

Correlation Between Central Corneal Thickness and Intraocular Pressure Measurements with Goldmann Applanation Tonometer and non Contact Tonometer and its Implication on Glaucoma

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Background :

Goldmann applanation tonometer (GAT) is considered as the gold standard method of measuring intraocular pressure (IOP) and it has been proven that IOP measurement is affected by central corneal thickness (CCT). Recent studies have shown that apart from CCT some other factors of corneal biomechanics like corneal hydration, bioelasticity also affect IOP to some extent.



Central corneal thickness is an important parameter concerned with IOP because it can mask an accurate reading of IOP either by underestimating or overestimating in thinner or thicker CCT respectively. In a meta-analysis of CCT in eyes designated as normal, mean CCT was 538 ± 31 μm. Slit lamp based pachymetry values were slightly less than Ultrasonic measurements 530 ± 29 μm vs 544 ± 34 μm respectively. In a study in Indian eyes found that CCT was between 500-550 μm.

Methods

Study was conducted in 200 eyes of patients in the age group of 20-80 years attending tertiary eye care center over a period of 2 years. IOP was measured in 100 eyes of 70 diagnosed cases of glaucoma patients using GAT and Non contact tonometer and this was

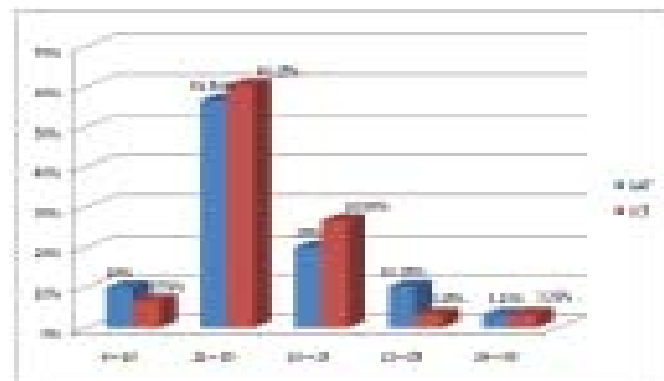
compared with IOP measurements in 100 eyes of 50 normal control subjects with similar techniques. The IOP was assessed with Appasamy slit lamp mounted Goldmann applanation tonometer. Prior to applanation tonometer,



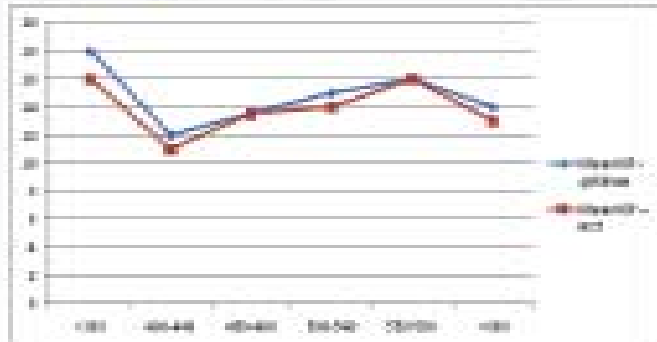
Non contact tonometry with Keeler pulsar Non-contact tonometer and the central corneal thickness with Souer ultrasonic pachymetry was assessed in all patients and an average of 3 readings was obtained. Furthermore the effect of central corneal thickness (CCT) on IOP measurement in normal and glaucomatous eyes by using two different tonometers was also evaluated as well as to see on stage of glaucoma.

Results

Distribution of IOP in the study group



Comparison of Mean IOP with NCT And Gat Versus Central Corneal Thickness



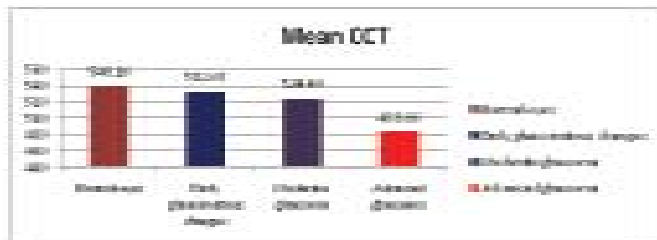
CENTRAL CORNEAL THICKNESS IN µm

IOP measurements by both methods i.e NCT as well as GAT is affected by CCT. The difference in IOP by the two methods is more significant at the extremes of CCT measurements. NCT measurement is affected by CCT more significantly than the GAT.

Mean difference of IOP between GAT and NCT

GLAUCOMATOUS EYES	2.55 mmHg
NORMAL EYES	1.33 mmHg

Glaucomatous eyes are more affected by the difference in IOP measurement by the two Methods



Patients having a low CCT often presented with an advanced stage of glaucoma

Conclusion

Central corneal thickness is an important parameter to complete overall clinical picture of glaucoma patients. It helps tailor management decisions especially in borderline suspects and ocular hypertensives. Actual IOP correction appears unnecessary in each patients. Intraocular pressure readings may require adjustment

especially when measured with NCT/GAT in those patients who have CCT that is significantly different from population mean. A low CCT can lead to underestimation of the IOP and hence leading to under estimation of stage of glaucoma. The CCT is a better predictor than IOP in identifying those at higher risk of developing primary open angle glaucoma when combined with some ocular risk factors. Ocular Hypertension Treatment Study (OHTS) have determined a significant relationship between CCT and IOP and the need to adjust IOP applanation tonometry readings by a factor to consider the effect of CCT in order to understand the "true" IOP.

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