Original Article

Clinical profile and predictors of visual outcome in nonarteritic anterior ischemic optic neuropathy

ABSTRACT

Background: Nonarteritic anterior ischemic optic neuropathy (NAION) is a disorder of the optic nerve head causing acute painless visual loss in the elderly. Several ocular and systemic risk factors predispose to optic nerve head ischemia. Patients usually have a moderate visual loss which tends to stabilize in a few months, but complete recovery may not occur.

Aim: This study aimed to study the clinical profile of NAION and to find the predictors of visual outcome in the study group.

Materials and Methods: This prospective case series study included 25 patients with unilateral acute visual loss and clinical features suggestive of NAION. Detailed history and investigations were done to detect the risk factors implicated for the disease Patients were followed up for 6 months. Initial and final vision were analysed to assess the visual outcome. Statistical analysis was performed using SPSS.

Results: Mean age was 58.08 ± 8.118 years. There was no gender predilection. The most common type of disc edema was diffuse hyperemic, and the most common field defect was inferior altitudinal. Systemic comorbid conditions such as dyslipidemia, smoking, hypotension, diabetes, and hypertension had higher odds of developing NAION even though not statistically significant. Correlation between initial vision and visual acuity at 6 months was statistically significant and spontaneous improvement in vision was seen in 16% of patients.

Conclusion: Pallid disc edema and poor initial visual acuity were predictors of poor visual outcome.Female gender, hyperemic disc edema, and superior field defect had a favorable outcome. Associated comorbidities increased the risk of visual loss.

Keywords: Nonarteritic anterior ischemic optic neuropathy, risk factors, visual outcome

INTRODUCTION

Nonarteritic anterior ischemic optic neuropathy (NAION) is characterized by the acute painless monocular or rarely binocular loss of vision that may progress over several hours or days. This occurs from the vascular occlusive disease of small vessels supplying the anterior portion of the optic nerve head. Etiology is uncertain, but various ocular and systemic risk factors have been postulated. A small and crowded "disk at risk"[1,2] may mechanically contribute to the vascular event. In the absence of definite treatment, it is important to find out the risk factors and control or treat them as the disease has a guarded prognosis.

Aim

To study the clinical profile and assess the relation of systemic risk factors as well as visual outcome in patients with NAION.

Study design

This was prospective case series study.

MATERIALS AND METHODS

A total of 25 eyes of 25 patients diagnosed to have NAION over a period of 1 year were included in the study, after approval from the Institutional ethics committee. Informed consent was obtained from all patients. A detailed history regarding various risk factors proposed for the disease was taken. All patients

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underwent a complete ophthalmic evaluation which included visual acuity, pupil assessment, color vision using Ishihara chart, visual field by Humphrey field analyzer (model no: 720I 8371) whenever possible and fundus examination with +90D lens, direct and indirect ophthalmoscopy. NAION was diagnosed by the presence of RAPD, defective color vision, hyperemic or pallid disc edema with splinter hemorrhage, and visual field defects. Snellen acuity was converted into logMAR for statistical analysis. Visual acuity at 6 months follow-up,[3] and its outcome with comorbidities was analyzed. Visual improvement was considered when there was a three-line improvement in Snellen acuity. Statistical analysis was performed using SPSS software version 18 (SPSS Inc., PASW, Chicago, USA). Chi-square test was done to find significance and odds ratio (OR) was calculated to find the systemic risk factors for poor visual outcome.

RESULTS AND ANALYSIS

The mean age of presentation was 58.08 ± 8.118 years (Range: 43–74 years). The different age groups affected is shown in Table 1, and most of the patients were in the age group 51-60 years. There were 12 male patients (48%) and 13 female patients (52%) in this study. Right eye was more commonly involved (60%) compared to the left eye (10%). Co morbid conditions noted in the study is shown in Table 2. Hypertension and diabetes were the most common co morbid conditions associated with NAION in our study. Odds ratio was calculated to find the strength of association of various risk factors with NAION [Table 3]. Figure 1 shows the initial visual acuity and visual acuity at 6 months follow up. Type of Disc oedema was correlated with initial visual acuity and vision at six months [Table 4]. It was found that majority of patients had diffuse hyperemic disc oedema. Table 5 shows relation between visual field defect, initial vision and vision at six months. The most common field defect in this study was inferior altitudinal.

DISCUSSION

Twenty-five eyes of 25 patients diagnosed to have NAION were included in this study. The mean age of presentation was 58.08 ± 8.118 years, similar to other studies[4-7] However, Hattenhauer *et al*.[8] found the mean age to be 72 years. There

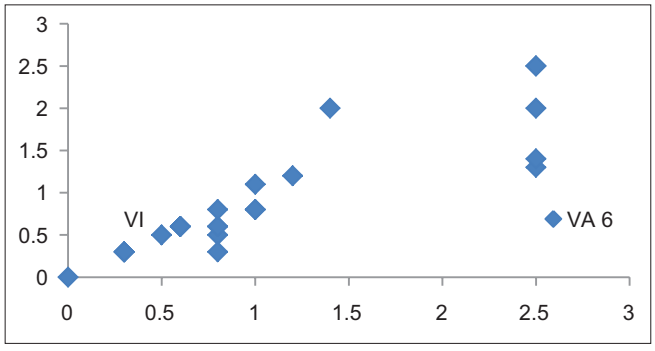

Figure 1: VI – Initial vision, VA6 – Vision at 6 months

Table 1: Age group

Age group (years)	*n* (%)
40-50	4 (16)
51-60	13 (52)
61-70	5 (20)
71-80	3 (12)

Most of the affected patients were between 51 and 60 years

Table 2: Comorbid conditions

Comorbidity	Present, *n* (%)	Absent, *n* (%)	Controlled, *n* (%)	Uncontrolled, *n* (%)
Hypertension	14 (56)	11 (44)	4 (28.6)	10 (71.4)
Diabetes	17 (68)	8 (32)	4 (23.5)	13 (76.5)
Dyslipidemia	2 (8)	23 (92)		
Hypotension	2 (8)	23 (92)		
Smoking	3 (12)	22 (88)		

Hypertension and diabetes were the most common comorbid conditions

Table 3: Odds ratio of co morbid conditions

Comorbidity	OR	95% CI
Hypertension	2.727	0.243-30.664
Diabetes	1.500	0.131-17.180
Dyslipidemia	1.211	1.004-1.460
Hypotension	1.211	1.004-1.460
Smoking	1.222	1.004-1.488

OR>1 indicates greater odds of comorbid conditions to affect vision in NAION. CI – Confidence interval, OR – Odds ratio, NAION – Nonarteritic anterior ischemic optic neuropathy

Table 4: Type of disc edema and initial vision and vision at 6 months

Type	*n* (%)	Mean logMAR V1±SD	Mean logMAR V6±SD
Hyperemic diffuse	10 (40)	1.060±1.059	0.730±0.583
Hyperemic sectoral	4 (16)	0.625±0.287	0.650±0.331
Pallid diffuse	7 (28)	1.886±1.063	1.671±1.024
Pallid sectoral	4 (16)	0.600±0.355	0.475±0.236
P		0.090	0.025

V1 – Initial visual acuity, V6 – Acuity at 6 months, Most common type of edema was diffuse hyperemic. SD – Standard deviation, LogMAR: Logarithm minimum angle of resolution

Table 5: Visual field defect versus initial vision and vision at 6 months

Type	*n* (%)	Mean LogMAR V1±SD	LogMAR V6±SD
Superior altitudinal	3 (12)	0.2±0.173	0.2±0.173
Inferior altitudinal	16 (64)	0.8±0.275	0.7±0.413
Central	3 (12)	2.1±1.55	1.533±1.36
Others	3 (12)	3±0.00	2.133±0.808
P		0.000*	0.002

Others – Nonspecific field defects and where field could not be plotted due to gross reduction in vision, V1 – Initial vision, V6 – Vision at 6 months, Most common was inferior altitudinal field defect. SD – Standard deviation, LogMAR: Logarithm minimum angle of resolution

was no gender predilection in this study a finding similar to that found by Miller and Arnold.[9] However, other studies by Repka *et al*.[4] and Lee *et al*.[10] found males to have increased risk of developing NAION, unlike our study. All patients who showed visual improvement were females in this study (Chi square test p value 0.057)whereas Ischemic optic neuropathy decompression trial (IONDT)[11] found better vision in males. The right eye was more commonly involved (60%) and showed more improvement in vision (20%) compared to the left eye (10%) on follow-up.

Systemic comorbidities noted in this study were hypertension, diabetes, and dyslipidemia. [Table 2] These findings were in accordance with several other studies.[4,9,12,13] There was also the history of smoking and hypotension. Majority of patients with hypertension and diabetes who developed NAION had the uncontrolled disease as shown in Table 2. Moreover, newly detected diabetic patients had less improvement in vision on follow-up (28.6%) compared to diagnosed cases (40%) even though not statistically significant (Chi-square 0.885). OR was calculated to measure the strength of association of the various comorbidities with visual loss in NAION [Table 3]. Patients with dyslipidemia[14,15] as well as those with a history of hypotension[16-18] and smokers[15,19] showed no improvement in vision at 6 months of follow-up in this study. However, Hayreh *et al*. found no association of smoking with tobacco.[20] Most of the studies found hypertension and diabetes as risk factors for developing NAION, as they may predispose to decreased optic nerve head perfusion via microvascular occlusion. In our study, a high OR for hypertension (OR 2.72) and diabetes (OR 1.5) may indicate higher odds of these diseases having a poor visual outcome in patients with NAION and is relevant clinically even though not significant statistically [Table 3].

In our study, 18 patients (72%) had a presenting visual acuity of 6/6-6/60, whereas 7 patients (28%) had an initial vision of 5/60 or less. This was similar to the finding of Hayreh *et al*.[3] where 49% had initial acuity of more than or equal to 20/30 and 23% had ≤20/200. We found that mean logMAR vision at presentation was 1.048 ± 0.802 and vision after 6 months follow-up improved to 0.900 ± 0.694. This shows that there is some improvement in visual acuity in patients with NAION, as seen by Hayreh *et al*.[3,21] and Dickersin *et al*.[22] Initial group mean acuity was compared to final mean acuity at 6 months using *t*-test, and it was statistically significant ($P = 000$). However, Arnold and Hepler[23] no significant change in initial and final mean visual acuity after 3 months follow-up in their study. A three-line Snellen acuity visual improvement was noted in four patients (16%) in our study after 6 months without any specific treatment. This is in accordance with Hayreh's study[21] and IONDT[22] where spontaneous improvement in vision was noted in eyes with NAION.

Color vision was defective in 16 (64%) patients in this study. Disc edema in NAION may be diffuse or segmental.[9,24] which may be pallid or hyperemic. The most common type of disc edema noted in our study was diffuse hyperemic [Table 4]. However, Arnold and Hepler[25] segmental edema to be common. Patients with a diffuse type of edema (hyperemic or pallid) had poor acuity on presentation [Table 4]. After 6 months of follow-up, some visual recovery was seen in hyperemic edema but not in those with pallid edema, and this finding was statistically significant [Table 4]. The most common field noted in this study was inferior altitudinal [Table 5] as seen in various studies by Sabt,[17] Gerling *et al*.,[26] Han *et al*.,[27] and Hayreh and Zimmerman[28] and this showed some improvement in visual acuity. The typical absolute inferonasal defect described by Hayreh and Zimmerman was seen only in 4 out of 14 patients in our study. Patients with superior field defect had good acuity on presentation, and maintained this on follow-up. Greatest reduction in initial vision was seen in patients with the central visual loss as expected. Patients in whom field charting could not be done due to poor initial vision did not show any improvement [Table 5].

Studies by Sawle *et al*.[12] and Lee *et al*.[29] showed that patients with NAION have an increased risk of cerebrovascular disease and ischemic heart disease. Thus it is important to have a detailed systemic evaluation of all patients with NAION.

CONCLUSION

Predictors of favorable visual outcome in NAION in our study were female gender, hyperemic disc edema and superior field defect. The poor visual outcome was seen patients who had pallid disc edema and very poor initial visual acuity. Associated comorbidities such as hypertension diabetes, dyslipidemia, history of hypotension, and smoking increased the risk of visual loss. As there is no established treatment or NAION, the clinicians primary role should be to control the modifiable risk factors postulated for the disease. This may help to reduce the ischemic insult to some extent in the affected eye as well as prevent recurrence and occurrence of such an event occurring in the fellow eye. It may also help in preventing a cerebrovascular accident later, thus reducing morbidity and mortality.

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Conflicts of interest
There are no conflicts of interest.

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