

Etiological and Recovery Factors Among Patients with Isolated Oculomotor Nerve Paralysis Attending a Tertiary Care Setting-A Prospective Observational Study

Dampuru Chandana¹, Tirumuru Divya², Gantela Sirisha³, Nallabantu Lakshmi Chowdary⁴, Triveni Chimata³

¹Post Graduate, Department of Ophthalmology, NRI Medical College, Guntur, Andhra Pradesh, India

²Assistant Professor, Department of Ophthalmology, NRI Medical College, Guntur, Andhra Pradesh, India

³Professor, Department of Ophthalmology, NRI Medical College, Guntur, Andhra Pradesh, India

⁴Professor & HOD, Department of Ophthalmology, NRI Medical College, Guntur, Andhra Pradesh, India

ABSTRACT

Background: To analyze the etiology, clinical presentation and outcome of oculomotor nerve paralysis.

Materials and Methods: It is a prospective study. All cases for the study is collected from the patients presenting themselves directly to Department of Ophthalmology, some cases are referred from Department of Neurology and Neurosurgery, NRI Medical College and General Hospital, Chinakakani from 2017 to 2019.

Results: Most of the patients belong to 51- 60 yrs age group (9) followed by age group 41-50 yrs (7). Among 30 patients right eye was involved in 13 patients, and the left eye was involved in 17 patients. No patients had bilateral palsy. The most common cause of isolated oculomotor cranial nerve paralysis is DM and HTN (microvascular ischemia) in 19 patients. In the present study, out of 9 hypertensives patients with third cranial nerve paralysis eight not recovered and one recovered, out of 21 patients, ten recovered and 11 not recovered. 18 had pupil sparing oculomotor nerve paralysis and 12 had pupil involving paralysis among 30 patients .Patients with pupil sparing oculomotor cranial nerve paralysis recovered completely within six months.

Conclusion: Finally we concluded that microvascular ischemia i.e. diabetes and hypertension, incomplete paresis and pupil sparing paralysis has high chances of complete recovery.

Keywords: DM, Oculomotor cranial nerve paralysis, Hypertension.

Corresponding Author: Dr. Tirumuru Divya, Assistant Professor, Department of Ophthalmology, NRI Medical College, Guntur, Andhra Pradesh, India.

INTRODUCTION

The oculomotor nerve is the third cranial nerve. It is motor in function. It supplies extraocular muscles like superior rectus (SR), inferior rectus (IR), inferior oblique (IO), medial rectus (MR), levator palpebral superioris (LPS) and intraocular muscles like sphincter pupillae and ciliary muscle.

Oculomotor nerve palsy can result from lesions located anywhere from the nucleus located in the midbrain to termination of the oculomotor nerve in extraocular muscles within the orbit.

Third cranial nerve palsy may be acquired or congenital, pupil – sparing or pupil – involving, complete or partial, isolated or associated with other cranial nerve palsies.

Most acquired cases are due to microvascular ischemia or microvascular angiopathy, i.e., diabetes mellitus (DM) and hypertension (HTN). Other causes like intracranial aneurysm and head injuries.

Patients may present with a variety of symptoms and signs. Clinical features of complete oculomotor nerve palsy are complete ptosis due to paralysis of levator palpebrae superioris, eyeball is deviated out and down slightly

intorted due to unopposed actions of lateral rectus, superior oblique, remaining extraocular movements are restricted, diplopia, head is turned on opposite side of lesion, tilted towards the same side and chin is slightly raised. In the case of partial paralysis, there is incomplete involvement of muscles

If the superior division of oculomotor nerve is only involved results in double elevator palsy with true or pseudo ptosis. Superior rectus and levator palpebrae superioris are spared if the inferior division is only involved. Diagnosis and treatment of oculomotor nerve paralysis vary according to etiology and mode of presentation.

Third cranial nerve palsy is due to microvascular angiopathy, i.e., DM, HTN, which is usually pupillary sparing and resolves completely. Traumatic or compressive lesions like tumors third nerve paralysis resolve incompletely and may show signs of aberrant regeneration.

Aims and Objectives

- To analyze the etiology of oculomotor nerve paralysis
- To analyze the common clinical patterns arising in the background of acquired oculomotor nerve paralysis
- To assess the recovery in patients with isolated oculomotor nerve paralysis

MATERIALS & METHODS

Source of data: All cases for the study is collected from the patients presenting themselves directly to Department of Ophthalmology, some cases are referred from Department of Neurology and Neurosurgery, NRI Medical College and General Hospital, Chinakakani from 2017 to 2019

Sample size: 30 cases

Duration of study: 2 years (October 2017 to September 2019)

Inclusion Criteria

- Isolated oculomotor nerve paralysis
- All ages groups and sex were included
- The patient who give consent for the study

Exclusion Criteria

- Congenital oculomotor nerve palsies have been excluded
- Patient with incomitant squint due to multiple cranial nerve palsies
- The patient who are not giving consent and unco-operative

Study Design: It is a prospective study, No potential risk is involved in this study

Statistical Analysis: Results will be expressed in the form of percentages.

RESULTS

Age distribution

In the study of 30 patients of isolated oculomotor cranial nerve paralysis 2 patients belong to 21-30 yrs age group, 4 patients in 31-40yrs age group, 7 patients belong to 41- 50 yrs age group, 9 patients in 51- 60 yrs age group, 6 patients in 61-70yrs age group, 2 patients in more than 71 yrs age group. Most of the patients belong to 51- 60yrs age group followed by age group 41-50 yrs.^[7,9]

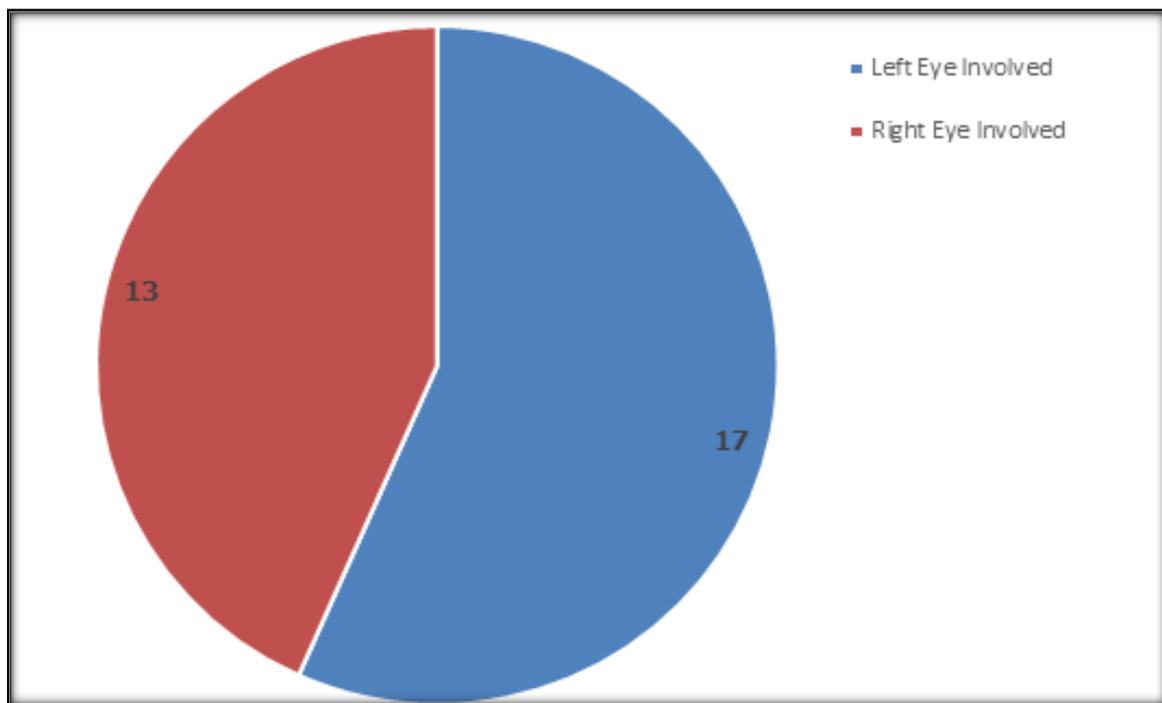
Table 1: Age distribution

Age	Number	Percentage
21- 30yrs	2	6.7 %
31- 40 yrs	4	13.6 %
41- 50yrs	7	23.4%
51-60 yrs	9	30%
61-70 yrs	6	20 %
> 71 yrs	2	6.7 %

Sex distribution**Table 2: Sex distribution**

Sex	Number	Percentage
Males	11	37%
Females	19	63%

Among 30 patients, 11 males and 19 females showed third cranial nerve paralysis.

Laterality**Figure 1: Distribution according to laterality**

Among 30 patients right eye was involved in 13 patients, and the left eye was involved in 17 patients. No patients had bilateral palsy.

Distribution according to pupillary involvement**Table 3: Distribution according to pupillary involvement**

	Number	Percentage
Pupil sparing	18	60%
Pupil involving	12	40%

Among 30 patients, 18 had pupil sparing oculomotor nerve paralysis, and 12 had pupil involving paralysis.

Distribution According to Etiology**Table 4: Distribution According to Etiology**

Cause	Number	Percentage
DM, HTN (Microvascular diseases)	19	63.4 %
Trauma	5	16.6 %
Idiopathic	3	10 %
Miscellaneous TB		
meningitis	2	6.7 %
Demyelinating Diseases	1	3.3 %

The most common cause of isolated oculomotor cranial nerve paralysis is DM and HTN (Microvascular ischemia) in 19 patients. Out of 19 patients with DM and HTN, 10 had diabetes mellitus, 1 had both diabetes and hypertension. Other causes or non –ischemic causes like trauma was the cause in 5 patients, idiopathic in 3 patients, in 2 patients due to TB meningitis and demyelinating disease in 1 patient.

Distribution According to Type of Palsy**Table 5: Distribution According to Type of Palsy**

Type of paralysis	Number	Percentage
Complete	10	33.33%
Incomplete or partial	20	66.67%

In the present study, out of 30 patients, 10 had complete paralysis, and 20 had incomplete oculomotor cranial nerve paralysis.

Distribution according to pain**Table 6: Distribution according to pain**

Pain	Number	Percentage
Present	13	43.33%
Absent	17	56.67%

In the present study among 30 patients 13 patients had pain and pain is absent in the remaining 17 patients

Recovery at six months in various etiologies**Table 7: Recovery at six months in various etiologies**

	DM and HTN	Trauma	Idiopathic	TB meningitis	Demyelinating disease
Complete Recovery	9	1	0	0	0
Partial Recovery	5	2	0	1	0
Not Recovered	5	2	3	1	1

In the present study, out of 19 patients with microvascular ischemia, nine patients completely recovered five patients partially recovered, and five patients not recovered.

Out of five patients with trauma, one completely recovered, two patients partially recovered, two not recovered.

Three patients with the idiopathic cause are not recovered, two patients due to Tb meningitis one partially recovered and one not recovered, one patients with demyelinating disease did not recover

Comparison of recovery with the type of paralysis**Table 8: Comparison of recovery with the type of paralysis**

	Recovered	Not recovered	P-value
Complete palsy	3 (30%)	7 (70%)	<0.017
Incomplete palsy	15 (75%)	5 (25%)	

Out of 20 patients with incomplete paralysis, 15 patients recovered and five not recovered, and out of 10 complete paralysis patients, three recovered and seven not recovered. Patients with incomplete paralysis recovered more compared to complete paralysis, and results are significant as the chi-square value is 5.9259, and P-value is <0.017.

Comparison of recovery in pupil sparing and pupil involving paralysis**Table 9: Comparison of recovery in pupil sparing and pupil involving paralysis**

	Recovered	Not recovered	P value
Pupil sparing	14 (77.78%)	4 (22.22%)	< 0.0149
Pupil involving	4 (33.33%)	8 (66.67%)	

Among 18 patients with pupil sparing palsy, 14 (77.78%) recovered, and 4 (22.22%) not recovered, out of 12 patients with pupil involving palsy 4 (33.33%) recovered and 8 (66.67%) not recovered. Patients with pupil sparing palsy recovered more compared to pupil involving paralysis, and it is significant as P-Value is < 0.0149.

Comparison of recovery in ischemic and non-ischemic patients**Table 10: Comparison of recovery in ischemic and non-ischemic patients**

	Total	Recovered	Not recovered	P Value
Ischemic	19	14(73.68%)	5(26.32%)	<0.04
Non - ischemic	11	4(36.36%)	7(63.64%)	

In this study, among 19 ischemic patients with third cranial nerve paralysis, 14 patients with third cranial nerve paralysis recovered and five not recovered, and out of 11 non – ischemic patients i.e due to other causes, four recovered and seven not recovered. Ischemic patients recovered more compared to non- ischemic patients and results are significant as chi-square value is 4.0431 and p-value is <0.04

Comparison of recovery in hypertensives and other patients**Table 11: Comparison of recovery in hypertensives and other patients**

	Recovered	Not recovered	P value
Hypertensives	8	1	<0.034
Other patients	10	11	

In the present study, out of 9 hypertensives patients with third cranial nerve paralysis eight not recovered and one recovered, out of 21 patients, ten recovered and 11 not recovered. Among microvascular ischemia next to diabetes hypertension is the cause of third nerve paralysis hypertensives recovered more compared to non- hypertensives i.e third cranial nerve paralysis due to other causes and result is significant as chi-square value is 4.4709 P-value < 0.034

Comparison of Recovery in diabetic and other patients**Table 12: Comparison of Recovery in diabetic and other patients**

	Recovered	Not recovered	p- value
Diabetic patients	14	4	< 0.01
Other patients	4	8	

Among 18 diabetic patients with third cranial nerve paralysis, 14 patients with third cranial nerve paralysis recovered and four not recovered, out of 12 non – diabetic patients i.e third cranial paralysis due to other causes, four recovered and eight not recovered. Among microvascular ischemia, diabetes was the most common cause for oculomotor cranial nerve paralysis and has good chance of recovery so more diabetic patients recovered compared to non- diabetic patients and test is significant as chi- square value is 5.9259 P-value is <0.01

Comparison of recovery in trauma and non- trauma patients**Table 13: Comparison of recovery in trauma and non- trauma patients**

	Recovered	Not – recovered	P-value
Trauma	3	2	1
Non- trauma	15	10	

In present study among five trauma patients with third cranial nerve paralysis, three patients with third cranial nerve paralysis recovered and two not recovered compared to non –traumatic patients in which 15 recovered and ten not recovered and the test is statistically insignificant as chi-square is 0 and P-value is 1 as the two trauma patients are associated with multiple fractures and required longer periods of follow up

Statistical analysis of factors influencing the recovery of third cranial nerve paralysis**Table 14: Statistical analysis of factors influencing the recovery of third cranial nerve paralysis**

Variables	Chi- square	P- value
Diabetes	5.9259	0.01
Hypertension	4.4709	0.034
Pupil sparing	5.9259	0.0149
Incomplete paralysis	5.625	0.017

According to the present study DM, HTN, pupil sparing and incomplete paralysis are the significant factors influencing the recovery and it is statistically significant.

Among 30 patients, MRI/CT–scan was normal in 12 patients whereas MRI was abnormal in 8 patients; among 4 are trauma patients MRI finding in 2 patients was SDH.

In one patient MRI finding is hemorrhage in temporoparietal lobe and other patient is #left side medial wall maxillary sinus. Two patients of TB meningitis, MRI finding was T2 and Flair hypointensity with significant pachymeningeal enhancement suggestive of tubercular pachymeningitis MRI finding in hypertensive patient is infarct in putamen.

DISCUSSION

Isolated third cranial nerve paralysis is the second most common ocular nerve paralysis next to abducens nerve palsy.

This study is to determine the various etiological patterns, also to analyze the common clinical patterns of acquired oculomotor cranial nerve paralysis and to assess the recovery.

Comparison of age distribution in the study population

In the present study maximum number of cases belongs to above fifth decade Which was comparable to Lolla Ramachandra Murthy and Renu Shukla Dubey study (51-70 years), Tadamichi. A et al study (> 50 yrs).^[7,8]

Comparison of sex distribution in the study population:

In the present study of 30 cases, 19 were females, and 11 were males who were comparable to Lolla Ramachandra Murthy & Renu Shukla Dubey out of 50 cases 32 were females, and 18 were males. Out of 63 cases, 26 were males, and 37 were females in Kiyong Kim et al study.^[7,9]

Comparison of Laterality in the Study population:

In the present study, right eye involvement was 43.33%, and left eye involvement was 56.67%,

Whereas in Green et al,^[10] study right eye involvement was 43.1% and left eye was 55.4 %, and bilateral is 1.5 %. In the present study, no bilateral involvement was seen.

Microvascular ischemia (63.33%) was the most common etiology in the present study which was comparable to Kiyong Kim.et.al study (54.9%),^[9] Lolla Ramachandra Murthy the present study was probably higher incidence of microvascular etiology in isolated carnial nerve paralysis.

Microvascular ischemia (63.33%) was the most common etiology in the present study which was comparable to Kiyong Kim.et.al study (54.9%).^[9]

Microvascular ischemia (63.33%) was the most common etiology in the present study which was comparable to Kiyong Kim et al study (54.9%),^[9] Lolla Ramachandra Murthy & Renu Shukla (48%).^[7] the present study was probably we Higher incidence of have studied only isolated oculomotor cranial nerve paralysis.

Comparison of Diabetes study etiology among microvascular ischemia in the present

Diabetes (52.64%) was the most common cause among microvascular ischemia, which was comparable to Lolla Ramachandra Murthy &Renu Shulka Dubey study (46%).

Trauma (16.67%) is the second common cause next to microvascular ischemia which is comparable to Lolla Ramachandra Murthy &RenuShulka (14%), P.Muthu and P.Pritty 37 study (15%), Rush and Young series38 (16.2%).

Comparison of Idiopathic etiology in the present study

In the present study, idiopathic cause comprised of 10% which is comparable to Lolla Ramachandra Murthy & Renu Shukla Dubey (14%),^[7] Rama et al study (10.5%).^[11]

TB meningitis accounts for 6.67 % in the present study, which is comparable to Jean – Claude Mwanza, MD, et al (6.40%).^[9]

Comparison according to pupillary involvement in the present study

In the present study, pupillary sparing was 60 %, and pupil involving was 40 % which is comparable to Lolla Ramachandra Murthy & Renu Shukla Dubey study pupil sparing was 64%,^[7] and pupil involving was 36%, Chengo Fang, MD et al,^[12] study pupil sparing was 57%, and pupil involving was 43%.

Comparison of type of paralysis in the present study

In present study out of 30 patients 20 patients (66.67%) showed incomplete paralysis and ten patients (33.33%) were complete paralyzes which were comparable to Mizushima .et.al6study majority were incomplete paralysis 19 (62.8%) and 9 (32.1%) were complete paralysis.

Comparison of recovery according to pupillary involvement

In the present study, 70% of pupillary sparing palsy and 30 % of pupil involving paralysis recovered, patients with pupillary sparing paralysis recovered more compared to involving pupillary paralysis which is comparable to Lolla Ramachandra Murthy & Renu Shukla Dubey study,^[7] where 64% of pupillary sparing paralysis recovered more compared to 36% of pupil involving paralysis.

CONCLUSION

Isolated oculomotor cranial nerve paralysis is the second most common ocular nerve paralysis next to sixth nerve palsy. The most common cause of isolated oculomotor cranial nerve paralysis is microvascular ischemia i.e., diabetes and hypertension, which can be easily diagnosed. Most common age group affected in this study is fifty – sixty years. Females are more commonly effected than male. LE was involved more compared to RE.

The most common cause of isolated oculomotor cranial nerve paralysis is diabetes and hypertension (microvascular ischemia) i.e in 19 patients third cranial nerve paralysis was due to DM and HTN which can be easily diagnosed.

Among microvascular ischemia, diabetes was the most common cause.

Most of the diabetic oculomotor cranial nerve paralysis showed complete recovery within six months. Trauma is the next common cause after microvascular ischemia of isolated oculomotor cranial nerve paralysis.

18 had pupil sparing oculomotor nerve paralysis and 12 had pupil involving paralysis among 30 patients. Patients with pupil sparing oculomotor cranial nerve paralysis recovered completely within six months

Longer follow-ups are required in patients with idiopathic causes. Microvascular ischemia i.e. diabetes and hypertension, incomplete paresis and pupil sparing paralysis has high chances of complete recovery.

Acknowledgment

The author is thankful to Department of Ophthalmology for providing all the facilities to carry out this work.

REFERENCES

1. Asbury AK, Aldredge H, Hershberg R, et al. Oculomotor palsy in diabetes mellitus: a clinical-pathological study. *Brain* 1970;93 555-566
2. Asbury AK, Fisher CM, Aldredge H, et al. Oculomotor palsy in diabetes mellitus, a clinicopathological study. *Brain* 1970; 555 – 566.
3. Shintani S, Tsuruoka S, Minato Y, et al. Radiologic – clinical correlation. Isolated third nerve palsy caused by midbrain hemorrhage. *AJN Am J Neuroradiol* 1994; 15: 1508 – 1511
4. Jung JS, et al. Risk factors and prognosis of the isolated ischemic third, fourth, or sixth cranial nerve palsies in the Korean population. *J Neuroophthalmol*. 2015 Mar; 35 (1)37-40
5. Kim JS, Kang JK, Lee SA, et al. Isolated or predominant ocular motor nerve palsy as a manifestation of brain stem stroke. *Stroke* 1993;24:581-586
6. Mizushima H, Seki T. Midbrain hemorrhage presenting with oculomotor nerve palsy: case report. *Surg Neurol* 2002; 58:417-420
7. Lolla Ramachandra Murthy & Renu Shukla Dubey. A Clinical and Aetiological Study of Ocular Motor Nerve Palsy. *Ophthalmol Allied sci*. 2019; 45-49
8. Akagi Tadamichi, et al. Cause and prognosis of neurologically isolated third, fourth, or sixth cranial nerve dysfunction in cases of oculomotor palsy. *Japanese Journal of Ophthalmology* 2008; 52:32-35

9. Kiyoung, Kim, et .al. Clinical course and Prognostic Factors of Acquired Third, Fourth, and sixth cranial Nerve Palsy in Korean Patients.Korean J Ophthalmol.2018,32;221-227
10. GreenWR, Hackett ERF, Schlesinger NS. Neuro ophthalmologic evaluation of oculomotor nerve paralysis.Arch Ophthalmol 1964 :72: 154 -167
11. Rama V, Vimala J, Chandrashekar M, Anjaneyulu .C, Dinakar I.Ophthalmoplegia, a study of ninety cases. to 1980; 28:13-16
12. Chengbo Fang, MD et al. incidence and Etiologies of Acquired Third Nerve Palsy Using a Population-Based Method JAMA Ophthalmol.2017 January 01; 135 (1): 23-28