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Research Article

OUTCOME FOLLOWING STEROID THERAPY IN CASES WITH ACUTE OPTIC NEUROPATHY REPORTING TO TERTIARY CARE CENTER

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ABSTRACT

Objectives: The objective of the study was to evaluate the etiological factors in patients of acute optic neuropathy reporting to tertiary care centers and response to steroid therapy in acute optic neuropathy.

Methods: All the patients selected were subjected to the detailed ocular examination which included best-corrected visual acuity and fundus examination. After ocular and systemic examination and relevant investigations, the underlying etiological diagnosis of acute optic neuropathy was established after this, they were started on intravenous methylprednisolone followed by oral prednisolone.

Results: A total of 30 patients with acute optic neuropathy presented in the tertiary care center during the study period. A visual improvement of more than two lines, after steroid therapy, was observed in 54.5% of cases of traumatic optic neuropathy, 53.8% of cases of optic neuritis, and 33.3% of cases of anterior ischemic optic neuropathy.

Conclusion: Marked visual recovery and prognosis can be seen in timely managed patients. In traumatic optic neuropathy, steroid therapy should always be considered in diagnosed patients of traumatic optic neuropathy irrespective of the timing of presentation.

Keywords: Traumatic optic neuropathy, Anterior ischemic optic neuropathy, Optic neuritis, Steroid therapy.

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INTRODUCTION

The term "optic neuropathy" describes optic nerve damage due to various causes. The damage to the optic nerve leads to characteristic features of optic neuropathy which include diminution of vision, afferent pupillary defect, dyschromatopsia, change in optic disc, and visual field defect (unilateral) [1]. Optic neuropathy may result from various etiologies including congenital or acquired causes. Congenital causes include mitochondrial disorders or hereditary illness whereas acquired causes may result in acute or chronic optic neuropathy. Causes underlying acute optic neuropathy include inflammation, ischemia, demyelinating disorders, and trauma. Acquired chronic optic neuropathy may result from associated compression of the optic nerve, infiltration, nutritional deficiencies, or toxic substances [1].

The exact incidence of optic neuropathies is not known. Optic neuritis is one of the most common causes of optic neuropathy.

Management of optic neuropathy depends on the underlying etiology. For inflammatory optic neuropathy, oral steroids are the mainstay treatment. However, initially, the patient may require intravenous (IV) methylprednisolone followed by an oral low-dose steroid to keep the disease in a state of remission [2,3]. The role of steroid is controversial in cases with ischemic and traumatic causes. Few studies recommend steroids as they help in reducing associated inflammation and swelling, whereas few studies provide insufficient evidence for the efficacy of treatment with steroids. Previous studies have focused on individual etiologies of optic neuropathy. Data evaluating the etiological factors and their outcome following acute optic neuropathy are lacking, especially in the Indian scenario.

With the above background, the present study was conducted at a tertiary care center to evaluate outcomes following steroid therapy in cases with acute optic neuropathy.

METHODS

Study design

This was a prospective observational study conducted in the Department of Ophthalmology Gandhi Medical College, Bhopal, and Kamla Nehru Hospital, Bhopal, (M.P.). This study was done from October 2019 to May 2021 after obtaining approval from the Institutional Ethics Committee.

Sample size

All the patients diagnosed with acute optic neuropathy with recent onset of impaired vision were included using purposive sampling.

Inclusion criteria

- Patients of optic neuropathy with recent onset of impaired vision
- No history of previous treatment with steroids for optic neuritis in the other eye.

Exclusion criteria

- Pre-existing/coexisting ocular diseases
- Old and treated case
- Traumatic optic neuropathy associated with severe head injury
- Traumatic optic neuropathy associated with Berlin edema.

Written consent was obtained from all the study participants after explaining the nature and purpose of the study. They were ensured that confidentiality will be maintained and the option to withdraw from the study was always kept open. Using a pro forma, data were collected

with respect to sociodemographic variables such as age, gender, socioeconomic status, and residence. Detailed history regarding clinical presentation, onset, duration, associated systemic or ocular disease along with drug history, and personal history was obtained and entered in pro forma.

All the patients were then subjected to a detailed ocular examination which included

1. Best-corrected visual acuity (VA) on Snellen's E-chart
2. Fundus examination.

After ocular and systemic examination and relevant investigations, the underlying etiological diagnosis of acute optic neuropathy was established. After this, they were started on IV methylprednisolone 1 g IV for 3 days, followed by oral prednisolone 60 mg once daily. This was continued for 1 week and tapered by 10 mg/week and stopped after a period of 6 weeks.

Patients were advised for regular follow-up after a period of 6 weeks. Visual outcome was assessed at the final follow-up and findings were noted.

Statistical analysis

Data were compiled using MS Excel and analyzed using IBM Statistical Packages for the Social Sciences software version 20. All the variables were grouped as per mathematic transformation into nominal/ordinal/interval and ratio. The extent of type one error was measured with parametric analysis. Z-test was applied for proportion and the t-test was used to find out any significant difference among the detected proportion and mean. The Chi-square test was applied at appropriate places. $p<0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

The study was conducted on a total of 30 patients with acute optic neuropathy presenting in the tertiary care center during the study period.

In the present study, the majority of the patients with acute optic neuropathy, that is, 43.3% had optic neuritis as their etiology, followed by 36.7% of cases who had traumatic optic neuropathy. Only 20% of cases had anterior ischemic optic neuropathy (AION) as a cause for acute optic neuropathy (Table 1).

The mean age of patients with acute optic neuropathy was found to be 38.57±16.59 years in our study. The majority of the patients, 66.6% (n=20), belonged to the 19–45-year age group. The mean age of presentation of AION was 59.2 years, the same for optic neuritis was 36.6 years, and that in traumatic optic neuropathy was found to be 38.5 years. Thus, AION was presented in the majority of the older subjects (50–70 years), whereas optic neuritis and traumatic optic neuropathy were more common in younger subjects (10–50 years) (Table 2).

In the present study, females (76.92%) were more commonly affected compared to males in cases with optic neuritis. Traumatic optic neuropathy was found to be predominant in males (81.81%), while in cases with AION, there was no gender predilection (Fig. 1).

In the current study, all 6 (100%) cases with AION had associated systemic illness, of which 33.33% had diabetes mellitus and 66.67% had hypertension. In patients with optic neuritis, 69.23% of cases had no associated comorbidities whereas 3 (23.07%) cases had multiple sclerosis, while only 1 (7.6%) case was diagnosed with neuromyelitis optica. In cases with traumatic optic neuropathy, no associated systemic disease was found in 8 (72.7%) cases, whereas only 2 (18.2%) and 1 (9.1%) cases had associated diabetes and hypertension, respectively (Fig. 2).

In the present study, the majority of the cases with AION (66.7%), optic neuritis (15.38%), and traumatic optic neuropathy (63.63%) had an associated history of smoking/alcohol consumption. This association was also found to be statistically significant with a $p<0.05$ (Table 3).

In the present study, better vision was found to be in cases with optic neuritis compared to the cases with AION and traumatic optic neuropathy where the majority of the cases had poor vision (<1/60). All the cases, that is, 6 (100%) cases with AION, had poor vision (<1/60). In cases with optic neuritis, 3 (23.07%) cases had 6/6–6/12 vision, 1 (7.69%) case had 6/18–6/36 vision, and 4 (30.76%) cases had 6/60–2/60, whereas the majority, 5 (38.46%) cases of this group, also had poor vision (<1/60). In cases with traumatic optic neuropathy, a maximum of 8 (72.72%) cases had poor vision (<1/60), whereas

Table 1: Etiology of acute optic neuropathy

Diagnosis	Frequency (n=30)	Percentage
AION	6	20
Traumatic optic neuropathy	11	36.7
Optic neuritis	13	43.3

AION: Anterior ischemic optic neuropathy

Table 2: Age distribution in cases of acute optic neuropathy

Diagnosis	Frequency (n=30)	Mean age	Age (max)	Age (min)
AION	6	59.2	68	50
Optic neuritis	13	28.6	45	15
Traumatic optic neuropathy	11	38.5	50	12

AION: Anterior ischemic optic neuropathy

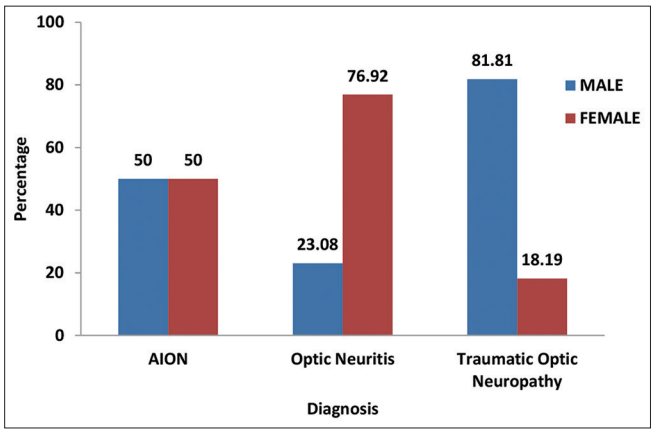

Fig. 1: Distribution of patients according to gender in acute optic neuropathy

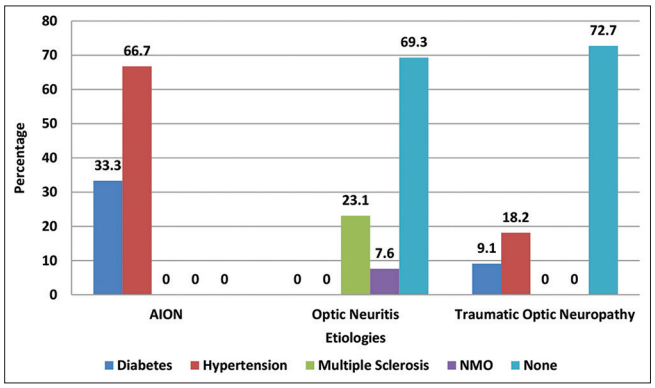

Fig. 2: Evaluation of comorbidity in cases of acute optic neuropathy

1 (9.09%) case each had a vision of 6/6–6/12, 6/18–6/36, and 6/60–2/60 (Table 4).

In the present study, the most common optic disc findings in AION were disc pallor with blurred disc margins seen in 100% (n=6) of cases, with disc hemorrhages seen in the peripapillary region in 83.33% (n=5), which was absent in a single case.

In most of the cases, 61.53% (n=8) of optic neuritis had normal disc findings with no hyperemia or blurring of disc margins as they had retrobulbar neuritis. The rest 5 (38.46%) cases of optic neuritis had hyperemic discs with blurred disc margins.

Normal disc findings were seen in 100% (n=13) of cases of traumatic optic neuropathy (Table 5).

A visual improvement of more than two lines, after steroid therapy, was observed in 54.5% (n=6) of cases of traumatic optic neuropathy, 53.8% (n=7) of cases of optic neuritis, and 33.3% (n=2) of cases of AION, while no improvement of VA was observed in 66.6% (n=4) of cases of AION, 30.7% (n=4) of cases of optic neuritis, and 27.2% (n=3) of cases of traumatic optic neuropathy. Although the majority of the cases with AION had no visual improvement after steroid therapy, the observed association was found to be statistically insignificant (p>0.05) (Table 6).

In the present study, the majority of the patients with acute optic neuropathy, that is, 43.3%, had optic neuritis as their etiology, followed by 36.7% of cases that had traumatic optic neuropathy. Only 20% of cases had AION as a cause for acute optic neuropathy. This is similar to the cross-sectional observational study done by Pandey and Bihari (2007) [4] on the etiological profile of optic neuropathy, in which the majority of the cases had idiopathic optic neuritis (35%) which was found to be the most common cause of optic neuropathy whereas AION was present in 7.5% of cases. The results of the present study are comparable to the study done by Pandey and Bihari as both are observational studies done in a tertiary eye care center with a limited sample size.

Table 3: Distribution of patients according to history of addiction (smoking/alcohol) in AON

Diagnosis	History of addiction (smoking/alcohol)	
	Present (%)	Absent (%)
AION (6)	4 (66.67)	2 (33.33)
Optic neuritis (13)	2 (15.38)	11 (84.62)
Traumatic optic neuropathy (11)	7 (63.63)	4 (36.37)
Chi-square	7.3123	
p–value	0.0258	

AION: Anterior ischemic optic neuropathy

Table 4: Distribution of patients according to BCVA in the affected eye

Visual acuity	Etiology		
	AION (6)	Optic neuritis (%) (13)	Traumatic optic neuropathy (%) (11)
6/6–6/12	0	3 (23.07)	1 (9.09)
6/18–6/36	0	1 (7.69)	1 (9.09)
6/60–2/60	0	4 (30.76)	1 (9.09)
<1/60	6 (100)	5 (38.46)	8 (72.72)
Total	30		

BCVA: Best-corrected visual acuity, AION: Anterior ischemic optic neuropathy

Sociodemographic profile

The mean age of patients with acute optic neuropathy was found to be 38.57±16.59 years in our study. The majority of the patients, 66.6% (n=20), belonged to the 19–45 year age group which was also found to be statistically significant. The mean age of presentation of AION was 59.2 years, the same for optic neuritis was 36.6 years, and that in traumatic optic neuropathy was found to be 38.5 years.

In the present study, females (76.92%) were more commonly affected compared to males in cases with optic neuritis. Traumatic optic neuropathy was found to be predominant in males (81.81%), while in cases with AION, there was no gender predilection.

This is similar to a study done by Miller and Arnold in 2001 [5], in which AION was the most common acute optic neuropathy in patients over 50 years.

Similarly, in the study done by Repka *et al*. [6], in AION, equal incidence rates were noted among male and female subjects.

In the present study, the mean age of presentation in traumatic optic neuropathy is 38.5 years, and 81.81% of patients were male as men in Indian society work outside the house whereas most women in the Indian scenario are housewives.

This result was similar to the retrospective study conducted by Sivakumar *et al*. [7] in Pondicherry, India, on the clinical profile and visual outcome of 56 patients with traumatic optic neuropathy.

Associated comorbidities

The results of the current study are comparable to the study conducted by Kim *et al*. [8] on the Korean population wherein, 24 (53.3%) of the 45 patients had hypertension and 14 (31.1%) had diabetes mellitus.

Similarly, in the study conducted by Pandit *et al*. [9], about 47% of cases with multiple sclerosis have associated optic nerve and spinal cord lesions.

VA

In the present study, better vision was found to be in cases with optic neuritis compared to the cases with AION and traumatic optic neuropathy where the majority of the cases had poor vision (<1/60).

All the cases, that is, 6 (100%) cases with AION, had poor vision (<1/60). This was comparable to other studies conducted by Atkins *et al.* [10], which reported similar VA at the time of presentation in 35–53% of the patients included in the study.

Table 5: Distribution of patients according to fundus examination in affected eye in cases of AON

Diagnosis	Fundus finding					
	Margin(%)		Hyperemia (%)		Disc hemorrhage(%)	
	Blurred	Normal	Present	Absent	Present	Absent
AION (6)	6	0	0	6	5 (83.33)	1
Optic neuritis (13)	5 (38.46)	8 (61.53)	5 (38.46)	8 (61.53)	0	13 (100)
Traumatic optic neuropathy (11)	0	11 (100)	0	11 (100)	0	11 (100)

AION: Anterior ischemic optic neuropathy

Table 6: Association of diagnosis with visual improvement after steroid therapy

Diagnosis	Visual improvement		
	No improvement	1–2 line	>2 line
AION (6)	4 (66.6)	0 (0)	2 (33.3)
Optic neuritis (13)	4 (30.7)	2 (15.3)	7 (53.8)
Traumatic optic neuropathy (11)	3 (27.2)	2 (18.1)	6 (54.5)
Chi-square	8.3		
p-value	0.87		

AION: Anterior ischemic optic neuropathy

Visual outcome following treatment

A visual improvement of more than two lines, after steroid therapy, was observed in 54.5% (n=6) of cases of traumatic optic neuropathy, 53.8% (n=7) of cases of optic neuritis, and 33.3% (n=2) of cases of AION, while no improvement of VA was observed in 66.6% (n=4) of cases of AION, 30.7% (n=4) of cases of optic neuritis, and 27.2% (n=3) of cases of traumatic optic neuropathy. Although the majority of the cases with AION had no visual improvement after steroid therapy, the observed association was found to be statistically insignificant (p>0.05).

Similarly, Bendel [11], described that vision improved in all patients, with an average pre-treatment vision of 20/100 and an average post-treatment vision of 20/25.

The largest series on steroid treatment was published by the International Optic Nerve Trauma Study [12], which reported an improvement in 54% of the patients after 3 months of follow-up.

About 37% of the patients treated with megadose steroids in Sadeghi *et al*. study [13] showed improvement after 3-month follow-up.

In the study conducted by Emmatty *et al*. [14], 9 of 16 patients showed a significant improvement on steroids.

According to Lee *et al*. [15], 91.7% of the patients treated with IV methylprednisolone 250 mg for 3 days, followed by oral prednisolone 1 mg/kg for 11 days, had shown at least one-line improvement of VA, and it was statistically significant (p>0.05). Among those eyes which were treated conservatively, 77.8% had shown at least one-line improvement of VA.

CONCLUSION

The present study concludes that optic neuritis is the most important cause for acute optic neuropathy. In traumatic optic neuropathy, the present study concludes that steroid therapy should always be considered in diagnosed patients of traumatic optic neuropathy irrespective of the timing of presentation.

Treatment when given early that is within 72 h of trauma, good visual outcome noted. In the present study, however, it was observed that initiation of treatment in cases of traumatic optic neuropathy even beyond 72 h of trauma can significantly alter the visual prognosis. The final visual recovery significantly depends on the risk factor involved, the type of injury, and the time elapsed between injury and starting of treatment.

Limitation of the study

Being a tertiary care hospital, the patients presented at the study area presented late after several referrals which was the major cause of late presentation and hence poor visual prognosis.

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AUTHOR'S CONTRIBUTION

All authors have contributed to the study design, manuscript writing, and review, data analysis, and article finalization.

CONFLICTS OF INTEREST

None.

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None.

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