Nomograms to use with Scleral Profilometry

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Purpose

Profilometry offers scleral data up to 20mm horizontally and vertically. Scleral lens designs are currently updated rapidly offering more features, more parameters and finally more comfort to the patient. However, it is easy to get lost combining scleral data with all the scleral lens parameters. In this poster two guidelines are suggested to make it easier to combine Profilometry for scleral lens designing. This poster also provides a theoretical explanation for the data tilt of the measurements.

Method

Profilometry data is measured in sagittal height (SAG) which sounds similar to the SAG used with scleral lenses. When combining these two SAG data sets, tilt should be taken in consideration. If a toric scleral lens is placed on a table then the table "levels" the lens to a horizontal plane. Profilometry data is levelled based on the location of the limbus (at a chord length of roughly 12mm). Tilting based on the limbus does explain why many eye shapes do look very asymmetric. But often a scleral lens designed with a toric haptic will fit on an asymmetric eye. The following guidelines are based on clinical experience. They try to overcome the tilt difference between the scleral lens and the eye. At the Primary Functional Depth (PFSD)[1] of a lens, the point where the lens start to land on the eye, the lens usually is designed spherically. However, J. Jedlicka et al[2] showed that often, the toricity of the sclera is already present at the limbus. Generally speaking, a lens lands about 1mm beyond the limbus. Therefore, the author suggests to check the amount of scleral toricity at a 13mm chord length. 100 to 150 microns of difference at that location could be considered as a threshold to design a toric PFSD.

Temporal decentration is another concern with scleral lenses. L Kowalski et al[3] have shown that the difference between the nasal and temporal SAG (N/Tsag) is significantly correlated with the temporal decentration. They observed that over 400 microns of difference the decentration of the lens is more than 0.5mm in the temporal direction. Translated to a guideline: consider a quad specific haptic if the N/Tsag is larger than 400 microns.

Conclusion

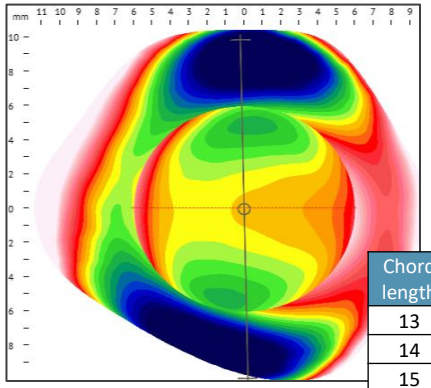
In this poster two guidelines are suggested to analyse Profilometry data which could be used for most modern scleral lens designs. However, this guidelines could be finetuned for specific lens designs. Also, a theoretical background is given to clarify the differences between lens SAG and eye SAG.

Bisphere elevation maps are becoming the standard for reviewing scleral data. They use data rotated based on the limbus location. However this does not have a direct relation with the best lens fit. Using the limbus rotated data may lead to excessive asymmetric designing. Therefore the data could be re-rotated based on the desired lens diameter. Here it is useful to know the design/shape of the landing zone. The best fitting scleral lens is distributing its weight 360 degrees around, without impingement or edge lift. The middle of the landing zone is the position which could be used to predict the best lens fit. And as a result this could be a useful diameter to use for re-rotating the data to calculate the best quad-specific lens fit.

Guideline: PFSD Designing

If the toric SAG difference is over 100 microns @ 13mm consider a toric transition zone.

The corneal and scleral shape of this eye is with the rule and shows a high SAG toricity. Usually, the SAG toricity gradually increases with the chord length. Typically, there is already over 50% of SAG toricity present where the lens starts landing on the eye compared to a 17mm chord.



Chord length	SAG difference	% of SAG
13	420	51%
14	500	61%
15	600	73%
16	720	88%
17	820	

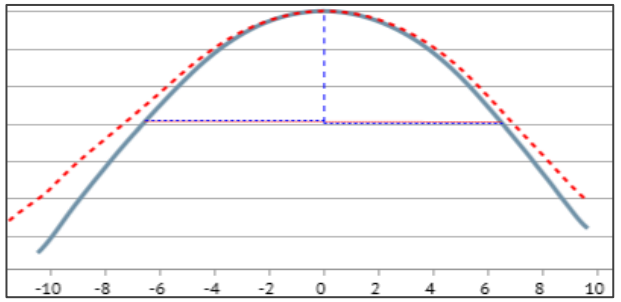


Figure 1: Displayed the N/Tsag differences over a 13mm chord.

Guideline: Quad specific designing

If the nasal/temporal SAG difference is over 400 microns @ 15mm consider a quad specific landing zone.

Scleral lenses are more and more available in a quad specific design, but often 840 microns is beyond the available parameters available. Often the lathe possibilities are the limiting factor.

Measuring the N/Tsag differences over 15mm may give a good indication to choose a toric or a quad specific design. Over 400 microns of N/Tsag differences may give more than 0.5 of temporal decentration.

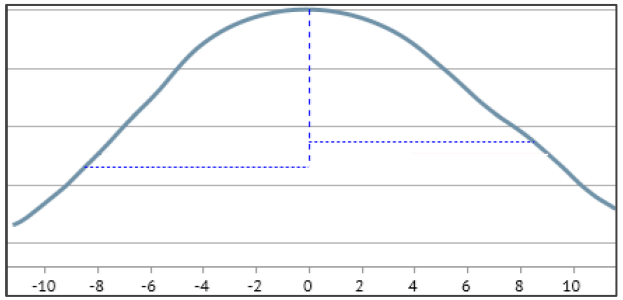


Figure 2: Displayed the N/Tsag differences over a 17mm chord showing 840 microns of difference.

References

1. Michaud L, Lipson M, Kramer E, Walker M. The official guide to scleral lens terminology [published online ahead of print, 2019 Sep 24]. Cont Lens Anterior Eye. 2019;S1367-0484(19)30219-X. doi:10.1016/j.clae.2019.09.006

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3. Kowalski LP, Collins MJ, Vincent SJ. Scleral lens centration: The influence of centre thickness, scleral topography, and apical clearance [published online ahead of print, 2019 Dec 10]. Cont Lens Anterior Eye. 2019;S1367-0484(19)30325-X. doi:10.1016/j.clae.2019.11.013