Clinical Study of Optic Neuropathies

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Abstract

Introduction: Optic neuropathy is a frequent cause of vision loss encountered by ophthalmologist. The diagnosis is made on clinical grounds. The history often points to the possible etiology of the optic neuropathy. A rapid onset is typical of demyelinating, inflammatory, ischemic and traumatic causes. A gradual course points to compressive, toxic/nutritional and hereditary causes. The classic clinical signs of optic neuropathy are visual field defect, dyschromatopsia, and abnormal papillary response. Study objectives were to study etiological factors causing optic neuropathies.

Materials and Method: This analytical study was performed in Krishna Medical College Hospital, Karad for a period of months. The initial examination was started with anterior segment examination on slit lamp and fundus examination with direct ophthalmoscope. The material for the present study consists of 65 optic neuropathy patients during the 18 months period from November 2017 to May 2019.

Results: During this study, in Krishna Hospital karad we noticed that glaucomatous optic neuropathy is the most common type of optic neuropathy and traumatic optic neuropathy is the second most type.

Conclusion: Glaucoma being frequent cause of vision loss , is unfortunately not diagnosed at early stage and as age advances the risk of glaucoma increases also hypertension is one of the risk factors, so routinely every patient >40 years of age is to be assessed for glaucoma by noting optic disc changes and intra ocular pressure. If necessary Dynamic Perimetry is to be done for further evaluation.

***Keyword**: Optic neuropathy, Dyschromatopsia, Glaucoma, Glaucomatous optic neuropathy, Traumatic optic neuropathy, Dynamic perimetry.*

Introduction

Optic neuropathy is one of the common causes vision loss encountered by the ophthalmologist. The diagnosis is mainly on clinical grounds. The history often points to the possible etiology of the optic neuropathy. Optic nerve damage from any cause is called as **Optic neuropathy**. Damage or death of the nerve fibres, Leads to the characteristic features of optic neuropathy. Posterior or Retrobulbar optic neuropathies are associated acutely with a normal optic disc appearance. Anterior optic neuropathies are those with the swelling of optic nerve head. In almost all cases, at the end of 4 to 6 weeks after the onset of damage or visual loss, optic disc becomes pale, even when vision recovers and is referred as 'Optic atrophy'.

A rapid onset is typical seen in demyelinating, inflammatory, ischemic and traumatic causes. A gradual course of disease is suggestive of compressive, toxic/nutritional and hereditary causes. The classic clinical signs of optic neuropathy are decreased vision , dyschromatopsia, abnormal pupillary Response and visual field defect.

There are ancillary investigations that can support the of optic neuropathy diagnosis. Visual field testing by either manual kinetic or automated static perimetry is very important in the diagnosis. In optic neuropathies like demyelinating and compressive type, it is essential

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to do neuro-imaging of the brain and orbit.

Materials and Method

A cross sectional case study on the optic neuropathies and a study on the recent classification of Optic neuropathies depending on the etiological factors was conducted in the department of Ophthalmology, Krishna hospital, Karad.

Source of data- All eligible optic neuropathies patients according to inclusion criteria, presented to the OPD at Krishna Hospital during November 2017 to May 2019 were included in the study.

Sample size : 65 cases

Inclusion criteria:

All cases of optic neuropathies

Exclusion criteria:

- Paediatric cases
- Unconscious patients
- Optic neuropathies in mentally retarded patients

Ocular examination included

- Anterior segment examination: Slit lamp biomicroscopy.
- Pupillary reaction : RAPD.
- Posterior segment examination: Direct ophthalmoscope.

Indirect ophthalmoscope.

- Perimetry.

Results

There were 46 males (70.77%) and 19 females (29.23%) out of 65 participants in our study. The most common age group in our study was 61-70 years with 19 patients (29.235%), followed by 51-60 years 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%).

Majority of the patients, 44 out of total 65 (67.69%) did not have any systemic disease. 11 patients (16.92%) had hypertension, 6 patients (9.23%) had both diabetes and hypertension while rest 4 patients (6.15%) had only diabetes.

Table 1 : Etiological classification of Optic neuropathies

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%
Non-arteritic ischemic optic neuropathy(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%

Majority of the patients, 36 out of 65 (55.38%) were having glaucomatous optic neuropathy.

Co-Relation of Optic Neuropathy and Visual Field Defects

1) Glaucoma

Table 2: Visual field defect types in glaucoma

Type of visual field defect	Number of eyes (out of 39 eyes)	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%

The most common visual field defect was arcuate / double arcuate vision seen in 14 patients (35.90%), followed by various scotomas seen in 12 patients (30.77%), tubular vision in 10 patients (25.64%).

2) TOXIC/ NUTRITIONAL OPTIC NEUROPATHY

Out of total 7 eyes with visual field defects in Toxic/ nutritional optic neuropathy, 5 were Centrocecal (71.43%), one eye each had Arcuate/Double Arcuate defect and various scotoma.

3) RETINITIS PIGMENTOSA

Out of 8 patients having Retinitis pigmentosa, 6 had peripheral constriction

4) POST PAPILLOEDEMA OPTIC ATROPHY

All 3 eyes out of 4 (75%) of post papilloedema optic atrophy have visual field defect of type 'Enlargement of Blind spot'.

5) OPTIC NEURITIS

3 out of 4 eyes (75%) with optic neuritis had field defects. Each eye showed visual field defect Arcuate/ double arcuate scotoma, centro cecal and various scotoma.

6) DIABETIC PAPILLOPATHY

Both eyes of diabetic papillopathy had field defects of type 'Peripheral constriction'

7) COMPRESSIVE OPTIC NEUROPATHY

Two eyes each had bi-temporal visual field defect and pie on floor defect in compressive optic neuropathy

8) NON ARTERITIC ISCHEMIC OPTIC NEUROPATHY (NAION)

Two eyes with Non-arteritic ischemic optic neuropathy (NAION) have field defect of type 'Altitudinal defect'.

Table 3: Different types field defects seen in optic neuropathies

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

Total 68 eyes in our study had visual field defects. 39 of them had glaucoma & rest 29 eyes were other neuropathies.

Table 4: Association between the various field defects seen in glaucoma and other optic neuropathies

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

$X^2 = 36.13$, **$p < 0.0001$** – highly significant

Highly significant association was seen between the type of field defects in glaucoma and other diseases ($p < 0.0001$), where 36 out of total 42 field defects (85.71%) seen in glaucoma were either Tubular vision / Arcuate/ Double arcuate / various scotomas as compared to the majority of the other optic neuropathies contributing to 23 out of total 26 (88.46%) field defects in other categories. This shows that the field defects in glaucoma were either Tubular vision / Arcuate/ Double arcuate / various scotomas which were significantly higher than other field defects seen in other optic neuropthies.

Discussion

The present cross-sectional study was conducted on total 65 patients with optic neuropathies. The data was collected from patients regarding demographic profile, detailed history, detailed ophthalmologic examination and relevant investigations like G1 Dyanamic Octopus perimetry in all the patients with good fixation.

The analysis of study data obtained showed that out of 65, 46 were males (70.77%) and 19 were females (29.23%). Most common age group in our study was 61-70 years with 19 patients with a range of 26-82 years.

When we considered systemic diseases like Hyperension, Diabetes and optic neuropathies, it was noted that individual Hypertension is associated in 11 cases(16.9%), Diabetes 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)[1]; McCulley et al(2005)[2]** have shown that hypertension is one of the risk factors for developing NAION in patients with the age above 50 years.

Majority of the patients, 59 out of total 65 (90.77%) had RAPD in any of the eyes which is suggestive of unilateral or asymmetrical optic neuropathy. Rest 6 cases were of almost symmetrical optic neuropathy or bilateral optic atrophy cases.Majority of the patients, 36 out of 65 (55.38%) were having glaucomatous optic neuropathy which is found to be the most common type.

In our study all cases of toxic optic neuropathy had addiction history of tobacco and alcohol of more that 15 to 20 years of duration. In studies like **Behbehani R et al(2007)[3]** and **Foulds WS et al(1974)[4]** it has been discussed that addiction of tobacco and alcohol is major risk factor for developing Optic neuropathies especially Toxic/ Nutritional optic neuropathies.

In our study ,8 patients with glaucoma had hypertension (22.22%), 5 had both diabetes & hypertension (13.90%) and 3 had only diabetes (8.3%) .While some studies like **P. Mitchell et al(1996)[5], L. Bonomi et al(2000)[6], N. Orzalesi et al(2007)[7]** reported that systemic hypertension is a risk factor for glaucoma.

In Glaucoma patients ,when the comparision of vision and cup disc ratio was done separately in right eye and left eye , it was found significant association between the vision & CDR of RE ($p < 0.001$) in glaucoma patients as well as there was significant association between the vision & CDR of LE ($p < 0.001$) in glaucoma patients.

Out of 130 eyes of 65 cases , in 93 eyes perimetry was done and in rest 37 eyes perimetry was not done because of low vision and loss of fixation. Total 81 eyes showed visual field defect out of 93 eyes.

Visual field defect types in glaucoma: The most common visual field defect was arcuate / double arcuate vision seen in 13 patients (33.33%), followed by various scotomas seen in 12 patients (30.77%), tubular vision in 10 patients (25.64%). Similar things has been showed in **Kedar et al(2011)[8],** that Arcuate scotoma is caused by lesions to the retinal nerve fibres or to the ganglion cells in superior or inferior arcuate nerve fibre bundles. Glaucoma is the most frequent cause of an arcuate scotoma .

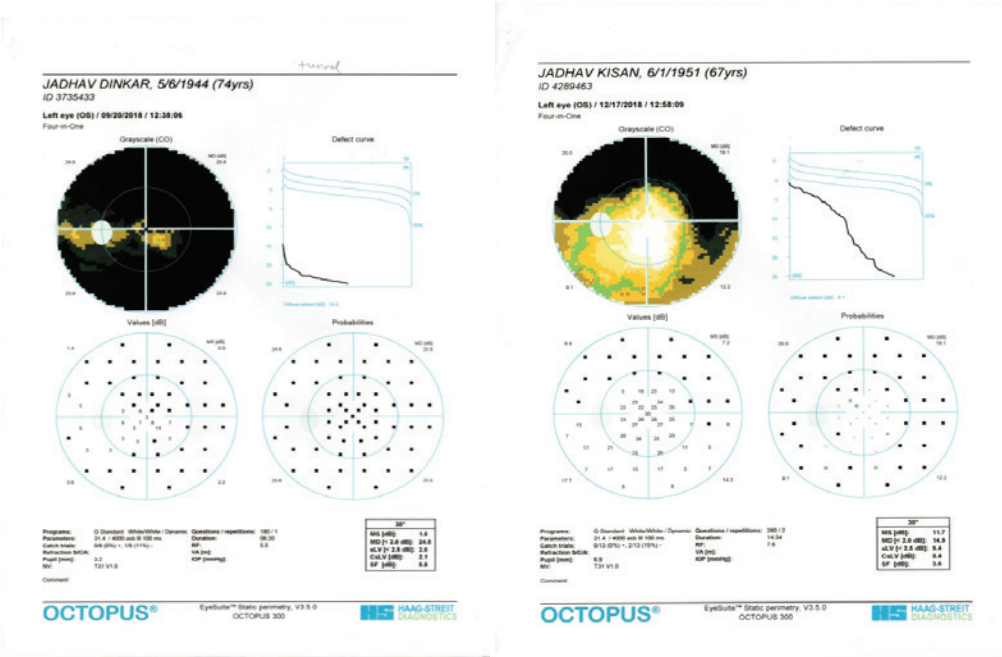

Figure 1: Tubular vision(on left) and Arcuate (on right) field defects in Glaucoma patient.

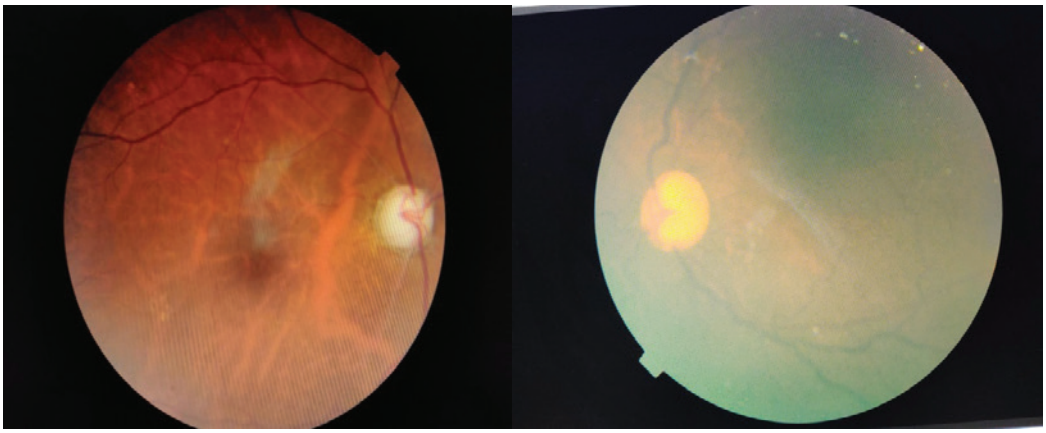

Figure 2: This figure showing both eyes Glaucomatous optic neuropathy

Out of total 7 field defects in Toxic/ nutritional optic neuropathy, 5 were Centrocecal (71.43%), one eye each had Arcuate/Double Arcuate defect and various scotoma. Central, cecocentral visual field defects in Toxic/ nutritional optic neuropathy were also seen by **Behbehani R et al(2007)[3]** in their study. In **Forsek I et al(2016)[4]** showed that Cecocentral scotomas are frequently associated with nutritional/ toxic optic neuropathies and commonly present bilaterally.

3 out of 4 eyes (75%) with optic neuritis had field defects. Each eye showed visual field defect Arcuate/ double arcuate scotoma, centro cecal and various scotoma.

In study **Behbehani R et al(2007)[3]** it has been discussed that usually a central scotoma is brought on by a lesion in the papillomacular bundle or fovea and lesions responsible for this type of defect are Leber's hereditary mitochondrial optic neuropathy (LHON), toxic-nutritional optic neuropathies, vascular lesions, multiple sclerosis, glaucoma, and optic neuritis.

In compressive optic neuropathy , we found 2 eyes of pituitary macroadenoma had bi temporal visual field defect and in case of craniopharyngeoma (two eyes) there was Pie on the floor type of field defect. In study **T J Walsh et al(1985)** , it has been discussed that hemianopic defects can arise from a variety of causes, some of which are; lesions to the optic tract, tumors, trauma and lesions at the visual cortex in the occipital lobe. **T J Walsh et al(1985)** and **Behbehani R et al(2007)[3]** observed arcuate and hemianopic type of field

defects in patients of compressive optic neuropathy.

Out of 8 patients having retinitis pigmentosa, 6 had peripheral constriction (75%) and 2 patients had tunnel vision (25%). All 3 eyes out of 4 (75%) of post papilloedema optic atrophy have field defect of type Enlargement of Blind spot'.

Behbehani R et al(2007)[3] also explained that the hemianopic field defect which respect the vertical midline indicate the lesion at or posterior to chiasma and a junctional scotoma, known as the ipsilateral nasal half field defect and the contralateral temporal half field defect is suggestive of lesion compressing at the junction of optic nerve and chiasm.

In our study, highly significant association was seen between the type of field defects in glaucoma and other diseases ($p < 0.0001$), where 35 out of total 41 field defects (85.37%) seen in glaucoma were either Tubular vision / Arcuate/ Double arcuate / various scotomas as compared to the majority of the other optic neuropathies contributing to the 23 out of total 27 (85.19%) field defects in other categories.

This shows that the field defects in glaucoma were either Tubular vision / Arcuate/ Double arcuate / various scotomas which were significantly higher than other field defects seen in other optic neuropathies.

Conclusion

In a clinical practice setting, it is not easy to find out the cause of optic neuropathy. In a variety of clinical conditions have visual loss which is accompanied by the color desaturation and RAPD is often present. In the last decade the spectrum of the optic neuropathies has expanded enormously. As we now know that optic neuropathies could be the initial presentation of a number of closely related diseases which require the early and accurate diagnosis for the treatment to be successful. A good detailed clinical history and examination supported by a judicial choice of investigations and knowledge of the different clinical conditions that result in the optic neuropathy allow us for a quick diagnosis as well as early intervention.

Among Optic neuropathies ,Glaucoma being most common and preventable cause of blindness the Glaucoma screening and awareness programmes to be conducted along with cataract evaluation.

Our hospital being situated near National highway, all most all Traumatic optic neuropathies were because of Road traffic accidents.

Glaucoma being frequent cause of vision loss , is unfortunately not diagnosed at early stage and as age advances the risk of glaucoma increases also hypertension is one of the risk factors, so routinely every patient >40 years of age is to be assessed for glaucoma by noting optic disc changes and intra ocular pressure. If necessary Perimetry is to be done for further evaluation.

Ethical Approval: All procedures performed on human participants were in agreement with ethical standards of the Institutional and/or National Ethics Committee.

Source of Funding : In this project , the cost of investigations of the studyparticipants was born by the institute research fundings**.**

Conflict of Interest : None

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