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OPTIC NEUROPATHIES: A CROSS-SECTIONAL STUDY

Dr. Gaurav Paranjpe
Assistant Professor, Department of Ophthalmology, Krishna Institute of Medical Sciences
Krishna Vishwa Vidyapeeth, Karad , Email ID- gaurav65@yahoo.co.in
Dr. D.B.Shirke
Assistant Professor, Department of Ophthalmology, Krishna Institute of Medical Sciences
Krishna Vishwa Vidyapeeth, Karad , Email ID- drdnyaneshshirke928@gmail.com
Dr. Sanvedya Kadam
Associate AssistantProfessor, Department of Ophthalmology, Krishna Institute of Medical Sciences
Krishna Vishwa Vidyapeeth, Karad , Email ID- k.sanvedya87@gmail.com

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ABSTRACT

Research findings have indicated that ON is a medical illness characterized by damage to the ON, which can occur due to a range of different causes. Optic neuritis (ON) is distinguished by the degeneration or demise of nerve fibers, leading to distinctive manifestations. The diagnosis of ON could potentially be strengthened with additional examinations. The assessment of the visual field, whether through manual kinetic perimetry or automated static perimetry, plays a vital role in achieving an accurate diagnosis. The utilization of neuroimaging techniques to examine the brain and orbit plays a pivotal role in the diagnosis of ON, encompassing both demyelinating and compressive subtypes. Therefore, our study aimed to conduct an evaluation and assessment of ON. 65 patients involved in the study. All patients received a comprehensive examination that included VA, IOP, ASE, PR,RAPF,PSE, GON,HOT and TON. In our study we found that, significant correlation between FD type in G and other diseases ($p < 0.0001$). This indicates that G had TV, A, DA, or different scotomas(S), which were much greater than other ON. G is the most common and preventable cause of V impairment and blindness. Thus, G awareness efforts should be prioritized alongside cataract evaluation. If necessary, perimetry is necessary for a more complete assessment.

Keywords: ON**,** VA, IOP, ASE, PR,RAPF,PSE, GON,HOT and TON.

INTRODUCTION

Studies concluded that the condition referred to as optic neuropathy (ON) encompasses optic nerve damage resulting from various causes. ON is characterized by the damage or death of nerve fibers, resulting in specific features. Posterior or retrobulbar ON are characterized by an acute presentation and exhibit a normal optic disc appearance. This occurs even if vision is

restored and is commonly known as "optic atrophy". “Benevenutus Grassus, a renowned 13th-century Italian oculist with extensive travel experience, conducted a series of observations. The observation of a fixed dilated pupil, even in an apparently clear eye, served as an indication of optic nerve obstruction. Consequently, the recommendation was made to refrain from pursuing treatment”.[1]

Furtehrmore, one of the most prevalent reasons for VL according to many studies was that an ophthalmologist sees is ON. Clinical symptoms and signs are used to make the diagnosis. In many cases, the history might help determine what's causing the optic neuropathy. Demyelinating, inflammatory, ischemic, and traumatic causes typically have a quick onset. Diseases that progress slowly may have genetic, toxic, nutritional, or compressive origins. Decreased vision, dyschromatopsia, an aberrant pupillary response, and a VFD are the hallmarks of ON in the clinical setting. The diagnosis of ON might be bolstered by further exams. Testing the visual field, either manually with kinetic perimetry or automatically with static perimetry, is crucial to making a correct diagnosis. Studies have also shown that, “neuroimaging of the brain and orbit is crucial in diagnosing ON, including demyelinating and compressive types”.Thus, the goal of our study was to evaluate & assess ON .

AIM

To evaluate the clinical study of ON.

INCLUSION CRITERIA

1. All cases of optic neuropathy .
2. Both male & female were included.

EXCLUSION CRITERIA

1. Paediatric cases
2. Unconscious patients
3. Optic neuropathies in mentally retarded patients.

MATERIALS & METHOD

We have conducted a cross sectional type of study in department of Opthalmology, KH, Karad starting from October 2017 ending to May 2019 with total of 65 patients. Furthermore, a written informed consent was taken from all the patients who were included in the study. Followed which, detailed history of present illness, general examination, examination of visual acuity (VA),intra-ocular pressure (IOP) using Goldmann’s Applanation Tonometer (GAT) , anterior segment examination (ASE) on slit lamp biomicroscope (SLB), pupillary reaction (PR), RAPF, posterior segment examination (PSE) by indirect & direct opthalmoscopy after dilation with 0.8% tropicamide (TA)& 5% phenylephrine (PE) eye drop (if not contraindicated), were done in patients with good fixation. Patients with decreased vision, affected PR, increased IOP, increased cup-to-disc ratio, and field defects on perimetry were categorized as having glaucomatous optic neuropathy (GON). Patients with a history of trauma (HOT), decreased vision, and affected pupillary reaction (PR) were categorized as having trauma optic neuropathy (TON).

RESULT

	Number	Percentage (%)
Female	19	29.23%
Male	46	70.77%
Total	**65**	**100%**

Table 1: Gender–wise distribution

In our study we found that, there were 46 males (70.77%) & 19 females (29.23%) patients in our study.Hence, male : female ratio was 2.42:1.

Age group (years)	Number	Percentage (%)
21-30	3	4.62%
31-40	6	9.23%
41-50	10	15.38%
51-60	13	20.00%
61-70	19	29.23%
71-80	12	18.46%
81-90	2	3.08%
Total	**65**	**100%**

Table 2: Age-wise distribution

In our study we found that, most common age group was 61–70 years with 19 patients (29.235), followed by 51–60 years with 13 patients (20.00%), 71–80 years with 12 patients (18.46%), 41–50 years with 10 patients (15.38%), 31–40 years with 6 patients (9.23%), 21–30 years with 3 patients (4.62%), and 81–90 years with 2 patients (3.08%).

Systemic diseases	Number	Percentage (%)
Diabetes mellitus	4	6.15%
Diabetes mellitus, Hypertension	6	9.23%
Hypertension	11	16.92%
No systemic diseases	44	67.69%

Total	**65**	**100%**

Table 3: Association of high BP & diabetes

In our study, we found that 44 out of a total of 65 (67.69%) did not have any SD.11 patients (16.92%) had high BP, 6 patients (9.23%) had both DM and high BP, and the rest (4.15%) had only DM.

Addiction	Number	Percentage (%)
No	51	78.46%
Yes	14	21.54%
Total	**65**	**100%**

Table 4: Association of Addition

In our study, we found that a total of 14 patients (21.54%) had addictions to tobacco and alcohol.

RAPD	Number	Percentage (%)
No	6	9.23%
Yes	59	90.77%
Total	**65**	**100%**

Table 5 : Relative afferent pupillary defect

In our study, we found that 59 out of a total of 65 (90.77%) had RAPD in any of the eyes.

Classification	Number	Percentage (%)
Glaucoma optic neuropathy	36	55.38%
Traumatic optic neuropathy	10	15.38%
Toxic / Nutritional optic neuropathy	5	7.69%
Retinitis Pigmentosa	4	6.15%
Compressive optic neuropathy	3	4.62%
(NAION)	2	3.08%
Optic neuritis	2	3.08%
Post papilloedema optic Atrophy	2	3.08%
Diabetic papillopathy	1	1.54%
Hereditary optic neuropathy	0	0%

Anomalous optic nerve	0	0%
Total	**65**	**100%**

Table 6 : Etiological classification of ON

In our study we have found that, the majority of the patients, 36 out of 65 (55.38%), had GON. 10 patients (15.38%) had traumatic optic neuropathy, 5 patients (7.69%) had toxic or nutritional optic neuropathy, and 4 patients (6.155%) had retinitis pigmentosa.

GON

	Number	Percentage (%)
Female	12	33.33%
Male	24	66.67%
Total	**36**	**100%**

Table 7 : Gender–wise distribution in Glaucoma patients (GP)

In our study we have found that,the majority of the patients with GP were males 24 out of 36 (66.67%), while the rest were females (33.33%).

Age groups(years)	Number	Percentage (%)
41-50	3	8.33%
51-60	8	22.22%
61-70	16	44.44%
71-80	8	22.22%
81-90	1	2.78%
Total	**36**	**100%**

Table 8 : Age–groups in GP

In our study we found that,the most common age group in GP was 61–70 years, with 16 patients (44.45%).

Systemic diseases	Number	Percentage (%)
Diabetes mellitus	3	8.33%
Diabetes mellitus, Hypertension	5	13.89%
Hypertension	8	22.22%
No systemic diseases	20	55.565

Total	**36**	**100%**

Table 9 : Association of high BP & DM in GP.

In our study we have found that, out of 36 GP cases, 8 patients with G had high BP (22.22%), 5 had both DM and high BP (13.9%), and 3 had only DM (8.3%).

Addiction	Number	Percentage (%)
No	28	77.8%
Yes	8	22.2%
Total	**36**	**100%**

Table 10: Association of addiction in GP.

In our study we have found that, out of 36 GP, 8 had a history of addictions (22.2%).

VISION	CUP DISC RATIO			TOTAL
	<0.4	0.4-0.7	>0.7	
(6/6)-(6/12)	7	0	0	7
(6/18)-(6/60)	0	11	3	14
FC 3mt-FCCF	0	0	3	3
PL ,PR	0	1	3	4
No PL	0	0	8	8
Total	**7**	**12**	**17**	**36**

Table 11 : Right eye vision & cup disc ratio in GP

We found that, $X^2 = 56.1$, $p < 0.001$, significant association between the Vision & Cup disc Ratio of right eye.

VISION	CUP DISC RATIO			TOTAL
	<0.4	0.4-0.7	>0.7	
(6/6)-(6/12)	2	0	0	2
(6/18)-(6/60)	0	8	7	15
FC 3mt-FCCF	1	3	4	8
PL ,PR	0	0	4	4

No PL	0	1	6	7
Total	**3**	**12**	**21**	**36**

Table 12: Vision left eye & cup disc ratio ratio (GP)

We found that, $X^2 = 30.81$, $p < 0.001$, significant association between the Vision & Cup disc Ratio of left eye

Co-relation of ON & Visual field defect (VFD)

1.Glaucoma

Perimetry	Number of eyes (out of 72 eyes)
Done	49
Cannot be done	23
Total	**72**

Table 13 : Perimetry in GP

In our study we found that, in GP, perimetry was done in 49 eyes out of total 72 (86.06%).

Visual field defect	Number of eyes (out of 49 eyes)
Present	39
Absent	10
Total	**49**

Table 14 : FD in GP

In our study we found that, out of 49 eyes in which perimetry was done, visual field defects were present in 39 eyes (79.59%).

Type of visual field defect	Number of eyes (out of 39eyes)	Percentage
Arcuate/Double Arcuate	14	35.90%
Various Scotomas	12	30.77%
Tubular vision	10	25.64%
Peripheral constriction	2	5.13%
Altitudinal	1	2.56%
TOTAL	**39**	**100%**

Table 15 : VSD type in GP

In our study we found that, the most common visual field defect was A or DAV seen in 14 patients (35.90%), followed by various S seen in 12 patients (30.77%) and tubular vision in 10 patients (25.64%).

2.TOXIC /NUTRITIONAL O N (NON)

Field defect	Number of eyes (out of 10 eyes)
Present	7
Absent	1
Perimetry not done	2
TOTAL	**10**

Table 16 :Presence of field defects (FD) in toxic / NON

In our study we found that, 7 out of 10 eyes (70%) with toxic or NON have VFD.

Type of visual field defect	Number of eyes (out of 7 eyes)	Percentage
Centrocecal	5	71.43%
Arcuate/Double Arcuate	1	14.29%
Various scotomas	1	14.29%
TOTAL	**7**	100%

Table 17: VFD types in toxic / NON

In our study we have found that, out of a total of 7 eyes with VFD in toxic or NON, 5 were centrocecal (71.43%), and one eye each had an arcuate or double arcuate defect(DAV)and various S.

3.RETINITIS PIGMENTOSA (RP)

Field defect	Number of eyes (out of 8 eyes)
Present	8
Absent	0
TOTAL	**8**

Table 18: Presence of VFD in RP

In our study we found that, all 8 eyes with RP had VFD (100%).

Type of visual fielddefect	Number of eyes (out of 8 eyes)	Percentage
Tunnel vision	2	25.00%
Peripheral constriction	6	75.00%

TOTAL	**8**	**100%**

Table 19: VFD types in RP

In our study we have found that, out of 8 patients having RP, 6 had PC (75%) and 2 patients had TV (25%).

4.Post-papilloedema optic atrophy (PPOA)

Visual field defect	Number of eyes (out of 4 eyes)
Present	3
Absent	1
TOTAL	**4**

Table 20: Presence of VFD in PPOA

In our study we have found that, all 3 eyes out of 4 (75%) with PPOA have VFD of type, enlargement of Blind spot".

5.Optic Nerve (ON)

Visual field defect	Number of eyes (out of 4 eyes)
Present	3
Absent	1
TOTAL	**4**

Table 21: Presence of VFD in ON

In our study we found that, 3 out of 4 eyes (75%) with ON had VFD.

Type of visual field defect	Number of eyes (out of 3 eyes)
Centrocecal	1
Arcuate/Double Arcuate	1
Various Scotomas	1
TOTAL	**3**

Table 22 : Types of FD in ON

6.Diabetic Papillopathy (DP)

Both eyes of DP had field defects of type "peripheral constriction.

7. Compressive optic neuropathy (CON)

Visual field defect	Number of eyes (out of 6 eyes)
Present	4
Absent	0
Perimetry not done	2
TOTAL	**6**

Table 23: Presence of VFD in CON

In our study we have found that, out of 6 eyes 4 (66.67%) with CON had VFD.

Type of visual field defect	Number of eyes (out of 3 eyes)
Bi-temporal defect	2
Pie on floor defect	2
TOTAL	**4**

Table 24: Types of FD in CON

In our study we have found that, 2 eyes each had a bi-temporal VFD and a pie-on-the-floor defect in compressive ON.

8.Non arteritic ischemic optic neuropathy (NAION)

In our study, we found that two eyes with non-arteritic ischemic optic neuropathy (NAION) have a field defect of type "altitudinal defect.

Type of optic neuropathy	Tubular vision	Altitudinal	Arcuate/ Double arcuate	Centrocecal	Enlarged blind spot	Tunnel vision	Peripheral constriction	Various Scotoma	Pie on floor	Bi-temporal	Total
Glaucoma	10	1	14	-	-	-	2	12	-	-	39
Traumatic	-	-	-	-	-	-	-	-	-	-	0
Toxic / Nutritional	-	-	1	5	-	-	-	1	-	-	7
Retinitis pigmentosa	-	-	-	-	-	2	6	-	-	-	8
NAION	-	2	-	-	-	-	-	-	-	-	2

Compressive	-	-	-	-	-	-	-	-	2	2	4
Post Papilloedema	-	-	-	-	3	-	-	-	-	-	3
Optic Neuritis	-	-	1	1		-		1	-	-	3
Diabetic Papillopathy	-	-	-	-	-	-	2	-	-	-	2
TOTAL	**10**	**3**	**16**	**6**	**3**	**2**	**10**	**14**	**2**	**2**	**68**

Table 25: Different types FD seen in ON

In our study, we found that a total of 68 eyes had VFD. 39 of them had G, and the remaining 29 had other neuropathies.

	Tubular vision / Arcuate/ Double arcuate / Various Scotoma	Other field defects	Total
Glaucoma	36	3	39
Others	6	23	29
Total	42	26	68

Table 26: Association between various FD seen in GP & other ON

In our study, we found that a highly significant association was seen between the type of FD in G and other diseases ($p < 0.0001$), where 36 out of the total 42 FD (85.71%) seen in G were either tubular vision, arcuate, double arcuate, or various scotomas, as compared to the majority of the other ON contributing to 23 out of the total 26 (88.46%) FD in other categories. This shows that the FD in G were either tubular vision, arcuate, double arcuate, or various scotomas, which were significantly higher than other FD seen in other ON.

DISCUSSION

In our study, total participants were divided into 7 groups with an age interval of 10 years. Researchers have concluded in past that , "when we considered systemic diseases like hypertension, DM, and ON, it was noted that individual hypertension is associated with 11 cases (16.9%), DM in 4 cases (6.2%), and combined hypertension and diabetes in 6 cases (9.2%)". "Both the patients of Non Arteritic AION had history of Hypertension and in studies like Tsai et al(1998)[2] McCulley et al(2005)[3] have shown that hypertension is one of the risk factors for developing NAION in patients with the age above 50 years". In the research conducted by us, a total of 14 patients were identified as having addiction, accounting for 21.54% of the sample population. All instances of toxic optic neuropathy were observed in individuals with a history of addiction to tobacco and alcohol, lasting for a duration of 15 to 20 years or more. "The relationship between tobacco and alcohol addiction and the development of optic neuropathies, specifically toxic and nutritional optic neuropathies, has been explored in studies such as Behbehani R et al. (2007)[4] and Foulds WS et al. (1974)".[5]

T"he most common VFD in our study was AV or DAV seen in 13 patients (33.33%), followed by various scotomas seen in 12 patients (30.77%) and tubular vision in 10 patients (25.64%)". Similar things have been shown in "Kedar et al. (2011)[6] arcuate scotoma is caused by lesions to the retinal nerve fibers or to the ganglion cells in superior or inferior arcuate nerve fiber bundles. G is the most frequent cause of an arcuate scotoma". In our study, "8 GP had hypertension (22.22%), 5 had both DM and hypertension (13.9%), and 3 had only DM (8.3%)". While some studies, like "P. Mitchell et al. (1996)[7], L. Bonomi et al. (2000)[8], and N. Orzalesi et al. (2007)[9], reported that systemic hypertension is a risk factor for GP".

Limitation of the study

1. Our study was a short durstion type of study.
2. During our study period , we didnt get case of neuromyelitis optica & multiple sclerosis .
3. Sample size was small.
4. VEP test was not done to all patients.

CONCLUSION

Among the various ON, it is imperative to acknowledge that G stands as the most prevalent and avoidable cause of V impairment leading to blindness. Therefore, it is of utmost importance to prioritize the implementation of comprehensive G screening initiatives and awareness campaigns, which should be conducted in conjunction with the evaluation of cataract conditions. Due to our hospital's strategic proximity to the National Highway, a significant majority of the cases involving TON can be attributed to the unfortunate occurrence of road traffic accident. G, a prevalent catalyst for visual impairment, regrettably eludes early detection. As one ages, the susceptibility to G escalates, with hypertension serving as one of the contributing risk factors. Consequently, it is imperative that individuals surpassing the age of 40 undergo routine assessments to evaluate the presence of G through careful observation of optic disc alterations and intraocular pressure. If deemed necessary, it is imperative to conduct perimetry in order to facilitate a more comprehensive assessment.

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