Centro de Lentes de Contacto

Introduction

Generating information about the overall sagittal height of the anterior eye (OC-SAG) is gaining more attention lately in the contact lens field. Initially as a major contributor to fit scleral lenses, it is now used to better understand soft lens fitting and soft lens behavior on-eye.^{1 2} What is of utmost importance, is to understand the differences that exist in various meridians on that ocular surface.³ The average OC-SAG in a 360-degree fashion most likely will provides the best value to select a soft lens in the fitting principle. Some instruments and eye care practitioners (ECPs) in clinical practice use the horizontal OC-SAG only in the soft lens fitting process (as it is more difficult to measure vertical values). If only the horizontal OC-SAG is used – how much difference is there from the average 360-value and how much difference is there compared to the vertical or other meridians?). This unknown factor may be one of the puzzle in understanding soft lenses based on sagittal height in clinical practice.

Purpose

Methods

- ✓ OC-SAG of 50 healthy right eyes obtained with profilometry (ESP, Eye Surface Profiler, Eaglet Eye, The Netherlands).
- ✓ Values obtained for 15 mm and 12.8 mm chords in 360-degrees around the clock in 1-degree steps.
- Absolute differences between the horizontal (H), vertical (V), mean 360° and max/min values were obtained (Figure 1) and compared to a historical database with manual measurements with optical coherence tomography (Zeiss Visante AS-OCT) in another group of 39 patients.
- A three-dimensional model of mean OC-SAG values in the 360 degrees was also built and compared with the two methods (ESP and AS-OCT)



Discussion conclusions ✓ When looking at the anterior ocular surface in a 360-fashion – this study found that there are marked differences in OC-SAG values in different meridians. If only the horizontal OC-SAG value is used, this measurement typically differs by values less than ~100 µm compared to vertical or to average values. Especially compared to the average value – the H-OC-SAG does not give significant differences (and the OCT) imaging data less so than the profilometry data). Further research is needed to determine whether this finding (less than $\sim 100 \ \mu m$ difference) is clinically relevant in practice.

- similarities.

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OC-SAG values in 360 degrees

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To analyze the differences of ocular sagittal height values in different meridians and in 360 degrees with a profilometer based ocular surface topographer, and to compared this to historical data with optical coherence tomography (OCT) based data measuring the ocular surface over the same chord diameters.

- ✓ H vs V absolute differences in OC-SAG at 15 mm chord:
- ✓ H-OC-SAG vs mean 360° OC-SAG absolute differences at 15 mm chord: - Profilometry: $58\pm52\mu$ m (range 0-260 μ m)
 - AS-OCT: 79±49 μ m (range 8-190 μ m)
- ✓ Mean maximum difference between any two meridians: - Profilometry: $171\pm90 \mu m$ (range 40-450 μm) using the profilometer - AS-OCT:227 \pm 74 μ m (range 90-390 μ m)

consistent.⁴⁻⁸ (*Table 1*).

	n	Mean OC- SAG horizontal meridian (H)	Mean OC- SAG vertical meridian (V)	Mean OC- SAG 360°	H-V difference	H-V absolute difference	H-360° difference	H-360° absolute difference	Max difference in the 360°
ост	39	3740±214 (3195-4240)	3745±199 (3290-4175)	3743±202 (3293-4221)	-5±134 (-235-255)	109±79 (0-255)	-34±87 (-190-127)	79±49 (8-190)	227±74 (90-390)
ESP	50	3653±158 (3330-3990)	3623±151 (3240-4030)	3637±135 (3280-3980)	30±136 (-240-430)	103±92 (0-430)	16±77 (-170-260)	58±52 (0-260)	171±90 (40-450)
Table 1 (unit µm)									

 \checkmark Others^{4 8 9} found mean 360 degrees OC-SAG values with profilometry in the ~3600 μ m range, while Ritzmann, Sorbara and Hall obtained values with AS-OCT in the ~3700 microns.⁵⁻⁷ This ~100 µm difference was also consistent in this study. Despite the difference in the mean 360 degrees OC-SAG values, the variation between meridians with both methods was very similar (~100 µm). It is unclear at this point where this difference stems from. Interestingly though, the differences in different meridians between the two instruments showed a high degree of

✓ The rotationally asymmetric nature of the sclera has of course an impact on the OC-SAG of the eye. These models obtained with two different methods in two different groups of healthy patients confirm a common pattern of OC-SAG values in 360 degrees, which can be defined by a hyperbolic paraboloid. This may be a better and more aplicable method than using single meridians.

✓ In conclusion: different meridians show different OC-SAG values, which may affect soft lens behavior on-eye. By measuring the H-OC-SAG

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Results - With the current automated profilometry method: $103\pm92 \mu m$ (range 0-430 μm) - The historical manual method based on AS-OCT: 109±79 μm (range 0-255 μm) -nasal area. \checkmark The mean profilometry values found where on average 106 μ m lower than the OCT values. This difference has been found in previous studies, and is 2800 3000

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- ✓ Three-dimensional models (Figures 2 and 3):
 - Common pattern with a less elevated nasal area and deeper **OC-SAG** values at the temporal side.
- Differences between quadrants were all more marked at the 15 mm chord diameter curves both methods.
- The SD of both curves obtained with the profilometry (12.8 and 15 mm chords) showed a higher variability at the inferior

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