

Highlighting the newest feature for biometric measurement – Improving your workflow with more insights

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Corneal topography provides information on corneal shape and the condition of the ocular surface that can influence IOL selection and affect the outcome of cataract surgery. Therefore, it is an essential tool in the preoperative evaluation of patients seeking refractive cataract surgery with an advanced technology IOL, but it also has a valuable role for optimizing planning of standard cataract surgery.

In August 2020, Carl Zeiss Meditec introduced Central Topography as a new feature provided by the IOLMaster 700. Now, surgeons using the IOLMaster 700 with integrated central corneal topography can check visually the cornea without adding another step and another device into the workflow. With a single measurement, the IOLMaster 700 provides biometry data, total keratometry, fixation check, and Central Topography information.

INSIGHTS FROM TOPOGRAPHY

Identifying irregularities of the cornea with a topographer is critical in the preoperative assessment of patients for cataract surgery because these abnormalities can influence surgical planning and affect outcomes.

By showing unusual steepening or flattening, imaging with a corneal topographer can alert surgeons to the possibility that a patient had previous excimer laser refractive surgery, a fact that might fail to be elicited during clinical history taking. The corneal topographer can also reveal a decentered ablation and indicate other cornea issues, including keratoconus, forme fruste keratoconus, or postLASIK ectasia. Suspicion for any of these conditions indicates a need for a more comprehensive diagnostic evaluation because of their relevance for IOL decision-making, IOL power determination, surgical planning, and setting proper patient expectations regarding postoperative vision.

IOLMASTER 700 INTEGRATED CENTRAL TOPOGRAPHY

The IOLMaster 700 generates anterior and total axial power maps representing approximately the central 4 mm of the cornea, an area that corresponds to the optically relevant zone for patients undergoing cataract surgery. It utilizes a consistent telecentric keratometry measurement principle to directly measure the surface slopes on each of 18 spot locations. This methodology nullifies perspective error from system misalignment,

and because every spot is an individual and independent measurement, it also avoids skew error that can occur with Placido disk technology. Curvature maps and dioptric maps are derived from the measured centroids.

The total axial power map is constructed by using the anterior curvature and adding pachymetry data and the posterior surface power, both derived from Swept-Source OCT, to the anterior surface power via a thick lens formula. Because the posterior surface power on the IOLMaster 700 is calibrated so that Total Keratometry (TK[®]) matches the keratometry in normal eyes, the anterior and total axial power maps are approximately the same in “normal” eyes. Dissimilarity in the appearance of the two maps support the identification of eyes in which the ratio of anterior to posterior corneal curvature is “abnormal”. Included in this category are eyes with a history of keratorefractive surgery along with outliers in the virgin eye population. In these cases, it is especially important to use TK for IOL power calculation.

In normal eyes, the ratios of anterior to posterior corneal curvatures lie within a narrow band. The use of keratometric index of refraction, without having to measure the posterior cornea, is mostly adequate. However, in post-keratorefractive surgery eyes where these consistent anterior-posterior relationships are altered, using TK powers that include the posterior corneal power has proven to be important.

Map interpretation

Using the ISO 19880 color scale, the IOLMaster 700 power maps might be seen to be more intuitive to read. The default fixed scale setting for the IOLMaster 700 Central Topography power maps covers most corneas. It has a 10 D range (39 D to 49 D) and uses 21 colors to display powers in 0.5 D steps with 44.0 D (mid scale) shown in bright green. However, the scale adjusts automatically and dynamically upward or downward, to adapt to the atypical flat (<39 D) or steep corneas (>49 D). In highly irregular corneas with wide variation of powers, an extended scale with >21 colors is automatically deployed.

Reliable reporting

To evaluate the performance of the Central Topography maps generated by the IOLMaster 700, I compared its anterior axial maps with the same from a dedicated

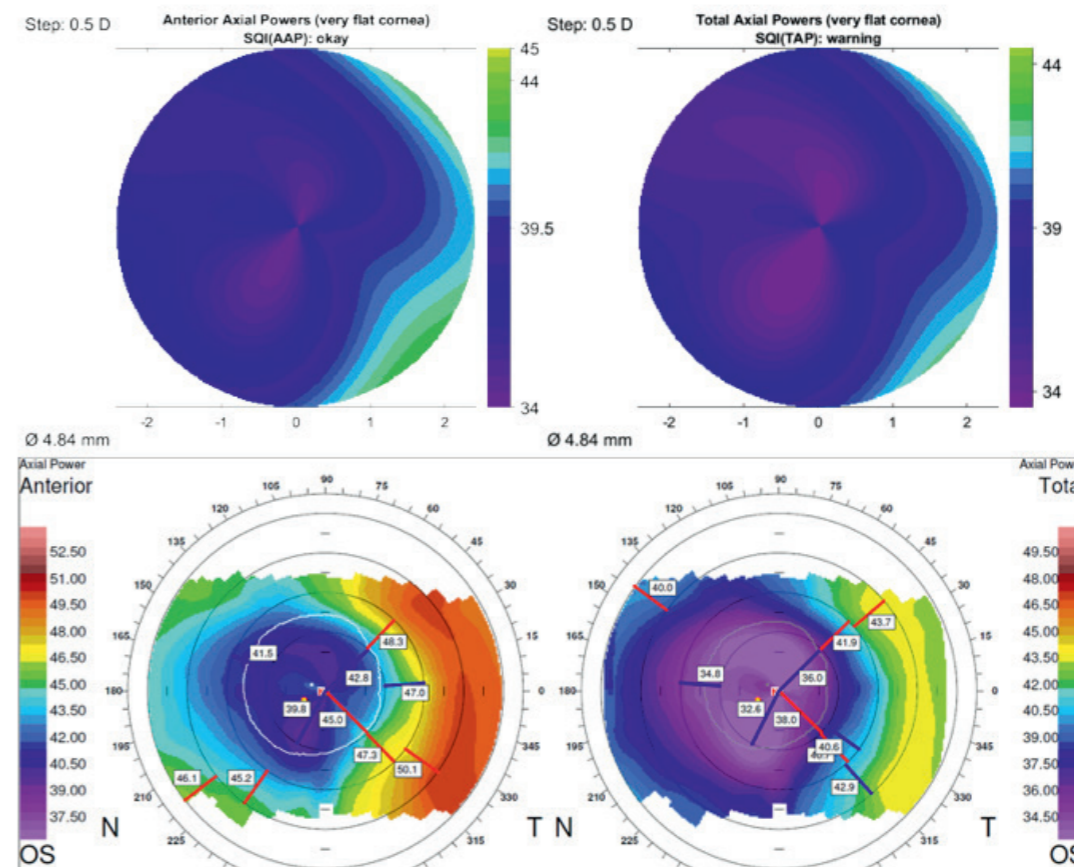


Figure 1a

Figure 1b

Figure 1a, b: Axial power maps for a post myopic LASIK patient from IOLMaster 700 Central Topography (a) and Orbscan (b) showing a flat central cornea

topographer (Sirius, CSO) in a study that included 36 eyes of 22 patients. Both maps are limited to about the same zone size. We looked for agreement in powers, axis alignments, and cornea shape classification. We found 89%, 89% and 72% of the maps were within 0.5D step for minimum power, maximum power and range of power, respectively. Axes agreement within 10 degrees were noted for the superior steep (75%), superior flat (69%), inferior steep (66%) and inferior flat (63%). We noted about 72% of the eyes had the same shape classification. These findings give me confidence that the IOLMaster 700 provides reliable Central Topography data.

CLINICAL CASE

A patient who had a history of myopic LASIK presented for cataract surgery. Typical of a post-myopic LASIK eye, IOLMaster 700 Central Topography showed a very flat central cornea (Figure 1a). The finding was confirmed using a dedicated topographer (Orbscan, Bausch + Lomb) (Figure 1b).

CONCLUSION

Biometry is an obligatory component in the evaluation of patients for cataract surgery. Corneal topography is important in a cataract practice to guide, plan and cus-

tomize cataract management. The IOLMaster 700 Central Topography is a functional unit, albeit only within the central cornea. It does not replace a dedicated corneal topographer for more detailed analysis of the cornea. Being integrated, it allows for seamless and streamlined cataract workflow.

Methods for improving workflow efficiency are always of interest to physicians, and finding strategies for streamlining protocols has gotten even greater attention as the COVID-19 pandemic continues. In that regard, the IOLMaster 700 with integrated Central Topography is an advance for providing surgeons more comprehensive patient data without any additional measurement or need for extra hardware.

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