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A retrospective five-year study of clinical profile of patients with acute binocular diplopia at a tertiary eye care center in Kerala

Ann J K[1,*]

[1] *Dept. of Ophthalmology, Little Flower Hospital and Research Centre, Angamaly, Kerala, India*

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ABSTRACT

Aim: To analyse the demography, clinical features and outcome of patients presented with acute binocular diplopia at a tertiary eye care centre of Kerala.

Materials and Methods: A retrospective review of medical records of patients presented with acute (<four weeks) binocular diplopia over the past five years was done. Detailed ophthalmic evaluation was done and risk factors were noted. Patients were followed up until cure or up to six months, whichever was earlier. Patients with restrictive strabismus or lack of follow up were excluded from the study.

Results: 161 eyes of 88 (54.65%) males and 73 (43.34%) females with a mean age of 55.71 years (range 6 to 93 years) were included. Isolated cranial nerve palsies were the most common cause for acute diplopia (n=142, 88.2%) and included pupil sparing 3^{rd} nerve palsy (n=38), pupil involving 3rd nerve palsy (n=8), 4^{th} nerve palsy (n=17) and 6th nerve palsy (n=79). Microvascular ischemia (n=119), traumatic (n=10), combined cranial nerve palsy (n=6), Idiopathic (n=13), Ocular myasthenia (n=5), Inter nuclear ophthalmoplegia (INO) (n=3), Parkinsonism (n= 1), Progressive Supra Nuclear Palsy (n=1) and decompensated comitant strabismus (n=3) were the other causes. Diabetes mellitus (n=102, 63.3%) was the most common vasculopathic factor followed by hypertension. Most patients (n=144, 89.4%) were relieved of their symptoms within six months.

Conclusion: Acute binocular diplopia, though an alarming and distressing condition, had very good prognosis in our patients. Meticulous clinical examination and investigations can establish the diagnosis in most of the cases.

1. Introduction

Diplopia is the simultaneous perception of two images of a single object. An ocular misalignment of more than 200 μm[1] cause binocular diplopia.[2] Disturbances can be at various levels, like supra nuclear disorders, cranial nerve palsies, neuro muscular junction disorders or at extra ocular muscles.[3–5] Serious underlying diseases like demyelination, vasculopathies and neoplasms must be considered in diplopia.[4,6] As previously reported, 16% of emergency visits for diplopia had underlying systemic disorder[7] Causes, risk factors and prognosis for diplopia varies with age and ethnicity.[8–12] However, there are limited Indian studies on acute diplopia.[13]

2. Aim

To analyse the demography, clinical features and outcome of patients presented with acute binocular diplopia at a tertiary eye care centre of Kerala.

3. Materials and Methods

The study protocol used a retrospective case record based observational study design to retrieve case records of

* *Corresponding author.*
E-mail address: drannjk@rediffmail.com (Ann J K).

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all subjects with acute binocular diplopia of fewer than four weeks duration who presented at the ophthalmology department of the study institute between January 2016 and December 2020. Patients with a complete cure of symptoms or a follow up for six months, whichever was earlier, were included. Patients with restrictive strabismus or lack of follow up were excluded from the study. Clinical and demographic details, duration of the complaint at the time of presentation, history of head trauma, and details of any systemic illness that may have led to the onset of acute binocular diplopia were retrieved from the records.

All patients underwent a detailed ophthalmological evaluation that included uncorrected and best-corrected visual acuity estimations, slit lamp examination of the anterior segment, assessment of the range of extra ocular movements, posterior segment assessments and diplopia charting.

Diplopia charting was performed with the patient seated in a dark room, head straight, wearing red-green goggles, with the red in front of the right eye and green in front of the left eye. A vertical source of light was projected from a one-meter distance, straight, in front of the patient (in primary gaze). The patient informed if they are appreciating the image as single or double. The patient also informed if the image was parallel or tilted and the distance between the images if they saw a double image. The light was shown in all other nine gaze positions and the patient was told to report in which direction diplopia occurs, and in which direction the deviation is maximum. The findings were recorded on a paper, as the right side and left side of the chart as (patient's right and left). The charting specified the distance of separation between two images as told by the patient and whether the image was tilted. Maximal separation of images is seen in the direction of action of paralyzed muscle. Restrictive strabismus was ruled out based on history, examination findings, investigations including imaging studies and forced duction test depending on each case.

Presence of systemic risk factors like hypertension, diabetes mellitus, dyslipidemia, coronary artery disease, cerebrovascular accident was confirmed either by history or laboratory results. The laboratory investigations included complete blood count, blood sugar, lipid profile and recording of the blood pressure. Brain imaging, CT or MRI, was done according to the discretion of the treating doctor. Ice pack test and neostigmine test were done in selected cases when there was fatiguability or diurnal variation of diplopia as per history to confirm myasthenia.

Details of imaging studies and treatment were retrieved from the case records. The interval to complete cure and any recurrence in the study period was recorded. Complete cure was defined as the presence of full range of extra ocular movements without diplopia.

Each patient identified through the case records was assigned a unique study identification number. Data from the case records were initially transcribed onto a pre-designed study form and entered into an MS Excel datasheet for further descriptive analysis.

4. Results

The study included 161 eyes of 88 (54.65%) males and 73 (43.34%) females with a mean age of 55.71 years (range 6 to 93 years). The right eye was involved in 84 patients and the left eye in 71 and both eyes were involved in 6 patients. Isolated cranial nerve palsies were the most common cause for acute diplopia (n=142, 88.2%) in the study population (Table 1)

Table 1: Distribution of ocular motor nerve palsy in the study population

Type of nerve palsy	**Number of eyes**
Pupil sparing 3rd nerve palsy	38
Pupil involving 3rd nerve palsy	8
4th nerve palsy	17
6th nerve palsy	79

The cause was presumed to be microvascular ischemia in 119 of these 142 eyes as it was a mononeuropathy with the presence of vasculopathic risk factors like diabetes (DM), hypertension (HTN), coronary artery disease (CAD), and cerebrovascular accident (CVA). (Table 2) summarises the causes of acute diplopia other than vascular mononeuropathy.

Table 2: Causes of diplopia excluding vascular mononeuropathy in the study population

Cause of diplopia	**Number of eyes**
Trauma related	10
Combined cranial nerve palsy	6
Idiopathic	13
Ocular myasthenia	5
Inter nuclear ophthalmoplegia (INO)	3
Parkinsonism	1
Progressive Supra Nuclear Palsy	1
Decompensated comitant squint	3

The ten post traumatic cases included two pupil involving 3^{rd} nerve palsies, a pupil sparing 3^{rd} nerve palsy and six 4^{th} nerve palsies and a sixth nerve palsy. The combined cranial nerve palsies included two Tolosa Hunt syndrome, one orbital apex syndrome, one meningioma, one glioma, and one ethmoidal mucocele exerting pressure effect at orbital apex. We were unable to find any cause for diplopia in 13 cases of isolated cranial nerve palsies and designated them as idiopathic. These included eight 3^{rd} nerve palsies, four 6^{th} nerve palsies and one 4^{th} nerve palsy.

Most (n=89, 55.3%) of the patients presented with acute diplopia belonged to 51 to 70 age group. We had 11 patients

under 45 years in ischemic group. Diabetes Mellitus (n=102, 63.3%) was the most common co-morbid risk factor in the study population.

The mean time of presentation was 1.5 weeks and most of the patients (n=104, 64.6%) presented within a week of the onset of symptoms. Most patients (n=144, 89.4%) were relieved of their symptoms within 6 months. The maximum recovery was seen within a month of onset (n=69, 42.8%) and 84.7% of eyes had recovered within three months. Seventeen patients did not recover within 6 months of the onset (Table 3).

Table 3: Causes of diplopia in the 17 patients who did not recover in 6 months

Cause of diplopia	Number of patients
6th nerve palsy (vasculopathic)	5
3rd nerve palsy after trauma	2
3rd nerve palsy following CVA	1
4th nerve palsy after trauma	4
Comitant squint	2
PSPN	1
Parkinsonism	1
Intracranial mass(glioma)	1

Late (>three months) recovery more frequent in third nerve palsy (19.56%). One of the patients with comitant squint underwent surgery and became asymptomatic. The other two cases with comitant squint have been scheduled for surgery. The patient with glioma was advised surgery but did not agree for surgery. Four patients developed recurrent cranial nerve palsy, two in same eye and two in opposite eye. All were vasculopathic nerve palsies.

70 cases underwent MRI brain and were normal in 30 cases. Small vessel ischemic changes were seen in 31 cases. The remaining nine patients had serious intracranial problems (compressive lesions, infarct/haemorrhage, and demyelination). Brain CT scan was done in 25 and eight (32%) had positive findings (mass, infarct/hemorrhage, fracture of cranial bones)

5. Discussion

There are only a few studies that have reported on acute diplopia from India, and most of these are from north India.[13–15] There is a recent study from Karnataka on 30 cases of ocular motor nerve palsies.[16] The distribution of age in our study population is similar to most previous studies[8,9,17] but is higher than a previous study from Delhi.[15] The study from Delhi[15] had a higher proportion of pediatric patients which may explain the lower mean age in that study. Most patients in this series were males which is similar to previous studies.[8,15] Patients with acute diplopia in this series presented early with 64.5% patients presenting within a week of onset. The early presentation may reflect the acute distress caused by the sudden onset diplopia.

The most common etiology of acute diplopia was ischemic vasculopathy in our study. This is in accordance with previous studies.[10,11,15] Diabetes was the most common risk factor, and this is probably explained by increasing prevalence of diabetes in our population and change in lifestyle.[18,19] The second most common cause was hypertension. The higher prevalence of acute diplopia in older ages may be explained by the association of diabetes mellitus and hypertension in older age groups.

The 6^{th} nerve palsy was the most common isolated cranial nerve palsies and is consistent with previous reports from the literature.[8,10,13,15,17] The reason for this observation is not clear. A previous study[17] has hypothesized that relatively lower vascular density of abducens nerve predispose it to microvascular ischaemic damage. The least affected nerve in our population was the trochlear nerve. Six out of 17 cases (35%) occurred after head trauma. Ischemic vasculopathy affecting 4^{th} nerve is comparatively rare in our group as previously reported.[15,17]

The next common cause for acute diplopia was idiopathic nerve palsy (n=13, 8%), followed by trauma (n=10, 6.2%). Some studies[13,20]reports undetermined cause as high as 48.7% and 21.9% respectively, but it was comparatively low in our study. A comprehensive workup is needed to throw light on various aetiologies of diplopia.

Patients diagnosed with myasthenia were referred to neurologist and they became symptom free with medical treatment. Patients who had Tolosa Hunt syndrome, orbital apex syndrome and INO also improved with medical treatment. Our study revealed neurodegenerative diseases like progressive supra nuclear palsy and Parkinsonism can also present with acute diplopia.

We did not advice MRI or CT on a routine basis. The recommendation of brain imaging studies was left to the discretion of the treating physician. Some of the referred cases already had undergone neuroimaging before coming to our centre. This led to a lack of uniformity in referring patients for imaging studies. Most (n=61) of the 70 cases that underwent a MRI of the brain did not reveal any treatable lesions and were either normal (n=30) or had only small vessel ischemic changes (n=31). The remaining nine patients had serious intracranial problems (compressive lesions, infarct/hemorrhage and demyelination); ie; 12.85% of our patients had important findings which cannot be missed out. Brain CT scan was done in 25 and eight (32%) had positive findings (mass, infarct/hemorrhage, fracture of cranial bones). As these results are highly variable, we recommend following the standard recommendations for neuroimaging. i.e; age less than 40 years, lack of comorbid conditions, presence of more than one neurological symptom and failure to resolve over period of time[15,21] rather than opt for imaging studies as a routine for every patient.

Most (89.44%) patients recovered in our group with maximum recovery seen in the first month and 84.72% recovery in first 3 months. Recovery rate of presumed microvascular cranial nerve palsy was 94.95%. Other reported studies also show excellent rate of recovery.[4,17] When we analysed the cases of late (>3 months) recovery in our study, we found these more common in patients with third nerve palsy (n=9, 19.56%).

The population in our study is older (mean age 55.7) compared to the populations studied in north India[13,15] (mean age 33 and 38 respectively). However, the pattern of frequency of cranial nerve involvement is same and prognosis is excellent in both groups. The recent study from Karnataka[16] has not mentioned the age of patients and they have third nerve as most affected. The current study is a single centre, retrospective study and may not be representative of the general population of patients with acute diplopia. The lack of uniformity in referrals for neuroimaging studies is another limitation of our study. However, the detailed ophthalmic assessments and documentation are strengths of the study. We recommend multicentre prospective studies to further study the risk factors associated with acute diplopia and outcomes after management in patients with acute diplopia.

6. Conclusion

This study demonstrates aetio-pathological profile of acute diplopia in a southern state of India, Kerala. Meticulous clinical examination and thorough work up can establish the diagnosis in most of cases. Our study shows that excellent recovery is possible in most cases with acute diplopia.

7. Source of Funding

None.

8. Conflict of Interest

None.

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Author biography

Ann J K, Consultant Ophthalmologist

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