Repeatability of Ocular Response Analyzer and Icare Rebound Tonometry

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Purpose. To analyze the individual inter-operator repeatability of the Ocular Response Analyzer (ORA) and Icare rebound tonometer in measuring intraocular pressure (IOP) and corneal hysteresis (CH).

Introduction. Primary open angle glaucoma is a leading cause of irreversible blindness worldwide. Of the many risk factors, IOP is the only variable that can be managed clinically. Tonometers that are accurate, easy to use and repeatable are essential for proper patient care.

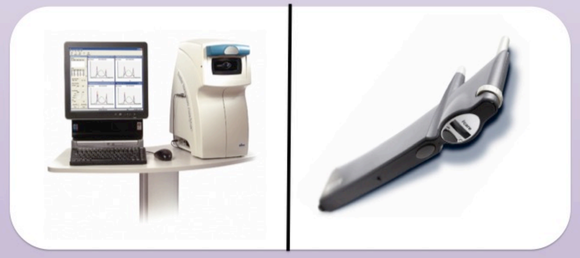

FIGURE 1.
The Reichert ORA (left) and the Icare Tonometer (right).

Although Goldman applanation tonometry (GAT) still remains the gold standard for IOP measurements, Icare and ORA separately have been shown to be highly consistent with GAT values; therefore, many offices in the US are using the Icare and ORA to manage their glaucoma patients. These devices are accurate, sterile, easy to use tools that do not require the use of topical anesthetic. In many practices, there are multiple people who may be measuring IOP at any given time, so it is vital for proper patient management to have a device that can produce repeatable measurements with minimal inter-operator variability.

For this project, each investigator measured three unique data points with the ORA including IOPg, IOPcc and CH representing Goldmann-correlated IOP, cornea-compensated IOP, and corneal hysteresis respectively. The Icare was used to obtain one single measurement of IOP.

Methods. 36 healthy volunteers, over 18 years old, were enrolled into this clinical study. Each participant had IOP measurements taken by 3 investigators using the Icare on one eye and the ORA on the other eye. The eye and order for each investigator was randomly selected but kept consistent between investigators per participant. One drop of Refresh Plus Preservative Free Artificial Tear (AT) was instilled before each round of data collection.

Example Time Table			
	Start Time	**@ 2 minutes**	**@ 4 minutes**
Volunteer 1	Initial drop of AT Investigator A: OD: ORA OS: Icare	2nd drop of AT Investigator B: OD: ORA OS: Icare	3rd drop of AT Investigator C: OD: ORA OS: Icare
Volunteer 2	Initial drop of AT Investigator C: OD: Icare OS: ORA	2nd drop of AT Investigator A: OD: Icare OS: ORA	3rd drop of AT Investigator B: OD: Icare OS: ORA

TABLE 1.
Example time table used for the experiment.

Results. Data was analyzed using repeated measures ANOVA modalities. Each set of measurements was assigned a Cronbach's α coefficient to represent the consistency of each data set. A higher Cronbach's α value indicates a more consistent data set and therefore a more repeatable device. An α value higher than 0.7 is considered satisfactory.

	IOPcc	**IOPg**	**CH**	**Icare IOP**
Cronbach's α	0.827	0.886	0.956	0.877

TABLE 2.
Cronbach's α for each data set. A value closer to 1.0 indicates more repeatability.

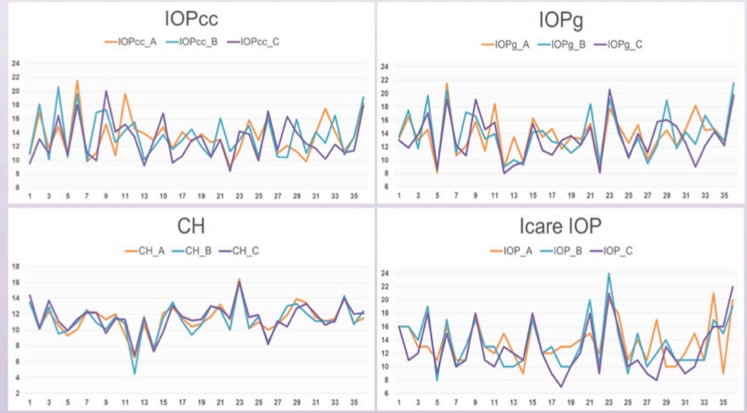

FIGURE 2.
Summary of raw data points.

Discussion. While all data sets earned a Cronbach's α coefficient well above satisfactory level, corneal hysteresis was by far the most repeatable measurement. This is clinically useful because low CH has been shown to be correlated with increased risk of progression in glaucoma patients. Optometric physicians can have confidence utilizing these machines with multiple technicians and/or doctors without compromising patient care.

We conclude that both instruments are acceptable to use interchangeably between multiple users while providing consistent IOP measurements.

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References.

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