UNCOVER MORE

All-in-one corneal and biometry platform

ANTERION® brings together corneal topography and tomography, biometry measurements, and IOL calculation to increase clinic workflow efficiency and improve patient care.

Uncover efficiency: www.ANTERION.info

Predictable Outcomes

Reliable Measurements

Diagnostic Confidence

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HEIDELBERG ENGINEERING

Accurate Results, Improved Outcomes

A NEW FRONTIER IN ANTERIOR SEGMENT DIAGNOSTICS AND BIOMETRY WITH THE ANTERION.

The ANTERION (Heidelberg Engineering; Figure 1) utilises high-resolution swept-source OCT images to provide the most important anterior segment examinations and measurements in one modular, upgradeable platform.

Every ANTERION comes with the Imaging App, for visualisation of the entire anterior segment, and can be adjusted to various clinical needs with three optional applications: Cornea App, Cataract App, and Metrics App.

The ANTERION exploits a 1300 nm wavelength, A-scan rate of 50,000 Hz, axial resolution of <10 microns, with B-scans up to 16.5 mm in length and 14 mm deep. This means that the entire anterior segment is captured, including the whole lens, in one shot.

Corneal tomography and topography data is generated from 65 meridian scans with an 8 mm length to produce data-rich imaging of the entire cornea. The fast scan rate and eye tracking ensure high reproducibility with a fast and efficient workflow.

Figure 1. ANTERION multimodal platform

Figure 2. The HEYEX 2 software connects and operates all Heidelberg Engineering products

Improved Workflow Efficiency

ANTERION has a fast acquisition time and eliminates the need to move patients between diagnostic devices. It is possible to acquire a comprehensive measurement dataset that includes corneal topography and tomography, biometry, and IOL calculation with just one click of the joystick button.

ANTERION is both intuitive and simple to use, making operator training easy. The ANTERION, SPECTRALIS, and HRT-RCM imaging platforms can be networked together via the HEYEX 2 image management and device integration software for convenient access to anterior and posterior segment diagnostics in one patient record (Figure 2).

Validated Precision and Accuracy

Oliver Findl, MD, MBA, Director and Professor of Ophthalmology, Hanusch Hospital, Vienna, Austria, et al. has recently published studies which compare measurements taken with the ANTERION to those taken with other biometers. Oliver writes a summary of his findings (on page 3).

Precision

" In this study we compared measurements obtained with the ANTERION (Heidelberg Engineering) to those obtained with the IOLMaster 700 (Carl Zeiss Meditec). A total of 389 eyes with age-related cataract were included in the study.[1]

Axial length. The ANTERION and IOLMaster 700 produced mean values of 23.54 ±1.18 mm and 23.55 ±1.18 mm, respectively. The mean difference between the two devices (0.01 mm) would lead to a 0.03 D error, which can be considered negligible on the final refractive outcome. 14 eyes required manual correction of the retinal pigment epithelium peak, a function that is only available with the ANTERION.

Keratometry. The mean K readings were 7.82 ±0.26 mm and 7.80 ±0.26 mm for the ANTERION and IOLMaster 700, respectively. This difference was not clinically relevant and can be attributed to the various measurement zones used by each device.

Anterior chamber depth. ANTERION measures anterior aqueous depth whereas the IOLMaster 700 measures ACD. The mean ACD with the ANTERION was 3.20 ±0.42 mm, and it was 3.13 ±0.43 mm with the IOLMaster 700. Again, this difference was not clinically relevant.

Lens thickness. The mean lens thickness with the ANTERION and the IOLMaster 700 was 4.65 ±0.43 mm and 4.59 ±0.43 mm, respectively.

From this study, we determined that good agreement was found between the ANTERION and the IOLMaster 700 for all parameters that are critical to IOL power calculation.

Repeatability

" We conducted another study comparing the repeatability of measurements between the ANTERON, IOLMaster 700 and Lenstar LS 900 (Haag-Streit). A total of 50 eyes were enrolled.[2]

Axial length. There was high repeatability with all three devices. In our hands, however, the ANTERION was slightly better than the Lenstar.

Keratometry. All three devices provided highly repeatable mean keratometry readings. The IOLMaster 700 was slightly superior for mean keratometry values, however, and the Lenstar produced slightly steeper keratometries. The within-subject standard deviation (Sw) was 0.083 for the IOLMaster 700, 0.018 for the ANTERION and 0.137 for the Lenstar.

Anterior chamber depth. Both swept-source OCT devices measured a slightly shallower anterior chamber depth (3.13 ±0.00 mm for the ANTERION and 3.06 ±0.03 mm for the IOLMaster 700) than the Lenstar (3.24 ±0.06 mm). Repeatability was also superior for the swept-source OCT devices (Sw: 0.004 for the ANTERION, 0.039 for the IOLMaster 700, and 0.134 for the Lenstar).

Lens thickness. Again, the Lenstar had the poorest reproducibility of the three devices. The Sw value was 0.037 for the ANTERION, 0.02 for the IOLMaster 700, and 0.180 for the Lenstar.

This study showed that the ANTERION has a high repeatability and reproducibility of measurements, especially for axial length, anterior chamber depth, and lens thickness.

Postoperative Axial Length

" We also studied the differences between pre- and postoperative axial length with the ANTERION and IOLMaster 700 (unpublished). A total of 50 eyes with different stages of cataract were included in the study.[2]

There was a slight difference in pre- and postoperative axial length for both devices, but it was smaller with the ANTERION (0.08 vs 0.07 mm). We noticed a slight correlation between the grade of cataract, where the difference was greater the denser the cataract was.

Conclusion

" The ANTERION is highly precise and accurate. The measurements taken with the ANTERION were comparable with those taken with the IOLMaster 700, with only very small differences between devices.

1. Fisus AD, Hirnschall ND, Findl O. Comparison of 2 swept-source optical coherence tomography–based biometry devices. J Cataract Refract Surg. 2021;47(1):87-92.

2. Fisus AD, Hirnschall ND, Ruiss M, Pilwachs C, Georgiev S, Findl, O. Repeatability of 2 swept-source OCT biometers and 1 optical low-coherence reflectometry biometer. J Cataract Refract Surg. 2021;47(10):1302-1307.

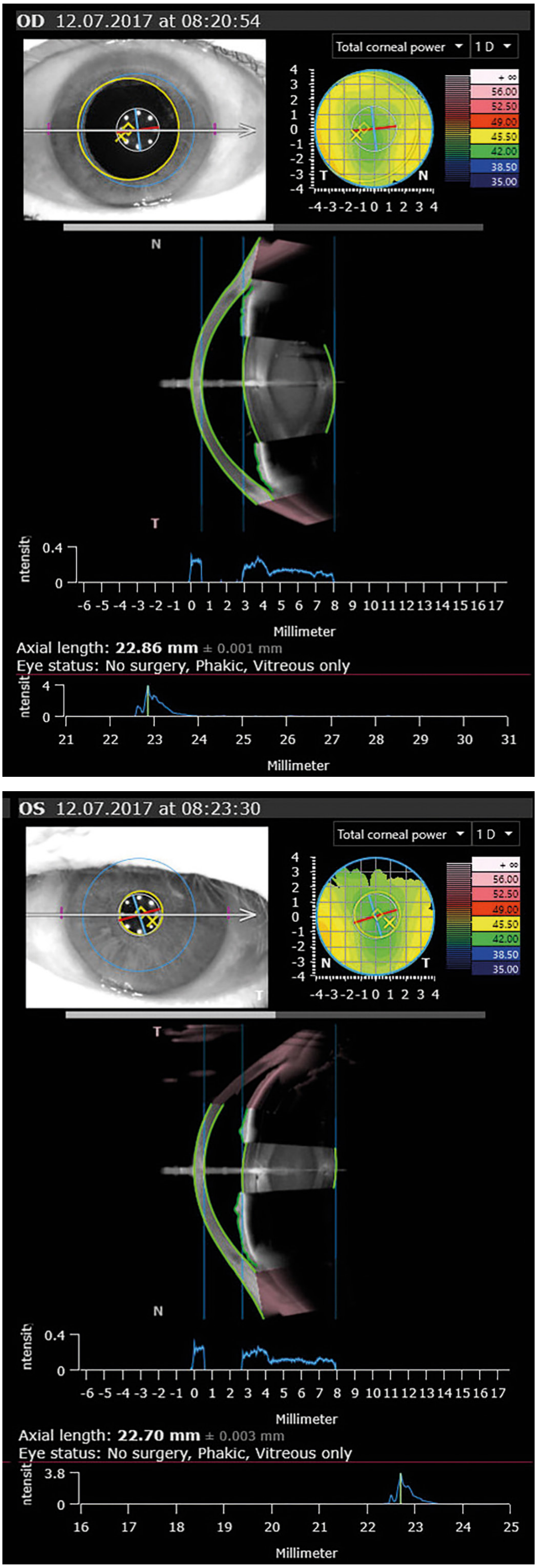

Figure 3. Cataract pre-operative evaluation with ANTERION (right eye in mydriasis and left eye in miosis).

Unique cornea data to assess complex geometries

An increasing number of patients present with irregular eye geometries, which can make calculating predictable refractive outcomes a modern challenge. Among these difficult cases are patients with previous laser vision correction, short eyes, or eyes with complex corneal shapes and pathologies. ANTERION helps clinicians cope with these cases by providing unique cornea data, precise preoperative measurements, various IOL calculation methods, and image-based lens assessment (Figures 3, 4 and 5).

Kjell Gunnar Gundersen, MD, PhD, iFocus Eyeclinic, Haugesund, Norway, describes postoperative outcomes, for both normal and difficult eyes, using ANTERION.

Normal Eyes

// My colleagues and I conducted a pilot study of 41 eyes of 21 patients to compare the ocular biometry measurements taken the ANTERION (Heidelberg Engineering), Argos (Alcon), and the Lenstar LS 900 (Haag-Streit). At baseline, the mean age of patients in this ongoing study was 76.0 ±6.1 years (range, 62–91 years), the mean preoperative keratometry (K) was 43.70 ±1.95 D (range, 38.80–48.60 D), and the mean preoperative keratometric astigmatism was 0.95 ±0.57 D (range, 0.20–2.17 D). The mean IOL power implanted in eyes was 20.30 ±3.10 D (range, 12.50–24.50 D). A toric IOL was implanted in 78% of patients.

Thus far, we have analyzed our results from the 5- to 6-week follow-up visit. Mean uncorrected and corrected distance visual acuity were 0.07 ±0.1 (range, 0.5–1.2) and -0.02 ±0.05 (range, 0.9–1.5), respectively. The mean spherical equivalent was 0.21 ±0.35 (range, -0.63 to 0.88), and the mean postoperative cylinder was -0.52 ±0.34 (range, -1.75 to 0.00 D). About 40% and 63% of eyes were within ±0.25 and ±0.50 D of the target refraction, respectively.

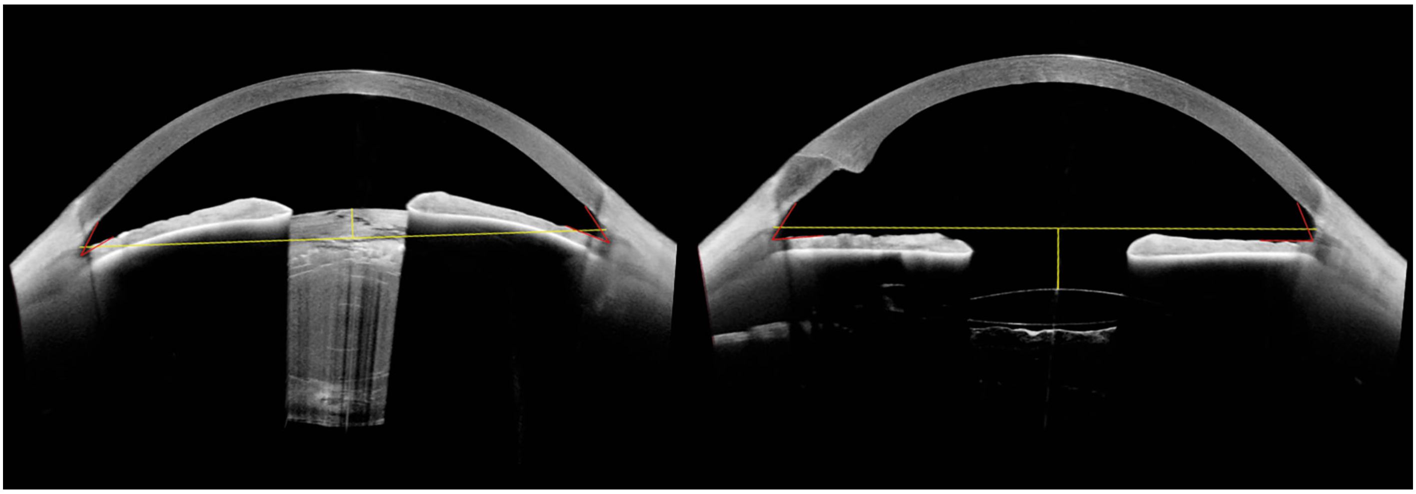

Figure 4. OCT images of the same eye before and after cataract surgery, including selected measurement overlays for anterior chamber angles, spur-to-spur distance, and lens vault.

Most impressively, the mean refractive prediction error (ie, the difference between the calculated and actual postoperative refractive error) with the Barrett True K formula was lowest on the ANTERION. The largest predictive errors, both arithmetic and absolute, were with the combination of Argos and Barrett True K, followed by the Lenstar and Barrett. This difference is not significant in such a small cohort. It is, however, a clear trend. We also looked at the results in eyes that received a low-powered toric IOL. Both the postoperative refractive cylinder and the uncorrected contrast sensitivity were significantly better with toric IOLs when swept-source OCT was used for optical biometry measurements.

Biometry in Difficult Eyes

" Some of the most difficult eyes to achieve accurate biometry for are post-LASIK eyes, short and long eyes, eyes with an irregular cornea (eg, keratoconus, prior corneal graft, and removed LASIK flap), and eyes with advanced cataracts. In these cases, a ray-tracing method can provide accurate measurements. Below is a case example in which the OKULIX IOL calculation method was used.

A 63-year-old man presented with stable keratoconus OU. At the precataract evaluation, refraction was -4.00 -2.50 x 45° with a visual acuity of 0.7 OD and -1.25 -0.50 x 45° with a visual acuity of 0.6 OS. Mean preoperative keratometry was 41.85 and 46.32 D OD and OS, respectively, and there was 5.98 D astigmatism at 137° OD and 9.61 D @ 39° OS. The axial length in the eyes was 24.82 and 24.60 mm, respectively.

Using the data from the OKULIX software, a 15.00 D IOL with 7.50 D of toricity was implanted OD and a 14.00 D IOL with 10.00 D of toricity was implanted OS. The postoperative refraction was similar in both eyes, and at 5-weeks postoperative the patient reported never seeing better uncorrected in bright light and reading well with only simple plus lenses.

Conclusion

" In my clinical experience, swept-source anterior segment OCT is the optimal way to achieve accurate and reproducible biometric measurements in all eyes. Optical biometry with the ANTERION is reliable both clinically and scientifically. Furthermore, this device has future potential to be used with epithelial thickness mapping.

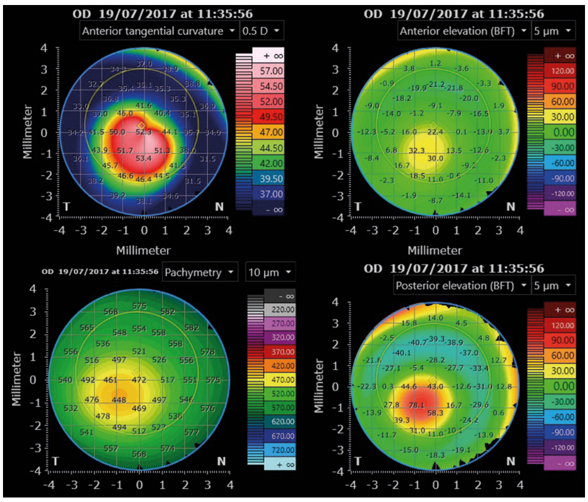

Figure 5. Eye with keratoconus in ANTERION Cornea App.

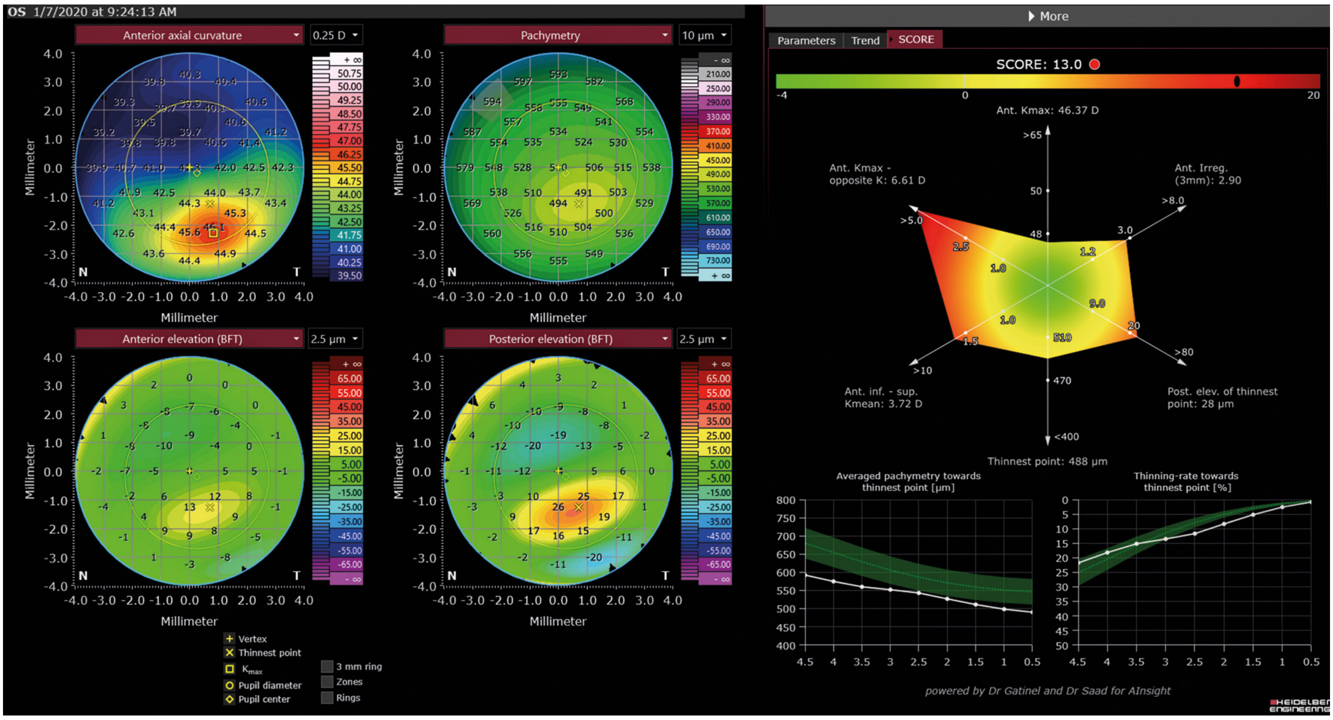

Figure 6. ANTERION Ectasia Display showing customizable corneal maps and SCORE. The SCORE tab presents the SCORE value, a radar map and pachymetry diagrams (powered by Dr. Gatinel and Dr. Saad). The SCORE value consists of different parameters that describe the magnitude of corneal steepening, thinning, and asymmetry to assist clinicians in detecting and monitoring ectatic changes. (The image shows investigational software that is currently under development.)

Futureproof, Upgradeable Platform

Heidelberg Engineering will launch several updates to the ANTERION in Spring 2022*, which will add diagnostic functionality.

Ectasia Evaluation

ANTERION provides a comprehensive toolset for detecting and analysing ectatic changes in the cornea with the "Ectasia View"**. Visualise the most important maps and parameters at a glance. Customise the diagnostic template with your preferred maps, combine data from different visits and information from both eyes, and track the details of progression using graphs and differential maps.

The Ecstasia View incorporates the Screening Corneal Objective Risk of Ectasia (SCORE) Analyzer (Figure 6) to aid in clinical decision-making and detecting forme fruste (asymmetrical) keratoconus and ectasia.

*Expected release date correct at time of publication and subject to change.

**Under development and not currently commercially available.

Epithelial Thickness Mapping

The ANTERION Epithelial Thickness Module** (Figure 7) provides all the information needed to thoroughly assess epithelial and stromal thickness of the patient's eyes. The parameters and maps for epithelial thickness can assist in refractive surgery planning, dry eye evaluation, screening for corneal ectasia and other diagnostic areas.

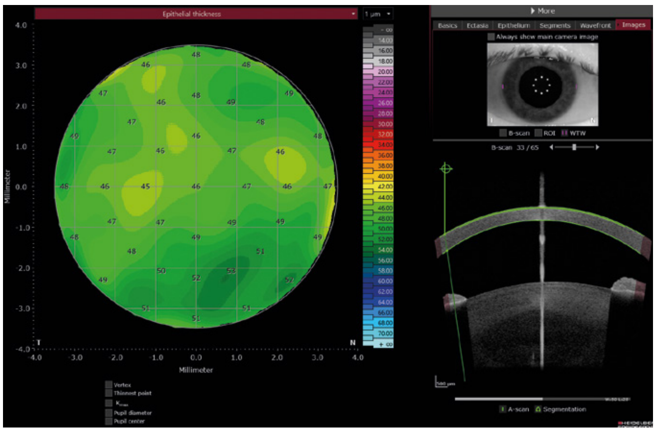

Figure 7. ANTERION Epithelial Thickness Mapping. (The image shows investigational software that is currently under development.)