions

Bitoric lenses are a very viable option for refractive correction in patients with the suitable amount of astigmatism. The lenses can considerably decrease the amount of rotation seen with soft torics to provide stable vision for the patient. It is important to inform a new GP patient on the adjustment period for increased lens awareness, so their expectations of comfort are appropriate.

References

1. Bennett, Edward, and Vinita Henry. *Clinical Manual of Contact Lenses*. 3rd ed. Philadelphia: Lippincott, Williams & Wilkins, 2009. 336-344. Print.
2. Heiting , Gary. "Toric Contact Lenses for Astigmatism." (2011) All about vision, Web. 23 Nov 2012. <<http://www.allaboutvision.com/contacts/torics.htm>>.
3. Raul Martín Herranz, Guadalupe Rodríguez Zarzuelo and Victoria de Juan Herráez (2012). Contact Lens Correction of Regular and Irregular Astigmatism, *Astigmatism - Optics, Physiology and Management*, Dr. Michael Goggin (Ed.), ISBN: 978-953-51-0230-4, InTech, Available from: <<http://www.intechopen.com/books/astigmatism-optics-physiology-and-management/contact-lens-correction-ofregular-and-irregular-astigmatism>>
4. Silbert, Joel. "Optometric Management." *Optometric Management*. (2007): <<http://www.optometricmanagement.com/articleviewer.aspx?articleid=71849>>.
5. Anderson , Bruce. "GP Lens Institute." *GP Lens Institute*. (2012): <<http://www.gpli.info/gr-case-29/>>.
6. Visser , E, R Visser , H Van Lier, et al. "Eye & Contact Lens: Science & Clinical Practice." *Eye & Contact Lens: Science & Clinical Practice*. 33.1 (2007): 13-20. <http://journals.lww.com/claajournal/Abstract/2007/01000/Modern_Scleral_Lenses_Part_I__Clinical_Features.3.asp>.