Central Corneal Thickness in patients with POAG and Normal patients

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AIMS AND OBJECTIVES

AIM: To evaluate central corneal thickness in patients with Primary Open Angle Glaucoma and Normal subjects.

OBJECTIVES: To evaluate central corneal thickness in patients with Primary Open Angle Glaucoma.

- To evaluate central corneal thickness in normal subject.

STUDY DESIGN : Hospital-based cross-sectional study.

STUDY SOURCE : Department of Ophthalmology, Sri Venkateswara Medical College and Sri Venkateswara Ram narayan Ruia Government General Hospital, Tirupati.

STUDY PERIOD One year from the date of Institutional ethical committee approval from February 2019 to March 2020

SAMPLE SIZE

SUBJECTS	NUMBER OF PATIENTS	NUMBER OF EYES
Primary open angle glaucoma	50	100 eyes
Normal subjects	50	100 eyes

INCLUSION CRITERIA

1. All the subjects above 50 years of age with or without cataract.

2. All subjects who have been diagnosed with Primary Open Angle Glaucoma

- with Intraocular pressures (IOP) prior to treatment > 21mmHg or current IOP on treatment < 21 mm HG measured by Goldmann's applanation Tonometer.

- Glaucomatous optic disc changes.

- Glaucomatous visual field defects at least in one hemifield not within 5 degrees of fixation of field defects in both hemifields and loss within 5 degrees of fixation in at least one hemifield (As per Preferred Practice Pattern POAG AAO Guidelines)

- Open angles on Gonioscopy

- 3. Normal subjects include subjects with

- Intraocular pressures < 21mm Hg in both the eyes measured by Goldmann's applanation Tonometer.
- Normal optic discs
- Normal visual fields
- Open angles on gonioscopy
- No family history of glaucoma,
- no suspicion of any form of glaucoma, or any other eye disease.

EXCLUSION CRITERIA

- Subjects with ocular diseases other than Primary Open Angle Glaucoma and normal eyes
- Subjects with corneal pathologies
- Previous intraocular or corneal surgery
- Diabetes mellitus
- use of contact lenses or any other conditions that may affect the corneal thickness
- Ocular trauma

METHODS

- All the patients aged 50 years and above were selected based on the above criteria, and written informed consent was obtained. A total of 100 subjects, 50 subjects with POAG, and 50 normal subjects, were included in the study. All the subjects underwent a complete ophthalmic evaluation, which includes

1. Medical and ocular history

2.Best-corrected visual acuity

3. Slit-lamp Biomicroscopy to exclude corneal pathology using CARL ZEISS MEDITECH AG 07740 Jena Germany.

- 4. Applanation Tonometry (ZEISS AT 030 – CARL ZEISS, Jena Germany).

5. Indentation Gonioscopy with ZEISS 4 mirror handheld gonio lens.

6. Dilated fundus examination and stereoscopic examination of the optic discs and the nerve fiber layer using a +90D lens with the slit lamp.

7. Pachymetry using DGH-550 Ultrasonic Pachymeter (DGH Technology Inc. Exton, PA, USA).

8. Visual field examination with Humphrey Visual Field Analyser (HUMPHREY FIELD ANALYSER MODEL-720i, CARL ZEISS MEDITEC Inc, Dublin, CA, USA).

STATISTICAL ANALYSIS

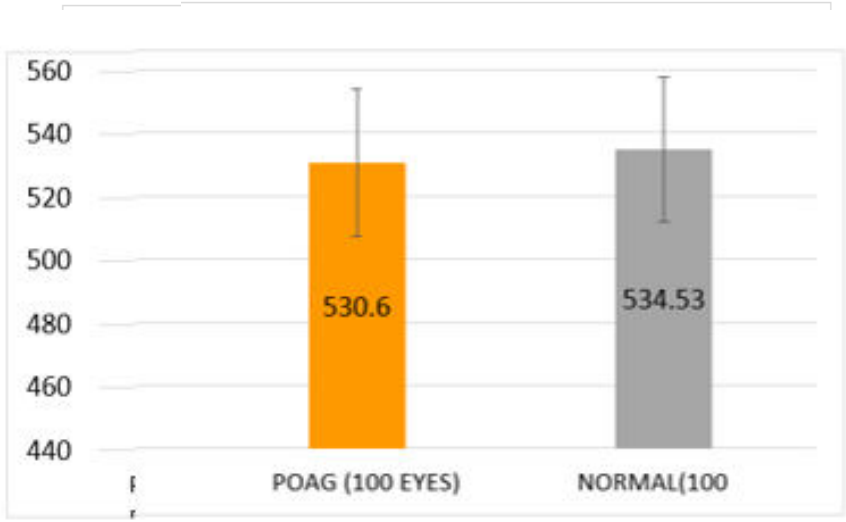
- Data were entered into an excel sheet, and statistical analysis was done using SPSS version 22.0. Frequency and percentage distributions were done for age and gender. Measurements of central corneal thickness, intraocular pressure was depicted in terms of mean and standard deviations. To compare the means between the groups T-test was used. P-value < 0.05 was considered as statistically significant

RESULTS AND ANALYSIS

Distribution of Central Corneal Thickness between study groups

Group	No.of eyes	Mean (µm)	Std deviation (µm)
POAG	100	530.60	23.41
NORMAL SUBJECTS	100	534.53	22.82

Distribution of Central Corneal Thickness (µm) among study groups

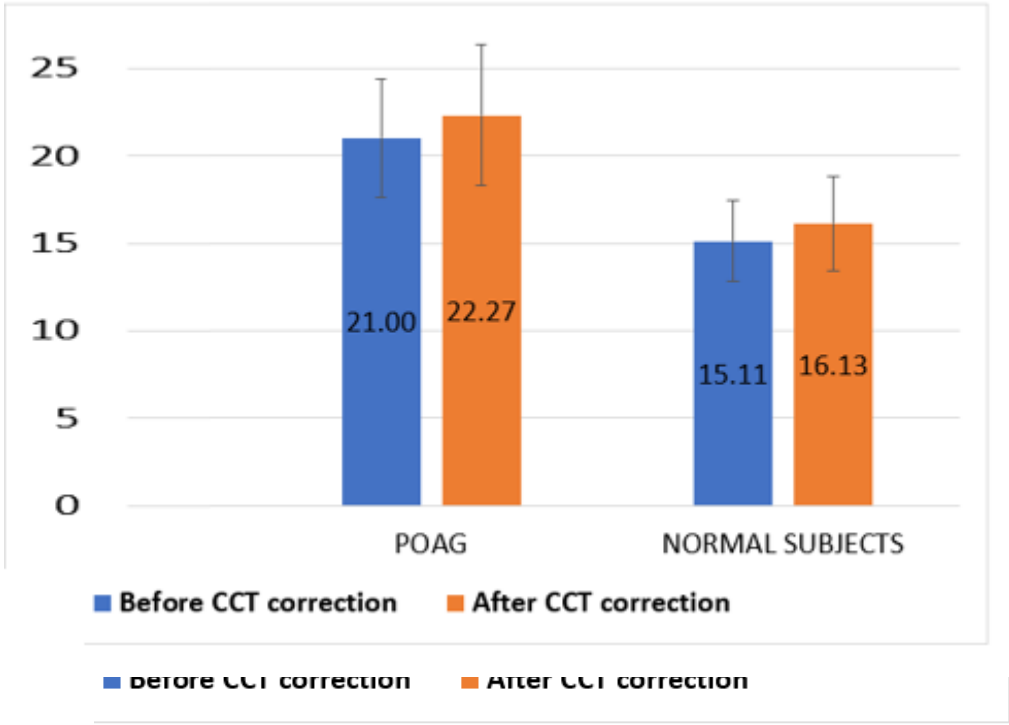


The mean central corneal thickness (in µm) was more in normal subjects (534.53±23.4) than primary open angle glaucoma subjects (530.60±23.4).

Mean intra ocular pressure before and after the CCT correction.

Group	No. of eyes	Mean (±SD) IOP (mm of hg)		P value
		Before CCT correction	After CCT correction	
POAG	100	21.00±3.4	22.27±4.0	<0.001*
NORMAL SUBJECTS	100	15.11±2.3	16.13±2.7	<0.001*

*Statistically Significant



There was high statistically significant difference between the means of intraocular pressure before and after central corneal thickness correction in both the groups. This emphasizes that underestimation of thin corneas in patients with POAG may lead to misdiagnosis of Normotensive glaucoma.

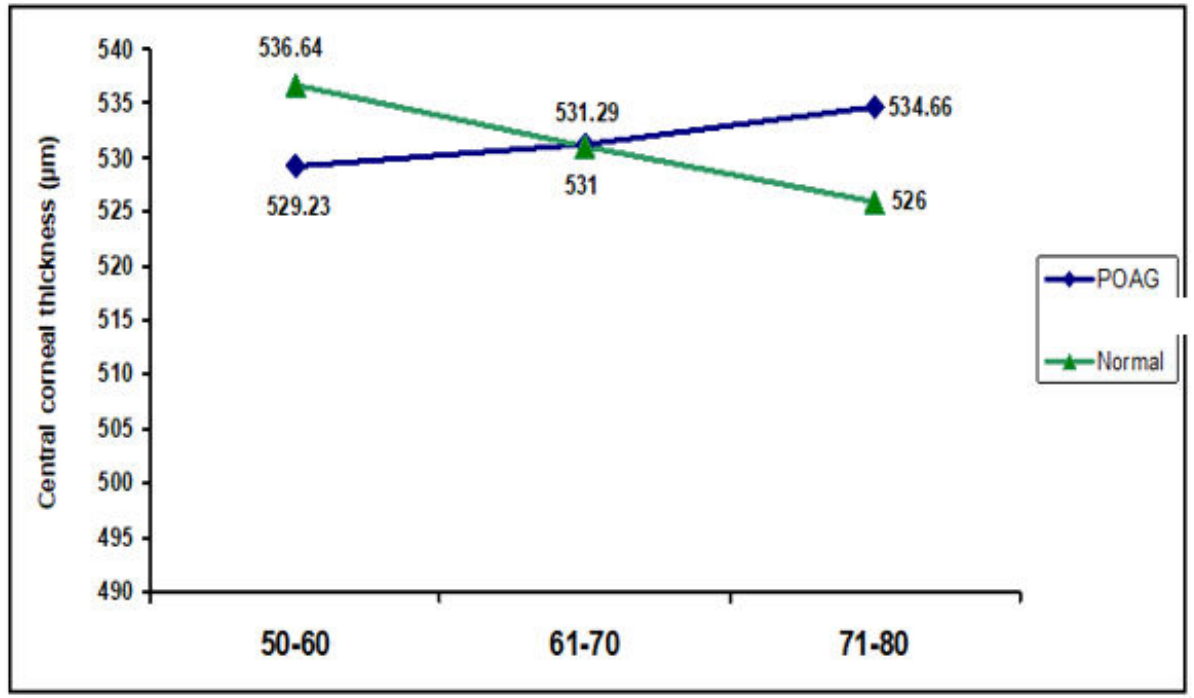
Comparison of mean CCT in POAG group with Normal subjects

	Group	Number of eyes	Mean (µm)	SD (µm)	P Value
CCT	Normal subjects	100	534.53	22.82	0.23
	POAG	100	530.60	23.41	

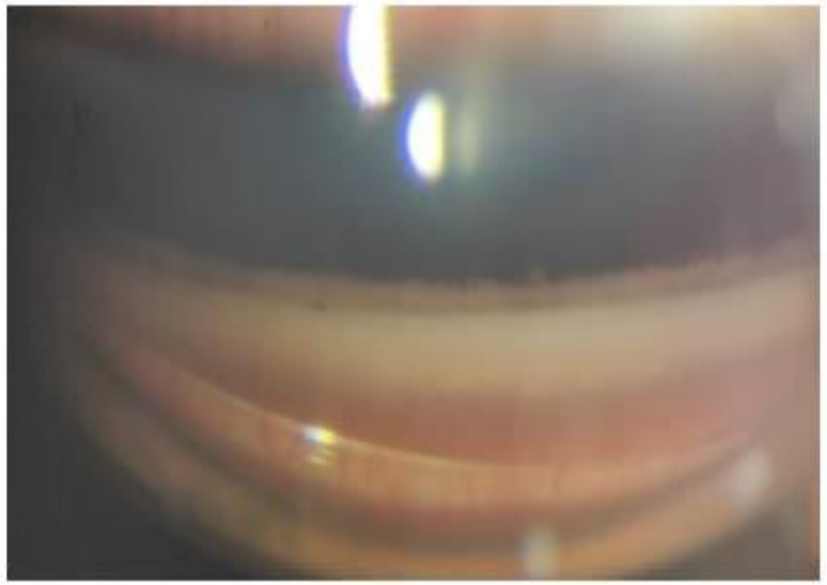
There was higher central corneal thickness (µm) in normal subjects (534.53±22.8) when compared to POAG group (530.60±23.41). The unpaired t test performed for mean central corneal thickness between normal and POAG did not show any statistically significant difference. Other studies that showed similar results as the present study .

Comparison of mean CCT and IOP between various age groups

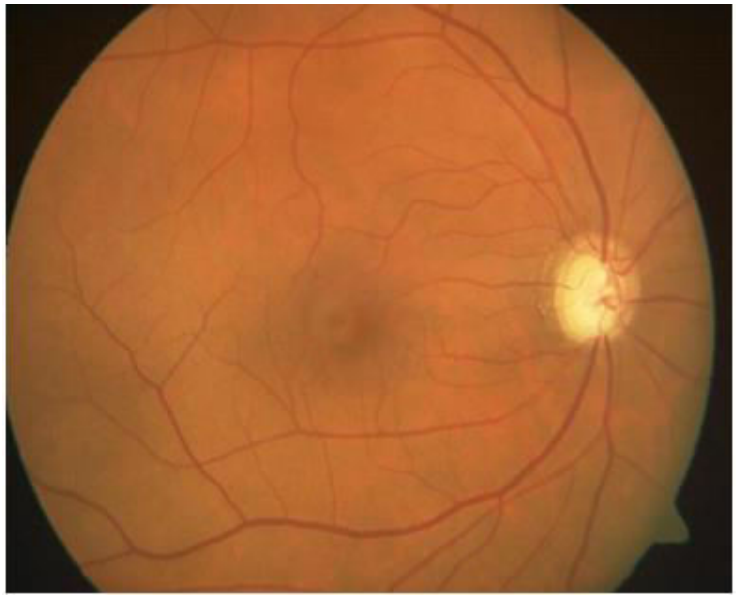
Age group	POAG			NORMAL SUBJECTS		
	No. of subjects	Mean CCT (µm)	Mean IOP (mm of Hg)	N	Mean CCT (µm)	Mean IOP (mm of Hg)
50-60	16	529.23	21.13	18	536.64	15.00
61-70	31	531.29	20.82	31	531.00	15.50
71-80	3	534.66	21.33	1	526.00	14.66



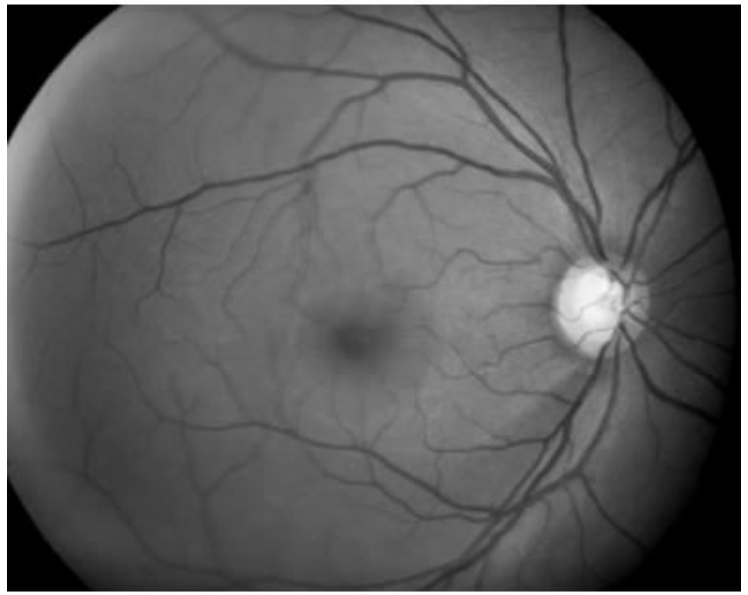
A study done by Noche CD et al[58] in 60 patients with POAG showed that there was no statistically significant difference of CCT as the age advances, which was similar to the present study.



Gonioscopy showing open angles in a case of POAG



Advanced Glaucomatous Cupping



Red-free image showing nerve fibre layer defect

STRENGTHS OF THE STUDY

1.As CCT is a confounding factor in GAT measurements, its evaluation gives an accurate estimation of IOP and thereby helping in taking a clinically relevant decision.

2.A single examiner was involved in measuring CCT and IOP in order to avoid any inter-examiner variability.

3.Ultrasound pachymetry is more accurate in measuring the CCT than optical pachymetry, as the measurement errors can be minimized.

LIMITATIONS:

1. Small sample size

2.This study being hospital-based, cannot give an exact estimation of the average CCT.

3.This study could not accurately emphasize the influence of CCT over IOP as the only single reading of IOP was taken, but measurement of diurnal variation of the IOP could have demonstrated a still higher IOP in the POAG groups than the normal subjects.

CONCLUSION

1. The mean Central corneal thickness in Primary Open Angle Glaucoma, there was no significant difference in mean CCT compared to normal subjects.

2.The effect of central corneal thickness may influence the accuracy of applanation tonometry in the diagnosis, screening, and management of patients with glaucoma.

3.The measurement of CCT helps to prevent the erroneous labeling of primary open-angle glaucoma patients as normal-tension glaucoma and normal patients as ocular hypertensives.

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