Defining Astigmatism: the basics

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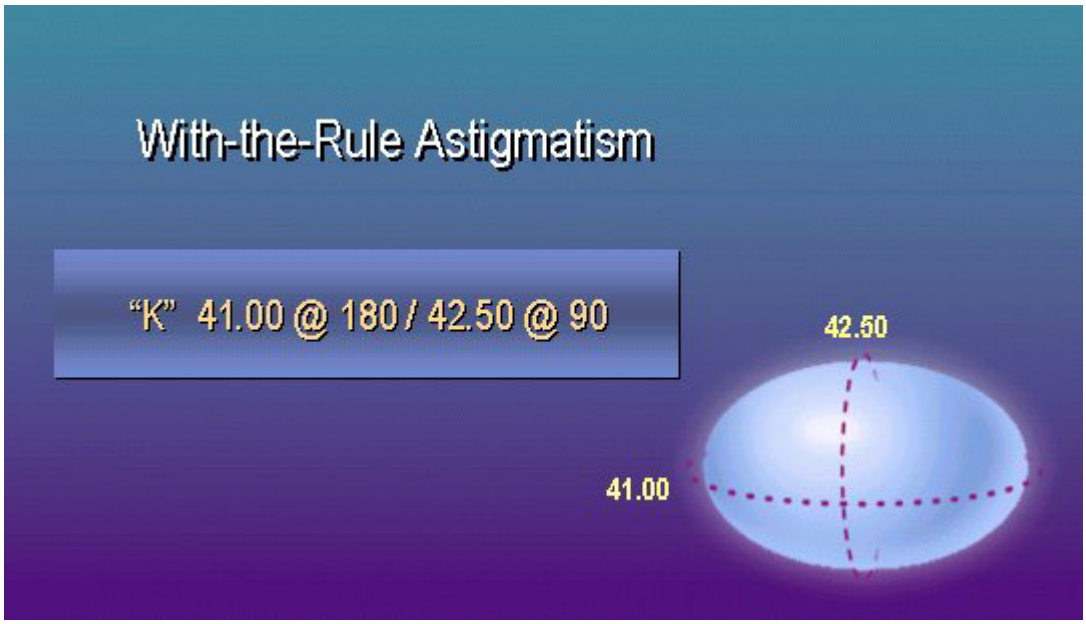
The primary goal of a refractionist is to provide the patient with the optimum cylinder axis and cylinder power correction to provide best corrected visual acuity. In contrast, a contact lens specialist, prior to determining the best rigid lens material or design required for a given eye, would more than likely "investigate" whether corneal astigmatism was regular, irregular or didn't equal the total amount of refractive astigmatism. Today that thought rarely enters the mind of the ocassional contact lens fitter, as they rarely see a patient wearing a spherical rigid contact lens (much less recommend a rigid lens to a prospective contact lens patient).

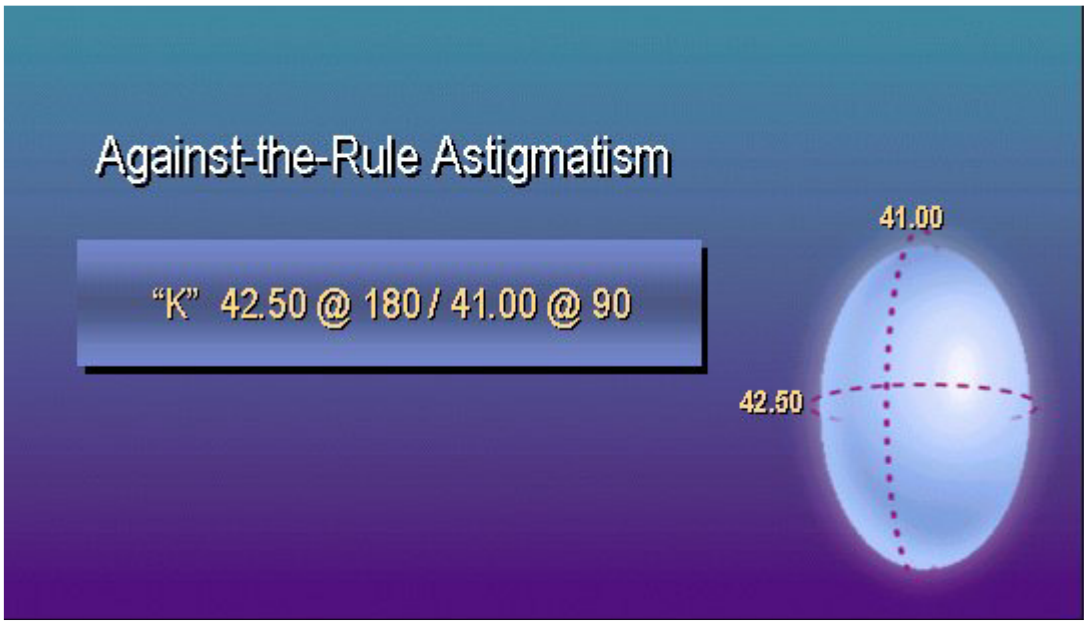
Enter the realm of Corneal Refractive Therapy™. As the high technology of CRT™ takes hold in the marketplace, fitters must get back to basics, appreciating the merits of refractive, corneal, and residual (or lenticular) astigmatism.

The total amount of astigmatic error found by manifest or cycloplegic refractometry is called ***Refractive Astigmatism***. ***Corneal Astigmatism*** is that astigmatism due to corneal irregularity and asphericity. Refractive astigmatism and corneal astigmatism maybe unequal and never cause visual concern with a spectacle wearer, however when only equal, clear vision is possible with a spherical rigid contact lens. ***Lenticular Astigmatism*** (also called internal astigmatism) is that astigmatism due to the shape of the crystalline lens. ***Residual Astigmatism*** is that amount of astigmatism remaining uncorrected after corneal astigmatism is neutralized or corrected by a contact lens or planned corneal reshaping. Some clinicians use the terminology, residual and lenticular, synonymously. However, the etiology of a residual astigmatism may be "induced" by improper contact lens choice, lens flexure, the presence of mixed astigmia or corneal surgery. In clinical practice, ***Lenticular*** or ***Residual Astigmatism*** is not measured, except by performing over-refractometry on a rigid contact lens to determine the net result.

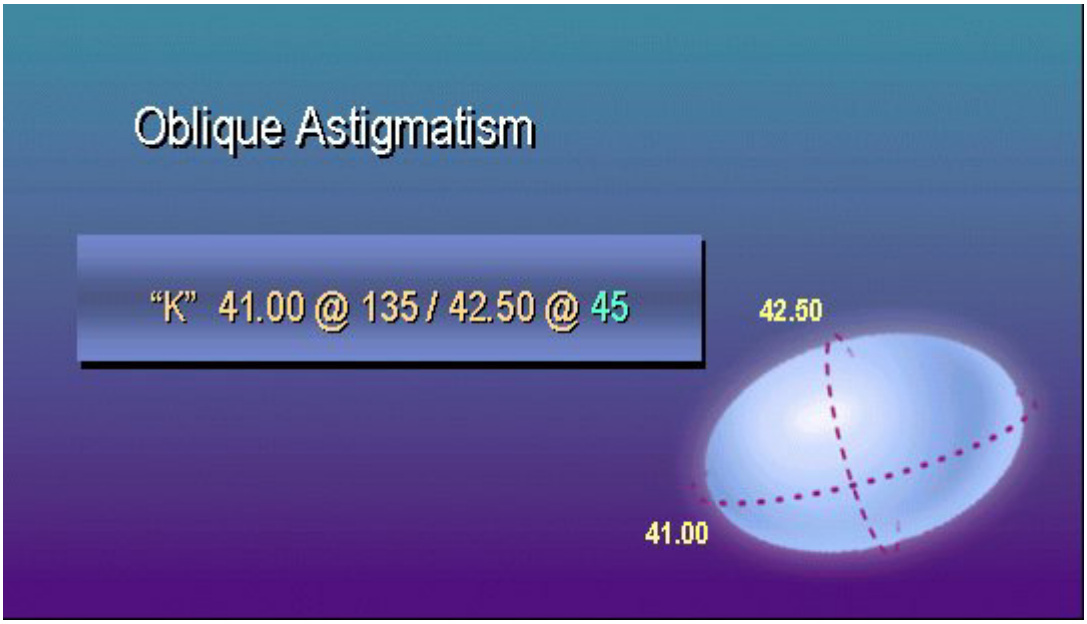
If astigmatism is present in the absence of corneal distortion, there's a good chance it's ***Regular Astigmatism.*** Regular astigmatism may either be classified as With-the-Rule, Against-the-Rule or Oblique. Irregular astigmatism and corneal distortion are usually not coincidental. ***With-the-Rule (WTR) Astigmatism*** occurs when the flattest curvature or weakest power is in the horizontal meridian; it is corrected by minus cylinder powers near axis 180. Conversely, ***Against-the-Rule (ATR) Astigmatism***, is present when the steepest curvature or strongest corneal refractive power is in the horizontal meridian; minus cylinder power near axis 90 corrects ATR. Against-the-Rule astigmatism is less common.



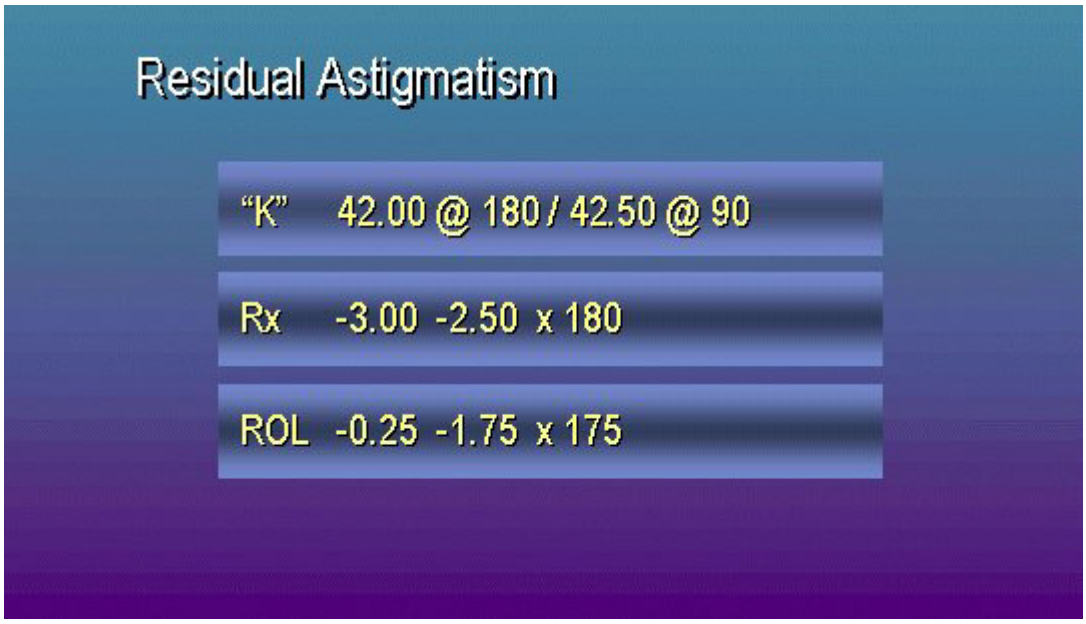
With-the-Rule Astigmatism



Against-the-Rule Astigmatism



Oblique Astigmatism



Residual Astigmatism occurs when the corneal astigmatism and refractive astigmatism are unequal. If placing a rigid lens with a spherical base curve on the above corneal curvatures, the "refraction over the lens" (ROL) depicts an uncorrected amount of corneal astigmatism, or a residual amount. This may represent astigmatism in the lens or lenticular astigmatism.