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Short-term results of steroid treatment in patients with non-arteritic ischemic optic neuropathy

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ABSTRACT

Aims: To evaluate the effects of steroid treatment on the best-corrected visual acuity (BCVA) and retinal nerve fiber layer (RNFL) in patients with non-arteritic ischemic optic neuropathy (NAION).

Methods: The retrospective study included 24 eyes of 24 patients who received 1 gram/day pulse steroid treatment for 3 days with a diagnosis of NAION. The patients' comorbidities, demographic information, intraocular pressure, BCVA, and RNFL measured by optical coherence tomography (OCT) were recorded before and after treatment at one month.

Results: The mean age of the patients was 64.35±14.6 (22-86). Diabetes mellitus was present in 14 patients (58.3%), hypertension in 13 (54.2%), and coronary artery disease in 5 (27.8%). The pre-treatment BCVA was 0.33±0.37, and post-treatment BCVA was 0.37±0.36 (p=0.365). The pre-treatment RNFL value was 208.0±57.9 µm, and post-treatment RNFL value was 113.6±32.6 µm (p<0.001). No additional complications related to treatment were observed.

Conclusion: While there was no significant difference in BCVA values at one month after steroid treatment, a significant anatomical improvement was observed in RNFL thickness.

Keywords: Non-arteritic ischemic optic neuropathy, pulse steroid, retinal nerve fiber layer

INTRODUCTION

Non-arteritic ischemic optic neuropathy (NAION) is a type of optic neuropathy characterized by sudden and painless unilateral loss of altudinal vision due to decreased blood flow to the optic nerve head.[1] Although NAION usually occurs in patients aged 50-70 years, approximately 10% of patients who develop NAION are younger than 50 years.[2]

Hypoperfusion and ischemia of the posterior ciliary arteries (PCA) are implicated in the development of NAION. The most commonly accepted view of ischemia is that transient hypoperfusion and nonperfusion occur without thromboembolic events. Another accepted, but less common, view is that ischemia may be caused by rare embolic occlusion of the arteries and arterioles that supply the optic nerve head.[3] Histopathological examination of the optic nerve reveals degeneration of the myelin sheath, axonal edema, axonal degeneration, and infarcts at the level of the lamina cribrosa.

Systemic diseases such as nocturnal hypotension, diabetes mellitus, hypertension, atherosclerosis, hypercholesterolemia, and obstructive sleep apnea syndrome are the most commonly blamed predisposing factors. In addition, small physiologic cup in the optic disc or lack of cup/disc area, small optic disc and vascular branching anomalies are other important predisposing factors for NAION.[4-7]

There is no treatment protocol for NAION whose efficacy has been fully recorded. Although there are various studies in the literature, the main aim of treatment is to reduce the edema of the optic disc head in the early period, to prevent stasis in the earliest period and thus to reduce the effect of ischemia. With the edema reducing and anti-inflammatory mechanism of action of steroids, NAION can be used for therapeutic purposes.[8]

In our study, we aimed to investigate the short-term effects of steroid use on retinal nerve fiber layer (RNFL) thickness and best corrected visual acuity (BCVA) in patients with NAION.

METHODS

The study was conducted in accordance with the ethical standards of the Declaration of Helsinki and approved by the Tokat Gaziosmanpaşa University Ethics Committee (Date: 06.06.2024, Decision No: 24-KAEK-186). Twenty-four eyes of 24 patients who were diagnosed with NAION between January 2021 and July 2023 in the Department of Ophthalmology, Tokat Gaziosmanpaşa University Hospital were retrospectively analyzed.

Patients who presented to the clinic with complaints of sudden visual loss and were diagnosed with NAION with relative afferent pupillary defect, optic disc edema and peripapillary flame-shaped hemorrhage, subitudinal and/or central visual field defect and were treated with 1 g/day pulse steroid for 3 days were included in the study. Patients were given antacidic drugs to reduce the side effects of steroids on the stomach. Blood glucose levels of the patients were monitored regularly. Blood pressure was monitored frequently because steroids may cause blood pressure elevation. Demographic data and systemic diseases were recorded at the first visit and one month after treatment, BCVA was measured using the Snellen chart, detailed ophthalmological examinations were performed, and intraocular pressure (IOP) measurements were recorded. RNLF measurements with spectral-domain optical coherence tomography (OCT) (Zeiss Cirrus HD-OCT 5000) were also recorded.

Patients with temporal arteritis, collagen tissue diseases, diabetic retinopathy, hypertensive retinopathy, optic neuritis, uveitis, and systemic drug use toxic to the optic nerve or retina were excluded.

SPSS 22.0 (IBM Corp., USA) program was used for the analyses. Distributional characteristics of the data were determined by Shapiro-Wilk's test. Normally distributed quantitative data were expressed as mean±standard deviation and categorical data were expressed as percentage (%). Dependent samples t-test was used to compare normally distributed quantitative data. A p-value less than 0.05 was considered statistically significant.

RESULTS

The study included 24 eyes of 24 patients. Of these, 12 (50%) were male and 12 (50%) were female.The mean age of the patients was 64.35±14.6 (22-86). Diabetes mellitus was detected in 14 patients (58.3%), hypertension in 13 (54.2%), and coronary artery disease in 5 (27.8%) (Table 1). The pre-treatment intraocular pressure was 15.3±3.2 mmHg, and post-treatment intraocular pressure was 15.44±2.8 mmHg (p=0.85). The pre-treatment BCVA was 0.33±0.37, and post-treatment BCVA was 0.37±0.36 (p=0.365). The pre-treatment RNFL value was 208.0±57.9 µm, and post-treatment RNFL value was 113.6±32.6 µm (p<0.001) (Table 2). No complications were observed post-treatment.

Table 1. Demographic characteristics of patients

Number of patients	**24**
Gender male (%), female (%)	12(50%)/12(50%)
Eye right (%), left (%)	14(58.3%)/10(41.7%)
Average age (distribution)	64.35±14.6 (22-86)
Additional diseases: DM (%), hypertension (%), coronary artery disease (%)	14(58.3%)/13(54.2%)/5(27.8%)

DM: Diabetes mellitus

DISCUSSION

Table 2. BCVA and RNFL values

	Before treatment	**After treatment**	**p value**
Best corrected visual acuity (Snellen Chart)	0.33±0.37	0.37±0.36	p=0.365
RNFL µm	208.0±57.9	113.6±32.6	p<0.001*

BCVA: Best corrected visual acuity, RNLF: Retinal nerve fiber layer

Visual acuity in NAION, which is characterized by sudden visual impairment, varies in a wide range from mild visual blurring to severe visual loss. In our study, the mean visual acuity of the patients was 0.33±0.37.

Although NAION is rarely reported to be seen in younger patients, it is typically reported to be seen over the age of 50 years10. In our study, the mean age of the patients was 64.35±14.6 (22-86), which is similar to the literature.

Many authors have stated that the pathogenesis of NAION is multifactorial. It has been suggested that it may be related to systemic disorders, such as nocturnal hypotension, diabetes, hypertension, and arteriosclerosis, which reduce the autoregulatory capacity of the optic disc. NAION is thought to result from transient hypoperfusion of the optic nerve head. Despite the varying prevalence of predisposing factors across different studies, systemic conditions such as diabetes, hypertension and coronary artery disease have been frequently reported in patients.[2-6] In our study, consistent with the literature, 58.3% of patients had diabetes mellitus, 54.2% had hypertension, and 27.8% had coronary artery disease, indicating a high prevalence of these predisposing factors.

There is no classical treatment for NAION with proven efficacy. When the literature is reviewed, various medical and surgical treatment options have been tried in NAION, but there is no clear opinion on their effectiveness. When we look at the treatment protocols, antiaggregant and thrombolytic agents to prevent the development of NAION in the other eye, neuroprotective agents and hyperbaric oxygen therapy for axonal protection and minimization of myelin loss, intravitreal anti vascular endothelial growth factor inhibitors (VEGF) to reduce disc edema, systemic and intravitreal steoid use have been reported.[10-13]

Steroid therapy is one of the most commonly used treatment options. The use of systemic corticosteroids as a treatment option for NAION began in the 1960s and 1970s, following several case series that showed improvement in visual outcomes in NAION patients treated with steroids.[8] The goal of steroid treatment is to increase blood flow to the optic nerve head by reducing edema and relieving compression of the capillaries, due to its anti-inflammatory and edema-reducing effects.[14] However, when we look at the studies, the effectiveness of steroids shows variability across different research.

In a study conducted by Hayreh et al.[13] on 613 patients diagnosed with NAION, the group given 80 mg/day prednisone treatment in the acute phase of the disease, i.e. in the first 2 weeks, was compared with the control group. In this study, it was reported that regression of disc edema was observed in 6.8 weeks in patients treated with systemic steroid therapy, whereas it was observed in 8.2 weeks in the control group. Visual acuity improved in 69.8% of the patients in the systemic steroid group, while this rate was 40.5% in the control group. As a result, it was reported that visual acuity, visual field improvement and optic disc edema improved more quickly.

In another case report, in a case of acute NAION with subretinal fluid and dense edema of the optic disc head, an increase in visual acuity and a decrease in disc edema with dense edema of the optic disc head were reported after high

dose (1 g/day) methylprednisolone administration for 3 days.[15]

In contrast to these studies, Rebolleda et al.[16] applied 80 mg/day systemic corticosteroid treatment in patients with acute NAION and found that steroid treatment was not effective in terms of visual acuity and anatomical improvement. In addition, they reported steroid-related complications in 3 patients, and therefore, it was reported that steroid did not have a beneficial effect in NAION in this study. Authors have emphasized that steroid treatment should be administered with careful consideration of the risk-benefit ratio and side effect profile for each individual patient.

In our study, while anatomical improvement was found in the thickness of the nerve fiber layer, we found no difference in BCVA.

Limitations

The limitations of our study include the short follow-up period and the small sample size. Additionally, the absence of a control group affects the quality of the study in determining the true efficacy of steroid treatment.

CONCLUSION

In conclusion, it was observed that steroid treatment did not significantly improve visual acuity in patients; however, it significantly improved the resolution of optic disc edema.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Tokat Gaziosmanpaşa University Ethics Committee (Date: 06.06.2024, Decision No: 24-KAEK-186)

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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