A new contact tonometer with the potential to be less affected by variations in corneal thickness and curvature can provide IOP measurements that meet the International Standard Organization’s (ISO) accuracy standards, according to a study presented by Gauti Jóhannesson MD at the 9th European Glaucoma Society Congress.

“The servo-controlled device uses a novel tonometry method called applanation resonance tonometry (ART). It is based on the Doppler principle and derives its measurements from the relationship between the force applied and the amount of area contacted, which is in turn proportional to the intraocular pressure (IOP),” said Dr Jóhannesson, Umeå University Hospital, Umeå, Sweden.

He noted that previous research has shown that manual ART fulfills the ISO’s standard for tonometers. The device has a force transducer which continuously measures the force needed to applanate the cornea and simultaneously registered the contact area through detection of frequency shifts with a resonator sensor, he added.

The ART technique has two available analysis procedures. One is dynamic and measures IOP during the indentation phase and the other is static and provides a Goldmann-like measurement during two seconds of full applanation, Dr Jóhannesson explained.

The prospective single-centre study involved 152 eyes of 77 patients divided into three groups with different IOP profiles. They underwent IOP measurements with Goldmann applanation tonometry (GAT), servo-controlled ART and manual ART, six times per method in a standardised order. The researchers designed the study according to the ISO requirements and defined precision as the standard deviation of difference against GAT.

The patients’ mean IOP as measured by GAT was 19.1 mmHg (range: 10–37 mmHg). The precision of the manual ART tonometer was 2.3 mmHg for both dynamic (r = 0.91) and static (r = 0.92) analyses. The precision of servo-controlled ART tonometer was 2.9 mmHg for dynamic analyses (r = 0.86) and 2.5 mmHg for static analyses (r = 0.90) (see figure).

The lower accuracy of the servo-controlled device’s dynamic measurements resulted from a shakiness of the motor. In the device’s latest design, the researchers have made the motor steadier by decreasing the probe velocity and reducing the accelerations, making the applanation more similar to the manual applanation.

“This study confirms that the ART methodology is feasible. The further developed manual ART fulfilled the ISO standard with both the dynamic and the static analysis techniques. The newly developed servo-controlled ART was close to fulfilling the standard using the static analysis technique, but failed in the group with the highest IOP range. Furthermore, servo-controlled ART has the potential to provide a more user-friendly form of tonometry, but further development is needed,” Dr Jóhannesson concluded.