

Prevalence of visual disability due to refractive errors in patients with cerebral palsy

Jasmine Mary Jacob¹, Sheldon Goudinho^{2,*}

¹Professor, ²Professor & HOD, Dept. of Ophthalmology, Dr Somervell Memorial CSI Medical College, Karakonam, Trivandrum

***Corresponding Author:**

Email: shelandjas@yahoo.com

Abstract

Cerebral palsy a diagnostic term to describe a group of motor disorders of early brain development.^(1,2) Children with cerebral palsy should be treated and rehabilitated so that they can live in an inclusive society where their potential life skills and scholastic performance can be far greater as compared to when isolated from society.^(3,4)

Objectives: (1). To assess the visual acuity in children with cerebral palsy and to estimate the degree of visual disability due to refractive errors. (2). To find association between refractive errors and type of cerebral palsy. 80 children were included in this cross sectional hospital based study. A detailed eye examination was done by an ophthalmologist. Refractive errors were present in 52 patients. Astigmatism was the most common refractive error accounting for 38.8 % of the cases. Degree of visual disability was assessed in these children. 18.75% of the cases had 100% visual impairment; 41.5% of the cases had 20% visual impairment. There was no significant association for refractive error with type of cerebral palsy in our study (p=0.543). The most common defects causing disability in children with cerebral palsy are amenable to treatment. The identification of visual defects and their timely treatment may have a bearing on the child's education.

Keywords: Cerebral Palsy, Visual Disability, Visual Acuity.

Introduction

“Cerebral palsy a diagnostic term to describe a group of motor disorders of early brain development”.^(1,2) It has a prevalence rate of 2/1000, making it the most common cause of chronic motor disability in children.⁽²⁾ Cerebral palsy may be due to developmental, genetic, metabolic, ischemic, infectious or other acquired aetiologies. There may be other developmental disorders like mental retardation, hearing disorders, visual disability, speech impairment, cognitive or behavioural handicap along with cerebral palsy.⁽²⁾

Little's early studies on cerebral palsy have shown that Strabismus, nystagmus, optic atrophy & refractive errors are common ocular problems in children with cerebral palsy.⁽¹⁾ Children with cerebral palsy should be treated and rehabilitated so that they could live in an inclusive society where their Life skills and scholastic performance is far greater as compared to when isolated from society.⁽⁴⁾ A multidisciplinary approach is most helpful in diagnosing early handicaps which could be treated in such children.⁽¹⁾ Thus an ophthalmologist should be included in the initial assessment.

This study would help to evaluate the visual acuity in these children, identifying children with defective vision and the type of refractive errors in them. Vision recording in these children is pain staking and requires the refractionist to practice patience and encouragement⁽³⁾ On most occasions corrections of refractive errors are often ignored and denied to these children. Correction of refractive errors in these children has often proved to help them in learning skills.⁽⁴⁾

Aim of Study

1. To assess the visual acuity in children with cerebral palsy and to estimate the degree of visual disability due to refractive errors.
2. To find association between refractive errors and type of cerebral palsy.

Materials and Methods

This was a cross sectional, hospital based study. Eighty children, who attended the Paediatrics outpatient department, diagnosed with cerebral palsy between 2012 and 2014 were included in the study.

Inclusion criteria: children aged between one and fourteen years, children already diagnosed with cerebral palsy.

Exclusion criteria: children above fourteen years, children with other learning disabilities, children diagnosed to have other disorders/syndromes apart from cerebral palsy which were associated with ocular problems.

Informed consent was obtained from the parents prior to participation in the study. A detailed history regarding gestational age at birth, birth weight of the child, antenatal and the postnatal period, age and parity of mother and any relevant treatment history was recorded. History of physical therapy and whether any rehabilitation was done was also noted.

A detailed ophthalmic work-up was done by a specialist. The visual acuity was assessed in each eye separately. A variety of methods were used according to the comprehension level of the children: Snellen's chart, Lea Symbol chart and Central Steady Maintained technique (CSM).

Refraction was done under cycloplegia in all children. It was done by instilling one drop of 1% cyclopentolate every five minutes for a total of three drops. Retinoscopy was done after 30 minutes. Post mydriatic test was done three days later and spectacles were prescribed for those who improved with glass correction.

The data was stored on a computerised database and analysed using SPSS Computer software (version 15.0). Chi square test, Fisher exact test & Mann Whitney U test were used in the statistical analysis and a p value of below 0.05 was considered as significant.

Results

Table 1: Percentage distribution of the sample according to age

| Age (years) | Count | Percent |
|-------------|---------|---------|
| <=5 | 19 | 23.8 |
| 5 – 10 | 26 | 32.5 |
| >10 | 35 | 43.8 |
| Mean ± SD | 8.8 ± 4 | |

Table 2. Percentage distribution of the sample according to sex

| Sex | Count | Percent |
|--------|-------|---------|
| Male | 52 | 65.0 |
| Female | 28 | 35.0 |

Table 3: Percentage distribution of the sample according to Visual acuity (VA)

| VA | Count | Percent |
|-------------|-------|---------|
| 6/6 | 48 | 30.0 |
| 6/9 - 6/18 | 59 | 36.9 |
| 6/24 - 6/60 | 10 | 6.3 |
| <6/60 | 5 | 3.1 |
| CSM | 28 | 17.5 |
| Not CSM | 10 | 6.3 |

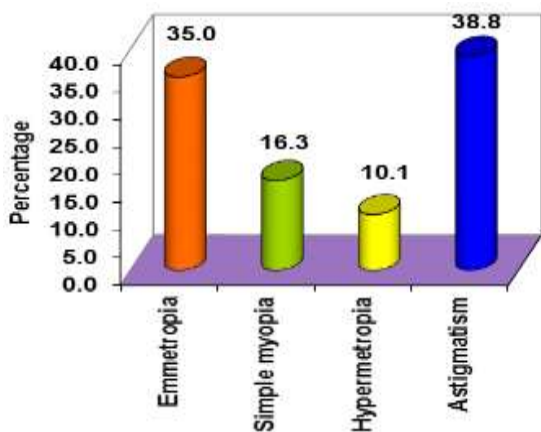


Fig. 1: Percentage distribution of the sample according to refractive error

Refractive errors were present in 52 patients. Astigmatism was the most common refractive error accounting for 38.8% of the cases. Majority of the patients were in the 6/9-6/18 category accounting for 36.9% of the total cases. 30% of the patients had normal vision.

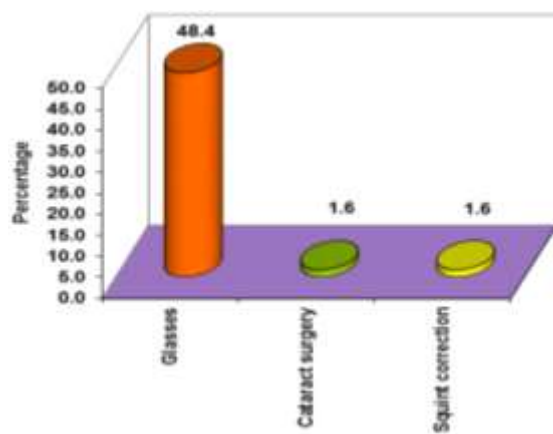


Fig. 2: Percentage distribution of the sample according to rehabilitation

Although conductive education was received by patients and 73 cases were being followed up with physical therapy and speech therapy at referral, none of the patients had previous regular ophthalmological examination and follow up. Glasses were prescribed for 30 patients; cataract surgery was done in one case and squint correction in one case.

Table 4: Percentage distribution according to degree of visual disability

| Degree of disability | No. of children | Percentage (%) |
|----------------------|-----------------|----------------|
| Category 0 | 33 | 41.5 |
| Category 1 | 4 | 5 |
| Category 2 | 1 | 1.25 |
| Category 3 | 12 | 15 |
| Category 4 | 3 | 3.75 |

Table 5: Association between type of CP and Refractive error

| Refractive error | Spastic D | | Spastic Q | | χ^2 | P |
|------------------|-----------|---------|-----------|---------|----------|-------|
| | Count | Percent | Count | Percent | | |
| Emmetropia | 21 | 41.2 | 6 | 31.6 | 2.14 | 0.543 |
| Simple myopia | 7 | 13.7 | 4 | 21.1 | | |
| Hypermetropia | 3 | 5.9 | 0 | 0.0 | | |
| Astigmatism | 20 | 39.2 | 9 | 47.4 | | |
| Emmetropia | 21 | 41.2 | 6 | 31.6 | | |

According to Chi square test there is no statistical association for refractive errors with type of CP

Discussion

Significant refractive errors (65%) were found, the most common being astigmatism (38.8%). Taylan et al also found significant refractive errors, primarily hyperopia, in 70.1% of their study eyes. Lower visual acuity was found more frequently among patients who had spastic tetraplegia which was consistent with literature.⁽⁶⁾ Kozeis et al also reported significant refractive errors in 62.9% of their study eyes.⁽⁷⁾ Katoch et al reported myopia of 13.5%, hypermetropia of 20% and astigmatism of 34% in their study population. Myopia is reportedly more frequent in spastics while hypermetropia predominates in the dyskinetics.⁽³⁾ This study demonstrated that the refractive errors are more evenly distributed.

Study conducted by Sanjay Marasini et al reported myopia (39%), hyperopia (29%), astigmatism (39%) in the study population.⁽⁸⁾ Govind A and Lamba, in their study, reported an incidence of 50% of astigmatism.⁽⁹⁾

“The normal development of accurate accommodation, convergence and visual acuity in infancy is closely associated with the refractive status of the eye”.⁽¹⁰⁾ A high prevalence of refractive errors in the younger age group could suggest that emmetropisation had been hampered.

Other published literature demonstrates an association between the severity of physical and intellectual impairment in cerebral palsy with accommodative dysfunction.⁽¹¹⁾ The reduction of accommodation in these patients because of the higher prevalence of significant refractive error was found to have an association with a higher frequency of squint.⁽¹²⁾ As the prevalence of refractive errors in this group of children is higher than the normal population, there is a need for more research to understand the development of refractive errors in CP.

A Snellen's equivalent of 6/6 was recorded in 24 children (30%). 36.9% of the children had vision ranging from 6/9 - 6/18. 17.5% of the children were CSM positive. One reason for this could have been the child's fatigue or prolonged inattention during the visual acuity testing. It is possible that the presenting acuity recorded for each child was not actually their best acuity but merely the best effort the child was able to make.

The accurate measurement of visual acuity in children with CP is a difficult task. More reliable tests like, Snellen's/Sheridan Gardiner Chart, Lea symbol chart were used in about half the patients. The less reliable and qualitative vision assessment method CSM was used in those in which this was not possible. VEP acuity measurement technique offers an alternative for assessing visual function in uncooperative and nonverbal children. However this test could not be used in this study due to lack of facility.

Degree of visual disability was assessed in these children. 18.75% of the cases had 100% visual impairment; 41.5% of the cases had only 20% visual impairment.

According to the Chi square test, there is no significant association for refractive error with type of cerebral palsy in our study ($p=0.543$). Study conducted by Taylan Ozturk et al reported significant frequency of high hyperopia, myopia, high myopia in the spastic tetraplegic subtype of cerebral palsy ($p=0.006$, $p=0.041$, $p=0.012$ respectively).⁽⁶⁾ Study conducted by Peter Black et al showed that spastic diplegia carried a higher risk of refractive errors accounting for 68% of the total cases, followed by spastic tetraplegia accounting for 52.8%.⁽¹³⁾ Spastic diplegia was the most common subtype of CP in our study with a rate of 67.5%. Spastic quadriplegia came next with 25% of the cases showing this subtype. Statistical association between the various subtypes could not be demonstrated in our study due to the small sample size.

Ocular problems were reported to be more frequent in the spastic diplegic subtype of disease which is reported to be the most common type of CP in literature.^(7,13,14,15,16) This was also demonstrated in our study. On the contrary, ophthalmological problems were rare in cases with dyskinetic type of CP.⁽¹⁷⁾

Poor visual acuity due to uncorrected refractive errors, which is commonly seen in CP, can affect the physical and intellectual capacity of the patient. Visual function is an important entity that has a direct bearing on the learning process of a young child.

Conclusion

30% of cases had normal vision. 36.9% of the cases had visual acuity ranging from 6/9-6/18. Majority (41.5%) of the cases had 20% visual disability, 18.75%

of the cases had 100% visual disability. There was no statistical association for refractive error with the subtypes of cerebral palsy in our study though refractive errors were more frequent in spastic diplegia ($p=0.543$).

The diagnosis of cerebral palsy has usually been made by the time a child reaches twelve months of age and only rarely after eighteen months. It is vital that the child should have his or her initial ophthalmological assessment at this age. Many common defects are amenable to early treatment. The identification and correction of these defects, can have a bearing on the child's future education. Therefore early referral of children diagnosed with CP for ocular examination is very important for their overall development.

References

1. Little WJ. The classic: Hospital for the cure of deformities: course of lectures on the deformities of the human frame. 1843. Clinical orthopaedics and related research. 2012;470(5):1252-6.
2. Johnston MV, Hoon AH, Jr. Cerebral palsy. Neuromolecular medicine. 2006;8(4):435-50.
3. Fantl EW, Perlstein MA. Ocular refractive characteristics in cerebral palsy. American journal of diseases of children. 1961;102:36-41.
4. Black PD. Ocular defects in children with cerebral palsy. Br Med J. Aug 16, 1980;281(6238):487-8.
5. Guzzetta A. Visual disorders in children with cerebral palsy: is the picture still 'blurred'? Developmental medicine and child neurology. 2014;56(2):103-4.
6. A. Taylan Ozturk, A. Tulin Berk, Aylin Yaman. Ocular defects in children with spastic subtype of cerebral palsy. Int J Ophthalmol. 2013;6(2):204-10.
7. Kozeis N, Anogeianaki A, Mitova DT, Anogianakis G, Mitov T, Klisarova A. Visual function and visual perception in cerebral palsied children .Ophthalmic Physiol Opt. 2007;27(1):44-53.
8. Marsini S, Paudel N, Adhikari P, Shrestha JB, Bowan MD. Ocular Manifestations in children with cerebral palsy. Optom Vis Dev. 2011;42(3):178-82.
9. Govind A, Lamba PA. Visual disorders in cerebral palsy. Indian journal of ophthalmology. 1988;36(2):88-91.
10. Currie DC, Manny RE. The development of accommodation. Vision research. 1997;37(11):1525-33.
11. Kozeis N, Anogeianaki A, Mitova DT, Anogianakis G, Mitov T, Klisarova A. Visual function and visual perception in cerebral palsied children. Ophthalmic & physiological optics: the journal of the British College of Ophthalmic Opticians. 2007;27(1):44-53.
12. Breakey AS, Wilson J, Wilson BC. The relationship between visual disorders and visual-perceptual deficits in cerebral palsy. Developmental medicine and child neurology. 1968;10(2):251-2.
13. Black P. Visual disorders associated with cerebral palsy. The British journal of ophthalmology. 1982;66(1):46-52.
14. Grether JK, Cummins SK, Nelson KB. The California cerebral palsy project. Pediatric Perinat Epidemiol. 1992;6(3):339-51.
15. Buckley E, Seaber JH. Dyskinetic strabismus as a sign of cerebral palsy. American journal of ophthalmology. 1981;91(5):652-7.
16. Arnoldi KA, Pendarvis L, Jackson J, Batra NN. Cerebral Palsy for the Pediatric Eye Care Team Part III: Diagnosis and Management of Associated Visual and Sensory Disorders. The American orthoptic journal. 2006;56:97-107.
17. Guzzetta A, Mercuri E, Cioni G. Visual disorders in children with brain lesions: 2. Visual impairment associated with cerebral palsy. European journal of paediatric neurology: EJPN: official journal of the European Paediatric Neurology Society. 2001;5(3):115-9.