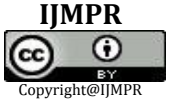
**International Journal of Medical and Pharmaceutical Research**
**Website**: https://ijmpr.in/ | Print ISSN: 2958-3675 | Online ISSN: 2958-3683
**NLM ID:** 9918523075206676
Volume: 4 Issue:3 (May-June 2023); Page No: 91-100

**Original Article**

IJMPR





# Study to Correlate the Pressure-to-Cornea Index (PCI) with Structural and Functional Measures of Glaucoma

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## ABSTRACT

**Introduction**: Glaucoma is a multi factorial optic neuropathy that is a leading cause of irreversible blindness worldwide. Pressure-to-Cornea Index(PCI) is a significant parameter in the pathogenesis of glaucoma. In this study, we aimed to evaluate the normative database of PCI and its correlation with structural and functional measures of glaucoma. **Methods**: A cross-sectional study was conducted on 71 glaucoma patients. PCI was measured using spectral-domain optical coherence tomography. Structural measures including cup-to-disc (CD) ratio, central corneal thickness (CCT), and intraocular pressure (IOP) were recorded. The functional measure was the mean deviation (MD) of the visual field. Statistical analysis was performed using SPSS version 21. **Results**: The mean age of the patients was 56.2±9.4 years. PCI was not affected by gender. There was a weak positive correlation between PCI and age (r=0.256, p=0.011). PCI was significantly correlated with CCT (r=-0.301, p=0.003) and IOP (r=0.546, p<0.001). CD ratio did not show a significant correlation with PCI (r=0.033, p=0.770). Similarly, no significant correlation was found between PCI and MD (r=-0.160, p=0.139). **Conclusion**: PCI is a useful parameter in glaucoma evaluation, and our study provides a normative database for PCI in glaucoma patients. PCI showed a significant correlation with CCT and IOP. The integration of PCI with these parameters may better reflect an individual's susceptibility to glaucomatous damage than either parameter alone. However, PCI did not correlate with CD ratio or MD, suggesting that it may have limited use as a structural or functional measure of glaucoma. Further studies are needed to validate these findings and determine the clinical utility of PCI in glaucoma management.

**Key Words**: *Pressure-to-cornea index, glaucoma, cup-to-disc ratio, central corneal thickness, intraocular pressure, mean deviation*

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## INTRODUCTION

Glaucoma is a group of disorder characterised by a progressive optic neuropathy resulting in characteristic appearance of optic disc and specific pattern of irreversible visual field defects that are associated frequently but not invariably with raised intraocular pressure. It is the second leading cause of blindness and the leading cause of irreversible blindness worldwide.

It is estimated that by end of 2020 there will be approximately 80 million people with glaucoma, an increase of about 20 million since 2010. Global prevalence of glaucoma is 2% over the age of 40 years and 10% of those over 80 years of age increasing from 3.54% or 64.3 million people in 2013 to a projected 111.8 million people by 2040. Furthermore it is thought that at present over 8 million people are bilaterally blind due to glaucoma, a figure is set to rise to over 11 million by 2020 with the increasing prevalence.

The role of Intraocular Pressure (IOP) as a major causative risk factor in glaucoma has already been confirmed in several large multicentric, randomized controlled clinical trials . In addition, many studies have also pointed out the importance of Central corneal Thickness (CCT) as a parameter reflecting the accuracy of tonometric reading as well as our decision making in the management of glaucoma.

At present time, corneal thickness is believed to influence the glaucoma diagnosis in two ways: as physical parameter influencing the accuracy of applanation tonometry and as independent risk factor for glaucoma[1]. Both the influences have been proved to exist by earlier studies but both have non- specific effect. Specifically, IOP correction formulae for CCT deviate significantly from one another.

Based on the Ocular Hypertension (OHT) Treatment Study , it was concluded that CCT was an independent predictive factor for the development of glaucoma[2,3] WONG et al. noted that CCT was a significant determinant of I0P in Asian persons aged 40-80 years, Especially in younger patients[4].

Central Corneal Thickness can influence IOP measurement by Goldmannapplanation tonometry resulting in an inaccurate reading. That is particularly true in thinner corneas in which applanation tonometry readings are lower than true values. A meta-analysis of the possible association between CCT and IOP measures of 133 data sets revealed that a 10% difference in CCT would result in a 3.4 +/0.9mmHg difference in IOP[5]. The magnitude of the effect, however, is subject to much individual variation[6].

A number of algorithms have been proposed to correct applanation tonometry readings according to CCT. However, there is a wide disagreement among investigators as to if there is an adequately validated correction algorithm[7]. Corrections using only CCT and curvature may not be sufficient in each individual case[8].

In this study, we have investigated a new parameter, the pressure-to-cornea Index (PCI). The index is based on raw measures of IOP(applanation) and CCT (NIDEX Optical Biometer) and is thought to reflect a more precise glaucoma risk than either parameter used alone. PCI will integrate IOP and CCT as a single risk factor for glaucoma.

**AIMS AND OBJECTIVES**

1. To determine correlation between Intraocular pressure and central corneal thickness.
2. To determine correlation between pressure-to-cornea index (PCI) with structural and functional measures of glaucoma.

**Secondary objectives:**

1. To determine correlation between PCI and mean deviation value of automated perimetry.
2. To determine correlation between PCI and cup to disc ratio.

**MATERIAL AND METHODS**

**Setting**:= The study was conducted at Department of ophthalmology, Sant Parmanand Hospital.

**Design of Study**:- The study type is observational cross sectional comparative hospital based clinical study. All the patients visiting OPD of Ophthalmology Department, Sant Parmanand Hospital, who satisfied the inclusion and exclusion criteria were enrolled for the study. Duration of study – 1 year

**SAMPLE SIZE**

The study observed Pearson's correlation coefficient between PCI and MD was - 0.356. Taking this value as reference, the minimum required sample size with 80% Power of study and 5% level of significance is 71 patients .So total sample size is taken as 71.

Formula used is :

$$N=\left(\frac{Z_{\alpha}+Z_{\beta}}{C(r)}\right)^{2}+3$$

C( r) = ½ log ( 1+r / 1-r );

where $Z_{alpha}$ is value of Z at two Sided alpha error of 5% and $Z_{beta}$is value of Z at power of 80%. Calculation:

1) C(r)=.5*(log(1.329/(1-.329))=.342 N=((1.96+.84)/.342)$^2$ +3 =70.03=71(approx)
2) C(r)=.5*(log((1-.356)/(1.356))=-.372 N=((1.96+.84)/(-.372))$^2$ +3=59.65=60(approx.)

**Inclusion Criteria:**

1. Age >40 years
2. Both genders
3. Any ethnicity
4. Open Angles on Gonioscopy
5. Patient with primary open angle glaucoma

**Exclusion Criteria :**

1. Subjects with Cataract surgery
2. Previous incision for glaucoma
3. Laser surgery for glaucoma
4. Any Ocular surgery

**METHOD:**

Patient coming to the OPD of Ophthalmology department, Sant Parmanand Hospital were enrolled in the study after taking informed and written consent. A detailed careful history and complete ophthalmic examination is done. Uncorrected visual acuity (UCVA) and Best corrected visual acuity (BCVA) is checked using Snellen‟s chart. Anterior segment evaluation is done by slit lamp (SHIN-NIPPON SL-102). IOP is determined with Goldmannapplanation tonometer (SHIN-NIPPON SL-TM B-45). Three consecutive readings istaken and the mean of those is considered. Angle of anterior chamber is assessed by performing gonioscopy with Goldmann‟s three mirror gonio lens. Dilated fundus examination is done with slit lamp biomicroscopy (using +90D VOLK lens). Visual field is done using Humphrey‟s automated static Perimetry using SITA standard 24-2 program. Perimetry results with reliable indices only were taken into consideration. CCT is measured by Nidex optical biometer. The procedure is repeated thrice by a single observer. The average of the three readings is taken. A measure of ratio of untreated IOP and $CCT^3$ in mm gives the variable PCI.

**Ophthalmic Evaluation**

All subjects signedan Informed consent and underwent a Complete eye examination, which included:
History
Best corrected Visual acuity
Refraction (subjective refining)
Slit Lamp biomicroscopy (SHIN-NIPPON SL-102)
IOP measurement (applanation tonometer SHIN-NIPPON SL-TM B-45)
Gonioscopy (Goldmann Three mirror lens)
Dilated fundus examination ( volk +90D aspheric lens)
VF testing ( SITA standard 24-2, HFA ll-i series)
CCT (Nidex optical biometer)

**STATISTICAL ANALYSIS**

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD and median. Normality of data was tested by Kolmogorov Smirnov test. If the normality is rejected then non parametric test were used. Pearson correlation coefficient / Spearman rank correlation coefficient (for non parametric data) were used to correlate quantitative variables with each other. A p value of <0.05 was considered statistically significant. The data were entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

**RESULTS:**

**Table 1: Descriptive statistics for age and gender distribution of study population**

| **Age (Years)** | | |
|---|---|---|
| Mean (SD) | 56.76 (8.82) | |
| Median (IQR) | 59 (48.5-63) | |
| Range | 41 – 74 | |
| Gender | **Frequency** | **Percentage** |
| Male | 38 | 53.50% |
| Female | 33 | 46.50% |
| Total | 71 | 100.00% |

The mean age of the participants was 56.76 years (SD=8.82), with a median age of 59 years (IQR=48.5-63) and a range of 41-74 years.

The study included 38 male participants (53.50%) and 33 female participants (46.50%), with a total of 71 participants. These gender proportions indicate that the study had a relatively balanced gender distribution.

**Table 2: Summary of Ocular Parameters in Study Participants"**

| | **IOP (OD)** | **IOP(OS)** |
|---|---|---|
| Mean (SD) | 23.18 (4.08) | 22.56(4.20) |

| | | |
|---|---|---|
| Median (IQR) | 22 (22-24) | 22 (20-26) |
| Range | 14 – 38 | 14-38 |
| | **CCT (µm)(OD)** | **CCT(µm)(OS)** |
| Mean (SD) | 519.49 (27.05) | 520.52(27.26) |
| Median (IQR) | 512 (502.5-535) | 515(501-535) |
| Range | 465 – 618 | 475-620 |
| **CD Ratio (OD)** | | **CD Ratio(OS)** |
| Mean (SD) | 0.52 (0.15) | 0.55(0.14) |
| Median (IQR) | 0.5 (0.4-0.6) | 0.5(0.5-0.6) |
| Range | 0.3 - 0.8 | 0.3-0.9 |
| | **MD OF VF (dB) (OD)** | **MD OF VF(dB)** |
| Mean (SD) | -7.41 (8.38) | -7.36(9.65) |
| Median (IQR) | -4.65 (-9.19--2.17) | -3.68(-7.6--1.81) |
| Range | -33.37 | -44.96 |
| | **PCI (OD)** | **PCI(OS)** |
| Mean (SD) | 169.71 (42.93) | 164.41(41.87) |
| Median (IQR) | 165.4 (143.7-190.2) | 165.4(133.5-190) |
| Range | 94.7 – 308 | 76.27-299.2 |

The study found that the mean IOP in the right eye was 23.18 mmHg (±4.08) and in the left eye was 22.56 mmHg (±4.20), with a median of 22 mmHg (IQR: 22-24) and 22 mmHg (IQR: 20-26), respectively. The range of IOP values varied from 14 to 38 mmHg in the right eye and December 38 mmHg in the left eye.

The mean CCT in the right eye was 519.49 µm (±27.05) and in the left eye was 520.52 µm (±27.26), with a median of 512 µm (IQR: 502.5-535) and 515 µm (IQR: 501-535), respectively. The range of CCT values varied from 465 to 618 µm in the right eye and 475 to 620 µm in the left eye.

The study also measured the Cup-to-Disc Ratio (CD Ratio), which is the ratio of the diameter of the cup to the diameter of the optic disc. The mean CD Ratio in the right eye was 0.52 (±0.15) and in the left eye was 0.55 (±0.14), with a median of 0.5 (IQR: 0.4-0.6) and 0.5 (IQR: 0.5-0.6), respectively. The range of CD Ratio values varied from 0.3 to 0.8 in the right eye and 0.3 to 0.9 in the left eye.

The study also measured the Mean Deviation (MD) of Visual Field (VF), which is a measure of the average deviation of sensitivity from the age-corrected normal threshold values. The mean MD of VF in the right eye was -7.41 dB (±8.38) and in the left eye was -7.36 dB (±9.65), with a median of -4.65 dB (IQR: -9.19 to -2.17) and -3.68 dB (IQR: -7.6 to -1.81), respectively. The range of MD values varied from -33.37 dB in the right eye to -44.96 dB in the left eye.

Finally, the study measured the Pressure-to-Cornea Index (PCI), which is the ratio of the IOP to the CCT. The mean PCI in the right eye was 169.71 (±42.93) and in the left eye was 164.41 (±41.87), with a median of 165.4 (IQR: 143.7-190.2) and 165.4 (IQR: 133.5-190), respectively. The range of PCI values varied from 94.7 to 308 in the right eye and 76.27 to 299.2 in the left eye.

**Table 3: Association between PCI (OD) and Parameters**

| **Parameters** | **PCI (OD)** | **p value** |
|---|---|---|
| **Age (Years)** | Correlation Coefficient (rho) = 0.15 | 0.199[1] |
| **Gender** | | 0.226[2] |
| Male | 173.72 ± 40.81 | |
| Female | 165.10 ± 45.45 | |
| **IOP (OD)*** ** | Correlation Coefficient (rho) = 0.66 | <0.001[1] |
| **CCT (µm) (OD)*** ** | Correlation Coefficient (rho) = -0.79 | <0.001[1] |
| **CD Ratio (OD)** | Correlation Coefficient (rho) = -0.03 | 0.774[1] |
| **MD OF VF (dB) (OD)** | Correlation Coefficient (rho) = 0.07 | 0.538[1] |

****Significant at p<0.05, 1: Spearman Correlation, 2: Wilcoxon-Mann-Whitney U Test* **Table 4: Association between PCI (OS) and Parameters**

| Parameters | PCI (OS) | p value |
|---|---|---|
| **Age (Years)** | Correlation Coefficient (rho) = 0.1 | 0.391[1] |
| **Gender** | | 0.523[2] |
| Male | 167.41 ± 40.18 | |
| Female | 160.94 ± 44.10 | |
| **IOP (OS)***** | Correlation Coefficient (rho) = 0.79 | <0.001[1] |
| **CCT (µm) (OS)***** | Correlation Coefficient (rho) = -0.76 | <0.001[1] |
| **CD Ratio (OS)** | Correlation Coefficient (rho) = 0.02 | 0.882[1] |
| **MD OF VF (dB) (OS)** | Correlation Coefficient (rho) = -0.15 | 0.204[1] |

****Significant at p<0.05, 1: Spearman Correlation, 2: t-test*

For PCI (OD), there was a significant positive correlation with IOP (OD) (rho=0.66, p<0.001) and a significant negative correlation with CCT (µm) (OD) (rho=-0.79, p<0.001). No significant correlation was found with age, gender, CD ratio (OD), or MD of VF (dB) (OD).

For PCI (OS), there was a significant positive correlation with IOP (OS) (rho=0.79, p<0.001) and a significant negative correlation with CCT (µm) (OS) (rho=-0.76, p<0.001). No significant correlation was found with age, gender, CD ratio (OS), or MD of VF (dB) (OS).

**Table 5: Correlation coefficients between various ocular parameters in a study population.**

| Correlation | Spearman Correlation Coefficient | P Value |
|---|---|---|
| IOP (OD) vs PCI (OD) | 0.66 | <0.001 |
| IOP(OS) vs PCI (OS) | 0.79 | <0.001 |
| CCT (µm) (OD) vs PCI (OD) | -0.79 | <0.001 |
| CCT(µm)(OS) vs PCI (OS) | -0.76 | <0.001 |
| CD Ratio (OD) vs PCI (OD) | -0.03 | 0.774 |
| CD Ratio (OD) vs PCI(OS) | 0.02 | 0.882 |
| MD OF VF (dB) (OD) vs PCI (OD) | 0.07 | 0.538 |
| MD OF VF(dB ) (OS) vs PCI (OS) | -0.15 | 0.204 |
| IOP (OD) vs CCT (µm) (OD) | -0.14 | 0.24 |
| IOP (OS) vs CCT (µm)(OS) | -0.23 | 0.049 |

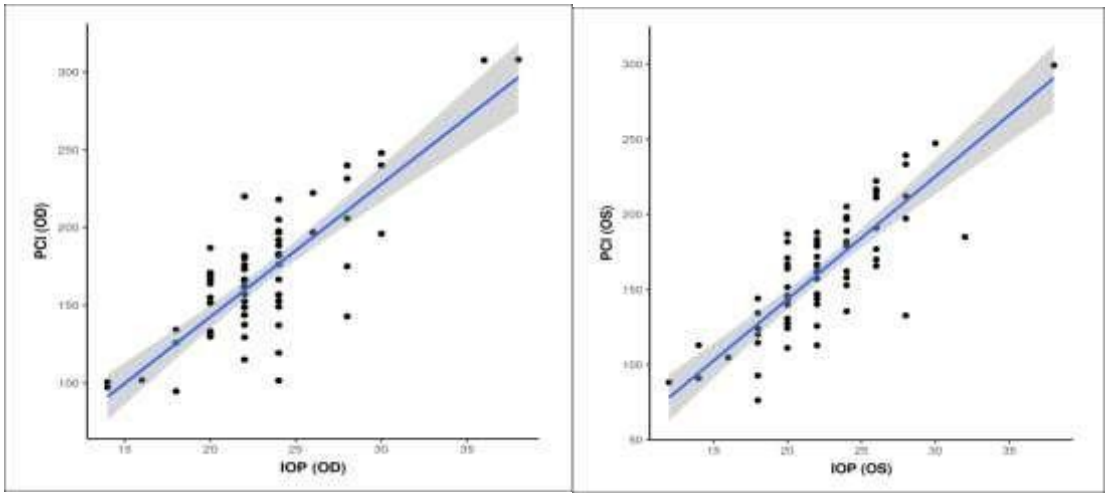


Figure 1: Correlation between IOP and PCI (n = 71)

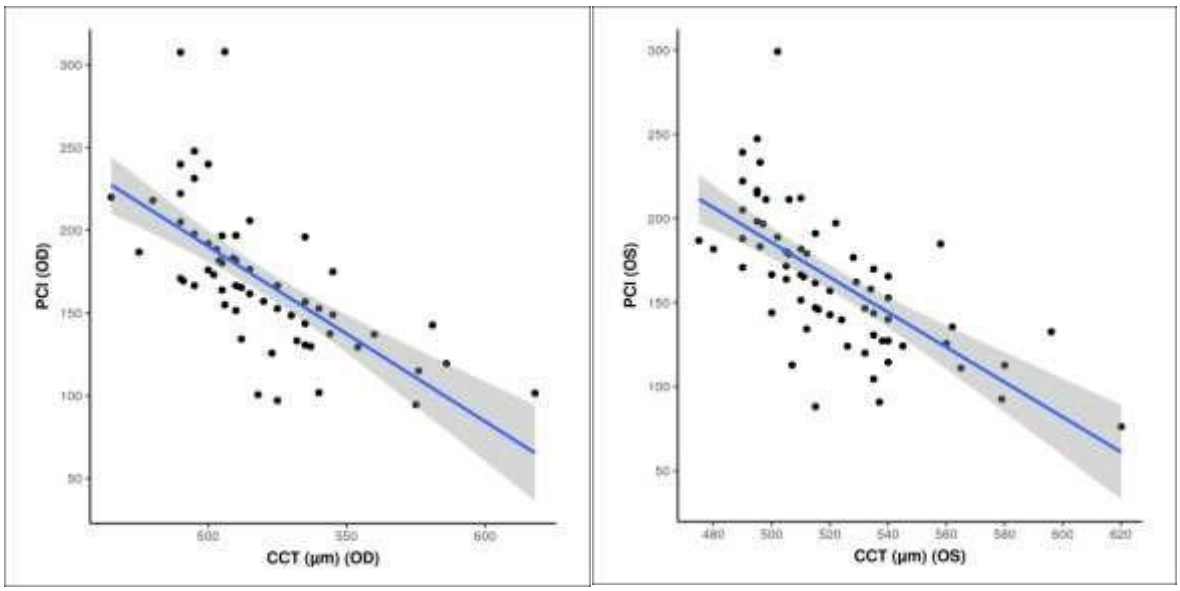


Figure2: Correlation between CCT (µm) and PCI (n = 71)

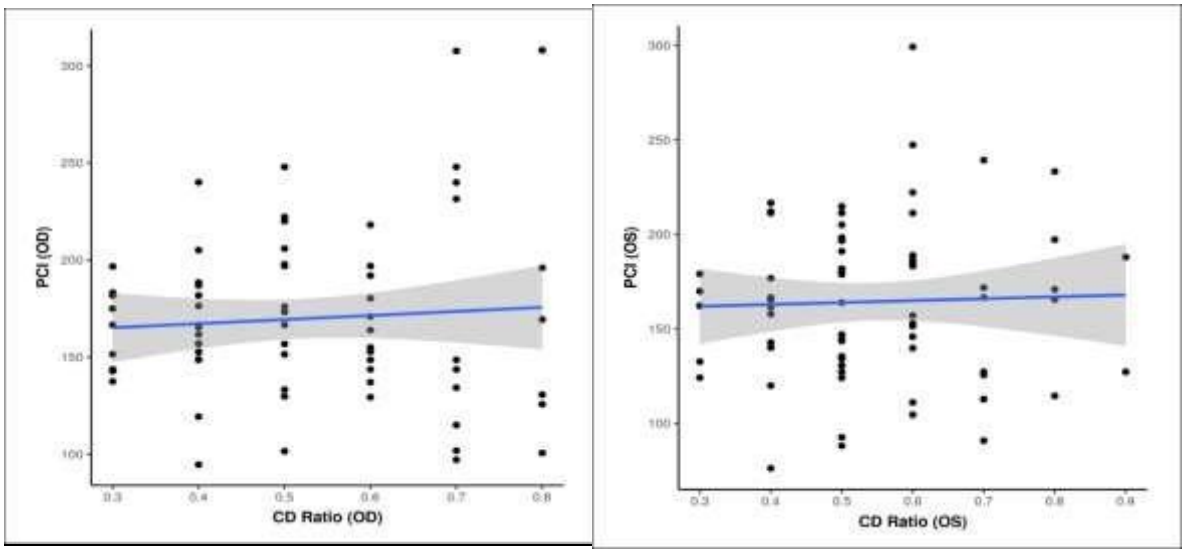

Figure 3: Correlation between CD Ratio and PCI (n = 71)

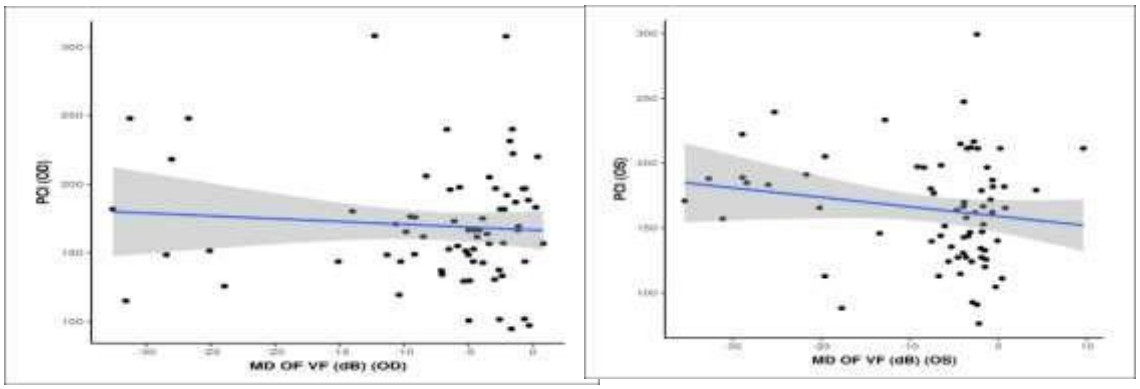


Figure 4: Correlation between MD OF VF (dB) and PCI (n = 71)

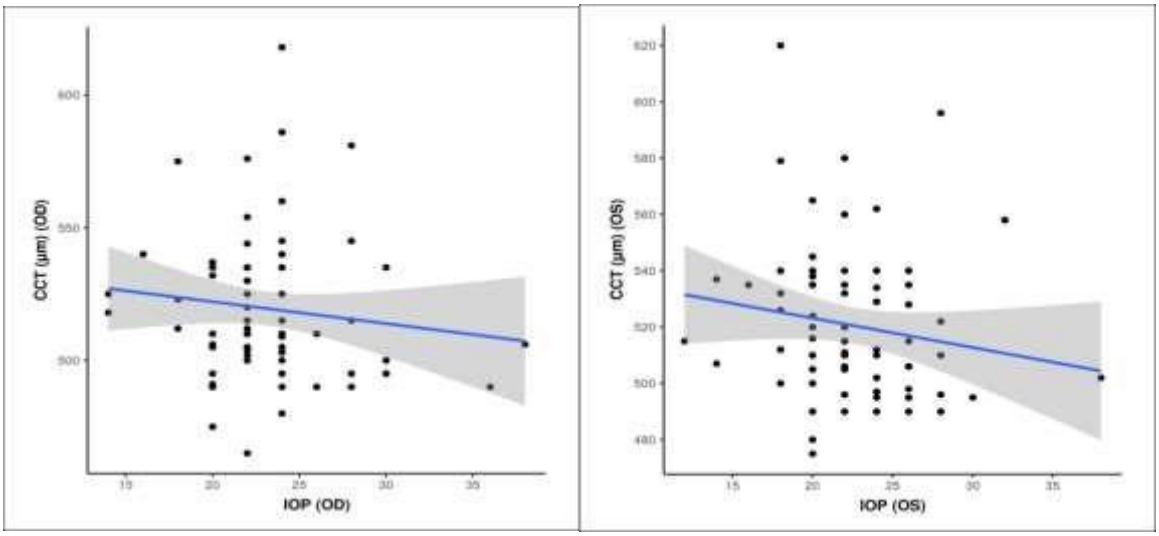


Figure 5: Correlation between IOP and CCT (µm) (n = 71)

There were strong positive correlations between IOP (OD) and PCI (OD) (rho = 0.66, $p < 0.001$), as well as between IOP (OS) and PCI (OS) (rho = 0.79, $p < 0.001$). In contrast, there were strong negative correlations between CCT (µm) (OD) and PCI (OD) (rho = -0.79, $p < 0.001$), as well as between CCT (µm) (OS) and PCI (OS) (rho = -0.76, $p < 0.001$). No significant correlations were found between CD ratio (OD) and PCI (OD) (rho = -0.03, p = 0.774), or between CD ratio (OD) and PCI (OS) (rho = 0.02, p = 0.882). There was also no significant correlation between MD of VF (dB) (OD) and PCI (OD) (rho = 0.07, p = 0.538), although there was a weak negative correlation between MD of VF (dB) (OS) and PCI (OS) (rho = -0.15, p = 0.204).

Finally, there were weak negative correlations between IOP (OD) and CCT (µm) (OD) (rho = -0.14, p = 0.24), as well as between IOP (OS) and CCT (µm) (OS) (rho = -0.23, p = 0.049).

**DISCUSSION**

In an attempt to integrate IOP and CCT into a unified risk factor, rather than simply attempting to correct for IOP measurement inaccuracy, Ilievet al.(2007) had proposed a new glaucoma index, the PCI[9]. In the present study, we comprehensively analyzed the correlation of PCI with structural and functional measure of glaucoma in both eyes of 71subjects.

In our study, 53.5% of the study subjects are male and 46.5% of study subjects are female.

The variable PCI (OD) is not normally distributed in the two subgroups of the variable Gender. Thus, non-parametric tests (Wilcoxon-Mann-Whitney U Test) is used to make group comparisons. The variable PCI (OS) is normally distributed in the 2 subgroups of the variable Gender. Thus, parametric tests (t-test) is used to make group comparisons.

There is no significant difference between both groups in terms of PCI (OD) (W = 732.500, p = 0.226) and PCI (OS) (t = 0.642, p = 0.523).

In the present study, mean age of study subjects (years) is 56.76±8.82. Non-Parametric tests (Spearman Correlation) is used to explore the correlation between the age and PCI variables, as atleast one of the variables is not normally distributed.

There is a weak positive correlation between PCI and Age (Years), and this correlation is not statistically significant.

In our study, the mean CCT (µm) (OD) is 519.49 ± 27.05 and the mean CCT (µm) (OS) is 520.52 ± 27.26 in 71 subjects. There is no difference between gender and no significant association with age. There is a strong negative correlation between PCI and CCT (µm) and this correlation is statistically significant. The finding of our study resembled that of Wolfs et al.(1997) study, in which CCT was slightly higher in patients with ocular hypertension, and was significantly lower in patients with primary open-angle glaucoma[10]. Since our study includes only subjects with primary open angle glaucoma, therefore mean CCT is lower.

Study by Nemesure, Hennis, Wu, Leskeet al.(2003) also stated that thinner CCT was a factor for OAG[11], while evaluating risk factors for POAG in 3222 subjects.

Similar to our findings, a study by Herndon, Weizer, Stinnett et al.(2004) concluded that Central corneal thickness is a powerful clinical factor in determining glaucoma severity [1]. Measuring CCT may aid the ophthalmologist in identification of glaucoma patients at high risk for progression. Lower CCT was significantly associated with worsened Advanced Glaucoma Intervention Study score, worsened mean deviation of visual field, increased vertical and horizontal cup-disc ratios, and increased number of glaucoma medications. Also, CCT is not significantly associated with gender[12].

Another study by Dueker, Singh, Lin et al.(2007) concluded that measuring CCT is an important component of a complete ocular examination, particularly for patients being evaluated for the risk of developing POAG[13].

In our study, the mean IOP (OD) is 23.18 ± 4.08 and there is a weak negative correlation between CCT (µm) (OD) and IOP (OD), and this correlation is not statistically significant (rho = -0.14, p = 0.240) which is similar to the study of Annette et al.[14]. There is a strong positive correlation between PCI (OD) and IOP (OD), and this correlation is statistically significant.

The findings in our study is similar to Hufnaglet al.(2007)study, done on 406 subjects. It was detected that CCT was significantly higher in OHT patients than in normals. In contrast, no statistically significant difference between normals and NTG or POAG patients was detected[15].

The mean IOP (OS) is 22.56 ± 4.20.There is a weak negative correlation between CCT (µm) (OS) and IOP (OS), and this correlation is statistically significant (rho = -0.25, p = 0.036).For every 1 unit increase in CCT (µm) (OS), the IOP (OS) decreases by 0.02 units. Conversely, for every 1 unit increase in IOP (OS), the CCT (µm) (OS) decreases by 1.04 units. There is a strong positive correlation between PCI (OS) and IOP (OS), and this correlation is statistically significant. This is comparable to study by Iyamu, Ituahet al.(2008) which concluded that the association between CCT and IOP for glaucoma subjects is weak, with an indication of an increase of 0.35 mmHg in intraocular pressure for every 10 µm corneal thinning[12].

Another study by Suzuki, Araie, and Iwase et al.(2005) showed large variation in CCT of normal subjects, which was significantly positively correlated with IOP[16].

In our study, there is a weak negative correlation between PCI and CD Ratio, and this correlation is not statistically significant. Franco and Kasahara et al.(2014) study concluded that C/D ratio is not a precise surrogate of glaucomatous optic disc damage without consideration of the relative disc size, area, and the quantitative assessment of neural rim width and area[17].

However, our study does not take into account localized defects of the neural rim, disk hemorrhages or the posterior bowing of the lamina cribrosa. Besides, glaucoma patients with small optic discs will have proportionally small C/D ratios, giving a falsely impression of healthy looking optic disk. Conversely, normal subjects with macrodiscs will present with large C/D ratios giving a false impression of damaged optic disk.

Hence, the C/D ratio is not a precise surrogate of glaucomatous optic disc damage. Using this structural measure is a major shortcoming and quantitative measures of the optic disk structure as provided by new technologies should have been a better choice for correlation studies.

In our study, there is a weak negative correlation between CD Ratio and MD OF VF (dB).For every 1 unit increase in CD Ratio (OD), the MD OF VF (dB) (OD) decreases by 14.71 units and for every 1 unit increase in CD Ratio (OS), the MD OF VF (dB) (OS) decreases by 29.45 units. This is similar to Franco and Kasaharaetal.(2014) study which stats that , lower the MD value, the more damaged the visual function is[17].

The MD value of automated perimetry is a weighted average decibel deviation from age normal database; the lower the MD value, the more damaged the visual function is.

In our study there is a weak positive correlation between PCI (OD) and MD OF VF (dB) (OD), and this correlation is not statistically significant (rho = 0.07, p = 0.538). There is a weak negative correlation between PCI (OS) and MD OF VF (dB) (OS), and this correlation is not statistically significant (rho = -0.15, p = 0.204).

In study by Nordmann et al.(2005) some variation in MD was observed in even the most severe patients (advanced glaucoma)[18]. In some subjects of their study, paracentral inferior and temporal inferior scores were greater than the MD, whereas the two nasal scores (superior and inferior) were less than the MD.

Automated Perimetry, as a psychophysical test, is subject to patient cooperation and individual cognitive function causing imprecision of the measurements. We have tried to minimize this imprecision by selecting only automated perimetry exams with good reliable indices. However, we have taken patients with cataract and that might have had influenced the value of MD.

Nevertheless, the MD can be affected by media opacity such as cataract and uncorrected refractive error. Confounding factors such as cataract might have an independent effect on MD. Since we did not consider cataract status for subjects included in our study, the final MD in our study may underestimate the true final MD once the impact of cataract is considered[19].

In our study, the mean PCI value for right eye is 169.71 and the mean PCI value for left eye is 164.41. Ilievet al.(2007) demonstrated that PCI range of 120–140 may be considered the upper limit of "normality", with a cut- off value of 120 in eyes with untreated applanation IOP in the normal range, and a cut- off value of 140 when IOP of 22 mm Hg and higher is measured[9].

A low PCI indicates "low risk of pressure- related damage", while a high PCI suggests "increased risk of pressure- related damage".. So, in this study, we are having higher PCI values because all the subject included in our study are POAG patients.

Shortcoming of our study is the use of both eyes of the same individual. Doing so for the measurement of an attribute or variable, rather than selecting one eye at random or the more severe affected eye for analysis tend to overestimate variability, artifactually influencing P value and decreasing chances of observing a significant effect, decreasing statistical power and increasing chances of type II error. We decided to use both eyes of the same patient to avoid waste of data.

Our study is a cross sectional study. Further longitudinal studies are warranted on the subject to explore other possible uses of PCI and strengthen its role as a unified risk factor and indicator of glaucoma severity. Other possible uses the can be explored are its use in glaucoma progression and thereafter in decision making of target pressure on the basis of PCI.

More recently, Leung et al. have proposed a new pressure-cornea-vascular index (PCVI)[20]. The index is derived from the PCI and extended with risk factors identified as associated with field-progression in a prospective cohort of 415 patients with NTG followed for 3 years.

Their study concluded that PCVI might be useful for predicting progression in NTG with a satisfactory AUC comparable to established scoring systems in neurovascular medicine. In my study, I had not assessed any vascular parameters and did not evaluate the PCVI.

**CONCLUSION**

In conclusion, this study provides important insights into the use of the Pulsatile Ocular Blood Flow Correlator Index (PCI) as a tool for assessing glaucoma in the population. Our results show that PCI is not affected by gender but weakly correlates with age, while there is a significant positive correlation between PCI and IOP as well as CCT. The integration of IOP and CCT into a single risk factor through PCI can better reflect an individual's susceptibility to glaucomatous damage than either factor alone. However, PCI appears to be an ineffective measure of structural damage among glaucomatous subjects, as there was no significant correlation between PCI and CD ratio. Additionally, the role of PCI as a functional measure of glaucoma may be limited in the presence of media opacities, as there was no significant correlation between PCI and MD OF VF (dB). These findings can help in improving the management and treatment of glaucoma, and aid in the development of new diagnostic tools for this condition.

## REFERENCES


1. Herndon LW, Weizer JS, Stinnett SS(2004). Central corneal thickness as a risk factor for advanced glaucoma damage. Arch Ophthalmol;122:17:21.
2. Kass MA, Heuer DK, Higginbotham EJ, Johnson CA, Keltner JL, Miller JP, et al(2002). The ocular hypertension treatment study: a randomized trial determines that topical ocular hypotensive medication delays or prevents the onset of primary open-angle glaucoma. Arch Ophthalmol;120:70113.
3. Gordon MO, Beiser JA, Brandt JD, Heuer DK, Higginbotham EJ, Johnson CA, et al(2002). The ocular hypertension treatment study: baseline factors that predict the onset of primary open angle glaucoma. Arch Ophthalmol;120:71420.
4. Wong TT, Wong TY, Foster PJ, Crowston JG, Fong CW, Aung T, et al(2009). The relationship of intraocular pressure with age, systolic blood pressure, and central corneal thickness in an asian population. Invest Ophthalmol Vis Sci; 50:4097102.
5. Bhan A, Browning AC, Shah S, Hamilton R, Dave D, Dua HS(2002). Effect of corneal thickness on intraocular pressure measurements with the pneumotonometer, Goldmannapplanation tonometer and Tono-pen. Invest Ophthalmol Vis Sci; 43:1389-92.
6. Doughty MJ, Zaman ML(2000). Human corneal thickness and its impact on intraocular pressure measures: a review and metaanalysis approach. SurvOphthalmol;44:367408.
7. Lee GA, Khaw PT, Ficker LA, Shah P(2002). The corneal thickness and intraocular pressure story: where are we now? Clin Experiment Ophthalmol;30:3347.
8. Herndon LW(2006). Measuring intraocular pressure adjustments for corneal thickness and new technologies.CurrOpinOphthalmol;17:1159.
9. Iliev ME, Meyenberg A, Buerki E, Shafranov G, Shields MB(2007). Novel pressure-tocornea index in glaucoma. Br J Ophthalmol;91:13648.
10. Wolfs RC, Klaver CC, Vingerling JR, Grobbee DE, Hofman A, de Jong PT(1997). Distribution of central corneal thickness and its association with intraocular pressure: The Rotterdam Study. Am J Ophthalmol;123:767–772.
11. Nemesure B, Wu SY, Hennis A, Leske MC(2003) Barbados Eye Study Group. Corneal thickness and intraocular pressure in the Barbados eye studies. Arch Ophthalmol;121(2):240-244. doi:10.1001/archopht.121.2.240.
12. Iyamu E, Ituah I(2008). The relationship between central corneal thickness and intraocular pressure: a comparative study of normals and glaucoma subjects. Afr J Med Med Sci;37(4):345-353.
13. Dueker DK, Singh K, Lin SC, et al(2007). Corneal thickness measurement in the management of primary open-angle glaucoma: a report by the American Academy of Ophthalmology. Ophthalmology;114(9):1779-1787. doi: 10.1016/ j.ophtha.04.068.
14. Annette, Hager MD; Kristina, Loge; Bernd, Schroeder MD; Mark-Oliver, Füllhas; Wolfgang, Wiegand MD, PhD(2008) Effect of Central Corneal Thickness and Corneal Hysteresis on Tonometry as Measured by Dynamic Contour Tonometry, Ocular Response Analyzer, and Goldmann Tonometry in Glaucomatous Eyes, Journal of Glaucoma; Volume 17 Issue 5 p 361-365 doi: 10.1097/IJG.0b013e31815c3ad3.
15. Hufnagl C, Hitzl W, Hornykewycz K, Grabner G, Reitsamer HA(2008). Vergleich der mittlerenzentralen Hornhautdickebei Patienteneines Glaukomvorsorge programs und ambulanten Glaukompatienten [Comparison of central corneal thickness in patients participating in a glaucoma screening programme and those who were examined in the glaucoma unit]. Klin Monbl Augenheilkd;225(2):151-154. doi:10.1055/s2007-963789.
16. Suzuki S, Suzuki Y, Iwase A, Araie M(2005). Corneal thickness in an ophthal-mologically normal Japanese population. Ophthalmology;112(8):1327–1336.
17. Franco AM, Kasahara N(2014). Correlation between the pressure-to-cornea index and both structural and functional measures of glaucoma. Indian J Ophthalmol;62(9):907-910. doi:10.4103/0301-4738.143924.
18. Nordmann JP, Mesbah M, Berdeaux G(2005). Scoring of visual field measured through Humphrey perimetry: principal component varimax rotation followed by validated cluster analysis. Invest Ophthalmol Vis Sci;46(9):3169-3176. doi:10.1167/iovs.04-1214.
19. Smith SD Katz J Quigley HA(1997). Effect of cataract extraction on the results of automated perimetry in glaucoma. Arch Ophthalmol; 115: 1515–1519.
20. Leung DY, Iliev ME, Chan P, Baig N, Chi SC, Tham CC, et al(2011). Pressure-corneavascular index (PCVI) for predicting disease progression in normal tension glaucoma. Br J Ophthalmol;95:110610.