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ORIGINAL RESEARCH ARTICLE

OVERVIEW OF OPTIC NEURITIS AND VISUAL OUTCOME IN A TERTIARY CARE HOSPITAL OF CENTRAL NEPAL

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ABSTRACT

Background: Optic neuritis is a visually debilitating and usually painful condition of the eye. As per the Optic neuritis treatment trial (ONTT) intravenous methylprednisolone has shown to accelerate recovery in Optic neuritis and has also been proven to somewhat decrease recurrence. This study was aimed to provide demographics of patients, clinical findings and features, investigative findings in cases of optic neuritis and the outcome of treatment for future references.

Methods: This prospective observational study was carried out in Chitwan Medical College, Department of Ophthalmology from 16 August 2021 to 15 October, 2021. Newly diagnosed cases of Optic neuritis were included in the study for treatment with intravenous methylprednisolone and oral steroids. SPSS version 26 was used to analyze the data entered in a specified proforma.

Results: Fourteen 63.6% of the study participants were females. Mean age of presentation of the study subjects was 51.45 years (Range 33-78, +- 13.0). Commonest presenting complaint was sudden onset diminution of vision (100%). Radiographic findings were present in 36.3 %. All study subjects had varying grades of relative afferent pupillary defect (RAPD), 45.4% participants had color vision defect, and visual field changes were detected in 36.6% (8) study subjects.

Conclusions: Optic neuritis presents with sudden onset diminution of vision usually in one eye. The treatment outcome with IV steroids followed by oral steroids when initiated early in cases of optic neuritis have an excellent visual outcome.

INTRODUCTION

A healthy optic nerve is a crucial conduit for impulses generated within the layers of the retina to leave the eye. Damage to the nerve fiber layer or optic nerve may compromise the quality of these signals.[1]

The mechanism responsible for acute optic neuritis (ON) has not been definitively identified but it is believed that an autoimmune reaction damages the myelin sheath that encompasses neurons within the optic nerve. Patients with documented autoimmune diseases [1] have a greater propensity for ON and there is a causal relationship between HLA DRB1[2] HLA-B27[3] and ON.

Corticosteroids were found to show benefit after neurological injury in both animal and human models.[4,5] This formed the basis for clinical trials, and in 1988, Spoor and Rockwell evaluated high-dose intravenous (IV) steroids in a trial for ON treatment and reported excellent outcomes.[6] In the wake of this report, and in part because of the variability in how ON was treated, the ON Treatment Trial (ONTT) was launched.[7]

Results from the ONTT showed that three days of high-dose IV methylprednisolone hasten visual recovery after ON. Lower-dose oral steroids increased the incidence of recurrent ON for reasons that remain unclear. Treatment with steroids was found in the ONTT to be safe, with minimal adverse events.[8]

This study was aimed to provide demographics of patients, clinical findings and features, investigative findings in cases of optic neuritis and the outcome of treatment for future references.

METHODS

This was a prospective observational study with intention to treat, carried out in the clinical setting of Ophthalmology outpatient department (OPD) in Chitwan Medical College (CMC) - Teaching Hospital from 16 August, 2021 to 15 October, 2021. Before the start of the study, an ethical approval was taken from the Chitwan Medical College institutional review Committee (CMC-IRC/078/079-022) to conduct the study. The study sample size was 22 subjects, convenience sampling was done as the sampling method to reach the sample size.

All the patients clinically diagnosed to have Optic neuritis (ON) were enrolled in the study. Patients with history of treatment before presenting to the Ophthalmology outpatient department, patients with chronic debilitating disease or immune-compromised status, patients with concomitant comorbid conditions, COVID-19 patients, patients not willing to give an informed consent and patients losing follow up in the first follow up were excluded from the study.

The study firmly adhered to the tenets of Helsinki declaration following the ethics of a study. An information sheet was provided to the patient, informed consent was taken from all the study subjects. The study subjects were told about the management protocol and were advised accordingly to follow up.

All study subjects underwent a thorough ocular examination including the anterior and posterior segments of the eye. Other causes of optic neuropathy like ischemic, traumatic, toxic, compressive and infiltrative were ruled out. Detailed history was taken regarding onset of visual loss, duration, whether associated with pain, history of any previous attack and history of any other systemic or neurological symptoms. Clinical examination included; determination of best corrected visual acuity (BCVA) on Snellen's chart (E chart for illiterates), pupillary reactions, Slit lamp Biomicroscopy and fundus examination under mydriasis. Investigations included contrast sensitivity on Pelli-Robson chart, color vision with Farnsworth Panel D15 test and Ishihara test.

Radiographic investigations included Magnetic resonance imaging (MRI) and or Computed tomography (CT) scan of the head and orbit.

Relative afferent pupillary defects were graded by using the swinging flashlight test with a standardized illumination time of 3 seconds (pause time) for each eye.[9]
Grade I: weak initial constriction and greater redilatation.
Grade II: initial stall and greater redilatation;
Grade III: immediate pupillary dilatation;
Grade IV: immediate pupillary dilatation following prolonged illumination of the good eye for 6 seconds;
Grade V: immediate pupillary dilatation with no secondary constriction.
An Interobserver's Kappa (K) value more than 0.8 was considered a strong agreement between the researchers.

Physician was consulted for fitness to start systemic steroids and possible interventions, post fitness for treatment. All patients were admitted to start IV Methyl Prednisolone 1gram once a day for three days and discharged on the fourth day on oral Prednisolone 1mg/kg/day for next 11 days.
Visual acuity was graded as following for the study subjects.
Normal: 6/18 or better
Mild impairment: <6/18 – 6/60
Moderate impairment: <6/60 – 3/60
Severe impairment/Blindness: <3/60 - /160, <1/60-PL, NPL

Optic neuritis was further classified in to following depending on the anatomic localization.[10]
Retrobulbar neuritis characterized by normal disc appearance;
Papillitis with swollen optic disc;
Perineuritis involving mainly the optic nerve sheath with or without optic disc oedema; and
Neuroretinitis characterized by swollen optic disc and a 'star figure' of macular exudates.

The study subjects were followed up in one week, one-month time for a detailed ocular examination and visual outcome post treatment.

Data was collected using a specialized proforma for the study, and entered in Statistical Package for the Social Sciences (SPSS) version 26 and analyzed.

RESULTS

A total of 22 study subjects participated in the study. 63.6% (14) of the study participants were females. Mean age of presentation of the study subjects was 47.2 years (Range 33-78, +- 14.2). Commonest presenting complaint in the study subjects was sudden onset diminution of vision (100%) followed by headache in 31.8% study subjects (Table 1).

Table 1: Patient demographic and ocular findings

Gender	**Study subjects (N)**	**Mean age±SD**
Female	14 (63.6%)	53.14±13.85006
Male	8 (36.4%)	48.50±11.92836
Chief complaints of the study participants		**Percentage (%)**
Sudden onset diminution of vision	15 (68.2%)	68.2
Diminution of vision and headache	7 (31.8%)	31.8
Total	22 (100%)	100
Eye Involved		**Percentage (%)**
Right Eye	11(50%)	50
Left Eye	10 (45.5%)	45.5
Both Eyes	1 (4.5%)	4.5
Total	22 (100%)	100
Clinical Diagnosis of the study subjects		**Percentage (%)**

Papillitis	13 (59.1%)	59.1
Retrobulbar Optic neuritis	7 (31.8%)	31.8
Neuroretinitis	2 (9.1%)	9.1
Total	22 (100%)	100
Visual acuity (VA)	**Presenting VA of the study subjects**	**Percentage (%)**
6/24-6/60	2 (9.1%)	9.1
5/60-3/60	11 (50%)	50
2/60-PL	9 (40.9%)	40.9
Total	22 (100%)	100
Grade	**Pupillary reaction in the affected eye of the study subject**	**Percentage (%)**
2	3 (13.6%)	13.6
3	8 (36.4%)	36.4
4	10 (45.5%)	45.5
5	1 (4.5%)	4.5
Total	22 (100%)	100

Radiographic findings were present in 36.3 % (8) study subjects of which 18.1% (4) study subjects showed features suggestive of demyelinating condition. All study subjects (22) had varying grades of relative afferent pupillary defect (RAPD), 45.4% (10) participants had color vision defect, visual field changes were detected in 36.6% (8) study subjects, seventeen (77.2%) study subjects had defective contrast sensitivity test. Post treatment with IV steroids yielded normal visual acuity in affected eye in one-month time in 90.0% (20) study subjects (Table 2).

Table 2: Clinical characteristics of the study subjects

Color vision test	**Frequency (%)**
Normal	3 (13.6%)
Defective	**10 (45.5%)**
Red green deficiency	3 (13.6%)
Protan anomaly	1 (4.5%)
Tritan (Blue-yellow) defect	4 (18.15)
Total color blind	1 (4.5%)
Could not be assessed	9 (40.9%)
Total	22 (100%)
Contrast Sensitivity test	
Normal	3 (13.6%)
Diminished	17 (77.3%)
Could not be assessed	2 (9.1%)
Total	22 (100%)
Magnetic Resonance Imaging/Computed Tomography (MRI/CT) findings in study subjects	
Normal	14 (63.6%)
Features specific to demyelinating conditions	4 (18.1%)
Other non-specific findings	4 (18.1%)
Total	22 (100%)
Visual Fields examination of the study subjects	
Normal	2 (9%)
Defective (Ceaco-central/centro-cecal scotoma)/paracentral	8 (36.3%)
Could not be assessed	12 (54.5%)
Total	22 (100%)
Intervention (treatment) in study subjects	
IV Methyl prednisolone + oral steroids	22 (100%)
Total	22 (100%)
Visual outcome in study subjects (Last follow up)	
<6/18 – 6/6	20 (90.9%)
6/24-6/60	1 (4.5%)
5/60-3/60	0
2/60-1/60	0
PL-NPL	1 (4.5%)
Total	22 (100%)

DISCUSSION

The predominant study subjects being females was consistent with the literature on optic neuritis and was also comparable with studies done elsewhere[11,12] However, the mean age of presentation of the participants in our study was higher than global surveys done on optic neuritis. It has been a known fact that the commonest presenting age group of optic neuritis is in adults of 18-45 years of age.[11,12] this finding of our study could have been attributed by a smaller sample size due to ongoing COVID-19 pandemic and shorter duration as well.

Unilateral optic neuritis was diagnosed in 21 (95.4%) study participants, however there was no difference in laterality of the involvement of the eyes. This finding our study correlated very well with the studies from India and China.[13,14] In this study more than 95% study participants had unilateral optic neuritis which is could be explained by the fact that bilateral optic neuritis is common in children, young adults and in patients with systemic illnesses like tuberculosis. In the current study, all the study subjected presented with sudden onset diminution of vision, whereas 31.8% (7) study subjects also complained of headache in the study. The findings of our study were comparable with the studies done in India by Saxsena et al[13] but differed from the studies done in China, India, Nepal and Japan.[14-17] The latter studies had a smaller number of participants presenting with chief complaints of pain on ocular movement or headache.

Of the 22 study participants, 13 study participants (59%) were cases of papillitis followed by 31.8% (7) retrobulbar optic neuritis and 9.0% (2) had neuro-retinitis. In the present study all the study participants were visually impaired 9% (2) mild visual impairment, 50% (11) moderate visual impairment and 40.9% (9) study subjects had severe visual impairment in the affected eye. All the study subjects had varying degree of relative afferent pupillary defect ranging from grade 2 – grade 5. The above study findings from this study was comparable to studies from Nepal[18] and India.[13,19] Interestingly, optic nerve treatment trial (ONTT) by Beck et al. showed retrobulbar optic neuritis as the predominant type which differed from our study findings.[20] Relative afferent pupillary defect is a significant clinical finding in cases of optic neuritis, in the present study this grading supported the diagnosis of optic neuritis especially the retrobulbar type and also helped in differentiating optic neuritis from optic nerve edema.

In our study, 40.9% (9) study participants color vision could not be assessed, one study subject had normal color vision whereas the rest 54.5% (12) study participants had color vision defect, blue-yellow color vision defect was the commonest followed by red-green deficiency. Similarly, 90.9% (20) study subjects had reduced contrast sensitivity test in the current study. These findings of our study (Table 2) were comparable to findings from study by Beck RW et al.[20] In the present study visual field test could be done in 45.4% (10) cases of which 36.4% (8) study subjects had visual field changes. In these eight study subjects, centro-cecal scotoma was the most common field defect followed by caeco-central and paracentral scotoma. The study findings were comparable to studies from Malaysia and Nepal.[18,21] in a study done in India by Jain et al generalized visual field constriction was the commonest finding, which did differ from our study finding.[15]

The presence of demyelinating lesions on brain Magnetic Resonance Imaging (MRI) at the time of clinical presentation is the strongest predictor for developing clinically definite multiple sclerosis (CDMS). MRI showing ≥2 white matter lesions (≥3 mm in diameter, at least 1 lesion periventricular or ovoid) indicates a high risk for CDMS.[22,23] In the current study all the study participants were subjected for Magnetic Resonance Imaging (MRI) and or Computed Tomography (CT) scan of the head and orbit. The radio imaging report of the study subjects were; 63.6% (14) study subjects had normal radiographic scans followed by 18.1% (4) with nonspecific radio imaging reports and only 18.1% (4) subjects showed periventricular plaques suggestive of demyelinating disease (Table 2). However, a lumbar puncture was not done in any of the study subjects for further investigations on demyelinating diseases. These suspected four subjects were discussed with internists and neuro-physicians and a common consensus was reached with the knowledge of existing literature[24] that the role of interferons does not appear to be justified following an isolated attack of typical optic neuritis. So, these study subjects are kept for a regular follow up.

In the current study ONTT guidelines were followed for treatment.[20] All the study subjects were admitted for IV Methyl Prednisolone therapy and oral steroids. 95.4% (21) study subjects in one-month follow up period had a normal vision, whereas the only study participant with bilateral optic neuritis and with periventricular plaques in the MRI in one month follow up had moderate visual impairment and grade 3 relative afferent pupillary defect in the right eye and no perception of light and grade 5 relative afferent pupillary defect in the left eye. The study subject was referred to neuro-physician for further management. The findings of this study may not be generalized to other parts of Nepal and abroad due to the short study period and a smaller sample size. However; this study can be taken as a pilot study to conduct larger sample size study in different settings.

CONCLUSION

Optic neuritis is commonest in the age group of 18-45 years of life and predominantly affects the females. In the absence of any known systemic illness as a cause; a magnetic resonance imaging (MRI) of the head and orbit is helpful to rule out demyelinating conditions like multiple sclerosis (MS). The prevalence of MS in the Asian continent is low hence the need for treatment with interferons. Systemic steroids specifically IV Methyl prednisolone plays a big role in quick visual recovery of the patients and also prevents recurrent optic neuritis. Visual acuity assessment, relative afferent pupillary defect grading, good history taking, color vision test, contrast sensitivity test, visual field tests play very important role in diagnosing

optic neuritis early. Optic neuritis management requires a multidisciplinary approach in a tertiary level setting comparable to the current study.

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CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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