

“INSTITUTIONAL BASED CLINICAL STUDY ON VISUAL FIELD DEFECTS IN PRIMARY OPEN ANGLE GLAUCOMA AND ITS CORRELATION WITH OPTIC DISC CHANGES”

Ophthalmology

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ABSTRACT

In South Asia, Glaucoma is the third leading cause of blindness, which estimates of 5,910,000 individuals blind due to cataract, 976,000 due to under-corrected refractive error, and 577,000 due to glaucoma. 3 It lasts lifetime and is the leading cause of irreversible but preventable blindness (5.80%) in India, which is second to cataract (62.60%). 4 Primary open angle glaucoma (POAG) is typically defined as a chronic optic neuropathy with slow progression estimated to affect 6.48 million people in India alone. 7 It has characteristic patterns of optic nerve damage and visual field loss. The final and common pathway for all of the potential etiologies of POAG is optic nerve head damage. 7 **Materials and methods-** The present study was conducted in the Regional Institute of Ophthalmology (RIO), GMCH, Guwahati for a period of 1 year from 1st August 2021 to 31st July 2022, on the patients who were investigated and diagnosed as cases of primary open angle glaucoma. **Results and observations:** Our study showed statistically significant correlation between visual field defect of right eye ($r=0.3118$, $p=0.001589$) and left eye ($r=0.3664$, $p=0.000177$) with Cup Disc Ratio of right and left eye. The correlation between visual field defects is found to be statistically significant ($r=0.2112$, $p=0.034919$) between right and left eyes which suggests that fellow eye is susceptible to visual field defects over a period of time. Our study showed statistically significant correlation between visual field defect of right eye ($r=0.3118$, $p=0.001589$) and left eye ($r=0.3664$, $p=0.000177$) with Cup Disc Ratio of right and left eye. **Conclusion:** The correlation between visual field defects is found to be statistically significant between right and left eyes which suggests that fellow eye is susceptible to visual field defects over a period of time.

KEYWORDS

INTRODUCTION

Glaucoma is a multifactorial progressive optic neuropathy that affects around 67 million people worldwide, with 6 million people blind and millions more suffering from visual disability. 1 It is characterized by recognizable patterns of alterations in the structure of the optic nerve head and nerve fiber layer of the retina and consequent visual field defects. 2 Whereas in high-income countries, Glaucoma is the leading cause of blindness, in South Asia, Glaucoma is the third leading cause of blindness, which estimates of 5,910,000 individuals blind due to cataract, 976,000 due to under-corrected refractive error, and 577,000 due to glaucoma. 3 It lasts lifetime and is the leading cause of irreversible but preventable blindness (5.80%) in India, which is second to cataract (62.60%). 4

Primary open angle glaucoma (POAG) is typically defined as a chronic optic neuropathy with slow progression estimated to affect 6.48 million people in India alone. It has characteristic patterns of optic nerve damage and visual field loss. The final common pathway for all the potential etiologies of POAG is optic nerve head damage. 5 Optic nerve head damage is thought to be secondary to primarily ganglion cell axon loss, though loss of blood vessels and glial cells has also been observed. 6 According to World Health Organization (WHO), the incidence of POAG is estimated at 2.4 million persons per year. For all types of glaucoma, the prevalence of blindness was estimated at more than 8 million persons, with 4 million cases being caused by POAG. 2

OCT (Optical coherence tomography)

Glaucoma is an optic neuropathy characterized by a specific and progressive injury to the optic nerve and retinal nerve fiber layer (RNFL). Therefore, examination of optic nerve head (ONH) and its surrounding RNFL is considered essential in both detecting and monitoring glaucoma. 6

AIMS AND OBJECTIVES:

- To determine the visual field defects in primary open angle glaucoma patients
- To correlate visual field defects with optic disc changes in patients of Primary open angle glaucoma

Anatomy And Physiology

- The angle is formed by following structures from anterior to posterior as identified gonioscopically 7
- The Schwalbe's line

- The Trabecular meshwork
- The scleral spur
- The ciliary body band

Optic Nerve Head Anatomy

Optic nerve head is defined as the distal portion of optic nerve that is directly susceptible to elevated intraocular pressure. 7

From its origin in the eye until it reaches the optic chiasma in the anterior cerebral fossa the ON can be divided into four segments:

Intraocular Part: 1 mm

Intraorbital Part: 30 mm

Intracanalicular Part: 6-9 mm

Intracranial Part: 10 mm

The intraocular portion of the optic nerve is also referred to as the optic nerve head (ONH). The visible most anterior part or the ONH is known as the optic disc.

MATERIALS AND METHODS

The present study was conducted in the Regional Institute of Ophthalmology (RIO), GMCH, Guwahati for a period of 1 year from 1st August 2021 to 31st July 2022, on the patients who were investigated and diagnosed as cases of primary open angle glaucoma. Ethical clearance was taken from the Institutional Ethics Committee before carrying out the study.

The nature of the study was explained to the patients and/or attendants for their cooperation and their informed consent was taken. 100 patients who were diagnosed as POAG during this period of study are included. Informed consent was taken from all the patients included in the study.

Inclusion Criteria

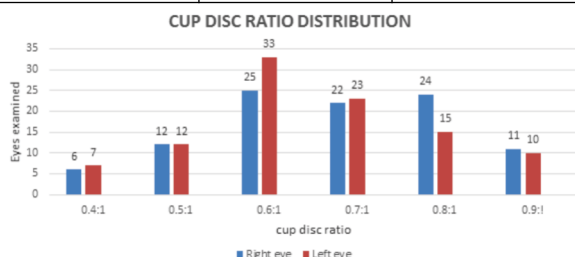
All patients 40 years and above investigated, diagnosed and treated accordingly as primary open angle glaucoma.

Exclusion Criteria

- Primary angle closure glaucoma
- Secondary glaucoma
- Congenital glaucoma
- Cases with lenticular opacity, corneal scarring or opacity which would make it difficult to evaluate fundus.

RESULTS AND OBSERVATIONS**Cup Disc Ratio In Both Eyes**

Cup: disc ratio	Right eye	Left eye
0.4:1	6	7
0.5:1	12	12
0.6:1	25	33
0.7:1	22	23
0.8:1	24	15
0.9:1	11	10



In our study, maximum number of eyes had vertical cup disc ratio as 0.6:1 that is 25 in the right eye and 33 patients in the left eye. 22 patients in right eye and 23 in left eye had vertical cup disc ratio as 0.7:1. 24 had cup disc ratio of 0.8:1 in right eye and 15 patients in the left eye.

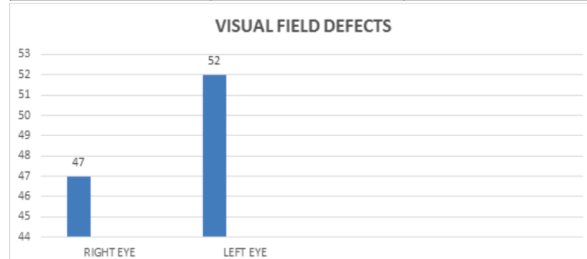
Our study showed statistically significant correlation between visual field defect of right eye ($r=0.3118$, $p=0.001589$) and left eye ($r=0.3664$, $p=0.000177$) with Cup Disc Ratio of right and left eye.

Visual Field Defects

In our study conducted, out of 200 eyes of 100 POAG patients, 99 eyes had visual field defects. Out of this, 47 right eyes and 52 left eyes had visual field defects.

Visual Field Distribution In Both Eyes

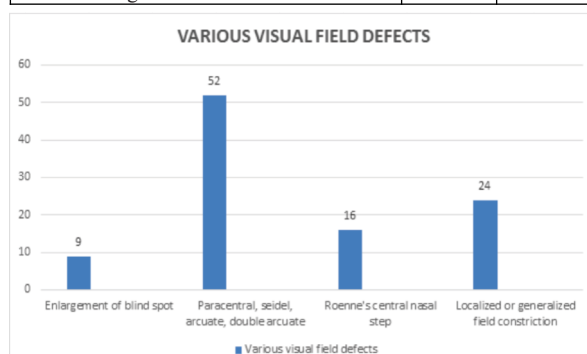
	Right Eye (%)	Left Eye (%)
Visual Field Defects	47	52



The correlation between visual field defects is found to be statistically significant ($r=0.2112$, $p=0.034919$) between right and left eyes which suggests that fellow eye is susceptible to visual field defects over a period of time.

Detectable Various Visual Field Changes In Patients

NATURE OF VFDs	Total eyes = 99	Percentage
Enlargement of blind spot	9	9.09
Paracentral, seidel, arcuate, double arcuate	52	52.52
Roenne's central nasal step	16	16.16
Localized or generalized field constriction	24	24.24

**Correlation Between Optic Disc Changes And Visual Field Defects**

Our study showed statistically significant correlation between visual field defect of right eye ($r=0.3118$, $p=0.001589$) and left eye ($r=0.3664$, $p=0.000177$) with Cup Disc Ratio of right and left eye.

	VFD (RE)	N	p-value
VISUAL ACUITY (RE)	Present	47	<0.00001
	Absent	53	
OPTIC DISC CHANGES (RE)	Present	47	P=0.001589
	Absent	53	
	VFD (LE)	N	p-value
VISUAL ACUITY (LE)	Present	52	<0.00001
	Absent	48	
OPTIC DISC CHANGES (LE)	Present	52	P=0.000177
	Absent	48	

DISCUSSION**Cup Disc Ratio:**

In our study maximum number of eyes had vertical cup disc ratio as 0.6:1 i.e. 25 patients in the right eye and 33 patients in the left eye had CDR as 0.6:1. 22 patients in the right eye and 23 patients in the left eye had cup disc ratio 0.7:1. Kwon et al in their study in 2003¹⁷³ found that 99.5 percentile of the population had vertical optic cup disc ratio as 0.64:1. In the ocular Hypertension Treatment Study (2002)⁸, vertical cup disc ratio was found to be a risk factor in development of POAG.

Drew R. Nannini, MA Heejin Kim, Fangda Fan, Xiaoyi Gao (2018)⁹ suggested that The Genetic Risk Scores were associated significantly with VCDR ($P < 0.0001$), after adjusting for age, gender, central corneal thickness, intraocular pressure, and education

Nathaniel Godswill Inye, Pepple Godswill (2021)¹⁰ in their study showed that at least 80% of VCDR correlated with the Mean deviation of matrix FDT amongst this cohort of POAG patients. It helps to buttress the fact that properly clinical evaluation of the optic nerve head remains an indispensable tool in glaucoma diagnosis and can be used in assessing glaucoma severity in resource poor setting.

Visual Field Defects

Aizhu Tao, Yuanbo Liang, Juanjuan Chen, Haishuang Hu, Qiangjie Huang, Jingwei, Zheng Cong, Ye Fan, Lu et al (2020) suggested that There is a moderate structure-function correlation between visual field sensitivity thresholds measured with automated perimeter and macular vascular density assessed by OCT.¹¹

CONCLUSION

The correlation between visual field defects is found to be statistically significant between right and left eyes which suggests that fellow eye is susceptible to visual field defects over a period of time.

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