

## ORIGINAL ARTICLE

# Comparison of central corneal thickness (CCT) of normal tension glaucoma and primary open angle glaucoma

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### ABSTRACT:

**Background:** An optic neuropathy known as glaucoma is characterized by the formation of an optic disc and a particular pattern of abnormalities in the visual field. It is often, but not always, linked to an elevated intraocular pressure. The present study was conducted to compare the central corneal thickness (CCT) of normal tension glaucoma (NTG) and primary open angle glaucoma. **Materials & Methods:** Patients of normal tension glaucoma (35) were put in group I, patients of primary open angle glaucoma (POAG) (35) were put in group II and healthy subjects in group III (35). The CCTs were measured by using ultrasonic pachymetry. **Results:** Group I had 20 males and 15 females, group II had 19 males and 16 females and group III had 18 males and 17 females. The mean CCT in left eye in group I was 504.3  $\mu$  and in right eye was 504.1  $\mu$ . In group II, in left eye was 523.6  $\mu$  and in right eye was 523.4  $\mu$ . In group III, in left eye was 526.9  $\mu$  and in right eye was 526.7  $\mu$ . The difference was significant ( $P < 0.05$ ). **Conclusion:** The central corneal thickness was significantly lower in the normal tension glaucoma patients as compared to that in the controls and in the primary open angle glaucoma patients.

**Keywords:** central corneal thickness, intraocular pressure, primary open angle glaucoma

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### INTRODUCTION

An optic neuropathy known as glaucoma is characterized by the formation of an optic disc and a particular pattern of abnormalities in the visual field. It is often, but not always, linked to an elevated intraocular pressure.<sup>1</sup> The IOP is the most significant risk factor despite the involvement of other factors since it is the only risk factor that we have been able to pharmacologically modify thus far. Precise IOP measurement is crucial for both clinical care of glaucoma patients and for classifying them. Thus, it is crucial to make sure that an extremely exact approach is used to take the IOP values. For calculating the IOP, Goldmann Applanation Tonometry (GAT) has long been regarded as the gold standard.<sup>2</sup>

Central corneal thickness (CCT) affects the accuracy of intraocular pressure (IOP) measurements obtained by tonometry. Thicker corneas tend to give falsely high IOP readings, while thinner corneas can give falsely low readings. Knowing the CCT allows clinicians to adjust IOP measurements for more accurate assessment.<sup>3</sup> Whereas an increased CCT of 0.59mm might result in an overestimation of 5.2mmHg when the real IOP was 20mmHg, a decreased corneal thickness of 0.45mm could lead to an underestimating of the Ophthalmology Section IOP by as much as 4.7mmHg. As a result, the IOP measurement utilizing the GAT may produce

artificially high values for people with thick corneas and low readings for those with thin corneas.<sup>4</sup> When determining the goal IOP levels for the management of glaucoma cases that have already been identified, as well as during follow-up, CCT is a crucial component that needs to be considered.<sup>5</sup> The present study was conducted to compare the central corneal thickness (CCT) of normal tension glaucoma (NTG) and primary open angle glaucoma.

### MATERIALS & METHODS

The present study was conducted on 70 cases of normal tension glaucoma (NTG) and primary open angle glaucoma (POAG) of both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. Patients of normal tension glaucoma (35) were put in group I, patients of primary open angle glaucoma (POAG) (35) were put in group II and healthy subjects in group III (35). The CCTs were measured by using ultrasonic pachymetry. The intraocular pressure was recorded by using Goldmann Applanation Tonometry (GAT). Gonioscopy was done by using a single or a 3 mirror contact to see the type of the angle. Data thus obtained were subjected to statistical analysis. P value  $< 0.05$  was considered significant.

**RESULTS**

**Table I Distribution of patients**

Gender	Group I	Group II	Group III
M:F	20:15	19:16	18:17

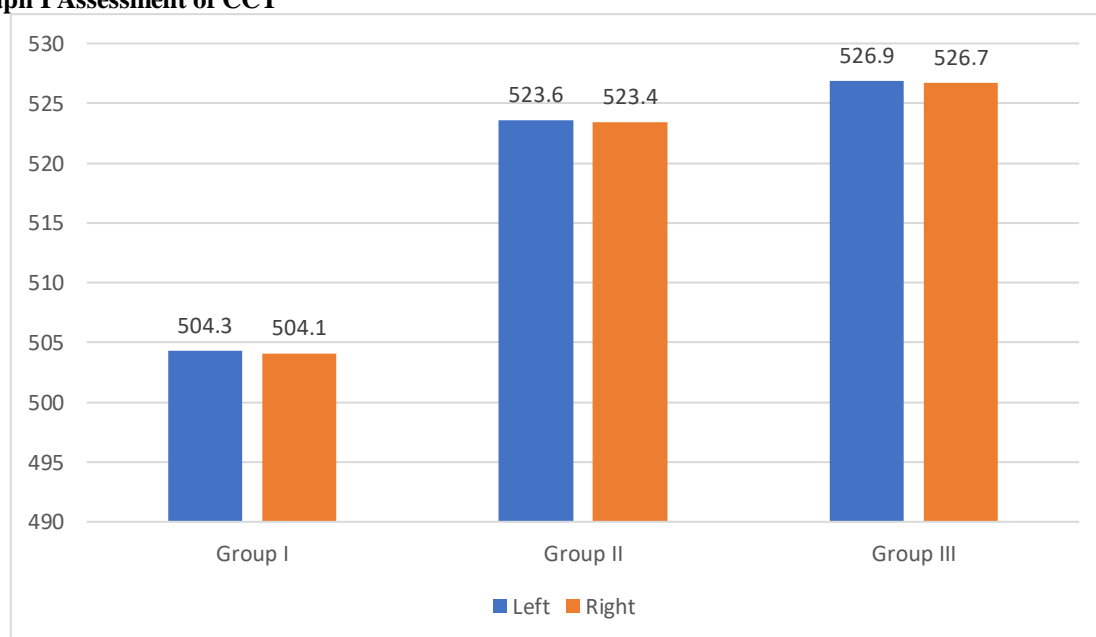
Table I shows that group I had 20 males and 15 females, group II had 19 males and 16 females and group III had 18males and 17 females.

**Table II Assessment of CCT**

Groups	Left	Right	P value
Group I	504.3	504.1	0.91
Group II	523.6	523.4	0.73
Group III	526.9	526.7	0.84
P value	0.02	0.01	

Table II shows that mean CCT in left eye in group I was 504.3 μ and in right eye was 504.1μ. In group II, in left eye was 523.6 μ and in right eye was 523.4μ. In group III, in left eye was 526.9 μ and in right eye was 526.7μ. The difference was significant (P< 0.05).

**Graph I Assessment of CCT**



**DISCUSSION**

According to studies, people with thinner CCT had a higher chance of developing and losing their glaucoma, including NTG.<sup>6</sup> Less biomechanical strength may be reflected by thinner corneas, which could make the optic nerve head more vulnerable to injury at lower IOP levels.<sup>7</sup> Numerous investigations have revealed that, in comparison to people with other forms of glaucoma or the general population, patients with NTG frequently have thinner CCTs.<sup>8</sup> Though the precise method by which narrower CCT leads to NTG is unclear, it is believed that thinner corneas could be a sign of a generally compromised structural integrity of the eye, including the optic nerve head.<sup>9</sup>The present study was conducted to compare the central corneal thickness (CCT) of normal tension glaucoma (NTG) and primary open angle glaucoma.

We found that Group I had 20 males and 15 females, group II had 19 males and 16 females and group III had 18males and 17 females. Shetgar et al<sup>10</sup>studied the

effect of CCT on the diagnosis and management of glaucoma patients. A total of 99 patients [35(35.35%) females and 64(64.65%) males] were included in the study with four study groups-37 controls (males-24 and females-13), 22 NTG (males11 and females-11), 28 POAG (males-21 and females-7), and12 OHT (males-8 and females-4). The measurement significant changes (>=1.5) and outcomes significant changes (>=3.0) for the study groups were calculated. Results: The mean CCT of the normal was 527.65± 21.90 μ, the mean NTG was 503.91 ± 11.31 μ, the mean POAG was 525.25± 23.59 μ and the mean OHT was 572.25± 22.71 μ. The difference which was observed in the mean CCT among the groups was statistically significant (p=1.5) after correcting the IOP for CCT was observed in 32.258% of the total glaucoma patients, with 27.3% patients (6 out of 22) in the NTG, 66.7% patients (8 out of 12) in the OHT and 21.4% patients (6 out of 28) in the POAG groups showing it. The difference which was observed was

statistically significant ( $p=3.0$ ) after correcting the IOP for CCT was seen in 6.45% of the total glaucoma patients, with none of the NTG group patients showing outcomes significant changes, whereas 3.57% patients (1 out of 28) in the POAG and 25% patients (3 out of 12) in the OHT groups showed these changes. The difference which was observed was statistically significant ( $p<0.05$ ).

We observed the mean CCT in left eye in group I was 504.3  $\mu$  and in right eye was 504.1  $\mu$ . In group II, in left eye was 523.6  $\mu$  and in right eye was 523.4  $\mu$ . In group III, in left eye was 526.9  $\mu$  and in right eye was 526.7  $\mu$ . Shah et al<sup>11</sup> assessed whether central corneal thickness (CCT) is a confounding factor in the classification of patients. Patients attending a general ophthalmic clinic: 235 clinically normal eyes, 52 eyes with normal-tension glaucoma (NTG), 335 eyes with primary open-angle glaucoma (POAG), 12 eyes with pseudoexfoliative glaucoma (PXE), 42 eyes with chronic angle closure glaucoma (CACG), and 232 glaucoma suspect (GS) eyes. The mean CCT was 553.9 microm (95% confidence intervals [CI] for the mean, 549.0-558.8 microm) in the clinically normal eyes, 550.1 microm (95% CI, 546.6-553.7 microm) in the POAG eyes, 514.0 microm (95% CI, 504.8-523.3 microm) in the NTG eyes, 530.7 microm (95% CI, 511.2-550.1 microm) in the PXE eyes, 559.9 microm (95% CI, 546.8-573.0 microm) in the CACG eyes, and 579.5 microm (95% CI, 574.8-584.1 microm) in the GS eyes. The differences of mean CCT between the groups were highly significant ( $P < 0.001$  analysis of variance). Eighty-five percent of eyes with NTG and only 36% of eyes with POAG had a mean CCT of 540 microm or less. Thirteen percent of eyes with POAG and 42% of GS eyes had a mean CCT greater than 585 microm.

The shortcoming of the study is small sample size.

## CONCLUSION

Authors found that the central corneal thickness was significantly lower in the normal tension glaucoma patients as compared to that in the controls and in the primary open angle glaucoma patients.

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