

Etiology of Oculomotor Nerve Paralysis

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ABSTRACT

Purpose: To determine the etiology of oculomotor nerve paralysis over a one year period at a university-based hospital.

Methods: This observational case series was conducted on consecutive patients with a clinical diagnosis of isolated oculomotor nerve paresis who were referred to the neuro-ophthalmology clinic at Farabi Eye Hospital, Tehran, Iran during 2001-2002. All patients were evaluated for hypertension and diabetes. In patients with confirmed diabetes mellitus or hypertension, oculomotor nerve palsy was diagnosed as ischemic. However if no recovery was observed up to four months, the patient underwent MRI and MRA. The etiology of oculomotor nerve palsy was classified into six categories including ischemia, trauma, aneurysm, neoplasm, miscellaneous and idiopathic.

Results: During the period of the study, 28 eyes of 28 patients (17 male and 11 female subjects) with mean age of 50.5 years were enrolled. Blepharoptosis was observed in 89.3%. Pupil reaction was normal in 50%, sluggish in 14.3% and absent in 35.7%. Pupil size was normal in 57.1% and mydriatic in 42.9%. The paralysis was ischemic in 42.8%, traumatic in 14.3%, aneurysmal in 7.1%, neoplastic in 7.1%, miscellaneous in 10.7% and idiopathic in 17.8% of the cases.

Conclusion: In the present series, ischemia was the most common cause of oculomotor nerve palsy in which the most prevalent underlying disorder was diabetes mellitus.

Introduction

The oculomotor nerve (cranial nerve III) innervates all internal and external ocular muscles except the superior oblique and the lateral rectus and is considered the most important nerve involved in ocular motility. Although oculomotor nerve palsy is less common than sixth and fourth cranial nerve palsies, it is associated with significant morbidity. Patients typically present with blepharoptosis, limitation in eye movement accompanied by exotropia and a dilated pupil which poorly reacts to light.¹ Acute paralysis of the third cranial nerve may suggest uncal herniation through the tentorium cerebelli, which can cause death if not diagnosed and treated early. Congenital oculomotor nerve palsy is rare compared to acquired oculomotor nerve palsy. Ischemia is the most common cause of pupil sparing oculomotor nerve palsy and intracranial aneurysms are the most common cause of isolated oculomotor nerve palsy involving the pupil.²

Most reports have stated ischemia as the most common cause of oculomotor nerve paralysis.³⁻⁵ Although the majority of patients with ischemic oculomotor nerve palsy suffer from diabetes mellitus, other disorders such as hypertension, atherosclerosis and migraine may manifest similarly.² In a study conducted by Baghery and Hendy⁶, trauma was reported as the most common

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cause of oculomotor nerve paralysis in Iran. Rucker⁴ reported aneurysm and neoplasm and Rush⁵ reported trauma as the second main cause of oculomotor nerve palsy.

The majority of peripheral oculomotor nerve palsies are caused by minor injury to vessels in subarachnoid space or in the cavernous sinus. Less common causes are compression (due to aneurysm or tumor) and inflammation (sarcoidosis and vasculitis). In cases of trauma-related third cranial nerve palsy, underlying lesions such as aneurysms and tumors should be considered and ruled out.² The American Academy of Ophthalmology (AAO) recommends that cranial MRI with contrast and MRA (Magnetic Resonance Angiography) with special attention to the circle of Willis be performed for patients with oculomotor nerve palsy with pupil involvement. Such cases should be considered secondary to aneurysms. The AAO also recommends that oculomotor nerve paresis without pupil involvement be re-evaluated during short intervals to detect pupil dysfunction which mandates further diagnostic examinations.

The present study was performed to determine the signs and causes of oculomotor nerve paralysis in patients referred to the neuro-ophthalmology clinic at Farabi Eye Hospital, Tehran, Iran.

Methods

This observational case series includes patients with a diagnosis of isolated oculomotor nerve palsy referred to the neuro-ophthalmology clinic at Farabi Eye Hospital, Tehran, Iran from March 2001 to March 2002. All patients were evaluated for systemic hypertension and diabetes mellitus. Fasting blood sugar levels were obtained and patients with no history of diabetes underwent the two-hour postprandial blood sugar test. If diabetes mellitus or hypertension was confirmed, the oculomotor nerve palsy would be diagnosed as ischemic. However, if no recovery was observed during four months of follow-up, the patient would undergo MRI and MRA. In patients with oculomotor nerve palsy involving the pupil, MRI was first requested and if negative, MRA with special attention to the circle of Willis was performed. All patients more than 50 years of age underwent routine laboratory tests including CBC, ESR and CRP to rule out giant cell arteritis. The etiology of the oculomotor nerve palsy was classified into six categories: ischemic, traumatic, aneurysmal, neoplastic, miscellaneous and idiopathic.

Results

Overall, 28 (12 right and 16 left) eyes of 28 (17 male and 11 female) patients with oculomotor nerve palsy were evaluated. Mean age was 50.5 years (range 11-75 years). The most common presenting symptom was lid ptosis in 22 patients (78.6%); 13 patients (46.4%) complained of headaches. Other symptoms included ocular deviation, diplopia and decreased vision. Underlying disorders included diabetes mellitus (9 patients, 32.1%), systemic hypertension (3 patients, 10.7%) and malignancy (2 cases, 7.1%). History of trauma was positive in 4 patients (14.3%).

Clinical examination revealed blepharoptosis in 25 patients (89.3%) and ocular deviation in 28 eyes (100%) including exotropia in 27 eyes (96.4%). Complete paralysis of the oculomotor nerve was present in 9 eyes (32.1%) and paresis was observed in 19 eyes (67.8%). Pupil size was normal in 16 eyes (57.1%) and mydriatic in 12 eyes (42.9%). Reaction to light was normal in 14 (50%), sluggish in 4 (14.3%) and absent in 10 (35.7%) eyes. Additional signs included proptosis in 2 eyes (7.1%), globe pulsation in one eye (3.6%) and oculomotor synkinesis in one eye (3.6%).

Neuroimaging (MRI and/or MRA) was performed for 19 (67.8%) patients and revealed an abnormality in 7 cases (25%) including aneurysms (two cases), intracranial tumors (two cases), brainstem ischemia (three cases). Neuroimaging was normal in the remaining 12 patients (42.8%).

The final diagnosis was classified as ischemia in 12 (42.8%), trauma in 4 (14.3%), aneurysm in 2 (7.1%), tumor in 2 (7.1%), miscellaneous in 3 (10.7%), and idiopathic in 5 (17.8%) cases. Among patients with ischemic pathology, 9 (32.1%) had diabetes mellitus and 3 (10.7%) had systemic hypertension; one patient had history of a cerebrovascular accident. One of the two patients with intracranial tumor was an 11 year-old patient with recurrence of astrocytoma and the second patient was a 46 year-old woman with a cavernous sinus tumor on the right side. The three patients classified as miscellaneous included a 65 year-old man presenting with headache, blepharoptosis and deviation in the right eye with laboratory findings (CPR: 4+ and ESR: 60 mm/h) highly suggestive of temporal (giant cell) arteritis. The second patient was a 37 year-old woman with Tolosa-Hunt syndrome and the third patient had ischemic brainstem lesions.

Discussion

The purpose of the present study was to determine the etiology of oculomotor nerve paralysis in an Iranian population at a referral eye care center. In the current study, 42.8% of cases were ischemic in origin. Diabetes was the underlying cause in 32.1% which is higher than figures reported in other studies.³⁻⁶ This adds to the significance of diabetes as an important cause of oculomotor nerve palsy in the Iranian population. In our series 9 of 12 patients (75%) with ischemic palsy had diabetes mellitus, which is in accordance with Jacobson's study in which the corresponding figure was 68%. Pupil involvement was observed in 11% of eyes with ischemic oculomotor nerve palsy which is close to the 14-32% range reported in other series.³⁻⁵

Trauma was the second common cause of paralysis in the present study which is similar to most other published studies.³⁻⁵ However, trauma was reported as the common cause in Bagheri's study which was also performed in Iran.⁶ One possible explanation for this discrepancy is that Bagheri's study was performed in cases who were seen at a strabismus clinic where probably fewer ischemic oculomotor nerve palsies are referred for surgery due to the transient nature of the disorder.

Intracranial aneurysms were demonstrated in 7.1% of our patients which is less than the 12% to 18% range reported in other studies.³⁻⁵ This discrepancy can be explained by the fact that Farabi hospital is an ophthalmology center as compared to other studies which have been performed in general hospitals.

Tumors were the cause of oculomotor nerve palsy in 7.1% of the cases; corresponding figures have been 10% to 18% in other studies.³⁻⁶ The frequency of oculomotor nerve palsy described as "miscellaneous" and "idiopathic" was similar to most other studies.³⁻⁶

Since ischemia has been reported as the most common cause of oculomotor nerve paralysis we believe that for cases of complete oculomotor nerve palsy with pupil sparing, evaluation and control of underlying disorders such as diabetes mellitus and systemic hypertension, and careful follow-up would suffice. However, in cases with partial nerve palsy or pupillary involvement, MRI with gadolinium enhancement and/or MRA with special attention to the circle of Willis is recommended.

One should also consider the possibility of vasculitis such as giant cell arteritis in elderly patients. We recommend further studies on the possible correlation between diabetes control and oculomotor nerve palsy.

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