

Ocular alignment and results of strabismus surgery in neurologically impaired children

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Received: 2011-04-14

Accepted: 2012-01-04

Abstract

• **AIM:** To evaluate ocular alignment and surgical results of strabismus surgery in neurologically impaired children.

• **METHODS:** Files of 33 neurologically impaired squint children were evaluated. Twelve patients had cerebral palsy (CP), 4 had CP with mental retardation, the rest had mental-motor retardation of unknown cause. Cycloplegic refractions, type and angle of strabismus, surgeries performed were recorded.

• **RESULTS:** Mean follow-up was 34.0± 16.5 months. Twenty-three patients had esodeviation, the remaining had exodeviation. In 19 patients, angle of deviations measured at different visits were highly variable. Twelve patients with stable angle of deviations or with unstable but high angle deviations had horizontal muscle surgery. Mean horizontal deviation decreased from 43.75± 10.69 D to 12.83± 8.38D with surgery.

• **CONCLUSION:** In neurologically impaired strabismic children, surgery is effective in patients with stable deviations or unstable but high angle deviations. Decision for surgery should be made after a long follow up period.

• **KEYWORDS:** cerebral palsy; mental-motor retardation; strabismus

DOI:10.3980/j.issn.2222-3959.2012.01.23

Can ÇÜ, Polat S, Yaşar M, İlhan B, Altıntaş AGK. Ocular alignment and results of strabismus surgery in neurologically impaired children. *Int J Ophthalmol* 2012;5(1):113-115

INTRODUCTION

There is a high prevalence of ocular problems in children with developmental disabilities [1]. In recent years there has been an increasing appreciation of the ocular motor abnormalities in handicapped children, and their

management has become an important aspect of pediatric ophthalmic practice. A significant proportion of such children have some form of strabismus as one aspect of their ophthalmic disorder. Ophthalmologic examination and determination of ocular misalignment are more difficult in patients with neurologically disabled children. They become even more difficult if mental retardation accompanies the condition [2]. An early ocular examination is essential for understanding and treatment of ophthalmic pathologies. In this study we evaluated the refractive status, ocular alignment and surgical results of strabismus in neurologically impaired children.

MATERIALS AND METHODS

Materials Files of 33 neurologically impaired squint children ranging between 6 months and 12 years of ages were evaluated retrospectively. Twelve patients had cerebral palsy (CP), 4 had cerebral palsy with varying degrees of mental retardation (MR), rest had mental-motor retardation of varying severity as a result of different or unknown causes. Cycloplegic refractions, type and angle of strabismus, surgeries performed were recorded.

Methods Cycloplegia was performed with 2 drops of cyclopentolate 1% with 30 minutes interval in patients older than 1 years of age and with 2 drops of tropicamide 0.5% 30 minutes interval in patients younger than 1 years of age.

RESULTS

Mean age at first admission was 4.48 ±2.92 years. Mean follow up was 34.0±16.5 months. Mean spheric equivalent of refraction was 3.14 ±1.95 diopters (D). Types of neurological problems of patients were cerebral palsy, mental and motor retardation (MMR) with known cause (epilepsy, Lawrence-Moon-Biedle syndrome, Down's syndrome) and mental-motor retardation without known cause. Epilepsy was the associated handicap in 6 patients (Table 1).

Six eyes (3 patients) (9.1%) had myopic refraction, 2 eyes (1 patient) (3.0%) were emmetropic and rest (87.9%) had hypermetropia. Astigmatism of 1D or more was present in 18 eyes(27.3%). Anisometropia of 2D or more was detected in 1 eye. Significant refractive errors (hyperopia over 2D, myopia over 1D, astigmatism over 1D) were present in 81.8 % of our patients (Table 2).

Strabismus in neurologically impaired children

Table 1 Causes of neurological disability

Cause of neurological disability	n(%)
CP with normal mental status	12(36.4)
CP with mental retardation	4(12.1)
MMR with known cause	9 (27.3)
MMR without known cause	8(24.2)

Table 2 Refractive status of eyes of the patients

Refraction	n(%)
Emmetropia	2 (3)
Myopia	6 (9.1)
Hypermetropia	58(87.9)
Astigmatism	18(27.3)
Anisometropia	1 (1.5)

In our study group, 23 patients had esotropia (ET) (70%). Two of them had fully refractive, 1 had partially refractive accommodative ET and 20 had non-accommodative ET. In 7 patients strabismus was alternating. Ten patients had exotropia (XT) (30%). In 19 patients, angle of deviations measured at different visits were highly variable ranging between orthophoria and 60D (57.5%). Twelve patients (36.4%) with stable angle of deviations or with unstable but high angle deviations had undergone horizontal muscle surgery. Eight had horizontal rectus recession-resection procedure in one eye, 2 had bimedial recession and 2 had single medial rectus recession. Mean horizontal deviation decreased from $43.75 \pm 10.69D$ to $12.83 \pm 8.38D$ after single strabismus surgery. In 41.6% of the patients, angle of deviations were equal or less than 10D at the last visit.

DISCUSSION

Neurologically disabled children have challenges in regards of examination and rehabilitation. The assessment of visual function and orthoptic condition of handicapped children was difficult. Some of these children are intellectually retarded or emotionally disturbed to a degree which makes co-operation with simple tests of vision and ocular alignment impossible at an age when they would normally be applicable. Since strabismus is particularly likely to be found in association with other visual system defects in neurologically handicapped children, a very thorough ophthalmic examination is necessary^[2].

Causes of neurological handicap are many. In our study most common cause was cerebral palsy (CP) and was the diagnosis in nearly half of the patients (48.4%). In some patients the causes of mental and motor retardation was established (Down's Syndrome, Lawrence Moon Biedle Syndrome, epilepsy) and in the rest, no apparent underlying pathology could be detected. CP is a disorder of movement and posture due to a defect or lesion of the immature brain^[3]. Since the visual motor system is involved

in many cases, strabismus is a frequent finding. Mental retardation, epilepsy visual defects and hearing problems may accompany this condition^[4]. A 50% incidence of strabismus is reported in a group of CP patients, while the incidence in the general population is only 3%^[5,6].

Significant refractive errors could be detected in patients with CP, psychomotor retardation, and other non-cerebral palsy neuromotor disabilities^[7,8]. In our group, only 1 patient was emmetropic. Significant refractive error (hyperopia over 2D, myopia over 1D, astigmatism over 1D) was found in 81.8 % of our patients.

In normal population, convergent strabismus occurs 4-5 times more frequently than divergent strabismus^[9]. In our study esodeviation was the most common (70 %) type of deviation. Exotropia was present in remaining 30%. The ratio of primary convergent versus divergent cases was 2.3:1. A change to exodeviation was noted in 1 case in primary esodeviation. Similar findings were reported by Erkkilä and co-workers. They reported 65 % esodeviation and 35 % exodeviation with ratio of primary convergent versus divergent cases as 1.9:1. They also reported low incidence of spontaneous alteration or an accommodative component of the squint^[8]. In our study spontaneous alteration was present in 7 cases and accommodative component was present in only 3 cases.

It is reported that in patients with mental and motor disability, visual function assessment may be complicated by day-to-day variability (same observer) for a child appeared to be larger than within-day variability (different observer)^[10]. Inconsistency can also be seen regarding the angle of deviation in neurologically impaired patients. This instability leads the surgeons to behave conservatively in making decision on surgery. In some such cases, severely unco-ordinated eye movements are associated with a very variable angle of squint, so that the exact amount of surgery which requires to be undertaken is difficult to assess. Also, the long-term results of strabismus surgery tend to be unpredictable, especially in the very young, and particularly in cases of cerebral palsy^[2,11]. In one study it is reported that a change to exodeviation occurred in 9 cases with primary esodeviation, in 4 of them, however, following surgery for a convergent angle^[8]. In our group, 1 patient who was initially esotropic became exotropic in subsequent examinations. Also in 19 patients (57.5%), angle of deviations measured in each patient at different visits were highly variable ranging between orthophoria and 60D. Because of instability and great variability of angle of deviations between visits, only 12 patients (36.4%) with stable angle of deviations or with unstable but high angle of deviations had horizontal muscle surgery to avoid consecutive strabismus.

Mean horizontal deviation decreased from $43.75 \pm 10.69D$ to $12.83 \pm 8.38D$ after single surgery. In 41.6% of the patients angle of deviation was equal or less than 10D at the last visit.

In conclusion, it can be said that in neurologically impaired strabismic children, significantly high refractive errors can accompany the ocular misalignment. Esodeviation is the most common type of ocular misalignment but it is striking that exodeviation is seen more frequently compared to normal population. Angle of deviations can be highly variable at different visits during the follow-up. Horizontal muscle surgery for patients with stable deviations or unstable but with high angle deviations is effective but decision for surgery should be made after a long follow-up period.

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