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COMPARISION OF PRIMARY OPEN ANGLE GLAUCOMA AND OCULAR HYPERTENSION BY INTRAOCULAR PRESSURE AND RETINAL NERVE FIBER LAYER

Ophthalmology

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ABSTRACT

Aim and Objective- To Evaluate Retinal Nerve Fiber Layer and Intraocular Pressure in Primary Open Angle Glaucoma and Ocular Hypertension.
Material and Method- Comparative type of Observational study done on 120 eyes of 60 patients. IOP measured by Goldmann Applanation Tonometer and average RNFL by SD-OCT.
Result- The mean IOP in right & left eye was statistically significantly higher in POAG group (27.4 & 27.9 mmhg) than OHT group (24.1 & 24.3 mmhg). The mean Retinal nerve fibre layer thickness (RNFL) in right & left eye was higher in OHT group (81.5μ & 82.7μ) as compared to POAG group (61.9μ & 65.2μ) and significant on unpaired t test (P<0.001).
Conclsion- The peripapillary Retinal Nerve Fiber Layer (RNFL) thickness evaluation is a useful method for diagnosis of glaucoma.

KEYWORDS

POAG, OHT, RNFL

INTRODUCTION

Glaucoma is an optic neuropathy with the characteristic appearance of an optic disc and a specific pattern of visual field defect, that is associated frequently but not invariably with a raised IOP.[1] Glaucoma affects more than 67 million persons worldwide, of whom about 10%, or 6.6 million, are estimated to be blind[2]. Glaucoma is responsible for about 14% of all blindness. In India, the estimated number of cases of glaucoma is 12 million, around one fifth of the global burden of glaucoma[3].

In open angle glaucoma, slow damage to optic nerve causes gradual loss of eyesight. If not treated, vision loss continues until total blindness develops. The term ocular hypertension was advocated in the 1970s to distinguish persons with 'normal' intraocular pressure (IOP) (i.e., =21 mm Hg) from those with an IOP greater than 21 mm Hg, who were considered to be at increased risk for open angle glaucoma[4,5]. Chandler and Grant *et al*[6] suggested referring to this condition as early open-angle glaucoma without damage.

Glaucomatous optic neuropathy causes progressive death of retinal ganglion cells and their axons. These structural changes precede VF defects as measured by standard automated perimetry. The peripapillary Retinal Nerve Fiber Layer (RNFL) thickness evaluation is a useful method to detect the early structural damage of glaucoma. Glaucoma can occur in all age groups including infants, but it is most common in elderly people[7]. So early detection, ideally before symptoms develop, is important to prevent visual loss.

AIMS & OBJECTIVES

To Compare Primary Open Angle Glaucoma (POAG) and Ocular Hypertension (OHT) by Retinal Nerve Fiber Layer (RNFL) and Intraocular Pressure (IOP).

MATERIAL & METHODS

The hospital based comparative type of observational study was conducted under upgraded Department of Ophthalmology, SMS medical College & hospitals, Jaipur on 120 eyes of 60 patients .

Inclusion criteria: Primary open angle glaucoma (POAG) has untreated IOP of greater than 21mmHg, with an evidence of optic nerve cupping and corresponding visual field defect. Ocular Hypertension (OHT) cases has untreated IOP of greater than 21mmHg, with a normal optic nerve head and normal visual fields.

Exclusion Criteria has Any Corneal pathology, Angle closure Glaucoma or Secondary Glaucoma, History of previous ocular surgery, Ocular infection or inflammation, Ocular Trauma, Age related macular degeneration or diabetic macular edema.

The intraocular pressure was recorded by using Goldmann Applanation Tonometry (GAT). The optic nerve head was examined by using a direct ophthalmoscope to look for any cupping. Then a detailed evaluation was done by using a 90D magnifying lens after mydriasis. The central corneal thickness was measured by using an ultrasound pachymeter. Retinal nerve fiber layer thickness was noted by spectral domain Optical Coherence Tomography (SD-OCT). Readings were taken in similar manner by a single observer.

RESULTS

Table 1: Comparison of Central Corneal thickness (CCT) between study groups

Eye	GROUP	N	MEAN (μ)	SD	t vale	P value
OD	POAG	30	515	28.5	-8.920	<0.001 (S)
	OHT	30	568.4	16.1		
OS	POAG	30	517.5	30.8	-6.219	<0.001 (S)
	OHT	30	562.2	16		
Mean	POAG	30	516.3	27.2	-8.812	<0.001 (S)
	OHT	30	565.3	13.7		

Table 2 : Comparison of IOP between study groups

Eye	GROUP	N	MEAN(mmhg)	SD	t vale	P value
OD	POAG	30	27.4	2.92	5.638	<0.001 (S)
	OHT	30	24.1	1.40		
OS	POAG	30	27.9	2.94	6.165	<0.001 (S)
	OHT	30	24.3	1.39		
Mean	POAG	30	27.7	1.65	6.714	<0.001 (S)
	OHT	30	24.2	1.10		

Table 3 : Comparison of mean Retinal Nerve fiber layer thickness between study groups

Eye	GROUP	N	MEAN(μ)	SD	t vale	P value
OD	POAG	30	61.9	14.7	-5.185	<0.001 (S)
	OHT	30	81.5	14.6		
OS	POAG	30	65.2	17.1	-4.129	<0.001 (S)
	OHT	30	82.7	15.8		

Table 4 : Correlation of RNFL with Visual field MD in study group

Eye	Group	Correlation coefficient (r)	P value
OD	POAG	0.568	<0.001 (S)
	OHT	0.162	0.394
OS	POAG	0.685	<0.001 (S)
	OHT	0.176	0.353

The mean CCT in right eye & left eye was higher in OHT group (568.4μ & 562.2μ) as compared to POAG group (515μ & 517.5μ). This difference was found to be statistically significant on application of unpaired t test (P<0.001). The mean IOP in right eye & left eye was higher in POAG group (27.4 & 27.9 mmhg) as compared to OHT group (24.1 & 24.3 mmhg) and this difference as found to statistically significant (P<0.001) in both eye. The mean Retinal nerve fibre layer thickness (RNFL) in right eye & left eye was higher in OHT group (81.5μ & 82.7μ) as compared to POAG group (61.9μ & 65.2 μ) and significant on unpaired t test (P<0.001).

DISCUSSION

Intra ocular pressure (IOP) is a major causative risk factor for the

development and progression of glaucoma. Glaucomatous optic neuropathy causes progressive death of retinal ganglion cells and their axons. These structural changes precede Visual Field (VF) defects as measured by standard automated perimetry. The peripapillary Retinal Nerve Fiber Layer (RNFL) thickness evaluation is a useful method to detect the early structural damage .

Central corneal thickness was the most consistent predictor of degree of glaucomatous damage as measured by the outcome variables. It has been suggested that a thicker CCT may be protective against glaucomatous damage, since CCT in ocular hypertensive patients tends to be thicker than in POAG patients [8,9]. The European Glaucoma Prevention Study[10] also had similar findings, with CCT found to be a powerful predictor for the development of POAG independent of IOP. OCT provides an objective and quantitative measurement of RNFL thickness by measuring echo time delay and intensity of backscattered light from different retinal layers using a low coherence interferometry. Optical coherence tomography helps in obtaining objective and reproducible measures of RNFL thickness and detects focal defects independent of the visibility of RNFL. It has two types Times domain and Spectral domain. Time domain systems acquire approximately 400 A-scans per second using 6 radial slices oriented 30 degrees apart. Spectral domain OCT scans approximately 20,000-40,000 scans per second. This increased scan rate and number diminishes the likelihood of motion artifact, enhances the resolution and decreases the chance of missing lesions. Sommer *et al*[11] in a 10-year follow-up study, reported that RNFL thinning is a sensitive indicator of the extent of glaucomatous damage and that RNFL loss precedes measurable ONH and visual field damage approximately six years before any detectable visual field defects. Lalezary M *et al*[12] showed a 10 mum thinner average, superior and inferior RNFL at baseline was predictive of glaucomatous change. Huang et al. [13] compared the capability of the optic disc, peripapillary RNFL thickness, macular inner retinal layer thickness and their combinations in differentiating a glaucoma suspect from perimetric glaucoma by using SD-OCT and found that average RNFL thickness is the optimal parameter to detect perimetric glaucoma.

In our study the mean Retinal nerve fibre layer thickness (RNFL) in right eye & left eye was higher in OHT group (81.5μ & 82.7μ) as compared to POAG group (61.9μ & 65.2μ) and this difference was found to statistically significantly on application of unpaired t test ($P<0.001$). Sujata S *et al*[14] found that the mean RNFL thickness was significantly less in ocular hypertensive (82.87±17.21μ) and glaucomatous eyes (52.95 ± 31.10μ), than in normal (94.26). The Pearson correlation coefficient of RNFL and visual field MD in POAG group in right eye was 0.568 and in left eye was 0.685 indicating strong positive correlation. Soliman and associates [15] reported a significant correlation (correlation coefficient $r = 0.557$) between average RNFL thickness and mean deviation on W/W perimetry. Parisi *et al* .[16] and Zangwill *et al*.[17] have also reported a significant correlation between average RNFL thickness and MD. Kanamori *et al*.[18] showed that the highest correlation coefficient in all parameters was 0.729 at the average RNFL thickness, suggesting that average RNFL thickness was most useful for monitoring glaucoma.

SUMMARY & CONCLUSION

This study confirmed that the ocular hypertension patients had significantly higher central corneal thicknesses than the primary open angle glaucoma patients. The mean Retinal nerve fibre layer thickness (RNFL) in right eye & left eye was significantly less in POAG group as compared to OHT group.

RNFL measurement with SD-OCT could provide important information for detection and evaluation of glaucoma. Therefore RNFL may aid the ophthalmologist in making a correct diagnosis and in a better management of glaucoma and the glaucoma suspects.

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