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Non-arteritic anterior ischaemic optic neuropathy (NA-AION): outcome for visual acuity and visual field defects, the Singapore scene 2

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ABSTRACT We report the six months follow-up findings in relation to visual acuity and visual field defects in a series of Singaporean patients with non-arteritic anterior ischaemic optic neuropathy seen in the neuro-ophthalmology service of the Singapore National Eye Centre. 90% of the patients were Chinese, and the most common vascular risk factor was hypertension. Visual acuity was normal at the outset in 40% of cases and unchanged in 85%, and the assessment of visual acuity alone was not found to be a satisfactory method to determine prognosis. Visual field defects were found in all the affected patients, the most common being in the inferior fields. After six months, visual field defects were found to be unchanged in 77% of cases, improved in 15.5% and worse in 7.5%. Overall visual function (visual acuity plus visual field) was unchanged in 81% of cases, and no patient had complete recovery.

Keywords: anterior ischaemic optic neuropathy, hypertension, vascular risk factors, visual acuity, visual fields
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INTRODUCTION

As previously reported from our centre, non-arteritic anterior ischaemic optic neuropathy (NA-AION) is the most common optic neuropathy encountered in our neuro-ophthalmology clinics,[1] and is also one of the most common causes of permanent, but fortunately, incomplete visual loss in our elderly population.

The outcome in respect of changes in visual acuity and visual fields in NA-AION patients has been reported in a north American population by Hayreh and Zimmerman from Iowa,[2] in which the authors concluded among other things that after six months, the condition has become stable "with no significant change after that". Whether their reported changes in visual acuity and visual fields can be applied to our NA-AION patients in Singapore is another matter. We attempted to obtain the follow-up data for a specified period of six months in a consecutive series of local patients with NA-AION, who were seen in the neuro-ophthalmology clinic at the Singapore National Eye Centre (SNEC). One of the two neuro-ophthalmology consultants (JFC) conducting such clinics at SNEC had seen the patients, and the diagnosis was confirmed by him in all cases.

METHODS

It is our practice in SNEC that all patients with a possible diagnosis of NA-AION presenting to our emergency department or as "walk ins" to our general clinics, where most patients with sudden visual loss present, are referred on as soon as possible to our neuro-ophthalmological service, where they are fully worked up and seen by a consultant. These two groups of patients were included in this prospective study in addition to those with a diagnosis of NA-AION referred directly to our specialist service by other consultants in SNEC or from the local private sector. In all, 121 patients, of whom 109 (90%) were Chinese (61 male and 48 female) along with four Malays (two male and two female) and eight Indians (5 male and 3 female), were seen over a period of five years. The proportion of Chinese patients in our cohort was higher than that (75%) of the Singapore population,[3] and males (56%) were predominantly involved (Table I). All patients were questioned regarding vascular risk factors, and if not known to be present, were investigated at

Table I. Demographics and clinical characteristics of the 121 Singaporean non-arteritic anterior ischaemic optic neuropathy patients in our study.

Demographic/clinical characteristic	No. (%); %SP
Male gender	68 (56); 49.5
Age range (yrs)	36–89
Mean age at initial visit (yrs)	61
Chinese	109 (90); 75.0
Indian	8 (7); 8.7
Malay	4 (3); 13.7
Bilateral involvement	5 (9.8)

SP: Singapore population[3]

Table II. Visual acuity outcome of 53 eyes from the initial visit to six months follow-up.

VA at initial visit	No. of eyes (%)	No. of eyes at 6 months follow-up (%)		
		No change	Improved	Worsened
6/6 to 6/9	21 (40.0)	21	0	0
CF to HM	15 (28.0)	12	1	2
Others	17 (32.0)	12	3	2
Total	53 (100.0)	45 (85.0)	4 (7.5)	4 (7.5)

VA: visual acuity; CF: counting fingers; HM: hand motion

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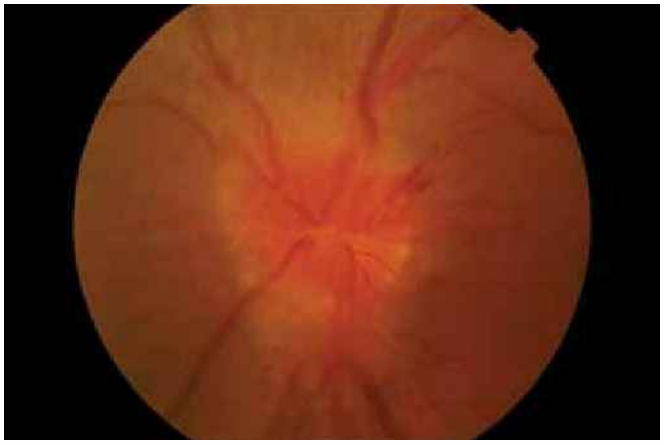

Fig. 1 Fundus photograph shows a hyperaemic oedematous optic disc with flame-shaped haemorrhages seen in acute non-arteritic anterior ischaemic optic neuropathy.

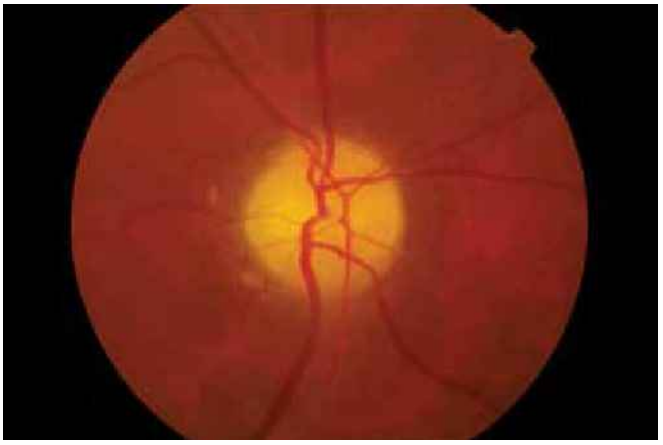

Fig. 2 Fundus photograph shows a yellowish pale optic disc seen in resolved non-arteritic anterior ischaemic optic neuropathy six weeks from onset.

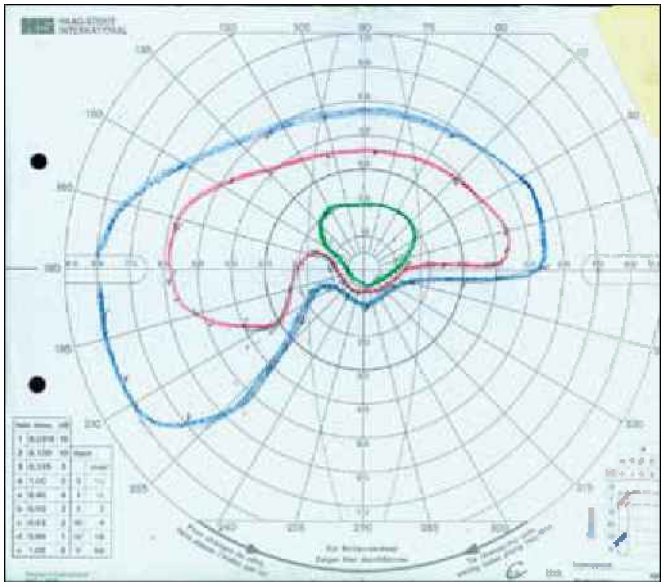

Fig. 3 Goldmann visual field chart shows an inferior nasal defect with fixation intact found in 45% of the reviewed patients.

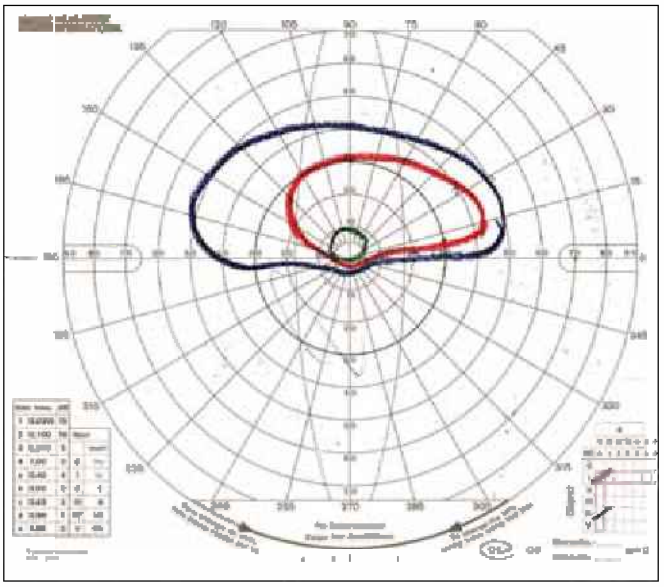

Fig. 4 Goldmann visual field chart shows a severe inferior altitudinal defect involving fixation found in 30% of the reviewed patients.

the initial visit. We requested patients with NA-AION to return for review at one, three and six months from the onset, and continued the follow-up for a full year, if possible. For the purposes of this investigation, only the patient's visual acuity and visual fields findings after six months were taken to assess the outcome. Best corrected visual acuity for distance was accepted, and a change of two lines on the Snellen chart was considered significant for improvement or otherwise.

Visual fields were assessed in most cases by Goldmann perimetry, which was performed by an experienced perimetrist, except where a Humphrey's field analysis had already been done by the first examiner, in which case we followed up with this same test. Changes in the visual field on follow-up was classified as 'no change', 'improved' or 'worsened', accepting an approximate 10% difference as significant. Visual field charts, the vast majority being from Goldmann perimetry and thus being more complex and difficult to define the exact parameters, were reviewed independently by both authors, as in the Iowa study,[2] where we also concluded that an overall subjective grading gave the best information, and thus, simply graded them as noted above.

RESULTS

It should again be emphasised that the patients with NA-AION presented with optic disc oedema and that the disc was hyperaemic (Fig. 1) at the outset and only became pale after about six weeks[1] (Fig. 2). In addition, flame haemorrhages on or at the disc margins were a common and characteristic finding.[1] Futhermore, visual acuity could be intact but visual field loss is to be found in all except in so-called 'incipient' cases.[4] We only managed to obtain accurate follow-up at six months on 51 patients (56 eyes) from our total of 121 patients with confirmed NA-AION, but this rate of review attained is not surprising in our population, where a 'no show' after one or two visits is common, particularly in the case of NA-AION, where we are unable to offer any curative treatment.

In all, 48 (94.1%) of our 51 reviewed patients were Chinese, with three (5.9%) Indians and no Malays. 33 (64.7%) were male and 18 (35.3%) female. Five (9.8 %) patients had sequential or bilateral disease, and three incipient or threatened NA-AION without loss of visual acuity or visual field. Therefore, the results on visual acuity and visual field outcome below and

in Tables II and III are in respect of 53 eyes. Visual acuity was essentially normal (6/9–6/6) at the outset in 21/53 (40%) eyes but was reduced to counting fingers or hand motion in 15 (28%). After six months, acuity was unchanged in 45/53 (85%) eyes, improved in four (7.5%), and worse in a further four (7.5%) (Table II). The eyes with poor acuity, as expected, had either scotomatous or altitudinal defects involving fixation.

The most common visual field defects found (Table III) were inferior nasal (Fig. 3) in 24/53 (45%) eyes followed by inferior altitudinal (Fig. 4) in 16/53 (30%), whereas similar upper defects occurred in only four (7.5%) eyes. Central and paracentral scotomatous defects were each found in four (7.5%) eyes, nasal peripheral defects in two and upper temporal, centro-caecal and general field constriction in one each. At the end of the six months review, the visual field defects were unchanged in 41/53 (77%) eyes, improved in eight (15.5%) and worse in four (7.5%) (Table III), and no field defect recovered completely. It should be noted that loss of a patient's lower visual field and scotomatous defects are the most visually disabling, and were found in over 80% of our patients. Vascular risk factors (VRFs), i.e. diabetes mellitus, hypertension or hyperlipdamia, were present in the whole cohort except for six (11.7%) patients (including one so-called 'incipient' case). All three factors were found in 15(29%) patients, two factors in a further 12 (23%) and diabetes mellitus alone in two patients. Hypertension was present in 31/51 (60%) patients, hyper-lipidaemia in 26/51 (50.9%) and diabetes mellitus in 25/51 (49%). We found no direct relationship between the incidence, type, multiplicity of these VRFs and visual outcome, severity or change in the field defects.

Table III. Type of visual field defect and outcome of 53 eyes from the initial visit to six months follow-up.

Visual field defect at initial visit	No. of eyes (%)	No. of eyes at 6 months follow-up (%)		
		No change	Improved	Worsened
Inferior nasal	24 (45.0)	20	4	0
Inferior altitudinal	16 (30.0)	12	2	2
Superior altitudinal	4 (7.5)	3	1	0
Central scotoma	4 (7.5)	1	1	2
Others	5 (10.0)	5	0	0
Total	53 (100.0)	41 (77.0)	8 (15.5)	4 (7.5)

DISCUSSION

It should be noted that the ethnic distribution of 90% Chinese among our reviewed patients is well in excess of their racial distribution (75%) in Singapore, and we had a majority (62.7%) of males who returned for their six months follow-up as compared to 56% in the initial cohort. As shown in Table II, visual acuity was good at the outset in 21/53 (40%) eyes, and this remained unchanged in 85%, with improvement or worsening in 7.5% each, whereas in the Iowa study,[2] 42.5% of eyes (irrespective of initial visual acuity) remained unchanged, 40.5% had overall improvement and 17% deteriorated. Hence, good visual acuity at the onset does not exclude a diagnosis of NA-AION, nor was this standard method of assessment of visual function alone found to be the best way to assess outcome in our patients.

Table III shows that the visual field defects in our series involved mainly the lower field or were scotomatous in nature, and remained unchanged after six months in 41/53 (77%) eyes compared to 64.6% in the Iowa series.[2] Eight of the 53 (15 %) field defects improved and 4/53 (7.5 %) worsened, whereas the corresponding Iowa figures were 20.4% and 15%, respectively.[2] We must emphasise that in contrast to visual acuity assessment, visual field testing by full field perimetry or Humphrey's analyser is essential not only for establishing the diagnosis of NA-AION but also for determining the outcome. It is also clear from our study that functional improvement (visual acuity plus visual field) in NA-AION is not to be expected, and it has remained unchanged in 81% of our Singaporean cases compared to 53.5% in the Iowa study.[2] Furthermore, there was no complete recovery in any of our patients.

The most common underlying vascular disease in our patients was hypertension (60%), followed by hyperlipidaemia (50.9%) and diabetes mellitus (49%), the latter of which is present in 8.2 per 1,000 population aged 18–69 years in Singapore.[5] In the seminal Ischemic Optic Neuropathy Decompression Trial[6] conducted in North America, hypertension was the most common vascular risk factor (47%) followed by diabetes mellitus in 24% of the cohort.

In conclusion, it would appear that in our patients with NA-AION, which is the most common adult optic neuropathy encountered in Singapore, and where there is "no proven effective therapy",[7] improvement is seldom seen. None of our patients received any specific treatment, such as corticosteroids or intravitreal therapy. Recovery in visual function is not to be expected, and improvement in the condition may only be achieved by prevention and better control of the underlying vascular risk factors involved.

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