

# Impact of Central Corneal Thickness on Intraocular Pressure among South Indian Primary Open Angle Glaucoma Patients

Lional Raj D<sup>1</sup>, Heber Anandan<sup>2</sup>, Mohamed Ali J<sup>3</sup>, Dhanisha JL<sup>3</sup>

## ABSTRACT

**Introduction:** Corneal thickness of less than 555µm provides false results of low intra ocular pressure, whereas, corneal thickness of more than 555µm provides a false result of raised intra ocular pressure when measured with Goldmann applanation tonometry. The primary aim of this study was to evaluate the influence of central corneal thickness on intraocular pressure and secondary aim is to evaluate the impact of age and gender on intraocular pressure in patients with primary open angle glaucoma.

**Material and methods:** Retrospective cross sectional study was conducted and data of 49 patients who were diagnosed with primary open angle glaucoma in between June 2013- June 2014 were collected.

**Results:** In males, the mean central corneal thickness (CCT) was 543.47±34.56, 547.05±25.01 in right and left eyes respectively. In females, the mean central corneal thickness was 538.89±30, 544.24±34.74 in right and left eyes respectively. In men, the mean intraocular pressure in the right and left eyes respectively was 21.74±3.07, 22.26±4.25, in females it was 20.72±3.36, 21.48±3.54 in right and left eyes respectively.

**Conclusion:** To prevent the optic nerve damage in patients suspect with glaucoma, evaluation of central corneal thickness is warranted.

**Keywords:** Intraocular pressure, corneal thickness, glaucoma

## INTRODUCTION

Central corneal thickness plays an important role in understanding the risk of glaucoma.<sup>1</sup> Corneal thickness of less than 555µm provides false results of low intra ocular pressure, whereas, corneal thickness of more than 555µm provides a false result of raised intra ocular pressure when measured with Goldmann applanation tonometry.<sup>2,3</sup> Intraocular pressure (IOP) is an important clinical outcome in glaucoma diagnosis. IOP should be recorded with an accurate technique for reliability.<sup>4</sup> The Ocular Hypertension Treatment Study (OHTS) showed that central corneal thickness (CCT) was a significant predictor of which patients with ocular hypertension are at higher risk for converting to glaucoma.<sup>5,6</sup> IOP measurement is altered by corneal thickness. Patients with thinner cornea would have very high IOP reading and thicker cornea patients would have very low IOP recording. Central Corneal Thickness (CCT) plays a major role in IOP manipulation.<sup>7</sup> IOP should be adjusted with CCT to target IOP in glaucoma management. Very few studies have been conducted on the impact of central corneal thickness on intra ocular pressure in South Indian population with primary open angle glaucoma. Through this study, we had evaluated the relation between central corneal thickness, age and gender on intraocular pressure in patients with primary open angle glaucoma (POAG) in a south Indian hospital. A little alteration due to unadjusted IOP with CCT can cause significant effect in the clinical therapeutics in glaucoma patients and glaucoma

suspects.<sup>8</sup> Study aimed to evaluate the influence of central corneal thickness on intraocular pressure and secondary aim is to evaluate the impact of age and gender on intraocular pressure in patients with primary open angle glaucoma.

## MATERIAL AND METHODS

A observational, retrospective, cross sectional study was conducted in accordance with the principles laid down in the Declaration of Helsinki for Medical Research. Data from the medical records of the 49 patients who were diagnosed with primary open angle glaucoma between periods of June 2013 - June 2014 were collected and analyzed. Primary objective involved evaluating the relationship between central corneal thickness and intraocular pressure in POAG patients while; secondary objective involved evaluating the influence of age and gender on intraocular pressure in patients with POAG. Central corneal thickness and intraocular pressure in both right and left eyes were recorded. Central corneal thickness was recorded using ultrasonic pachymeter; intraocular pressure was recorded using Goldmann applanation tonometer. Patients with other than POAG were excluded from the study.

## STATISTICAL ANALYSIS

For all quantitative variables Mean ± SD were calculated. Through Pearson Correlation test, relation between central corneal thickness and intraocular pressure was calculated with statistical significance value assigned at P<0.05 (two-sided). Of 49 patients, 30 patients (61%) were females while, 19 patients were males (39%). There were equal and (Figure 1) maximum number of patients in the age group of 46-60 (15 patients) and 61-75 (15 patients). (Table 1) In males, the mean central corneal thickness (CCT) in the right eye was 543.47±34.56 (range 490-585) and in left eye it was 547.05±25.01 (range 491-585). In females, the mean central corneal thickness in the right eye was 538.89±30 (range 490-589). In left eye it was 544.24±34.74 (range 490-600). The mean intraocular pressure in the right eye of males was 21.74±3.07 (range 19-27 mmHg) and it was 22.26±4.25 (range 19-32 mmHg) in the left eye, in females it was 20.72±3.36 (range 17-30 mmHg), 21.48±3.54 (range 14-26 mmHg) in right and left eyes respectively. There was a significant association between intraocular pressure and central

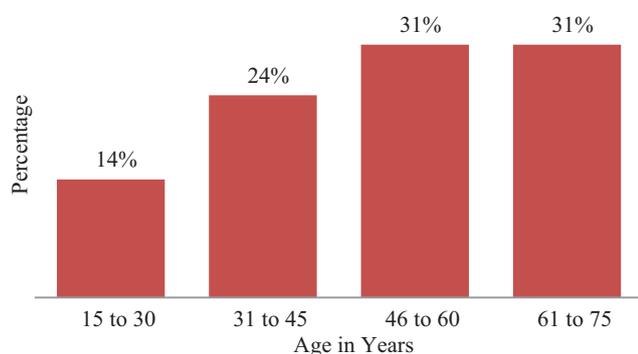
<sup>1</sup>Medical Director, <sup>2</sup>Senior Clinical Scientist, <sup>3</sup>Clinical Research Associate, <sup>4</sup>Research Optometrist, Dr. Agarwal's Eye Hospital, Tirunelveli, Tamilnadu, India

**Corresponding author:** Heber Anandan, Dr. Agarwal's Healthcare Limited, No.10, South By-pass Road, Vannarpettai, Tirunelveli – 627003, Tamilnadu, India

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Gender	CCT (Mean $\pm$ S.D.)		IOP (Mean $\pm$ S.D.)	
	O.D.	O.S.	O.D.	O.S.
Male	543.47 $\pm$ 34.56	547.05 $\pm$ 25.01	21.74 $\pm$ 3.07	22.26 $\pm$ 4.25
Female	538.89 $\pm$ 30	544.24 $\pm$ 34.74	20.72 $\pm$ 3.36	21.48 $\pm$ 3.54

**Table-1:** Mean  $\pm$ S.D of Central Corneal Thickness and Intraocular Pressure



**Figure-1:** Distribution of study patients in age group

corneal thickness in patients and it was estimated by using Pearson Correlation Coefficient ( $r=0.202$ ,  $p=0.05$ , two tailed test).

## DISCUSSION

The mean CCT was found to be 535.46  $\pm$  33.39 in African American, 552.59  $\pm$  34.48 in Caucasian.<sup>9</sup> In south Indian population CCT was 511.4  $\pm$  33.5. In males, it was 515.6  $\pm$  33, in females it was 508.0  $\pm$  32.8.<sup>10</sup> The mean CCT observed in our study population was higher than that of mean CCT observed in Vijaya, Lingam et al. study.<sup>10</sup> The reason for increased CCT in our patients is because our study consists patients only of primary open angle glaucoma with increased intraocular pressure, it can be inferred that high IOP for prolonged periods has led to corneal thickness through secondary influence on corneal endothelial deturgescence mechanism<sup>10</sup> in patients of this study. Our study population consists of patients who were above 40 years of age. Other factors which influence the intraocular pressure apart from central corneal thickness were not included in this study. The reason for the deviation of mean CCT in our study from CCT observed in Vijaya, Lingam et al. study<sup>10</sup> could be due to small sample size and non calculation of combined mean CCT of right and left eyes in male and females, and inclusion of only open angle glaucoma patients. Central corneal thickness of less than 555  $\mu$ m could be a reason for pseudo low intraocular pressure in our patients.

## CONCLUSION

Through our study we had concluded that there was an influence of central corneal thickness on intraocular pressure in patients with primary open angle glaucoma. There is a need for evaluation of central corneal thickness in patients who were presented with symptoms of glaucoma, but, with low intraocular pressure as it helps in providing effective intervention for controlling intraocular pressure and preventing optic nerve damage.

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