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Reply: We agree that several publications on vector analysis of astigmatism were published prior to the publication of Eydelman et al.[1] We chose the terminology of the 2006 Eydelman et al. publication because in this paper, a summary of the outcome of earlier investigations is given and the definition of a standardized analysis is addressed.

Because of the large number of publications on this topic, we tried to give an overview by referencing the 4 publications from the *Journal of Cataract & Refractive Surgery* 2001, volume 27, that focused on possible ways to analyze astigmatic data. Among these, a publication of Alpins was referred to in our paper. It was not our intention to give a complete overview of the history of cylinder vector analysis, which would have to take into account very early publications. In the German language, we find, for example, an article by Graff.[2] Furthermore, Alpins[3] and Holladay et al.[4] cite a contribution by Stokes, dated 1849. An overview of the history of crossed cylinder, for example, is given by Brookman,[5] who states that the history of crossed cylinders goes back more than 100 years. With the advent of refractive surgery with excimer lasers, this topic became more intensively discussed.[3,6–8] Many others have contributed to the understanding of vector analysis.—*Kathleen S. Kunert, MD, Christoph Russmann, PhD, Marcus Blum, MD, Georg Sluyterman v. L., PhD*

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Interpretation of doubled-angle plots

The article by Kunert et al.[1] should serve as a standardized template for authors and journals when reporting astigmatic outcomes. There is, however, one small error in the interpretation of the doubled-angle plots that we would like to clarify in view of our articles describing these methods.[2–4]

On page 761, column 2, of their article, Kunert et al. state that "[t]he ellipses of SD showed that there was slightly less variation in the *y* direction (superior–inferior) than in the *x* direction (nasal–temporal), but it was of the same order of magnitude." On a doubled-angle plot, the *x*-axis is not the "nasal–temporal" meridian and the *y*-axis is not the "superior–inferior" meridian as stated. As shown in our original figure of the doubled-angle plot (Figure 1), the radius of each ring has a constant magnitude, which is either positive or negative depending on the physical sign of the surgery. Negative is considered flattening or reducing the dioptric power in a meridian, and positive is steepening a meridian. In this case, the laser is removing a "smile" of tissue that flattens the steep meridian, so the physical equivalent is a negative sign for removal of tissue in any meridian. Each ring should be negative and represent the

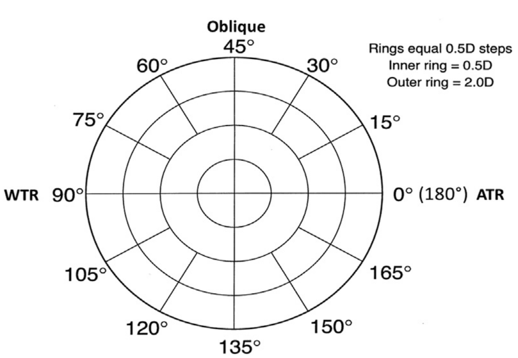

Figure 1. The doubled-angle plot is a polar plot of astigmatism data using the value of the cylinder for the magnitude and the axis of the astigmatism for the angle. The angles range from 0 to 180 degrees and correspond to the range of angles for astigmatism. The rings represent the magnitude of the astigmatism. In this example, the inner ring is 0.5 diopter (D); the outer ring, 2.0 D; and the step size between rings, 0.5 D.

dioptric amount of astigmatism treated in minus cylinder, as in our figure.

On the doubled-angle plot for this surgery, the left side of the x-axis would be the removal of with-the-rule (WTR) astigmatism and the right side of the x-axis, the removal of against-the-rule (ATR) (not nasal–temporal). The superior y-axis is the removal of oblique astigmatism in the 45-degree meridian and the inferior y-axis, the removal of oblique astigmatism in the 135-degree meridian (not superior–inferior meridian). Our comments would apply to the intended refraction correction in their Figure 1 as well as the error vector plots in Figures 2 and 3.

The only time one uses the signed x and y Cartesian coordinates is for the computation of the standard deviations and centroid, as they have done correctly.[3] Because most young patients had WTR astigmatism, the centroid of the intended refractive correction would be as shown on the left side of the x-axis, indicating that WTR was the predominant astigmatism and was more prevalent than either ATR or oblique astigmatism, which was equally balanced between the 45-degree and 135-degree meridians. This correction does not change their results but does change the comparison of meridians being discussed and is a very important clarification in the interpretation of doubled-angle plots.

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***Reply*:** We agree completely that the terms *with the rule* and *against the rule* are the correct interpretations for the x-axis in a doubled-angle plot and oblique astigmatism of 45 and 135 degrees for the y-axis, respectively. The terms *superior–inferior* and *nasal–temporal* would only make sense in a single-angle plot, as, for example, can be performed when the coma Zernike components are analyzed. In another paragraph of our publication (the description of intended refraction correction doubled-angle plot results), we used the correct interpretation. So the naming error occurred in 1 paragraph only.

With respect to the sign of cylinder, we would like to specify more precisely that our formulas (1, 2, and $C = |C|$), given in the appendix, assumes that positive cylinder notation is given (as in reference 2 of our publication). For example, a cylinder of -2.0 D at axis 0 degree will then be represented as $+2.0$ D at axis 90 degrees, which corresponds in the doubled-angle plot to the point ($x = -2$, $y = 0$) and $2A = 180$ degrees. An alternative would be not to use the absolute of cylinder but the cylinder value C' signed according to negative or positive cylinder notation and the corresponding angle A': Then the formula would be independent of the notation, as $x = C' \times \cos(2A') = -C' \times \cos[2(A' + 90)]$ and $y = C' \times \sin(2A') = -C' \times \sin[2(A' + 90)]$.—*Kathleen S. Kunert, MD, Christoph Russmann, PhD, Marcus Blum, MD, Georg Sluyterman v. L, PhD*

Intraocular lens optic capture and zonular impairment

Devranoğlu et al.[1] described their surgical approach in cases of marked zonular impairment. In these cases, they suggested a combination of previously described techniques, including the use of flexible nylon retractors for temporary capsule support, the use of a capsular tension ring (CTR), and the implantation of a sulcus-fixated foldable 3-piece intraocular lens (IOL) with the optic capture technique through the anterior continuous capsulorhexis.

Besides arguing that 3-piece IOLs of any geometry can be implanted in this way (and not only those with an “asymmetric biconvex optic”), we noticed that the authors did not describe exactly when during surgery they suggest placement of the CTR. It is also appropriate to mention that in cases of marked zonular impairment, CTR insertion might be challenging and risk further damage to the already altered zonule. The fish-tail technique could be useful in these cases.[2]

We also read that the technique they described for cases with marked zonular instability was “validated” in a series of 70 cases with no visible phacodonesis that presented with only “predisposing factors” for late IOL dislocation. We highlight that there is no need for capsule hooks in cases without phacodonesis as the hooks can lead to complications.[3] The use of a CTR does not prevent late in-the-bag IOL dislocation,[4] and capsular bag distension syndrome can occur with this technique.[5] In this respect, the authors did not detail how they ensure complete ophthalmic viscosurgical device removal from behind the IOL.

Finally, we might agree that in a few selected cases, this fixation method could be beneficial, although we must consider that generally, endocapsular