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CORRELATION BETWEEN OPTIC NERVE HEAD CHANGES AND VISUAL FIELD DEFECTS IN GLAUCOMA PATIENTS.

Ophthalmology

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ABSTRACT

Aim: To investigate the relationship of optic nerve head changes with visual field defects to establish a correspondence between structural and functional damage.

Material and Method: One hundred and thirty six eyes of 70 patients having glaucomatous disc damage constituted material for this prospective observational study. A detailed history and ocular examination was carried out. Optic nerve head changes were classified as disc changes, vascular changes and peripapillary changes. Optic nerve head changes were correlated with different visual field changes. Data were compiled and analyzed.

Result: The male female ratio was 39:31. The mean age was 53.85 years. The mean intra ocular pressure was 29.41 mm Hg. More than one type of optic nerve head changes were seen in many patients. Enlargement of blind spot was seen in isolation or in combination with other visual field defects leading to some overlapping. Approximately one third patients showed no field defects. Neuro retinal rim notching, disc border hemorrhage and Retinal Nerve Fiber Layer defects show a definite correlation with visual field defect. However, other optic nerve head changes may not follow any specific pattern of visual field loss.

Conclusion: Although, neuro retinal rim notching, disc border hemorrhage and retinal nerve fiber layer defects show a strong correlation with visual field defects, other optic nerve head changes do not always correspond with the visual field defects. The glaucomatous damage and monitoring of disease progression require measurement of both structural and functional changes.

KEYWORDS

Disc and field changes, optic nerve head changes, visual field defects.

Introduction:

Glaucoma is the second leading cause of blindness worldwide.[1] Optic nerve head examination and visual field plotting form the two major review systems available to ophthalmologists in diagnosing primary open angle glaucoma (POAG) and in evaluating the success of therapy.[2] Attempts have been made to correlate optic nerve head changes with visual field changes in the past.[3,4,5,6,7] It is possible that some structural changes do not relate to ganglion cell loss and vice versa.[8] Hence, this study was conducted to investigate the relationship of optic nerve head changes with the visual field defects to establish a correspondence between structural and functional damage.

Material & method:

One hundred and thirty six eyes of 70 patients (41 Primary open angle glaucoma, 25 Primary angle closure glaucoma and 4 Secondary glaucoma) having glaucomatous disc damage constituted material for this prospective observational study. Following were the exclusion criteria:

- Patients not willing to participate in the study.
- Patients having best corrected visual acuity < 6/60.
- Unreliable fields.
- Patients having retinal pathology e.g. Diabetic Retinopathy, Venous Occlusion etc.

A detailed history and ocular examination was carried out for each patient. The diagnosis of glaucoma was established with the help of Goldmann applanation tonometry (GAT), Slit lamp Indirect biomicroscopy, Standard automated perimetry (SAP) and Gonioscopy. The SAP was performed by G program of Octopus Visual Field Analyzer.

Optic Nerve Head (ONH) changes were classified as disc changes, vascular changes and peripapillary changes. ONH drawings were made paying attention to the finer details such as shape of the disc, area of cupping, pallor of neuro retinal rim (NRR) in all quadrants, vertical & horizontal cup disc ratio, any localized notching (specially superior & inferior cup margin), position & kinking of major disc vessels, splinter haemorrhage on disc, baring of circumlinear vessels, Retinal Nerve Fiber Layer (RNFL) defects and peripapillary chorioretinal changes (enlarged zone beta, alpha & pathological grey crescent) of both eyes.

The visual field (VF) changes were classified as no defect, Superior arcuate (SA), Inferior arcuate (IA), Superior nasal quadrant (SNQ), Inferior nasal quadrant (INQ), Superior temporal quadrant (STQ), Inferior temporal quadrant (ITQ), Combined defects and Enlargement of blind spot (EBS). All the data were compiled and analyzed.

Results:

The male female ratio was 39:31. The mean age was 53.85±4.6 years. The mean intra ocular pressure (IOP) was 29.41±5.3 mm Hg. More than one type of ONH changes were seen in many patients. EBS was seen in isolation or in combination with other visual field defects leading to some overlapping.

Table 1: Co-relation of disc changes of ONH with VF defects.

FIELD changes	DISC Changes in ONH (No. of eyes)		
	Generalized enlargement of cup (113)	Focal Notching (17)	Pale NRR (82)
No defect (n=48)	35 [30.9%]	4 [23.5%]	11 [13.4%]
SA (n=15)	11 [9.7%]	4 [23.5%]	10 [12.2%]
IA (n=14)	12 [10.6%]	3 [17.6%]	12 [14.6%]
SNQ (n=21)	17 [15.0%]	4 [23.5%]	16 [19.5%]
INQ (n=20)	18 [15.9%]	2 [11.7%]	17 [20.7%]
STQ (n=3)	3 [2.6%]	0 [0%]	3 [3.6%]
ITQ (n=1)	1 [0.8%]	0 [0%]	1 [1.2%]

Combined Defects (n=12)	12 [10.6%]	0 [0%]	12 [14.6%]
EBS (n=8)	8 [7.1%]	0 [0%]	8 [9.7%]
Comments	No definite relation with specific types of field defect.	Strong co-relation (76.5%) with specific area, type or quadrant involvement.	No definite relation with specific types of field defect.

Among the disc changes, a very good co-relation was found between focal notching of NRR and VF defects.

Table 2: Co-relation of vascular changes of ONH with VF defects.

FIELD changes	VASCULAR Changes in ONH (No. of eyes)		
	Baring of circumlinear vessels (95)	Bayoneting Sign (75)	Disc border Hemorrhage (17)
No defect (n=48)	17 [17.9%]	7 [9.3%]	4 [23.5%]
SA (n=15)	14 [14.7%]	10 [13.3%]	3 [17.6%]
IA (n=14)	11 [11.5%]	9 [12.0%]	2 [11.76%]
SNQ (n=21)	18 [18.9%]	16 [21.3]	3 [17.6%]
INQ (n=20)	18 [18.9%]	15 [20.0%]	2 [11.76%]
STQ (n=3)	3 [3.1%]	3 [4.0%]	2 [11.76%]
ITQ (n=1)	1 [1.1%]	1 [1.3%]	1 [5.88%]
Combined Defects (n=12)	12 [12.6%]	11 [14.6%]	0 [0%]
EBS (n=8)	8 [8.4%]	8 [10.6%]	0 [0%]
Comments	An early sign but No definite relation with specific types of field defect.	No definite relation with specific types of field defect.	Strong co-relation (76.47%) with specific area, type or quadrant involvement.

Among the vascular changes, a very good co-relation was found between disc border haemorrhage and VF defects.

Table 3: Co-relation of peripapillary changes of ONH with VF defects.

FIELD changes	PERIPAPILLARY Changes in ONH (No. of eyes)	
	Peripapillary Atrophy (77)	RNFL damage (56)
No defect (n=48)	5 [6.4%]	2 [3.5%]
SA (n=15)	11 [14.2%]	8 [14.2%]
IA (n=14)	12 [15.5%]	10 [17.8%]
SNQ (n=21)	15 [19.4%]	12 [21.4%]
INQ (n=20)	17 [22.1%]	11 [19.6%]
STQ (n=3)	3 [3.9%]	2 [3.5%]
ITQ (n=1)	1 [1.3%]	1 [1.7%]
Combined Defects (n=12)	12 [15.5%]	10 [17.8%]
EBS (n=8)	8 [10.3%]	7 [12.5%]
Comments	No definite relation with specific types of field defect.	Strong co-relation (78.57%) found between the area of RNFL defect and corresponding VF damage.

Among the peripapillary changes, a very good co-relation was found between RNFL defect and VF defects.

Discussion:

On analysis of demographic and base line data in the present study, the mean age of 53.85 years was in accordance with other studies.[9,10,11,12,13] A male preponderance was noted which is also in accordance with other studies.[14, 15, 16] The mean IOP was found to be 29.41 mm Hg which is similar to the observation made by other workers.[17,18,19,20]

Approximately one third of our patients showed no field defects. A generalized enlargement of cup was seen in majority of our patients. These findings are in accordance with the fact that progression of disc cupping often precedes VF damage from elevated IOP and the mode of early progression is usually a generalized expansion of the cup.[21,22,23]

We observed that focal notching of NRR, disc border hemorrhage and RNFL defects showed a strong correlation with VF defects. Disc border hemorrhage is considered as a sign of imminent RNFL danger and preceded VF defects.[24, 25] The site of hemorrhage coincides with location of VF progression.[26, 27] A direct relationship between nerve fiber loss and VF defects in patients with POAG has been reported.[3] The extent of cupping measured and VF defects have a significant correlation between each other.[4] These structural changes significantly correlate with functional changes.[7] The pattern and area of VF defect can be quite accurately anticipated in these three glaucomatous optic neuropathy changes. However, other ONH changes viz. Generalized enlargement of cup, Pallor of disc, baring of circumlinear vessels, Bayoneting sign and Peripapillary pigmentary disturbance or enlarged zone β due to glaucoma may not follow any specific pattern of VF loss. It is possible that some structural changes do not relate to ganglion cell loss and vice versa.[8]

Conclusion:

Although, neuro retinal rim notching, disc border hemorrhage and retinal nerve fiber layer defects show a strong correlation with visual field defects, other optic nerve head changes do not always correspond with the visual field defects. The glaucomatous damage and monitoring of disease progression require measurement of both structural and functional changes.

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