Comparison of the Anterior Chamber Angle Measurements using Artemis 2 and Ultrasound biomicroscopy

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Introduction

Gonioscopy is common standard technique that provides semi quantitative assessment of the angle width. However, the disadvantage of this technique is inevitable need for minimal illumination to visualize the angle, the uncertainty of the change in angle configuration when a goniolens is in direct contact on the cornea, and the dependence on examiner skill and experience for interpretation of the angle configuration, limit its role in providing precise angle assessment (Baikoff et al. 2004; Kalev-Landoy et al 2007). Thus, quantitative and objective assessment of the anterior chamber angle (ACA) is crucial for determining the risk of angle closure (Leung et al 2007; Radhakrishnan et al 2005).

Recently numbers of instruments introduce to provide quantitative, objective, and precise measurement of the anterior ocular segment which is vital screening tool to determine the risk factor of primary angle-closure glaucoma. These instruments are either ultrasound, or optical based techniques. Precise measurements of the anterior chamber angle can be obtained by ultrasound biomicroscopy (UBM) (Wang et al. 2009), anterior segment optical coherence tomography (OCT) (Müller et al. 2006), and the Visante OCT (Leung et al. 2008).

Aim

The aim of this study was to assess the agreements of ACA measurements obtained using the ultrasound biomicroscope and Artemis2. However, to the best of our knowledge, this is the first study to compare ACA measurements obtained with these devices on normal eyes.

Subjects and Methods

Fifty nine eyes of 59 healthy subjects (27women) were recruited for this study. Their mean age was 22 ± 2 years, and age range was 19–30 years.

Comprehensive anterior segment examinations of all subjects were performed using slit lamp biomicroscope.

The exclusion criteria included a positive history or objective signs of systemic diseases with ocular implications such diabetes mellitus, IOP ≥ 20 mmHg, high refractive error or high astigmatism ≥ 4.00 DS or ≥ 3.00 DC.

For each subject, one eye was randomly selected using a table of random numbers generated on Microsoft Excel.

All measurements of the anterior chamber angle were conducted by a single investigator. The measurements were conducted using the Artemis2 followed by UBM in the same clinic at one location, because Artemis 2 is less invasive than UBM.

The study was conducted in conformance with the ethical considerations laid out in the 2008 Declaration of Helsinki, and the study protocol was approved by the research ethics review board of the College.

Results

The mean (±SD) intraocular pressure was 14 ± 1.5 mmHg. The mean spherical equivalent of refractive error was -0.50 ±1.00 D.

The ACA mean ± standard deviation measurements for UBM and Artemis 2 were 41.46 ± 5.1 degree and 32.94 ± 6.0295 degree respectively.

The Repeated Measures Analysis of Variance of ACA measurements using UBM and Artemis 2 by single observer show that there is no significant difference and the P value were 0.99 and 0.76 respectively. The results show a strong correlation between the UBM and Artemis 2 for ACA measurements (r = 0.913 P<0.0001).

The paired t test the t value was 26.25 and there is significant difference between the mean UBM of ACA measurements and Artemis 2 of ACA measurements, and the P value was < 0.0001.

The Bland and Altman analysis mean difference and standard deviation was 8.5 ± 2.50 degree, and a limit of agreement was 13.4 and 3.6 degree (figure 1).

Conclusion

The measurements of ACA using UBM and Artemis 2 can not be used interchangeably, and clinically not acceptable.

References


Figure 1. Bland-Altman diagram showing difference and agreement limits of the anterior chamber angle (ACA) measured with the UBM and Artemis 2.

Mean difference: UBM_ACA - average Artemis ACA

Mean of all: 8.5

95% limits of agreement: 13.4, 3.6

Difference average UBM_ACA - average Artemis ACA

Mean of all: 8.5

95% limits of agreement: 13.4, 3.6

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