ORIGINAL ARTICLE

Nonarteritic Ischemic Optic Neuropathy

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Background: To describe the systemic and visual characteristics and prognosis in patients with nonarteritic ischemic optic neuropathy (NAION) undergoing different treatments.

Methods: Retrospective chart review was performed in Kaohsiung Veterans General Hospital patients from 1995–2005 with a clinical diagnosis of NAION, including nonarteritic anterior ischemic optic neuropathy and posterior ischemic optic neuropathy (PION). There were 14 PION patients out of a total of 103 cases. The average age at disease attack was 61 years old, and the ratio of males to females was 1.24:1. Comorbid systemic diseases and visual function were recorded at both initial presentation and the later follow-up period. The final results were recorded and compared by the different treatments they received in 4 groups.

Results: In all, NAION usually affected people > 50 years old, without any difference between sexes. Presenting visual acuity, age, and different treatment modes had no direct influence on the final visual outcome. The most significant associated factor was hypertension.

Conclusion: NAION is a serious illness; the visual deficit persists even with aggressive treatment. [*J Chin Med Assoc* 2007;70(2):61–64]

Key Words: anterior ischemic optic neuropathy, nonarteritic ischemic optic neuropathy, posterior ischemic optic neuropathy

Introduction

Ischemic optic neuropathies are the most frequent acute optic neuropathies in patients > 50 years of age.[1,2] Depending on the segment of optic nerve affected, they are subdivided into anterior and posterior ischemic optic neuropathies. Optic disc edema from ischemia to the anterior nerve is, by definition, present in anterior ischemic optic neuropathy (AION) and absent in posterior ischemic optic neuropathy (PION). AION is much more common than PION, accounting for 90% of cases of optic nerve ischemia.

AIONs are subdivided into nonarteritic and arteritic etiologies. Arteritic anterior ischemic optic neuropathy (AAION), classically due to inflammation of mid-sized arteries, is an ophthalmologic emergency, requiring prompt recognition and treatment to prevent devastating blindness. About 90–95% cases of AION are nonarteritic anterior ischemic optic neuropathy (NAAION).

Various therapies for ischemic optic neuropathy have been studied, including medical and surgical treatments, though without definitive beneficial results. Here, we addressed only patients with NAAION and PION at Kaohsiung Veterans General Hospital in the past 10 years and excluded AAION patients. Four different medical therapies were given. We performed retrospective chart review to survey the multiple relevant factors and visual outcomes in these patients.

Methods

In all, 107 Chinese patients were screened; 4 patients were excluded due to loss to follow-up in later visits. Chart review was from 1995–2005, and 103 consecutive patients (57 males, 55.34%; 46 females, 44.66%) were included in the study. Their ages ranged from 15 to 91 years old.

The inclusion criteria were sudden onset of loss of vision, relative afferent papillary defect (bilateral disease excepted), optic disc edema (in NAAION), and nerve fiber layer defect on visual field testing. Ocular medical

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Table 1. Vision change in each treatment group

	Group			
	Oral medication ($n=78$)	Oral prednisolone ($n=8$)	Methylprednisolone pulse therapy ($n=10$)	Observation ($n=7$)
Vision change (lines), *n* (%)				
Worse > 0.2 logMAR	10 (12.8)	2 (25)	1 (10)	0 (0)
Little or no change	42 (53.8)	2 (25)	6 (60)	4 (57.1)
Improvement > 0.2 logMAR	26 (33.3)	4 (50)	3 (30)	3 (42.9)

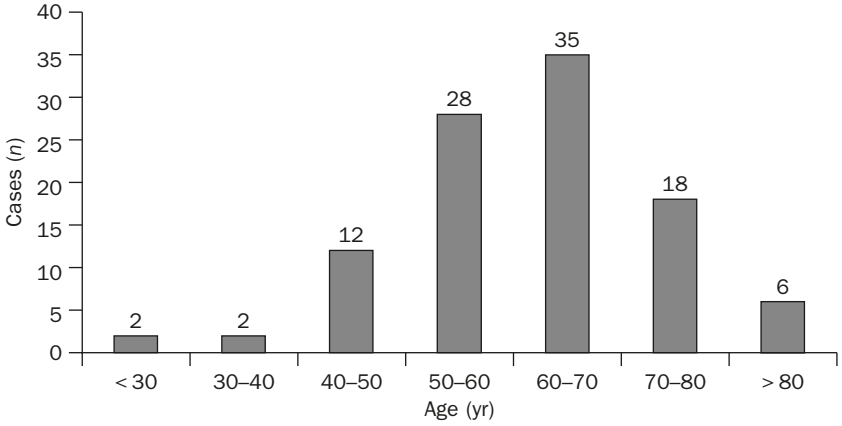

Figure 1. Distribution of age at disease attack.

history was obtained and complete eye examination was performed.

Patients were excluded if they had clinical features that suggested disorders other than nonarteritic ischemic optic neuropathy (NAION), such as a significantly elevated sedimentation rate or elevated C-reactive protein level. A history of inflammatory or infectious diseases was also eliminated by detailed history-taking or relative systemic and laboratory examination. If other central nervous system lesions were suspected, imaging study was arranged.

Subjects were divided into 4 groups depending on their treatment modes. Group 1 consisted of 78 patients who received supportive oral medication, e.g. aspirin, vasodilator and vitamin B complex. Group 2 consisted of 8 patients who had oral prednisolone. Group 3 consisted of 10 patients who underwent pulse methylprednisolone therapy. Group 4 consisted of 7 patients who were placed under observation only and did not receive any kind of treatment (Table 1).

Patients' best corrected visual acuity was measured by Snellen chart and notated by logMAR. Counting fingers, hand motion, light perception and no light perception were assigned the worse possible value in the logMAR. Visual acuity change for 0.2 logMAR was regarded as meaningful improvement or worsening. Vision stabilization was defined as the patient's vision not fluctuating in clinic visits for at least 3 times consecutively. Within treatment groups, visual outcome was assessed by *t* tests. All *p* values were 2-sided; $p<0.05$ was considered statistically significant.

Results

The study population comprised 14 patients with PION and 89 patients with NAAION. Fifty-seven patients were male. The male to female ratio was 1.24:1. Patients' systemic conditions were carefully reviewed. Hypertension had a prevalence of 58.3%, followed by diabetes mellitus (36.9%). Mean age at disease attack was 61 ± 12 years (range, 15–91 years) (Figure 1). Most patients were > 50 years old (84.5%).

Visual acuity improving by 0.2 logMAR was regarded as meaningful improvement. The final vision outcome showed that 36 of 103 patients (34.95%) had vision improvement, 54 patients (52.43%) had little or no change, and 13 patients (12.62%) had a worsening of vision. The visual acuity changes in each group are listed in Table 1. Because of the insufficient case number in some groups, no significant visual improvement difference between treatment groups was found

Table 2. Vision improvement by patient age and initial vision

	Cases (*n*)	Vision improvement (logMAR)*
Age (yr)		
< 30	2	0
≥ 30 to ≤ 50	14	–0.23
> 50	87	–0.19
Initial vision (logMAR)		
> 1	49	–0.49
1–0.2	40	–0.03
< 0.2	14	0.11

**Vision improvement = stabilized final vision minus initial vision, notated in logMAR (a negative value represents improvement).*

($p = 0.24$). Age and initial visual acuity also had no significant influence on vision recovery ($p = 0.32$ and $p = 0.08$, respectively) (Table 2). Finally, the mean duration from symptom onset to vision stabilization was 55 ± 98 days (range, 0 days to > 1 year).

Discussion

The diagnosis of ischemic optic neuropathy requires complete history-taking and exclusion of other possible diseases, such as multiple sclerosis, compressive optic neuropathy or other central nervous system-related lesions and inflammatory diseases. In younger patients, Leber's hereditary optic neuropathy should also be ruled out.[3]

The clinician's primary role in managing patients with this disorder is exclusion of arteritic causes and modification of vascular risk factors that might affect final visual outcome. So, subsequent occurrence in the second eye might be prevented. The rate of second eye involvement is 15% in the following 5 years.[4] Proper recognition can prevent unnecessary and expensive diagnostic evaluations and unnecessary exposure of the patient to inappropriate therapies.

There is no established treatment for ischemic optic neuropathy. Various medical therapies have been studied, without definitive beneficial results. These include phenylhydantoin, intraocular vasodilators, levodopa, intravenous norepinephrine, anticoagulation, aspirin, and corticosteroids.[5–10] It has been theorized that agents such as brimonidine tartrate or memantine may have a neuroprotective role in ischemic optic neuropathy; however, human trials have not been successfully performed.[11]

In 1989, it was first suggested that optic nerve sheath decompression surgery (ONDS) may be beneficial in patients with the progressive form of NAION,[12] and subsequent reports supported these findings.[13–15] However, the results of the Ischemic Optic Nerve Decompression Trial (IONDT) suggested that ONDS for NAION was not effective and may actually be harmful.[6]

In this study, the 4 groups had similar visual acuity outcomes independent of the different treatments, although the case number was limited. Also, regarding choice of treatment, we gave more aggressive therapy in clinically more serious patients (poorer visual acuity in the very first presentation) and younger patients. But we did not find any correlation between initial vision and the treatment patients received with final visual acuity ($p = 0.08$).

However, we found that poorer vision at first presentation had greater potential for improvement. On the contrary, fair vision at the first visit sometimes worsened in later follow-up. The condition may be due to early awareness of the disease and no matter what step we took, the disease continued on its own course. Age did not play a significant role in prognosis in our study ($p = 0.32$).

IONDT reported that 38 of 89 patients (42.7%) in the follow-up group improved ≥ 3 lines of visual acuity at 6 months, 40 patients (44.9%) had little or no change, and 11 patients (12.4%) had a worsening of vision by ≥ 3 lines.[6] However, this rate of improvement is higher than has been previously reported in the literature.[16,17] At the 24-month follow-up, 27 of 87 patients (31.0%) in the follow-up group improved ≥ 3 lines of visual acuity, 41 patients (47.1%) had little change, and 19 patients (21.8%) had a worsening of vision by ≥ 3 lines.[18] Our result was comparable to those of previous reports[16,17] and the IONDT outcome at the 24-month follow-up.

The mean time for vision stabilization was 55 days. But that result is biased because some patients did not seek medical help at the very beginning. The reason might be that they did not pay attention to their vision loss while they still had 1 sound eye. Therefore, this bias would affect the accuracy of the duration for vision stabilization.

Interestingly, male gender was slightly predominant in this NAION series, and this situation is similar to the prevalence rates of hypertension and hyperglycemia in Taiwan. We also found that males had poorer vision prognosis than females, although this was not statistically significantly ($p = 0.07$).

As we know, the risk factors for NAION include crowding disc, hypertension, diabetes mellitus, smoking, vasculitis, hyperlipidemia, renal failure, and migraine. In this study, we found that the most significant risk factor for ischemic optic neuropathy was hypertension, in 58.3% of patients (odds ratio, OR = 2.70,

compared with the prevalence rate in Taiwan), followed by diabetes mellitus in 36.9% of patients (OR=4.92, compared with the prevalence rate in Taiwan).[19]

In conclusion; about 1-third (34.95%) of patients with NAION had vision improvement regardless of what treatment they received. And, about half (52.43%) of all patients showed no change in vision after disease onset. The average time for vision stabilization was <2 months. Theoretically, steroids can reduce further tissue damage caused by edematous nerve head. Presenting visual acuity, patient age, and treatment received had no significant influence on the final visual outcome. Finally, we note that hypertension and diabetes mellitus are the leading underlying causes of NAION. Potential limitations of our study include its retrospective nature and selection bias. Because of the low incidence of NAION, an adequately controlled prospective study would be difficult but worthy of further workup.

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