Introduction: This study aims to compare the accuracy of intraoperative wavefront aberrometry (IWA) and conventional intraocular lens (IOL) prediction formulas in eyes undergoing cataract surgery.

Materials and Methods: Prospective study enrolling eyes with cataract that underwent phacoemulsification. All procedures were performed by one surgeon with the intraocular lens placed within the capsular bag. An intraoperative wavefront aberrometer (ORA, Alcon) measured aphakic refractive measurements intraoperatively and calculated the IOL power. For all patients, the IOL power was also estimated preoperatively using optical biometry (IOLMaster 500, Carl Zeiss Meditec) to calculate the SRK/T, Holladay, Hoffer Q and Haigis formulae.

Main study outcomes included mean and mean absolute prediction errors (PE, the difference between refractive error one month after surgery and predicted postoperative refractive error) for the different formulae and percentage of eyes within 0.50 and 1.00 diopters (D) of refractive PE.

Results: A total of 252 eyes were included in the study, from which 149 (59.1%) eyes were implanted with a monofocal IOL, 53 (21.0%) with a multifocal IOL, 37 (14.7%) with a toric IOL and 13 (5.2%) with a toric multifocal IOL. Overall, mean postoperative spherical equivalent at 1 month was -0.21±0.35 D. The lowest mean absolute PE was obtained using IWA (0.39±0.35D), followed by the Haigis formula (0.42 ±0.51D, p=0.440 vs IWA), Hoffer Q (0.46±0.49D, p=0.072 vs IWA), Holladay (0.49±0.57D, p=0.023 vs IWA) and SRK/T (0.50±0.56D, p=0.008 vs IWA). Percentage of eyes within ±1D and ±0.5D of PE was 95.2% and 71.0%, respectively, for IWA, 90.9% and 73.8% for the Haigis formula, 89.7% and 70.6% for the Holladay formula, 87.7% and 70.6% for the Hoffer Q formula, 87.7% and 70.6% for the Holladay formula, and 87.7% and 66.3% for the SRK/T formula.

Conclusions: IWA obtained the lowest mean absolute PE and the highest percentage of eyes within ±1D of PE. Mean absolute PE was significantly lower in IWA when compared to the SRK/T and Holladay formulae, but not significantly different when compared to the Haigis and Hoffer Q formulae.

In the era of premium IOLs, our results in this large cohort confirm the accuracy of IWA and its ability to consistently deliver excellent refractive outcomes.