Clinical evaluation of a servo controlled applanation resonance tonometer
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Purpose: A novel tonometry method, applanation resonance tonometry (ART), has in recent years been introduced. The ART technique is based on the relationship between force and contact area which is proportional to the intraocular pressure (IOP). The force needed to applanate the cornea is measured continuously with a force transducer and simultaneously the contact area is registered through a frequency shift with a resonator sensor. A manual ART (ARTmanual) has previously been shown to fulfil the International Standard Organization’s (ISO) standard for tonometers. The main purpose of this study was to assess the precision of a newly developed servo controlled ART (ARTservo) in a study designed according to the ISO requirements and compare it to the gold standard Goldmann Applanation Tonometry (GAT) and ARTmanual.

Methods: This prospective single-centre study on 153 eyes contained IOP measurements that were equally distributed into three groups; 23 mmHg. IOP was measured six times/method in a standardized order; GAT, ARTservo and ARTmanual. Both versions of ART were mounted on a biomicroscope. The ART technique has two available analysis procedures; a dynamic one that measures IOP during the indentation phase and a static one that causes a Goldmann-like measurement during two seconds of full applanation. Precision was defined as standard deviation of difference against GAT.

Results: The mean IOP of GAT was 19.4 mmHg (range: 10-56 mmHg). The precision of ARTservo using the dynamic and static analysis were 2.9 mmHg (r = 0.89) and 2.6 mmHg (r = 0.91) respectively. If an extreme outlier (IOP 56 mmHg) was excluded, the precision would be 2.50 mmHg using the static analysis. The precision of ARTmanual was 2.22 mmHg (r = 0.93) with the dynamic analysis and 2.25 mmHg (r = 0.94) with the static one.

Conclusions: The servo controlled ART improved the usability but had less precision than manual ART and further development are therefore needed. The precision of ARTservo has potential to be improved by decreasing the probe velocity and reducing the accelerations, which would make the applanation more similar to the manual applanation. The precision of ARTmanual was within the limits set by ISO-standard for eye tonometers.