Relationship Between Relative Lens Position and Appositional Closure in Eyes with Narrow Angles

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Abstract

Purpose: To investigate the relationship between relative lens position (RLP) and appositional closure in eyes with narrow angles.

Methods: Ultrasound biomicroscopy (UBM) was used to measure anterior chamber depth (ACD) and lens thickness (LT), and the IOLMaster to measure axial length (AL). The number of quadrants with appositional closure was assessed by UBM under dark conditions. The RLP was calculated thus: RLP = \(10 \times \frac{\text{ACD} + 0.5 \times \text{LT}}{\text{AL}}\).

Results: This study comprised 30 consecutive patients (30 eyes) with narrow-angle eyes defined as Shaffer grade 2 or lower and without peripheral anterior synechiae (24 women, 6 men; mean age ± SD, 67.3 ± 10.4 years; range, 42–87 years). Under dark conditions, 66.7% of the eyes with narrow angles showed appositional closure in at least one quadrant. Of the various ocular biometric parameters, only the RLP significantly decreased with appositional closure in at least one quadrant (\(P = 0.005\)).

Conclusion: A decrease in the RLP can be predictive of appositional closure for narrow-angle eyes under dark conditions.

Keywords: anterior chamber depth, axial length, narrow angle, relative lens position, ultrasound biomicroscopy

Introduction

Eyes with narrow angles are associated with shallow anterior chamber depth (ACD), a relatively anteriorly positioned lens, and short axial length (AL). Pupil-block, anterior nonpupil-block (plateau iris and peripheral iris crowding), lens-related, and retrolenticular mechanisms have been suggested to be the four main mechanisms of angle closure. In an Asian population, ultrasound biomicroscopy (UBM) showed that about 30% of primary angle-closure glaucoma (PACG) eyes with patent laser peripheral iridotomy had a plateau iris, which suggests the importance of nonpupil-block mechanisms. Devereux et al. reported that the optical method for measuring ACD yielded a sensitivity of 85% and specificity of 84% at a screening cutoff of less than 2.22 mm for detecting eyes with narrow angles in an Asian population. Although such measurement of ACD as a screening tool can detect narrow angles, ACD itself depends on the position of the anterior lens surface and is determined by lens thickness (LT) and lens position (LP). In addition, the relative lens position (RLP) has been considered to be an important factor in PACG.

As reported previously by several investigators, darkroom UBM has demonstrated the presence of appositional angle closure in a high percentage of eyes with narrow angles. As far as we know, however, there have been no reports on the relationship between RLP and appositional closure in narrow-angle eyes. In the study presented here, we investigated the relationship among ocular biometric parameters in association with appositional closure in eyes with narrow angles.
Participants and Methods

Participants

A retrospective study of 30 consecutive patients (30 eyes) with narrow-angle eyes defined as Shaffer grade 2 or lower and without peripheral anterior synchiae was conducted at the National Hospital Organization Osaka National Hospital between October 2007 and July 2009. Gonioscopic examination results were evaluated by a glaucoma specialist (YO). The study was approved by the institutional review board of Osaka National Hospital. The participants consisted of 24 women (80%) and six men (20%). Their mean age was 67.3 ± 10.4 years (mean ± SD, range 42–87 years).

Participants with a history of previously diagnosed glaucoma, subluxation of the lens, intraocular surgery, or laser peripheral iridotomy were excluded. When both eyes were examined, only findings for the left eye were included.

Biometry of the Eye

ACD, defined as the distance from the corneal endothelium to the anterior lens surface, and LT were measured by means of UBM (UX-03; Rion, Tokyo, Japan) under dark conditions. No cycloplegic or miotic agents were used before the measurements. The UBM system was equipped with a 25-MHz transducer, a 10 mm × 10 mm field of view, and a spatial resolution of approximately 150 mm. Axial length was measured with IOLMaster version 3.0 (Carl Zeiss Meditec, Jena, Germany). The lens position (LP) was calculated as LP = ACD + 0.5 LT, and the RLP as RLP = 10 × LP/AL. The number of quadrants with appositional closure was determined by means of UBM among four quadrants (upper, lower, nasal, and temporal) under dark conditions. The number of quadrants with appositional closure (defined as iridotrabecular apposition) among the four quadrants was also determined by UBM (Fig. 1).

Statistical Analyses

All analyses were performed with version 11 SYSTAT (Systat Software, Richmond, CA, USA). The Pearson correlation was used for analysis of the correlation between ACD and RLP. The t test was used to compare eyes with appositional closure in at least one quadrant with eyes without appositional closure. Sex differences were analyzed by using the Fisher exact test. A P value of less than 0.05 was considered statistically significant.

Results

Under dark conditions, 20 of the 30 eyes (66.7%) with narrow angles showed appositional closure in at least one