

Paralytic Strabismus: A Review of 13 Years at Tertiary Care Center in Western Central India

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Abstract

Purpose: To describe the incidence, aetiologies and follow-up of patients with paralytic strabismus.

Methods: This retrospective study included 193 strabismic patients with isolated III, IV or VI cranial nerve palsy, cases of the strabismus, from the Department of Ophthalmology of tertiary care center in western central India between January 2007 and December 2020. The present study analysed the injured cranial nerve, the affected eye, sex distribution, aetiology and follow-up.

Results: About 5.7% of the cases were congenital, and 16.1% were in the paediatric age group. The VI cranial nerve was the most frequently affected (56.5%) in these cases. The incidence was higher in males (58.1%) than females. Trauma was the common cause of III (7.1%), IV (8.3%) and VI (50%) nerve palsy. The disease management modalities included surgical, medical and spontaneous resolution.

Conclusions: The sixth cranial nerve was affected most frequently. However, the most common underlying cause was yet undetermined.

Introduction

Paralysis and paretic strabismus are characterized by weakness of one or more oculomotor muscles innervated by the nerves, resulting in an uncommon deviation that can require clinical and surgical treatment or spontaneous regression (1).

Paralysis or paresis of the cranial nerves III, IV and VI have been analyzed previously, and these studies are

classic hallmarks (2-5). Cranial nerve VI has been identified as the most affected region.

The present study aimed to elucidate the epidemiological and clinical profiles of paralytic strabismus and clinical outcome on follow-up with or without management.

Methods

This retrospective study analyses the incidence, aetiology and evolution of paralytic or paretic strabismus in patients seen in the

Ocular Motility Section of the Department of Ophthalmology of Drashti Netralaya, India the data of patients with paralytic paresis or paralysis were obtained from the electronic medical records from 2007 to 2018.

The aetiological factors of the cases were classified into four groups: trauma, vascular anomaly (including systemic diseases such as high blood pressure, diabetes mellitus and cerebral aneurysm), undetermined (no cause was found after the diagnostic investigation) and others. This grouping

facilitated the comparison between the current and previous data since most groups adopt this categorisation method. Congenital cases constituted an independent group. Evolution was also divided into five groups: regression spontaneous, surgery (patient undergoing surgery), without follow-up (patient follow-up was lost), still in follow-up and discharge after cure or on request.

Data related to sex, the affected nerve, the affected eye, the aetiology and the evolution of acquired paresis and isolated paralysis were collected in the pre-tested format, exported to Excel and analyzed using SPSS 22 (no conflict of interest). Descriptive and cross-tabulation statistics were used to analyze the data. $P < 0.05$ indicated statistical significance.

Results

The current cohort of 193/66 (34.2%) females and 127 (65.8%) males) patients with isolated paresis or paralysis of the muscles innervated by the cranial nerves III, IV or VI, correspond to 4.7% of the patients in Ocular Motility Section (Table 1).

The age of onset of the clinical manifestations of the group with paralytic strabismus or acquired paretic was between 1 and 85 years. The congenital cases were studied separately; 11/193 (5.7%) patients were congenital cases, and the remaining 182 (94.3%) were acquired paretic 31/193 (16.1%) constituted the pediatric age group.

The mean follow-up of the patients was 203.30 days.

The right eye was involved in 82/193 (42.5%), the left eye in 73 (37.8%) and both eyes in 38 (19.7%) cases.

Our cohort included 2 cases of myasthenia gravis, suggesting myogenic cause.

Herein, strabismus esotropia was found in 127/193 (65.8%) cases (Table-). Also, 42/193 (21.8%) cases occurred due to trauma to the cranial nerve or extra ocular muscle.

Furthermore, cranial nerve VI was affected in 110/193 (56.9 48.7%) cases, of which 15 (13.6 %) were traumatic, and 95(86.3 %) were non-traumatic.

Cranial nerve III was affected in 47/193 (24.4%) cases, of which 16 (34%) were traumatic, and 31 (66%) were non-traumatic.

Among the other causes of cranial nerve III palsy, the infection of the central nervous system was detected in 1 case.

Concerning disease management, 149/193 (77.2%) received medical treatment, 29 (15%) received surgical management, and 7 (3.6%) were advised but did not undergo surgery. Moreover, 18 (9.3%) cases did not receive any treatment, while 7 (3.6%) were lost to follow-up. A significant difference was observed between first presentation and final visit ($P=0.05$)

In the current cohort, 43/193 (22.3%) exhibited traumatic aetiology, and no relevant cause was identified in 114/193 (59.1%) cases.

The comparison between the deviation in primary position at the time of presentation and the end revealed significant differences ($p < 0.001$), but no difference was observed while comparing traumatic and non-traumatic cases ($P = 0.435$).

Discussion

The proportion of gender in the current cohort was similar to that described in the literature. This slight predominance of male sex could be attributed to the frequency of traumatic causes predominate in this sample (1).

Among the acquired isolated paralysis and paresis, the most affected cranial nerve was VI (56.9%), followed by III (24.4%) and IV (1.01%). These data coincide with those in the literature, wherein nerve VI was most affected with a frequency of 40.9% (2), 51.1% (3), 41.9% (4) and 55.0% (5). In a private clinic, that is a reference in strabismus (6), the frequency of cranial nerve IV involvement was 62.2%; this might be because the clinic is a differentiated reference service (1).

The data related to the affected eye showed a discrepancy between our sample and those in the literature. The right eye was involved in 82/193 (42.5%) cases, the left eye in 73 (37.8%) cases and both eyes in 38 (19.7%) cases, while Gustavo et al. reported 49.5% impairment of the right eye, 41.9% of the left eye and 8.6% of bilateral impairment (1).

Regarding paresis or acquired paralysis of cranial nerve III, 8.3% was traumatic aetiology, and 59.1% was due to undetermined causes. Some studies (7,8) showed that 45.5% were congenital cases. Another study (6) found a high frequency of indeterminate cases (23.7%), followed by vascular causes (19.8%). A previous study (8) also reported a frequency of 40.5% of undetermined cause and 29.2% of vascular aetiology. These differences could be attributed to the demographic properties of the catchment area. The low occurrence of vascular etiology (17.5%) is probably due to the lack of diagnosis or referral of these patients to our Department (1).

The cases of paresis or acquired paralysis of the cranial nerve IV incidence is lesser in our cohort (1.01%) compared to the higher rate (52.4%) reported by Gustavo et al. (1), wherein 30.5% cases were classified as the undetermined cause. Literature analysis (7) also revealed that trauma (25.7%) and vascular injury (15.7%) were the most frequent aetiological factors, while 28.3% were undetermined causes. The current study reported 5.7% congenital cases and 16.1% cases in the pediatric age group. Other studies (10) reported 43.5% congenital cases, 38.8% undetermined causes and 7.6% cases of traumatic origin. Another study (11) found 39.5% congenital cases, 34.0% traumatic causes and 23.2% cases of undetermined origin. Some surveys (12,13) conducted in children demonstrated that 57.3% of the cases were of undetermined cause, and 13.6% were detected during follow-up. Previous studies (4 and 9) also

observed that spontaneous regression occurred in 9.3% cases, and the frequency of these cases was 48.3% and 66.6%, respectively.

In the studies described above, vascular aetiology cases had the highest rate of spontaneous regression, while this group presented a low frequency in our cohort. In addition, the loss of patients to follow-up, which is common in public hospitals, may have caused a decrease in the frequency of this regression.

Jason et al. reported a similar outcome irrespective of the aetiology; however, the number of surgeries may be more than that in the current study (14). Kiyoungh et al also reported that vascular causes display maximum recovery rate and a short recovery time (15).

Conclusion

Paralytic strabismus is caused by several reasons. Disease management is either medical or surgical. Vascular causes show the highest rate of recovery and the shortest recovery period compared to other factors. Cranial nerve VI is the most commonly involved region, followed by III in this disease.

Declarations

- No financial support received from any company or institution
- This study is not presented at any conference or meeting
- Authors do not have any financial interest in any aspect of this study

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Tables

Table-1 Age and Sex distribution

	SEX		Total
	F	M	
0-10	7	8	15
11-20	12	13	25
21-30	5	31	36
31-40	7	20	27
41-50	9	22	31
51-60	12	20	32
61-70	10	11	21
>70	4	2	6
Total	66	127	193

Table-2 Aetiological category

	Frequency	Percent
	2	1.0
CONGENITAL	11	5.7
MYOGENIC	3	1.6
NEUROGENIC	134	69.4
NEUROGENIC+MYO	1	.5
TRAUMATIC	42	21.8
Total	193	100.0

Table-3 Type of strabismus

Type	Frequency	Percent
ESOTROPIA	123	63.7
EXOTROPIA	49	25.4
EXOTROPIA+HYPERTROPI	5	2.6
EXOTROPIA+HYPOTROPIA	6	3.1
HYPERTROPIA	8	4.1
HYPOTROPIA	2	1.0
Total	193	100.0