RELATIONSHIP BETWEEN THE STABILIZATION AXIS OF A SCLERAL LENS WITH TORIC PERIPHERALS AND THE AXIS OF CORNEAL ASTIGMATISM

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The beginning…

There are three types of astigmatism related to the different toricities of eye structures and scleral lenses. Corneal astigmatism, scleral astigmatism and lenticular astigmatism. Corneal toricity can be compensated through the tear meniscus produced by the scleral lens and can be quantified with a corneal topographer. The existence of scleral toricity can be quantified directly with a scleral topographer. And internal astigmatism can be measured objectively with aberrometer and topographer. The relationship between these three variables is not yet established.

Scleral lenses with toric periphery are stabilize in a certain orientation due to scleral toricity, to compensate residual astigmatism the axis of stabilization of the scleral lens should not vary with use. If the sclera is spherical, the orientation of the scleral lens will be variable and the effectiveness to compensate for residual astigmatism will be lower. However, if the sclera is toric the orientation of the scleral lens will always be the same and the compensation of residual astigmatism will be stable providing optimal visual quality.

On the other hand, we know that different sagittas can affect the fitting of scleral lenses.

The question is…

The purpose of this study was to analyze whether there is a correlation between the axis of corneal astigmatism and the stabilization axis of a scleral lens with toric periphery and diameter 16.50 mm (ICD™ from Paragon Vision Science). The difference in lens elevation between the highest and lowest meridian is 125 microns. On the other hand, we studied the behavior of two different sagittas and valued the rotation stability of this design.

What we did…

This study included 15 subjects (12 women and 3 men) with an average age of 23 years (20-27 years). Corneal topography (Medmont E300) was carried out in both eyes obtaining the axis of the flattest meridian. Two scleral lenses with toric periphery and different sagitta (4200 um and 4400 um) were fitted randomly between both eyes. The stabilization axis of the scleral lens was measured after 25 minutes of use. The stabilization axis was measured with an angle measurement software (Ondesoft Computing Inc.) using an image capture of the fitting. Subsequently, the lenses were rotated randomly by 40° in favor and counterclockwise, and the stabilization axis was remeasured after 25 minutes. Finally, OCT was performed to evaluate the lens-corneal separation and verify that there is no contact between the cornea and the scleral lens.

The outcome…

Table 1 shows the total sagitta of the scleral lens (S value), the initial stabilization axis of the scleral lens (A value) and the stabilization axis after the rotation of the scleral lens with toric periphery (B value) and the difference between these two values (A-B value).

Table 2 shows corneal astigmatism (CA value), the axis of flat meridian (FM value), the initial stabilization axis of the scleral lens (A value) and the difference between these two values (A-FM value).

	S	A	B	(A-B)		CA	FM	A	(A-FM)
OD PX 1	4200	105	110	5	OD PX 1	-2,74	92	105	13
OI PX 1	4400	48	45	3	OI PX 1	-1,65	90	48	42
OD PX2	4400	125	125	0	OD PX2	-1,06	151	125	26
OI PX2	4200	52	52	0	OI PX2	-0,61	58	52	6
OD PX3	4200	140	140	0	OD PX3	-2,25	172	140	32
OI PX3	4400	5	5	0	OI PX3	-2,69	168	5	17
OD PX4	4400	180	180	0	OD PX4	-2,63	20	180	20
OI PX4	4200	180	180	0	OI PX4	-1,78	6	180	6
OD PX5	4400	170	170	0	OD PX5	-2,29	179	170	9
OI PX5	4200	30	22	8	OI PX5	-2,05	27	30	3
OD PX6	4400	155	145	10	OD PX6	-1,84	4	155	29
OI PX6	4200	15	15	0	OI PX6	-1,76	168	15	27
OD PX7	4400	152	155	3	OD PX7	-1,99	170	152	18
OI PX7	4200	18	18	0	OI PX7	-3,28	16	18	2
ODPX8	4200	130	135	5	ODPX8	-3,62	13	130	63
OI PX8	4400	5	5	0	OI PX8	-5,21	167	5	18
OD PX9	4200	25	25	0	OD PX9	-2,15	23	25	2
OI PX9	4400	165	165	0	OI PX9	-3,58	169	165	4
OD PX10	4200	40	105	65	OD PX10	-1,17	13	40	27
OI PX10	4400	140	140	0	OI PX10	-1,42	170	140	30
OD PX11	4400	140	140	0	OD PX11	-0,38	148	140	8
OI PX11	4200	5	5	0	OI PX11	-0,88	170	5	15
OD PX12	4200	165	160	5	OD PX12	-0,51	37	165	52
OI PX12	4400	15	15	0	OI PX12	-0,85	166	15	29
OD PX13	4200	165	165	0	OD PX13	-1,05	20	165	35
OI PX13	4400	20	170	30	OI PX13	-1,39	164	20	36
OD PX14	4200	125	120	5	OD PX14	-2,08	176	125	51
OI PX14	4400	65	65	0	OI PX14	-1,82	8	65	57
OD PX15	4400	160	160	0	OD PX15	-0,43	28	160	48
OI PX15	4200	180	175	5	OI PX15	-0,48	157	180	23

Table 1   Table 2

Discussing the result…

On the vast majority of occasions we have found that the scleral lens with toric periphery is stable rotationally. In 87% of cases, the scleral lens was stabilized after turning in the same initial position with a maximum difference of 5º, limiting the maximum difference to 10º the percentage increases to 93%. Thus we can think that most scleras have a certain degree of toricity or irregularity for a cord of approximately 16 mm, coinciding with the support area of this scleral lens. Most centers in which scleral lenses are fitted do not have a system for studying the scleral shape. Therefore, we believe that this scleral lens toric design should be fitted as a first choice instead of the standard design. If during the fitting process there is no rotational stability, it should be changed to a design with spherical periphery.

We haven't found relationship between corneal toricity and scleral toricity (measured indirectly by stabilization of the scleral lens). Comparing the stabilization axis of each lens with the flatter axis of corneal astigmatism, we find that only in 27% of cases there is similarity between the values with a maximum error of 10º. Therefore corneal astigmatism doesn't predict the behavior of a scleral lens with toric periphery.

The behavior of the two lenses with different sagita is similar.

Finally…

- Scleral lenses with toric periphery are stable to rotation in most cases.
- The axis of corneal astigmatism is not a predictor of the stabilization axis of the scleral lens.
- We recommend starting the fitting of this design with toric periphery instead of spherical periphery.
- A difference of 200 um in the sagitta of the scleral lens does not influence its stability.

My disclosures…

- The authors have no financial interests in the subject matter of this poster.