# *Diurnal Variation in Anterior Segment Angle Structures Using OCT*

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The authors have no financial interests to disclose

# Background

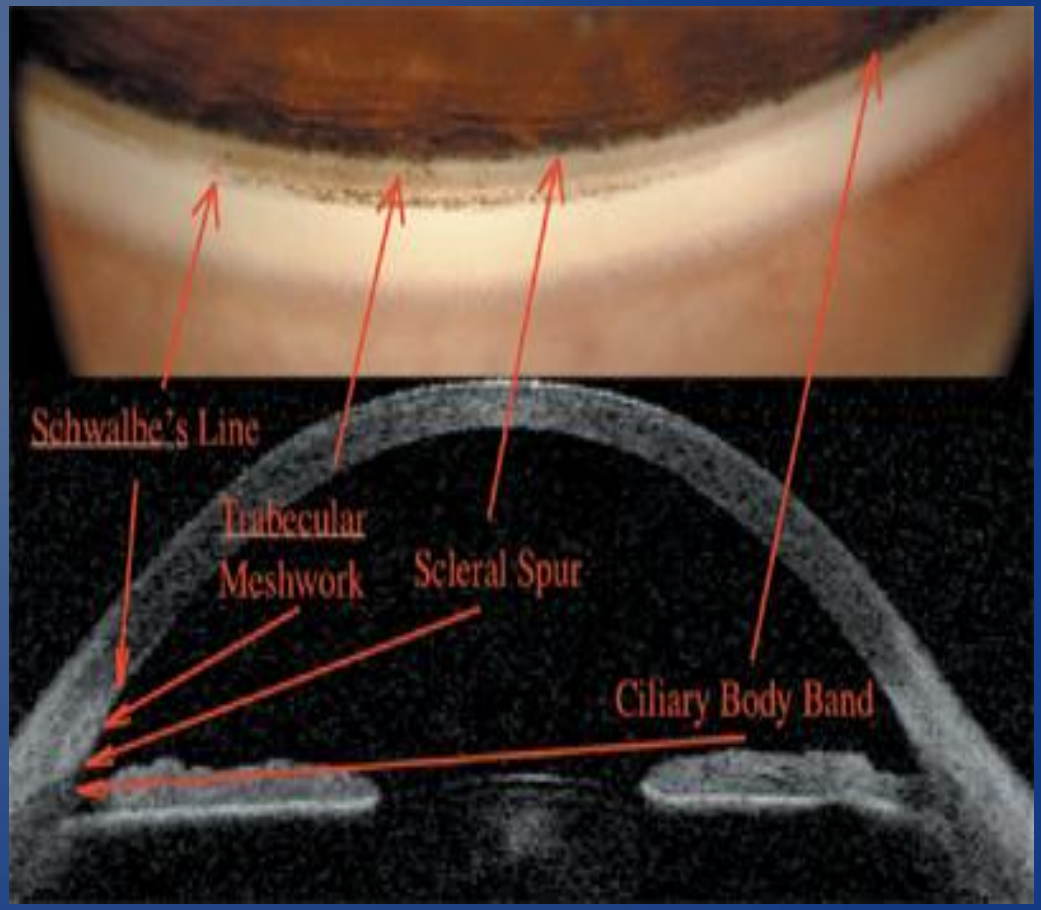
- Diurnal variations in intraocular pressure (IOP) occur with the typical peak hours at night to early morning.[5]
- Previous study demonstrates changes in aqueous flow rate that is inversely associated with the IOP.[6]
- The anterior segment angle morphology is important in the flow of aqueous; therefore further understanding changes in the angle can assist in IOP management.
- Anterior Segment Optical Coherence Tomography (AS-OCT) gives a cross-sectional image of the structures and dimensions of the anterior segment.[7] By utilizing this new technology, this study attempts to characterize significant angle changes in relation to changing IOP and time of day.

# Design

- The following study underwent IRB approval
- 20 Healthy eyes, mean age of 28.2 years old
- Mean cup/disc 0.269 ±0.0670
- Mean acuity 20/25 ±2.3 and refractive error -1.8 ±2.28 spherical equivalence
- IOP, AS-OCT, CCT, blood pressure and pulse measured in AM and PM
- Paired t-test analysis used for comparison

# Anterior Segment- OCT angle measurements

- Anterior Chamber Depth (ACD)
- Angle Opening Distance (AOD) –set at 500 and 750 µm from the scleral spur
- Anterior Chamber Angle at 500 µm from the scleral spur




Kobayashi H, Kobayashi K, Kiryu J, Kondo T. Ultrasound biomicroscopic analysis of the effect of pilocarpine on the anterior chamber angle. *Graefes Arch Clin Exp Ophthalmol.* Jul 1997;235(7):425-430.

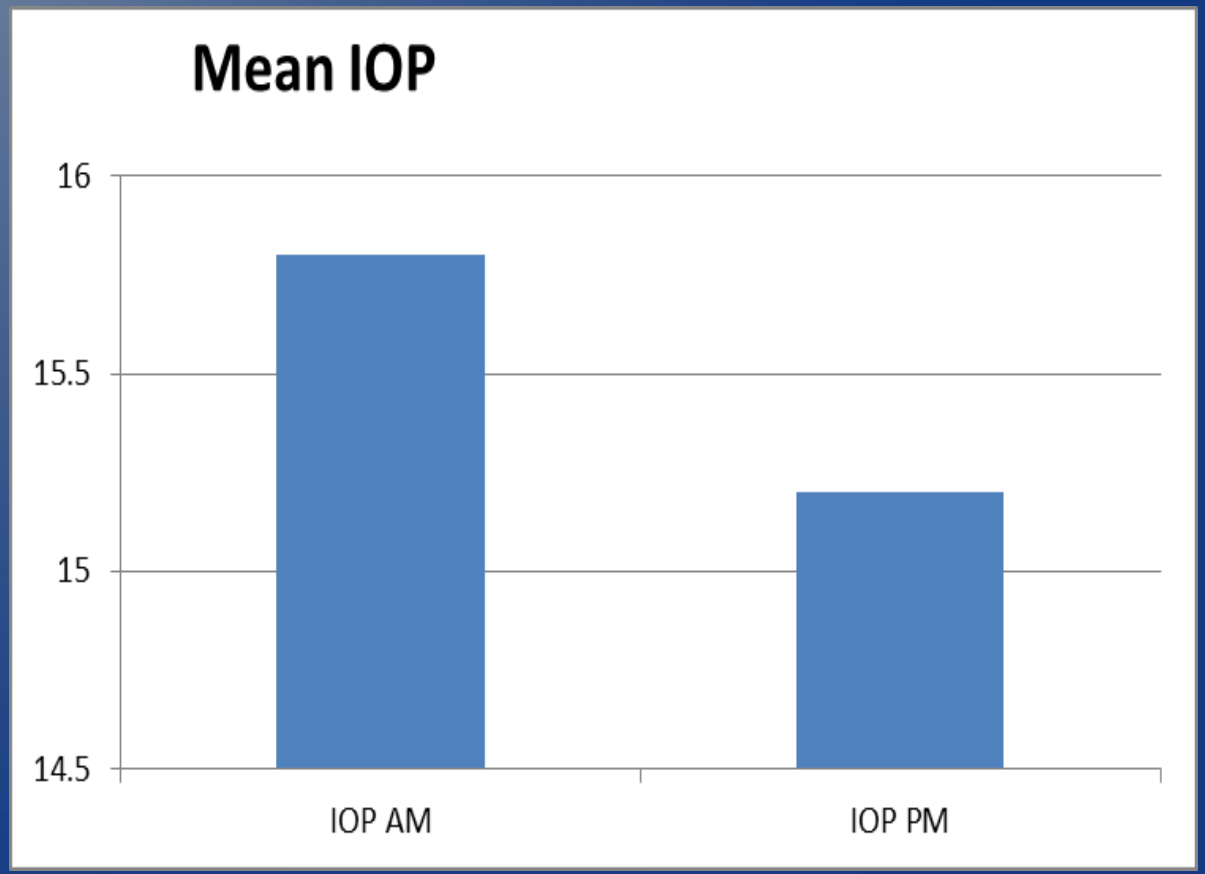
# Results

- Mean CCT AM 527.5 ± 40.64 µm and PM 523.6 ± 44.53µm
- CCT PM – AM difference was 3.95 µm, p=0.29
- Mean SBP AM 120.6 and PM 117.5 mmHg
- Mean DBP AM 76 and PM 73.6 mmHg
- Mean pulse AM 76 and PM 70.9 bpm
- No significant difference between AM and PM measurements with the above results
- Pupil diameter 3200 µm in AM and 3815 µm in PM with the difference being 615 µm, $p < 0.05$

# Intraocular Pressure

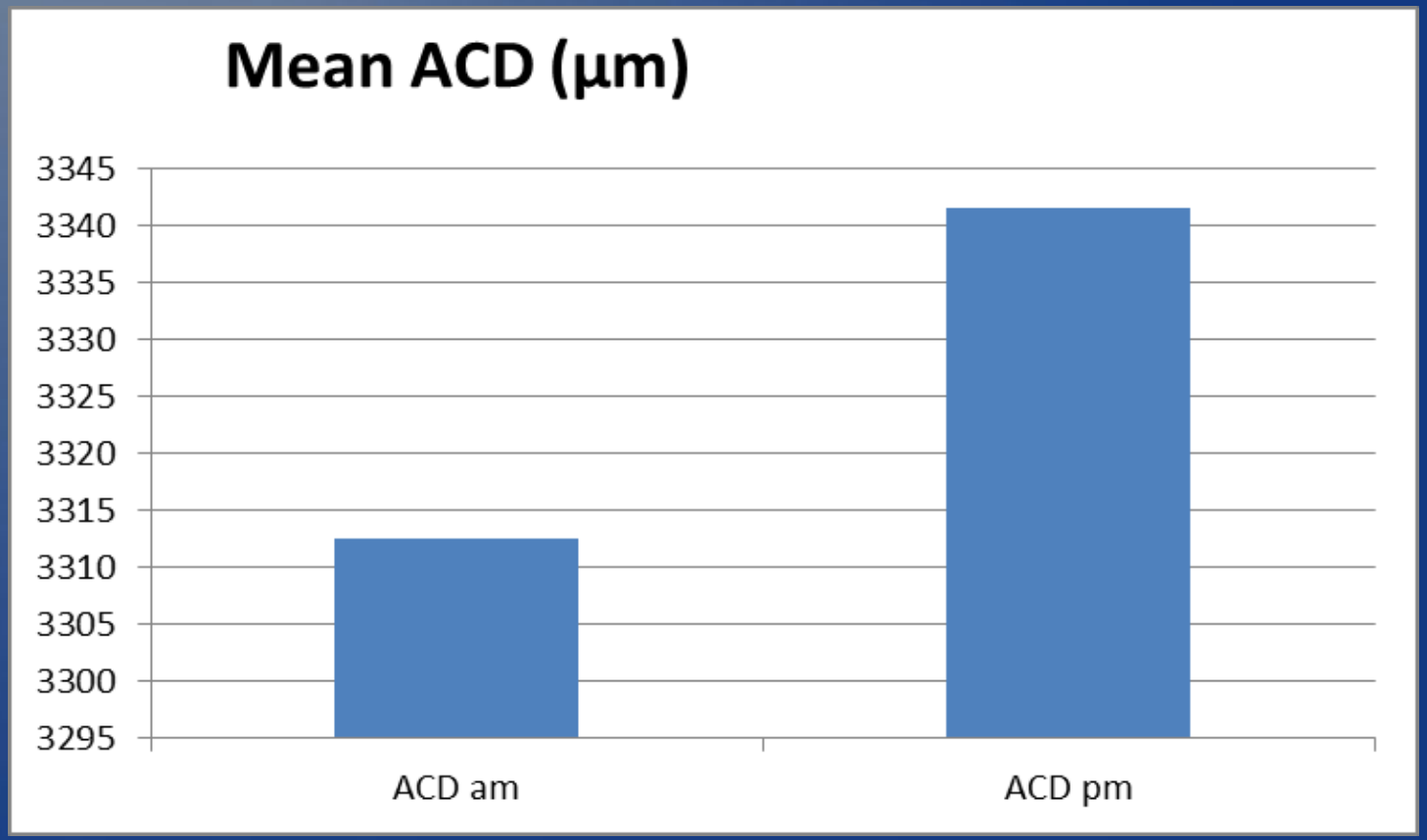
Mean PM IOP was 15.2 ±2.66 mmHg and AM was 15.8 ±1.89 mmHg.

The mean IOP difference (PM – AM) was -0.6 mmHg, p=0.284



# Anterior Chamber Depth (ACD)

Mean ACD PM is 3341.5 µm and ACD AM 3312.5 µm with the difference PM-AM being 29 µm, p=0.48.



# Angle Opening Distance

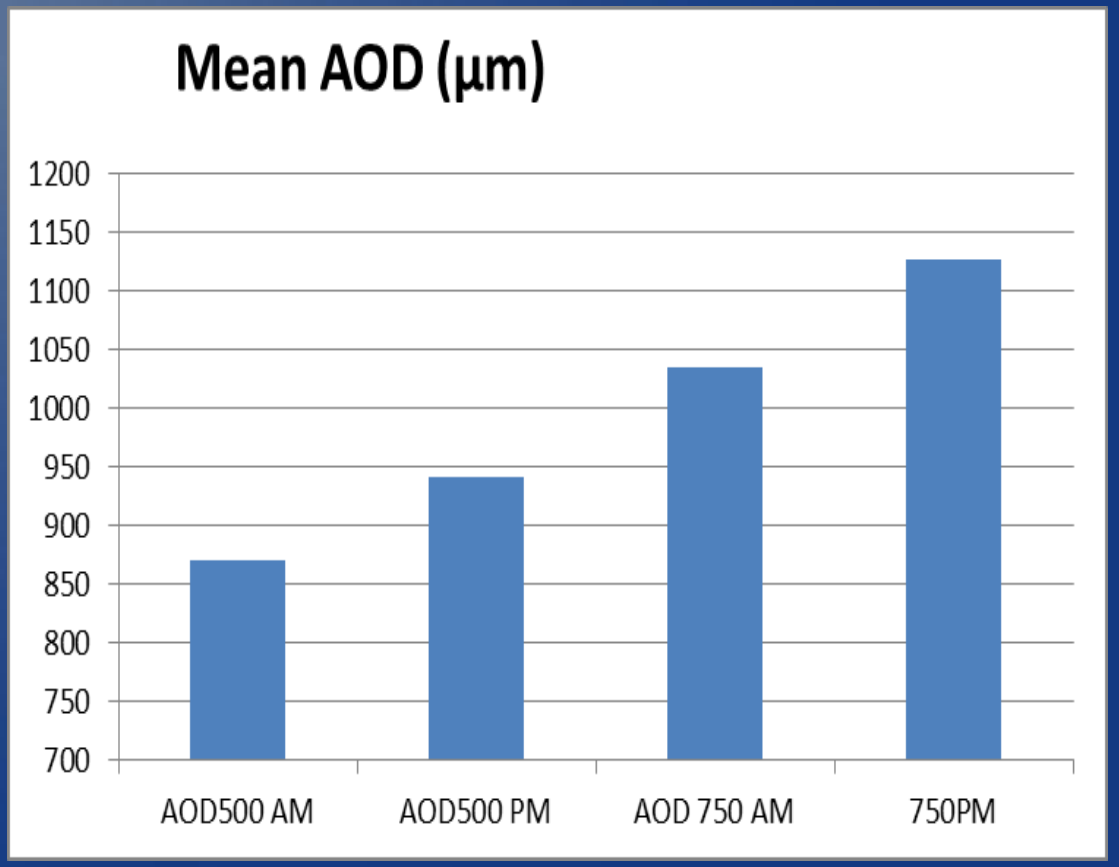
Mean AOD 500 PM = 941.5 ± 235.82 µm and AM = 870.0 ± 208.93 µm

PM-AM being 71.5 µm, $p<0.05$.

Mean AOD 750 PM = 1126.5 ± 270.76 µm and

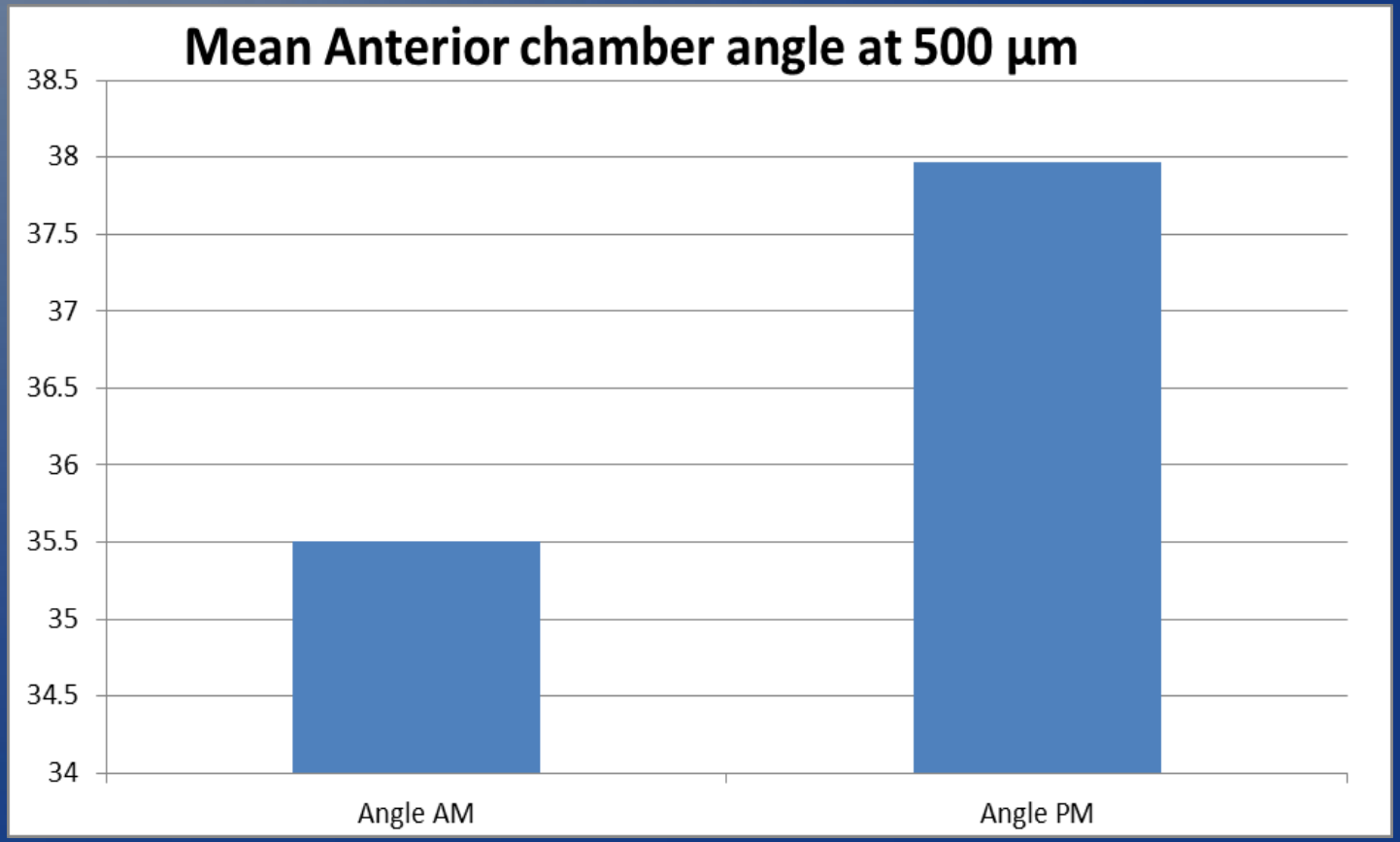
AM = 1034.5 ± 238.01 µm

PM-AM being 92.0 µm, $p<0.05$



# Anterior Chamber Angle

Mean angle 500 PM is 37.97 ± 5.865$^0$ and the AM is 35.51 ± 4.760$^0$ with the difference PM-AM being 2.45$^0$, p<0.05



# Discussion

1. This study demonstrated significant widening of the angles (specifically, changes in the AOD 500 and 750) in the afternoon measurements, consistent with diurnal IOP trend in previous studies – PM angle wider despite pupil size difference
2. Significant increase in pupil diameter in PM compared to AM measurements – possibly contributing to angle change by pulling back iris/lens diaphragm (note: no significant ACD change)
3. Implication that daily aqueous outflow is partially dictated by dynamic angle configurations
4. The lack of significant change in the CCT, IOP and ACD in our healthy population is likely due to the eye's normal aqueous outflow facilities being able to compensate for the diurnal flux in angle width. Conversely, glaucomatous and ocular hypertensive patients have been shown to have significantly greater diurnal fluctuations in IOP than healthy eyes.[1-2] This is due to their impaired aqueous outflow ability, especially at night.[3,8] The narrowing angle throughout the night to the morning likely further contribute to this greater nighttime elevation in the IOP which in glaucomatous eyes already have decreased aqueous outflow ability.

# Study Weakness

- Small study N=20
  - IOP changes not significant
- No control over pre-test activity
  - Pupil size difference and differences in sympathetic tone during testing
  - Ambient testing light was consistent

# Future Study

1. Increase the number of healthy subjects
2. Include pathologic eyes (glaucomatous, ocular hypertensives, glaucoma suspects)
3. Establish a pre-measurement R/R period

# References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