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# Correlation of Visual Field Defects with Glaucomatous Disc Changes in Patients with Primary open Angle Glaucoma.

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***Abstract :*** *Glaucoma is a leading cause of irreversible blindness. Number of estimated cases of glaucoma in india are 12 million, around one fifth of the global burden of glaucoma.These figures are expected to be doubled by 2020 AD. If not carefully looked for , diagnosis of open angle glaucoma is delayed because most often it presents without signs and symptoms and central vision remains preserved even in advanced glaucoma. Raised intra ocular pressure , structural changes including retinal nerve fibre layer thinning and cup disc ratio , functional changes reflected by visual field examinations are required for early diagnosis and for monitoring the progression of glaucoma.The present study was carried out on sixty known patients (120 eyes) of glaucoma Their optic nerve head was evaluated and compared with their visual field changes . In 80 eyes cup disc ratio corresponded with visual field defects whereas in 26 eyes visual field defects were ahead of cup disc ratio and in 14 eyes cup disc ratio was ahead of visual field defects concluding that both evaluation of optic disc and visual field analysis are important and needed to assess glaucomatous damage and to monitor of progression of glaucoma .*

***Keywords:****Glaucoma,Optic nerve head, Visual fields, Intraocular pressure*

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## I. Introduction

Glaucoma is a chronic degeneration of the optic nerve and one of the leading cause of vision loss in the world. It's important role as a cause of blindness has been known since 19th century. It has been referred as "Sneak thief of sight" because of progressive nature of damage to the optic nerve which result with no symptoms. There is a definitive causal relationship between level of intraocular pressure and damage to optic nerve with resultant change in visual field (Kitazawa and Horie, 1975)[1].Glaucoma is the second largest cause of blindness in United States (Leske, 1983)[2] as well as second largest cause of bilateral blindness in the world (Quigley, 1996). In 1995 Thylefors et al on global data of blindness mentioned that glaucoma accounted for 13.5% of total blindness in the world and 22.3 % of these were shared by India[3]. In 2013 Saxena R et al estimated that number of cases of glaucoma in india is 12 million, around one fifth of the global burden of glaucoma.These figures are expected to be doubled by 2020 AD.[4]

Von-helmholtz in 1857 classified glaucoma into three types – acute, chronic and secondary. They are further divided into open angle or angle closure type, according to manner in which aqueous outflow is impaired.The optic nerve head comprises of the nerve fibers that originate in the ganglion cell layer of the retina and converge upon the nerve head from all points in the fundus. . The appearance of the optic nerve head and peripapillary retina is the single most important clinical feature in establishing the presence of glaucomatous damage. It includes enlargement of the optic disc cup, thinning or saucerizing of the neural rim, disc hemorrhages, and peripapillary atrophy.Perimetry helps in detection and progression of glaucoma and has been used for a long time to evaluate the visual field defects. Automated white on white perimetry has been used as a standard technique to detect visual fields defects in glaucomatous eyes. Short wavelength automated perimetry (SWAP), which preferentially stimulates the short wavelength sensitive (SWS) pathway subserved by the large retinal ganglion cells, rather than the luminance pathway examined by conventional perimetry is more sensitive for visual field examination in early glaucoma. The goal of glaucoma therapy is not only to treat the intraocular pressure or the disc, not even the visual fields but is to ensure that the patient has good functional vision for duration of his life time while maintaining the quality of life. The present study was conducted to correlate the visual field defects with optic disc changes in patients with Primary open angle glaucoma.

## II. Material And Methods

A randomized prospective study was conducted on a total number of sixty cases to correlate the visual field defects (done by Humphrey Visual Field Analyzer perimeter) with glaucomatous disc changes (documented by Fundus Photography) in patients with IOP greater than 21mm Hg. All patient in the age group 40-70 years of both the sexes with IOP >21mm of Hg by applanation tonometer at two to three occasions in a day were included in the study. Patients with corneal opacity, cataract, conjuctivitis, uveitis, corneal ulcer , angle closure and secondary glaucoma were excluded from the study. After taking informed consent baseline detailed history and ocular examination was done consisting of best corrected visual acuity, intraocular pressure by Applanation tonometer, slit lamp examination gonioscopy, fundus examination. Visual field analysis was done using Humphrey Visual Field Analyser . Fundus Photography was done in selected patients.

## III. Observations

**TABLE I** : Age and sex wise distribution of patients with Primary open angle glaucoma.

| Age group in years | Male | Female | Total |
|---|---|---|---|
| 40-49 | 8 | 9 | 17 |
| 50-59 | 5 | 14 | 19 |
| 60-69 | 5 | 14 | 19 |
| >70 | 0 | 5 | 5 |
| Total | 18 | 42 | 60 |
| Percentage | 30% | 70% | |

Maximum number of patients 19 each were in the age group 50-59 and 60-69 years. There were 17 patients in the age group 40-49 years and 5 patients with age above 70 years of age. 18 patients were male and 42 patients were female.

**Table 2:** Area wise distribution of patients coming from urban and rural areas.

| Sex | Male | Female | Total | Percentage |
|---|---|---|---|---|
| Rural | 7 | 24 | 31 | 51.6% |
| Urban | 11 | 18 | 29 | 48.3% |

31 patients came from rural areas and 29 patients came from urban areas.

**Table 3** : Diabetes among patients with primary open angle glaucoma.

| Diabetic status | No. of patients | Percentage |
|---|---|---|
| Diabetic | 9 | 15 |
| Non diabetic | 51 | 85 |

In primary open angle glaucoma patients 9 patients 9(15%)were diabetic and 51(85%) were non diabetic.

**Table 4** : Refractive error in patients with primary open angle glaucoma.

| Refractive status | No. of patients | Percentage |
|---|---|---|
| Myopic | 25 | 41.6 |
| Hypermetropic | 19 | 31.6 |
| No refractive error | 16 | 26.66 |

In patients with primary open angle glaucoma 25 were myopic and 19 patients were hypermetropic whereas 16 were emmetropic.

**Table 5:** Cup -Disc ratio in patients with primary open angle glaucoma

| C:D ratio | No. of Eyes | Percentage |
|---|---|---|
| 0.4-0.5 | 30 | 25% |
| 0.5-0.7 | 76 | 63.6% |
| More than or equal to 0.8 | 14 | 11.4% |

Out of 120 eyes of 60 patients of open angle glaucoma 30(25%) eyes were having cup disc ratio between 0.4-0.5, 76 (63.6%) between 0.5-0.7 cup to disc ratio and 14 (11.4%) were having more than 0.8 cupping.

**Table 6:** Fundus changes in patients of primary open angle glaucoma.

| Fundus Changes | No. of Eyes | Percentage |
|---|---|---|
| Retinal nerve fibre layer defect | 120 | 100% |
| Cup Disc Ratio > 0.4 | 120 | 100% |
| Peripapillary atrophy | 96 | 80% |
| Disc hemorrhage | 8 | 6.6% |

Retinal nerve fibre layer defect in the form of wedge defect in red free light and increased cup disc ratio (>0.4) was seen in all the eyes . Peri papillary atrophy was seen in 96 eyes. Disc hemorrhages were seen only in eight eyes.

**Table 7** : Various visual field defects in patients with primary open angle glaucoma.

| Visual field defects | No. of eyes | Percentage |
|---|---|---|
| Nil | 22 | 13.3% |
| Early | 48 | 40% |
| Intermediate | 40 | 33.3% |
| Advanced | 10 | 8.3% |

48 eyes were having early visual field defects followed by 40 eyes were having intermediate visual field defects 22 did not have an visual field defects while 10 were having advanced visual field defects.

**Table 8 :** Comparison of disc changes with visual field defects in patients with primary open angle glaucoma.

| Comparison of disc changes with visual field defects | No. of eyes | Percentage |
|---|---|---|
| C:D ratio corresponding visual field defects | 80 | 66.66% |
| C:D ratio ahead of visual field defects | 14 | 10.16% |
| Visual field defects ahead of C:D ratio | 26 | 20.10% |

In 80 eyes with primary open angle glaucoma C:D ratio corresponded with visual field defects. In 14 eyes C:D ratio was ahead of visual field defects and in 26 eyes visual field defects were ahead of C:D ratio.

## IV. Discussion

In the present study, 60 diagnosed patients of primary open angle glaucoma were taken from OPD of Regional institute of Ophthalmology , Government Medical College, Amritsar.The maximum number of patients were in the age group of 50-59 years (39%) and 60-69 (39%) years.In a study Das J et al (2001)[6] found mean age of glaucoma to be 60.54 years.30% of the patients in our study were male and 70% female. In the study by Perkins and Jay (1960)[7] 56.5% were males and by Al Mansouri F (2002)[8] in Qatar prevalence was more in males(41.6%) than females (58.4%) . In the present study, majority 47% of patients presented with no symptoms whereas 20% presented with the complaints of eye ache and mild headache, 17% had painless diminution of vision and 11% patients presented with frequent change in presbyopic glasses. Similarly Adatia FA et al (2005) also observed that most of the patients presented with no symptoms [9].

In our study 76 (63%) eyes had 0.5-0.7 cup to disc ratio and 14(11.6%) had 0.8. Tanito M et al concluded that The IOP level correlates with topographic changes in the optic disc in eyes of patients suspected of having high-tension glaucoma.[10]. Danesh-Meyer et al

concluded that open angle glaucoma eyes had larger, deeper cups smaller rims more cup volume and less rim volume [11]Visual field defects were classified in the present study according to categorization done by Mills[12]. 48 eyes were having early visual field defects followed by 40 eyes having intermediate visual field defects, 22 eyes were having no visual field defects while 10 were having advanced visual field defects. In a study done by Gloster et al [13] out of 300 patients of primary open angle glaucoma 150 patients had no visual field loss while 50 patients each had early , intermediate and advanced field losses.

Michele Marraffa found that there is a direct relationship between nerve fibre loss and visual field defects in patients with primary open angle glaucoma[14].In the present study it was found that the cup disc ratio corresponds to visual field defects in 80 eyes (66.66%) .The perimetric visual field defects were ahead of cup disc ratio changes as measured by fundus photography in 26 eyes( 21%) . The cup disc ratio changes were ahead of perimetric field defects in 14 eyes(10.16%). Fritz D et al Vertical C/D ratio allows a precise separation of glaucomatous and non -glaucomatous eye but has a limited correlation with perimetric changes .In contrast temporal rim area correlates well with the perimetric changes .[15]

Cup disc ratio greater than 0.5:1 is the most important reported sign of glaucomatous disc damage. Nerve fibre layer atrophy is associated with risk of field loss. Localised defects are the easiest to detect and may be very specific to differentiate early glaucoma from normal eye [16,]Thierry g, Zeyen et al concluded that progression of field damage is an initial sign of primary open angle glaucoma which comes earlier than changes in cup disc ratio[17].J.Gloster[13] summarized that the extent of cupping measured from fundus photograph of 300 patients and their visual field defects using standard automated perimetry has a significant correlation between each other . The results of explorative study Miglior S. et al suggest that quantitative optic disc analysis may be more sensitive than visual field examination in detecting early glaucomatous changes, whereas visual field examination may be more sensitive than quantitative optic disc analysis in detecting glaucomatous progressions in eyes with well established glaucoma.[18]Balwantray et al in 2001 found that most patients with field changes also had disc changes; however, less than half of those with disc changes had field changes.[19]DF Garway Heath (2007) study states that glaucomatous damage and monitoring of disease progression require measurement of both structural changes and functional changes .It is possible that some structural changes does not relate to ganglion cell loss and vice versa .[20]

Atsuya Miki et al in 2012 also concluded that imaging devices are promising tools for monitoring patients with glaucoma but combining structural and functional analyses is useful for accurate monitoring of glaucoma progression.[21]Sourish Hege et al in 2014 concluded that disc damage likelihood scale (DDLS) is significantly correlated with the degree of glaucomatous visual field damage in patients with chronic simple glaucoma, and thus it is helpful in early diagnosis of glaucoma. DDLS is an easy, inexpensive, quick method to document and manage early cases of chronic open angle glaucoma.[22]

## V. Conclusion

Structural changes significantly correlate with functional changes . Therefore both evaluation of optic disc and visual field analysis are needed to assess glaucomatous damage and to monitor of progression of glaucoma . In the present study in 80 eyes cup disc ratio corresponded with visual field defects whereas in 26 eyes visual field defects were ahead of cup disc ratio and in 14 eyes cup disc ratio was ahead of visual field defects.

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