

Study of Clinical Profile of Optic Neuritis Patients in Hilly Region of North India

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ABSTRACT

Background: Optic neuritis (ON) is an acute inflammatory disorder of the optic nerve. **Objective:** To study the epidemiology and clinical course of the optic neuritis in our tertiary care centre and To study the outcome of patients of optic neuritis. **Methods:** The present study was prospective, interventional study conducted in the Department of Ophthalmology, Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun. Study was conducted on patients age < 15 years diagnosed with optic neuritis and the study was conducted for a period of for the period of 1 year and 6 months. **Result:** The study included total number of 25 eyes of 16 patients diagnosed with optic neuritis. The mean age of the patients ranged from 21-30 years (mean=33.0 ±11.8 years). There were 11 female patients (68.8%). Bilateral involvement was seen in 56.3 % of cases. The time of presentation was <1 week in 64% of cases. 48 % (12) eyes presented with BCVA <1/60 at presentation .Out of 25 eyes 60% eyes showed improvement in BCVA 4 weeks post treatment. RAPD was present in 100% of patients at presentation. Color vision was found defective in 24% of the eyes. Disc edema was seen in 40% of the eyes. Temporal pallor was found in 12% of the eyes. GHT was found outside normal limits (ONL) in 9% of the eyes. Mean MD was found -6.91±3.96 SD and mean PSD was found 6.21±3.94 SD. VEP was found prolonged in 100% of the eyes (mean=145.12±18.96). **Conclusion:** The majority of the cases in our study were young females presenting with typical optic neuritis and good visual prognosis but systemic work up for diseases like MS, Transverse myelitis, TB must be considered as these are the cases which reoccur and affect visual prognosis.

Keywords: Clinical Profile, Optic Neuritis, Color vision

INTRODUCTION:

Optic neuritis (ON) is characterized by unilateral or bilateral sudden loss of vision, often accompanied by peri-ocular pain. The majority of cases are idiopathic in origin. However, de-myelination, specifically multiple sclerosis (MS), is reported to be the most common aetiology in the Western literature [1,2]. Broadly, optic neuritis can be classified into the following categories depending upon aetiology and course: Idiopathic/ Clinically isolated, ON associated with MS, Infective or ON secondary to an autoimmune disorder, Autoimmune ON, Recurrent idiopathic ON, Neuroretinitis.

The earliest references to optic nerve dysfunction as a mechanism for vision loss are found in Arabic texts of ophthalmology written in the ninth century. In what is believed by some to be the first major textbook of ophthalmology, Hunain Ibn Is-Haq described three different forms of paralysis of the eye: those involving perception alone, those involving eye motion alone, and those involving both [3]. In one of the earliest English language textbooks of ophthalmology, published in 1823, George Frick wrote that without the advantage of the ophthalmoscope, it was impossible to distinguish uveitis, migraine, retinal detachment, optic nerve and orbital apex disorders [4]. With the widespread use of the ophthalmoscope in the second

half of the nineteenth century, the various diseases affecting the optic nerve and retina became distinguishable. Optic neuritis was first described with some uniformity by von Graefe in 1860 [5] and by Nettleship in 1884 [6].

Most cases of acute demyelinating optic neuritis occur in women (two-thirds) and typically develop in patients between the ages of 20 and 40 [7]. In India and other Asian countries the incidence of MS is reported to be low. Optic neuritis is the most commonly unilateral and tends to affect females more than males [8].

Optic nerve forms a channel to carry visual information to the primary visual nuclei, most of which is relayed to the occipital cortex of the brain where it is processed into vision. Inflammation of the optic nerve causes loss of vision usually due to the swelling and destruction of the myelin sheath covering the optic nerve. Direct axonal damage may also play a role in nerve loss in many cases [9].

Clinically, patient's presents with sudden loss of vision with an afferent pupillary defect in the involved eye, pain on movement of affected eye, and impairment of visual functions such as colour vision, contrast sensitivity and visual fields [7].

The aetiology can be divided into demyelinating, infectious, para-infectious, and non-infective inflammatory disorders [8]. The most common cause of optic neuritis worldwide is demyelinating disease, and in countries where multiple sclerosis is common, this accounts for the majority of cases [10].

In a young child, infectious and post infectious causes of optic nerve impairment should be considered as alternatives to optic neuritis, while in an older patient (>50 years), ischemic optic neuropathy (due, for example, to diabetes mellitus or giant cell arteritis) is a more likely diagnosis than optic neuritis. Alternative diagnoses should also be considered in patients with a bilateral presentation or those with other neurologic or systemic symptoms.

The present study was thus planned to study the clinical course and outcome of the patients of optic neuritis coming to a tertiary care hospital of India.

Material and Methods: This Prospective interventional time based study was conducted in the Department of Ophthalmology, Shri Guru Ram Rai Institute Of Medical and Health Sciences associated Shri Mahant Indresh Hospital, Patel nagar, Dehradun over a duration of one and a half years from 2016 to 2019 in patients of age ≥ 15 years diagnosed with optic neuritis presenting in eye OPD,

Sample Size: Total of 16 patients diagnosed with acute optic neuritis were selected to participate in this study. Each patient was followed up for a period of at least 6 months.

Inclusion Criteria

We included the patients in our study fulfilling the following criteria:

- Aged ≥ 15 years of either sex.
- Patients diagnosed with optic neuritis.
- Patient giving consent for the study.

The diagnosis of ON was based on clinical findings, including the presence of decreased visual acuity, painful eye movements, colour vision loss, relative afferent pupillary defect, and fundus examination.

Exclusion Criteria

We excluded all patients who had any of the following features:

- Patients < 15 years of age.
- Patients who were unable to cooperate.
- Patients who had other causes of vision loss in the clinically affected eye (including amblyopia, any retinal pathology or glaucoma,).
- Patients who had contraindications for systemic steroid use like Diabetes Mellitus, Severe Hypertension, Miliary Tuberculosis and other systemic infections, etc.
- Optic nerve involvement in uveitic disease.
- Traumatic optic neuropathy.

TREATMENT

Each patient was evaluated at presentation and treated with i.v methylprednisolone sodium succinate (MPSS) 1000 mg OD in 500 ml of 5% dextrose for three days followed by 11 days of oral prednisolone 1 mg/kg body weight and the dose was tapered over 2 weeks according to the recommendations of the Optic Neuritis Treatment Trial (ONTT) and outcome on the basis of best corrected visual acuity, papillary reactions, fundus examination will be seen after two weeks,

EXAMINATION AND PROCEDURES

Written informed consent was taken from all participants in the study.

After relevant history was taken, each patient underwent a comprehensive systemic and ophthalmological examination including Complete general physical examination, Visual Acuity (best corrected) using Snellen's chart, Evaluation for Relative Afferent Pupillary Defect (RAPD), Fundus examination (using +78 D lens on slit lamp), Colour vision testing using Ishihara pseudo isochromatic colour plates, Intra ocular pressure measurement using Non Contact Tonometer., Visual Field analysis using Humphrey field analyser (Swedish Interactive Threshold Algorithm SITA central 30-2 program), Pattern VEP, RNFL thickness by SD-OCT (Optical Coherence Tomography RS-3000 Advance a product of NIDEK CO., LTD. gamagori, aichi 443-0038, JAPAN), MRI brain and orbit enhanced with gadolinium contrast if possible and Systemic investigations (blood sugar testing, serum electrolytes, complete blood counts, CRP, ANA, ANCA, Serum

ACE, Montoux test, Serum Anti NMO IgGAb chest X-ray).Neurology opinion was taken.

Patients were evaluated and followed up for a period of at least 6 months. Evaluation was done at presentation, after 2 weeks post treatment, after 1 month, 3 months and 6 months post treatment.

- BCVA, RAPD evaluation, IOP, fundus examination after 2 weeks..
- OCT RNFL thickness at presentation, 1 month, 3 months and 6 months.
- MRI (Gadolinium contrast enhanced) and systemic investigations at presentation.

PROCEDURES

1. Visual Acuity: Taken as best corrected visual acuity on retro- illuminated Snellen's chart, from a distance of 6 metres. Snellen's visual acuity was then converted to get decimal acuity and visual acuity in logMAR for the ease of statistical analysis.

2. Relative Afferent Pupillary Defect (RAPD): Pupillary reactions of all subjects were assessed and presence of RAPD noted.

3. Fundus examination (+78 D lens): Thorough fundus examination was done and changes in the optic disc or peripheral retina were noted.

4. Colour Vision: Colour vision was tested using series of Ishihara pseudo isochromatic colour plates. It was tested in a room adequately lit by natural daylight. We used the first 17 number plates of Ishihara series and the number of plates that were read correctly on monocular examination was recorded.

5. Intraocular pressure: IOP measurement was don using Non Contact Tonometer NT 530P NIDEK Model IT-2000..

6. Visual Field (VF): The visual field charting of each patient was done using Humphrey automated perimeter. The program used was SITA-STANDARD central 30-2.

7. Pattern Visual Evoked Potential (VEP): Pattern VEP was performed on the guidelines of International Society for Clinical Electrophysiology of Vision (ISCEV) standards. Pattern VEP was performed in a

quite dark room. The patient was seated at a distance of 1 meter from the monitor (17 inch screen) with no pupillary dilatation. Surface disc silver chloride electrodes were used. The ground electrode was placed at the forehead in the midline. The reference electrode was placed at the vertex. A reversing checkboard pattern with a check size of 16 at a frequency of 1 Hz was used. Procedure was performed monocularly.

8. Optical Coherence Tomography (OCT): RNFL thickness was measured using SD-OCT(Optical Coherence Tomography RS-3000 Advance a product of NIDEK CO., LTD. gamagori, aichi 443-0038, JAPAN)

Retinal Nerve Fibre Layer (RNFL) Thickness using RNFL 3.45 scanning protocol. The RNFL scan pattern completes four circular scans in 0.16 seconds at a diameter of 3.45 mm, targeted around the optic nerve head. These scans are averaged and the result is presented within the normative range parameters.

9. MRI brain and orbit: MRI brain and orbit enhanced with gadolinium contrast was done in each patient at presentation.

10.. Systemic investigations: Blood sugar testing, serum electrolytes, complete blood counts, CRP,ANA,ANCA, Serum ACE, Montoux test, Serum Anti NMO IgGAb chest X-ray were done to rule out any systemic illness.

11. Neurologists opinion was taken.

Statistical Analysis

The data was analyzed using Statistical Package for the Social Sciences (SPSS) [version 17.0; SPSS Inc., Chicago, IL,USA]. Pretreatment, post-treatment and follow-up parameters for affected eyes were compared using the Paired't' test, or non-parametric Wilcoxon signed- rank test (in case distribution was not normal). Parameters between affected eyes of the patients were compared using unpaired 't' test, or non- parametric Mann Whitney test (in case distribution was not normal). For qualitative data Chi-square test/ Fisher's exact test was used. P value <0.05 was considered as statistically significant.

RESULTS

A total number of 16 patients with 25 eyes diagnosed with optic neuritis were included in the study over a period of one and a half years. Periodic evaluation of cases was undertaken over 6 months.

Table 1. Age distribution of study subjects

Age group (yrs)	N	%
<= 20	2	12.5%
21-30	7	43.8%
31-40	4	25.0%
41-50	2	12.5%
>50	1	6.3%
Total	16	100.0%
Mean age - 33.0 +/- 11.8 years		

Mean age of the patients was- 33.0 ± 11.8 years. The maximum number of patients were seen in age group (21-30 years). Out of the 16 patients, 5 patients were Male (31.3%) while 11 patients were Females (68.8%).

Table 2. Distribution of cases as per eye involved

Eye Involved	N*	%
Left Eye	4	25.0%
Right Eye	3	18.8%
Both Eyes	9	56.3%
Total	16	100.0%

*total eyes - 25

There was more bilateral involvement (56.3%) among cases than unilateral involvement i.e.(25%) left eye and (18%) right eye.

Table 3. Distribution as per time of presentation

Time of Presentation	N	%
<1 week	16	64.0%
1-2 week	7	28.0%
2-4 weeks	0	0.0%
>4 weeks	2	8.0%
Total	25	100.0%

Out of the 25 eyes, the time of presentation was <1 week in (64%) while no one presented in 2-4 weeks.

Table 4. Distribution as per visual acuity at presentation and 2 weeks post-treatment

Visual Acuity (Snellen's)	At Presentation		2 weeks post treatment	
	N	%	N	%
6/6 to 6/12	3	12.0%	15	60.0%
6/18-6/36	7	28.0%	5	20.0%
6/60 - 1/60	3	12.0%	2	8.0%
< 1/60	12	48.0%	3	12.0%
Total	25	100.0%	25	100.0%
p<0.05				

48% eyes presented with BCVA <1/60 at presentation done by using Snellen's visual acuity chart. Also out of 25 eyes 60% eyes showed improvement in BCVA 2 weeks post treatment with a p<0.05 which was statistically significant.

Table 5. Visual acuity at presentation and 2 weeks post-treatment in terms of mean LogMar values

Variables	Group	N	Mean	SD	p- value
Visual Acuity (LogMar)	At Presentation	25	1.64	1.01	<0.05
	2 weeks	25	0.52	0.85	

Best corrected visual acuity (BCVA) at presentation and 2 weeks after treatment in terms of logMar values.

The mean BCVA at presentation was 1.64 ± 1.01 SD and after 2 weeks was 0.52 ± 0.85 SD with a p-value of <0.05.

Table 6. Distribution as per RAPD at presentation and 2 weeks post-treatment

RAPD	At Presentation		At 2 weeks	
	N	%	N	%
Present	25	100.0%	3	12.0%
Total	25	100.0%	3	12.0%
p<0.05				

This table shows that at presentation RAPD was present in 100% of patients and in 12%, 2 weeks after treatment.

Table 7. Distribution as per presence of colour vision defect

Colour Vision	N	%
Defective	6	24.0%
Not Possible	12	48.0%
WNL	7	28.0%
Total	25	100.0%

There was defective colour vision in 24% of the eyes and not possible in 48% of the eyes and was found normal in 28% of the eyes.

It was found that the mean IOP at presentation was 14.76 ± 1.69 SD and after treatment it was found to be 15.28 ± 1.21 SD with a p-value of 0.22.

Table 8. Distribution as per fundus examination findings at presentation and 2 weeks post-treatment

Fundus Examination	At Presentation		At 2 weeks	
	N	%	N	%
Disc Oedema	10	40.0%	0	0.0%
Temporal Pallor	3	12.0%	4	16.0%
WNL	12	48.0%	21	84.0%
Total	25	100.0%	25	100.0%
p<0.05				

On fundus examination disc oedema was seen in 40% of the eyes. Temporal pallor was found in 12% of the eyes and normal fundus was seen in 48% of the eyes with a p-value of <0.05.

Table 9. Distribution as per perimetry findings

Glaucoma Hemifield test	N	%
Not Possible	16	64.0%
ONL	9	36.0%
Total	25	100.0%

Variable	N	Mean	SD
MD	9	-6.91	3.96
PSD	9	6.21	3.94

GHT was found outside normal limits (ONL) in 9% of the eyes. Mean MD was found -6.91 ± 3.96 SD and mean PSD was found 6.21 ± 3.94 SD

DISCUSSION

Optic neuritis is an acute inflammatory disorder of the optic nerve. The disease is characterized by unilateral sudden loss of vision in the affected eye, often accompanied by periocular pain. Majority of cases are idiopathic in nature however demyelination specifically multiple sclerosis is reported to be most common association in western literature. The other causes include viral infections, granulomatous infections such as tuberculosis, syphilis, lyme disease or cryptococcal meningitis. Since then many research has been conducted to understand the disease and its association with MS. Even as the western data [11] suggest that at least 50% of patients with optic neuritis will eventually develop MS. The studies from the Asia [12] and Africa [13] provide the contrary report. The main basis of this contradiction is probably that the clinical and the demographic profile of optic neuritis patients from this part of world is not same as that in western population. The prognosis of optic

neuritis in general is good. It is considered that prognosis of retrobulbar neuritis is better than papillitis, unilateral better than bilateral and also depends upon the severity of the disease at the time of presentation. The aim of our study was to find the epidemiological profile and systemic associations of patients diagnosed with optic neuritis in our setup.

In the present study, majority of patients were in third decade of life (21-30 years). This was in accordance to the study done by Saxena et al. [14] where out of 68 patients, 47 were in the age group of 21-40 years. Female preponderance, reported by optic neuritis infinity trial and various other studies was also seen in our study but study done by Jain IS et al. [12] reported male dominance. The study reported maximum patients with bilateral optic neuritis (56%) and rest had unilateral involvement. This was in accordance to study done by Eava Nikoskelainen [15] where initial involvement was 30% bilaterally. However Bradley and Whitty [16] reported, only 7% of the eyes were

involved bilaterally. The onset of disease was sudden and majority patient (64%) reported within 7 days in our study. This was in accordance to the study done by Wang et.al. [17] where 47% reported with few hours of presentation of symptoms. In most eyes the initial visual acuity was very poor; in 12 (48%) eyes, visual acuity was reduced to $<1/60$ followed by 7 eyes (28%) with 6/18-6/36 vision. Visual acuity was good (6/12 or better) only in 3 (13.2 %) eyes. Many patients came in recovery phase. Visual acuity improved to 6/12 or better in 60% eyes after 2 weeks of post treatment. These results were in accordance to the study done by Rohit et al. [18] where at the time of presentation, majority patients had only perception of light and after treatment 47% had improvement in vision (6/12).

Rapid afferent pupillary defect was seen in all the patients at the time of presentation but after two weeks of treatment only 12% patients had the defect. A study published in New England Journal [19] reported that, in unilateral ON, a relative afferent pupillary defect (RAPD) is found. In bilateral and symmetric cases or in cases with a preexisting optic neuropathy (eg. before ON—which may be subclinical) in the fellow eye, an RAPD may not be apparent. Color vision was checked using Ishihara charts. It was defective in only 24% patients and inconclusive in 48% patients. With respect to this, previous studies [19] have reported defective color vision in cases with central scotoma or with very poor vision but in cases with good initial visual acuity, there was no defect in the colour vision. Mean log MAR VA at presentation was 1.64 ± 0.01 . At the final follow-up, mean logMAR VA was 0.52 ± 0.85 . These results were in accordance to study done by Beck et.al. [20] where mean Log Mar VA was 1.6 at the presentation and 0.47 at the follow up.

Mean IOP at the time of presentation was around 14.7mm Hg and after two weeks' treatment it came around 15 mm Hg. However, study done to compare IOP in healthy subjects versus optic neuritis patients reported raised IOP (19.6mm Hg). Fundus examination at the time of presentation reported 40% disc oedema. Only 12% patients showed temporal pallor at presentation. After two weeks of treatment, 16% patients had disc pallor. These results were comparable to Jain et al. [21] where in (29.4%) patients, the appearance of the optic disc was normal, (56%) eyes showed blurring of the disc margins with or without oedema of the disc. One month later, out of the 61 eyes examined, (82%) showed pallor of the optic disc. Glaucoma hemifield test was used to detect any visual field defect in patients. According to optic neuritis treatment trial, abnormal visual field defect was defined when GHT was outside the normal range. Our study reported 36% patients with ONL. These visual field defects were also evaluated for mean deviation and mean pattern standard deviation in our study. Mean deviation reflects the overall depression (deviation from normal values) of the field. Normally it should not be less than -2dB. If the MD is

significantly outside the normal, then a P value is assigned to it. The pattern standard deviation (PSD) reflects the degree of departure (difference) of the measured VF pattern (shape) from the normal hill of vision. A small PSD reflects a smooth uniform hill of vision, while a large PSD value reflects an irregular hill of vision. In our study both MD and PSD were outside the normal limits in 36%, not possible in 64% because of poor vision at presentation. Similar results were reported by large clinical trial done on optic neuritis patients where 66 % had abnormal visual field defect [22].

CONCLUSION

The fact that majority of the cases in our study presented with simultaneous involvement of the both eyes and studies suggest multiple sclerosis is associated more commonly with bilateral disease but due to small sample size and short follow up duration we cannot conclude it to be common cause of optic neuritis in India. The other cases like metabolic, nutritional, toxic or infection should be looked for. Proper ophthalmic examination should be done in patients who have history of anti-tuberculosis treatment. The role of steroids therapy in typical cases of optic neuritis is controversial, there are workers for and against therapy. Since multiple sclerosis is not the common aetiology in India, we feel that steroids have a definite role to play in reducing the inflammation and shortening the course of the disease and improving the final results in our cases. Further long duration study with large sample size should be conducted to further evaluate the etiological factors and pattern of optic neuritis.

DECLARATIONS

Ethics Approval and Consent to Participate

The study was conducted after obtaining written informed consent from all participants. The study procedures were carried out in accordance with the applicable institutional ethical standards.

Consent for Publication

Written informed consent was obtained from the participants for publication of the study findings.

Availability of Data and Materials

The data generated and analyzed during the present study are available from the corresponding author upon reasonable request.

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

All authors contributed to the conception, conduct, analysis, interpretation, and preparation of the manuscript. All authors reviewed and approved the final version of the manuscript.

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AI Use Disclosure

The authors declare that no generative artificial intelligence tools were used to generate or substantially modify the scientific content of this manuscript.

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