Scleral Lens Fitting (Zenlens) based on Corneo-Scleral measurements using an ESP and an Automated Algorithm

Reinier Stortelder, Boptom, Brian Tompkins BSc Hons FC Optom FBCLA and
Keyur Patel BSc(Hons) OD DipTP(IP) DipGlauc FAAO FCOptom FBCLA Doctor of Optometry

Purpose

Lens re-orders with guaranteed fit programs have a significant impact on the net profit of contact lens laboratories. They also impact the net profit of the practitioner due to chair time consumed and they reduce the quality of the patient experience. Although lens re-orders are expected when fitting compromised eyes, reducing their prevalence is a win for patient, practitioner and lens manufacturer.

Finding the final good fit for a scleral lens can be a time consuming process, even for the experienced scleral lens practitioner. Various factors contribute to the complexity:

- Diagnostic lens sets usually only contain spherical lenses, even though research has shown that at least 97%[1] of all scleral lenses could use a toric peripheral back surface.
- Scleral shape has been shown to be asymmetrical[2].
- Determining the correct scleral lens landing zone with a slit lamp requires considerable skill and experience.

Recently a corneo-scleral Profilometer, the Eye Surface Profiler (ESP) (Eaglet Eye, Houten, The Netherlands) has been introduced that has the ability to measure the sclera up to 20mm beyond the edge of the cornea, for 360 degrees. An automated fitting algorithm was developed for the ESP to assist in selecting the optimal fitting lens, including the landing zone, based on the 3D measured profile of the eye. Such an algorithm has also been developed for Zenlens (Alden, Rochester, USA). This study aims to compare final fitting using diagnostic lenses against ESP algorithm derived fits for a Zenlens.

Methods

49 measured eyes were retrospectively fitted with the automated algorithm and compared with the final fitted lens. The algorithms uses the 3D ocular sagittal height (SAG) and matches the SAG of the Zenlens in steps of 100 micron. It next calculates the landing zone (APS) from the flattest and the steepest axis in steps of 2 APS. The guidelines advised by the manufacturer were used to calculate the SAG. For the landing zone the algorithm picked the best aligning APS.

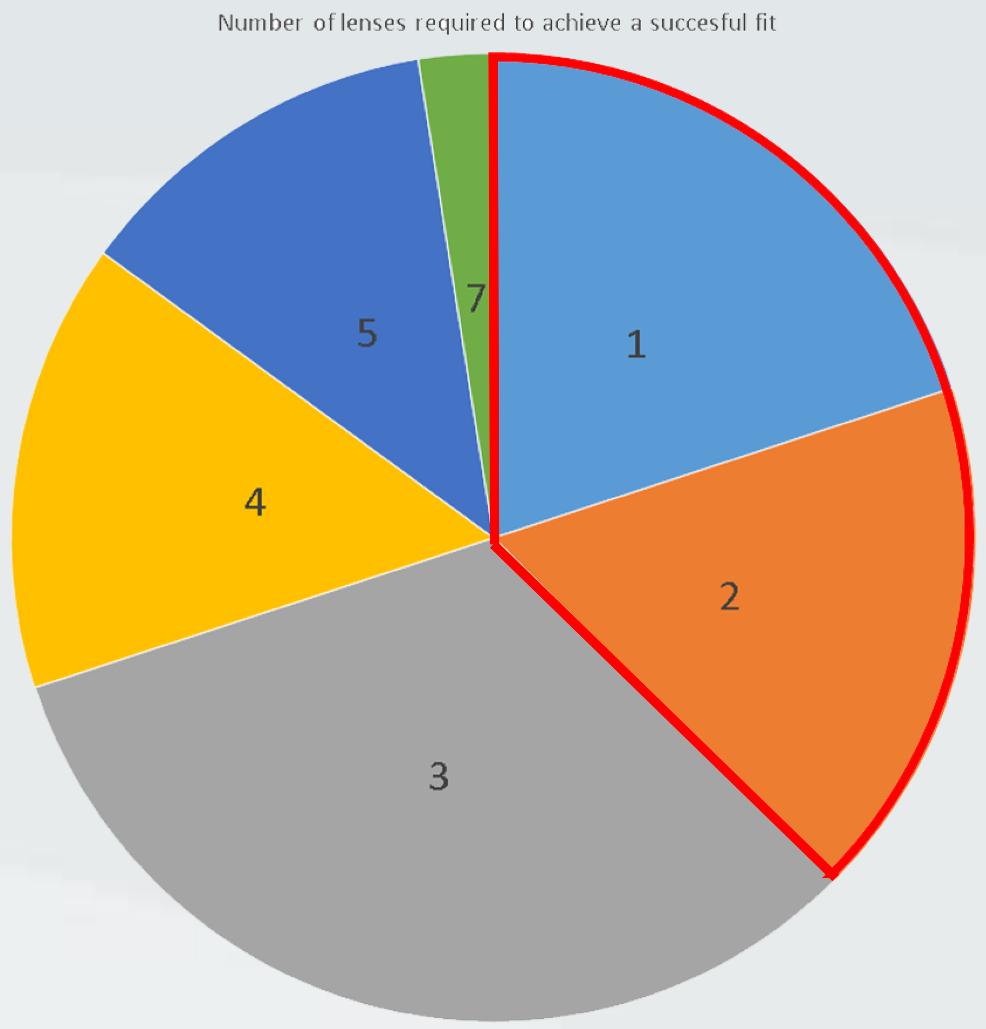
Contact and disclosure

Eaglet Eye, The Netherlands
Email: reinier.stortelder@eaglet-eye.com

Reinier Stortelder is an employee of Eaglet Eye
Brian Tompkins and Keyur Patel are employees of Tompkins Knight & Son

Results

Diagnostic lens method resulted in about 2/3 of cases requiring 3 to 7 lenses ordered before reaching the final good fit.
In contrast, an analysis of the good fit from diagnostic lenses and re-order final lenses and the algorithm driven lenses from the ESP demonstrated that 84% of the lenses recommended by the ESP fitting algorithm concur with the final lens fitted on the eye by the diagnostic lens and re-order method



It was noticed that the higher the difference between algorithm advice and the final fit, the higher the difference between the APS advised and finally fitted. This suggests that a better alignment of the peripheral back zone of the lens will give a lower settling. Beside this it is important to mention that there is a wide range of reasons for a practitioner to fit a higher or lower clearance. For example type/stage of disease, irregularity, wearing time and dryness.

The advised APS and final fitted APS shows a higher correlation for the horizontal axis and a lower correlation for the vertical axis. This could be explained by the fact that the vertical meridian of the lens on eye is judged in two steps (checking the superior part while the patient looks down and the inferior part when the patient looks up). The eyelids hide much of the lens and might even introduce tilt due to eyelid pressure.

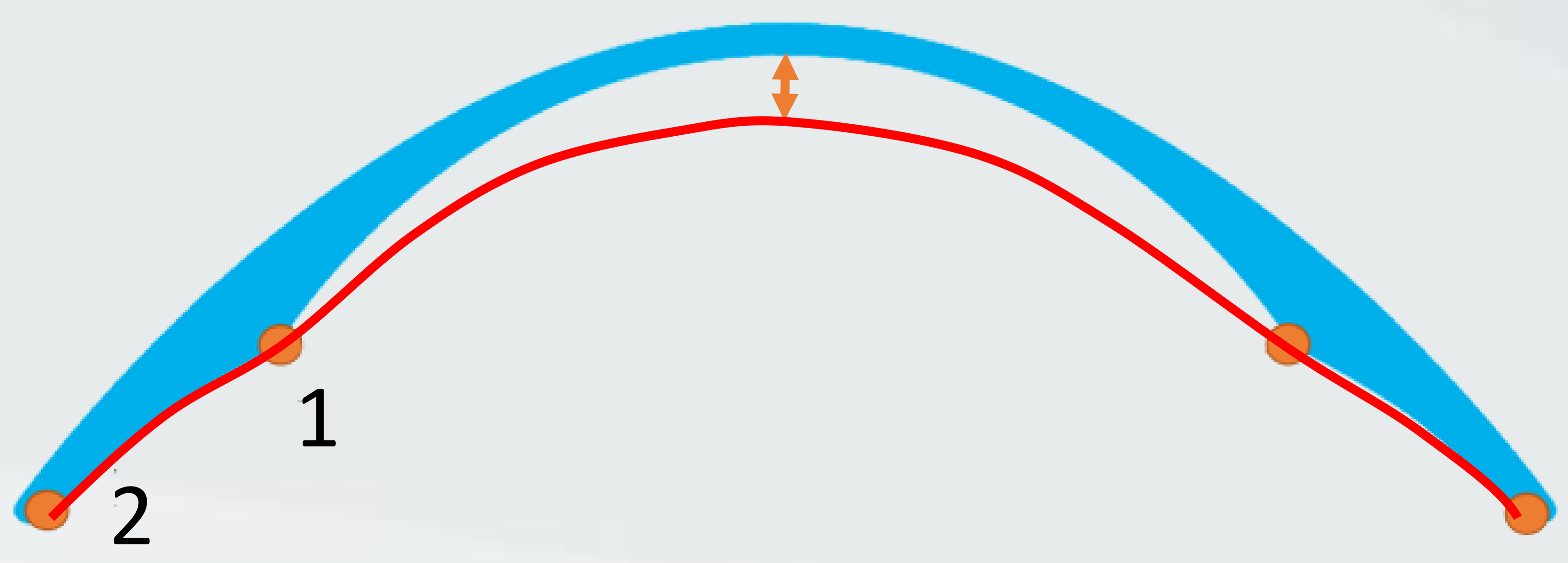
Conclusions

Fitting scleral lenses based on cornea-scleral mapping has the potential to assist the practitioner in the fitting process of scleral lenses. In combination with an automated algorithm, the practitioner is able to get more accurate 'first lens', which potentially would need less adjustments meaning less chair time and quicker final lens. Especially the back surface landing zone design leads to a number of re-orders which can be reduced by measuring the amount of scleral toricity.

Eaglet fitting algorithm

1: The first control point is the first point of touch with the sclera. The SAG is measured. To that SAG the prescribed clearance is added to clear the cornea resulting in the vault of the lens.

2: The second control point is at the end of the alignment zone. For the flattest meridian of the eye, the sag is measured.



3: The best aligning landing zone between point 1 and 2 is now calculated

4: In the orthogonal axis, the second point of touch is taken again and best aligning landing zone is selected.

References:
[1] Visser ES, et al. Medical applications and outcomes of bitangential scleral lenses 2013 Optom Vis Sci
[2] Kinoshita B, et al. Corneal toricity and scleral asymmetry... are they related? Poster presented during the Global Specialty Lens Symposium 2016 in Las Vegas