

Bi-toric, Back Toric or Aspheric? Choosing the right GP lens for high toric corneas

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The question is often raised about when it is beneficial to utilize toric base curve or aspheric lens designs for high corneal astigmats. At what point or amount of corneal or spectacle cylinder is it most advantageous to select a bi-toric, back toric or aspheric lens design? This article will provide practical recommendations on when and how to best utilize each design.

At what amount of corneal or spectacle cylinder should you consider not using a spherical design? Typically when you exceed 2 diopters of with-the-rule corneal cylinder, the percentage of success with a spherical design decreases. The greater the amount of corneal cylinder, the less the likelihood that spherical lenses will be successful. As corneal cylinder increases, a spherical base will typically become more uncomfortable and the physical fit will appear less acceptable.

When is it beneficial to go to an aspheric lens design? The obvious answer here would be when the corneal cylinder exceeds 2 diopters; however, the design selection will be dependent on the amount of corneal cylinder and respective spectacle cylinder present. From 2.00 to 3.50 diopters of corneal cylinder, with an equal amount of spectacle cylinder, Art Optical's ACE (Art Custom Eccentricity) is a good lens of first choice. The aspheric junctionless posterior surface of ACE provides good patient comfort and better physical alignment than a spherical base curve. ACE is fit steeper than flat K depending on the amount of corneal cylinder present. At 2.00 diopters of corneal cylinder the average base curve fit is .50 to .75 diopter steeper than K and at 3.00 diopters the average fit is 1.00 to 1.25 diopters steeper than K. ACE is a good alternative to a toric base curve design at the 2.00 to 3.50 corneal cylinder level, especially for patients who are concerned with the increased cost of toric lenses.

When is it beneficial to use a back toric lens design? Back toric lens designs are typically used when the corneal cylinder exceeds 3.00 diopters and the amount of corneal versus spectacle cylinder are relatively equal. Back toric lens designs have received bad publicity in the past due to the popular belief that back toric lens designs can not adequately correct spectacle cylinder. In actuality, back toric lens designs can be very successful on high corneal astigmats, with relatively equal amounts of spectacle cylinder, when the two thirds principle is used to calculate the base curve variance from flat to steep curvatures. To design a back toric lens, divide the spectacle cylinder by 1.5 and use the end result as the difference between the flat and steep base curve. We generally recommend to stay on flat K for the primary or flat base curve. As an example: K's are 42.00/45.00 spectacle Rx is -3.00-3.00x180. Divide the spectacle cylinder by 1.5 (3.00 divided by 1.5=2.00). Use 2.00 as the difference between flat and steep base curve with the flat base curve on flat K (42.00+2.00=44.00) the base curve fit would be 42.00/44.00 or 8.03/7.67mm. The two thirds principle utilizes the refractive index of the material multiplied by the difference between the flat and steep base curve to generate a neutralizing cylinder equal to the spectacle cylinder. This can be verified by neutralizing the cylinder power of a back toric lens designed with the two thirds principle. The cylinder amount present in the lens will be equal to the patients spectacle cylinder.

When is it beneficial to use a bi-toric design? Bi-Toric designs are typically used when the corneal cylinder exceeds 3 diopters and there is a substantial difference between the amount of corneal and spectacle cylinder. Having a substantial difference in toricity between the corneal and spectacle cylinder will normally not function for back toric lens designs. At that point it is better to go to a bi-toric lens design to achieve the best fit relationship and compensate for the calculated residual cylinder on the front surface. Designing a bi-toric lens is relatively simple. As a general rule of thumb, stay on flat K for the primary base curve and use a secondary base curve that is 1.00 diopter flatter than the steepest K. As an example: K's = 43.00/48.00, the primary base curve would be 7.84 (on K at 43.00) and the secondary base curve would be 7.18 (47.00 which is 1.00 diopter flatter than the steep K of 48.00). This base curve fit philosophy will function as long as the corneal cylinder exceeds 3.00 diopters. Using a secondary base curve that is 1.00 diopter flatter than the steep K will prevent seal off in the mid periphery and help promote a vertical tear pump that will establish better tear flow. The power is designed using the vertex corrected sphere power and the full amount of spectacle cylinder. As an example: K's are 43.00/48.00 Rx is -3.00 -3.50x180 the base curve fit would be 7.84/7.18 with a power of -3.00/-6.50. The power is shown as total cylinder power as it would be read in the lensometer, the converted power would actually be -3.00-3.50 at the with-the-rule spectacle cylinder axis. We have found that using the total amount of spectacle cylinder in the bi-toric design has been successful in the majority of the lenses we have produced for our customers. This philosophy is based upon tens of thousands of bi-toric lenses produced in RGP materials over the last 15 years.

We hope that the above information will be helpful in selecting the proper design for your high corneal astigmats. For more information about these designs, including additional fitting brochures, call our Consultation Direct Line at (800) 566-8001.

