# PREOPERATIVE KERATOMETRY MEASUREMENTS USING PARTIAL COHERENCE LASER INTERFEROMETRY VERSUS SCHEIMPFLUG TOMOGRAPHY IN INTRAOCULAR LENS POWER CALCULATIONS

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## Introduction

Automated keratometric (k) Readings provided by the partial coherence interferometry device (KIOLM) IOLMaster (version S.2, Carl Zeiss Meditec, Dublin, California, USA) have been the most widely used values for intraocular lens (IOL) power calculation and have long been considered the gold-standard keratometric measurements. The keratometer within the IOLMaster measures corneal power by analyzing reflections of light projected at 6 points on the cornea over a 2.3-mm paraxial radius.

Anterior segment imaging by the Pentacam Comprehensive Eye Scanner (Oculus, Inc., Wetzlar, Germany) isplaying more and more a vital role in preoperative evaluation of cataract patients. The Pentacam uses Scheimpflug technology to acquire detailed images of the cornea and of the anterior chamber. It uses a rotating camera that scans138,000 true elevation points over both the anterior andposterior corneal surfaces, forming a 3-dimensional image of the cornea. These values are then analyzed by the incorporated software to obtain corneal pachymetry, topography, keratometry, and anterior chamber photography.

## Aim of the Work

The aim of the study was to evaluate the predictability of k reading obtained by partial coherence laser interferometry vs Scheimpflug tomography in patients undergoing IOL power calculations for phacoemulsification cataract surgery and IOL implantation.

## Patients and Methods

The study included 30 eyes of 30 patients who were scheduled for cataract phacoemulsification surgery.

**Inclusion criteria:** Patients presenting with visually significant cataract older than 50 years.. In this series, the cataractous changes included nuclear changes ranging from stage 2 to stage 5, cortical changes ranging from stage 1 to stage 4, and posterior subcapsular changes ranging from stage 1 to stage 3, according to the Lens Opacities Classification System III

**Exclusion criteria:** Previous refractive surgery or any sort of corneal pathology. Eyes with any ophthalmic pathology other than cataract that might caused visual impairment.

**METHODS:** Prospective, comparative observational study Patients enrolled in this study were subjected to

1) Full history taking including:
- Age
- Gender
- Past ophthalmic history
- Medical history
- Surgical history
- Presenting symptoms

2) Full ophthalmologic examination including:
- Visual acuity (corrected and uncorrected).
- Fundus examination

All surgeries were performed by the same surgeon using phacoemulsification through a 2.2-mm limbal incision using White Star Signature Phacoemulsification System (Johnson & Johnson Vision, USA) An acrylic monofocal IOL was placed in the capsular bag in each case. The final refraction obtained by Topcon RM-800 Auto Refractometer (TOPCON CORPORATION, JAPAN) and visual acuity was obtained 4-6 weeks after surgery. Each eye was first evaluated with the Pentacam-HR Comprehensive Eye Scanner. All patients had to maintain good eye alignment, for best quality outputs. The KF, KTNP, and the KRP values from the Pentacam-HR unit taken at the 2- and 5-mm rings. This was followed by an optical biometry and keratometry performed by the IOLMaster (KIOLM). The K values from the Pentacam-HR unit were compared with the values obtained by the IOLMaster.

## Results

This study included 30 eyes of 30 patients who were followed up for one month.

**Keratometric readings:**

The mean automated K value from the IOLMasterkeratometer (KIOLM) was 44.83 ± 1.98D. Table 1 shows the Pentacam K values taken at ring diameters (2, 5 mm), using the different measurement modalities (Front [KF], True Net Power [KTNP], and total refractive power [KRP]). Table 1 shows the average difference between each of the Pentacam K readings (KF, KTNP, and KRP) and the IOLMaster's automated K values (KIOLM).

**Table 1**

| K average | Mean ± SD. | t | p | Mean diff. |
|---|---|---|---|---|
| **IOLMaster readings** | 44.83 ± 1.98 | – | – | – |
| **KF 2 mm** | 44.78 ± 2.01 | 1.119 | 0.272 | -0.05 ± 0.23 |
| **KF 5 mm** | 44.66 ± 2.02 | 1.266 | 0.301 | -0.17 ± 0.26 |
| **KTNP 2 mm** | 43.38 ± 1.98 | 32.667 | <0.001* | -1.45 ± 0.24 |
| **KTNP 5 mm** | 43.45 ± 1.97 | 44.879 | <0.001* | -1.38 ± 0.17 |
| **KRP 2 mm** | 44.16 ± 2.09 | 7.385 | <0.001* | -0.67 ± 0.50 |
| **KRP 5 mm** | 45.21 ± 2.04 | 8.849 | <0.001* | 0.38 ± 0.24 |

IOL prediction error data:

The mean±SD predictive error of IOLMaster was -0.052 ± 0.25D. MAE represents the difference predictive errors calculated from the IOLMASTER from the predictive refractive errors calculated from the K Readings obtained from Pentacam device ,which was from the KF map at 2mm ring was 0.006 ± 0.24D and 5mm ring was 0.071 ± 0.27D. KTNP at 2mm ring was -0.049 ± 0.18D and at 5mm ring was -0.107 ± 0.20D, KRP map at 2mm ring was -0.009 ± 0.20D and at 5mm ring was -0.078 ± 0.19D. A paired t-test between the predictive error calculated from the IOLMASTER K readings and from The Pentacam KF, KTNP and KRP K readings at 2mm and 5mm ring diameters showed that the difference was not statistically significant table 2.

**Table 2**

| APE | Mean ± SD. | t | p | Mean diff. |
|---|---|---|---|---|
| **IOLMaster readings** | 0.059 ± 0.73 | – | – | – |
| **KF 2 mm** | 0.023 ± 0.78 | 0.855 | 0.399 | 0.04 ± 0.23 |
| **KF 5 mm** | -0.060 ± 0.78 | 0.863 | 0.386 | 0.12 ± 0.24 |
| **KTNP 2 mm** | 0.110 ± 0.97 | 0.839 | 0.408 | -0.05 ± 0.34 |
| **KTNP 5 mm** | 0.116 ± 0.99 | 0.903 | 0.374 | -0.06 ± 0.35 |
| **KRP 2 mm** | 0.017 ± 0.87 | 0.769 | 0.448 | 0.04 ± 0.29 |
| **KRP 5 mm** | 0.087 ± 0.92 | 0.504 | 0.618 | -0.03 ± 0.30 |

## Conclusion

1. K readings of IOLMaster and the K reading obtained from the Pentacam especially at 2- mm ring diameter agree very well and can be used interchangeably.
2. There is no statistically significant difference between the Absolute prediction errors of the K readings from IOLMaster unit and the K readings of Pentacam unit.