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Research Article

Ocular Evaluation of Patients with Cerebral Palsy

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Abstract

Background: Cerebral palsy is a term used to describe a group of permanent disorders of posture and movement causing limitation in activity.

Aim: To assess the ocular status associated with CP including vision, refractive error, ocular alignment, ocular movement, anterior segment and posterior segment examination.

Methodology: The study included 40 eyes of 20 patients after being diagnosed with Cerebral Palsy by the Pediatric Department between October 2016 to August 2018. All patients were classified into Spastic, Hypotonic and mixed.

Results: 77.5% of total eyes had refractive error. Among this, hypermetropia was more common incidence rate of 55% followed by astigmatism (17.5%) and myopia (5%). Strabismus and nystagmus was present in 35% and 25% respectively. Ocular motility was found to be normal in all children. Ocular mobility and ocular anterior segment were found to be normal in all patients. Ocular posterior segment findings include optic disc cupping in 20% followed by Optic atrophy in 15% and tigroid fundus in 10%. We also had a rare finding of fundus albipunctatus seen in 1 child with spastic CP.

Conclusion: Ocular manifestations are common among cerebral palsy. Regular ocular examination is warranted in patients with CP, since vision plays a major role in over all development of child.

Keywords: Cerebral Palsy; Refractive Error; Strabismus; Optic Atrophy; Optic Disc Cupping

Introduction

The first medical description of cerebral palsy, in ancient world was made by Hippocrates in his work Corpus Hippocraticum. In early nineteenth century William John Little was the first personality to intensely engage cerebral palsy. William Osler and Sigmund Freud added significant historical hallmarks of cerebral palsy toward the end of the nineteenth century [1].

Cerebral palsy is a permanent, non-progressive disorder of movement and posture due to a lesion of the foetal or infant brain. It is the most common cause of physical disability. Cerebral palsy is a group of permanent and non-progressive disorder of the development of movement and posture which causes limitation in activity, that occurs during the development of the foetal or infant brain.CP is the most common cause of physical disability in early childhood and the overall prevalence is approximately 2–3 per 1000 live births [2,3].

The motor disorders of cerebral palsy are frequently accompanied by disturbances of sensation, cognition, communication, perception, and/or behaviour, and/or by a seizure disorder [4].

According to motor abnormalities, cerebral palsy can be classified as spastic (four subtypes), ataxic, athetoid, or atonic type [5].

Cerebral palsy is associated with an increased risk of ocular abnormalities especially remarkable refractive errors, strabismus, nystagmus, amblyopia and cortical visual impairment which are observed in 50–90% of the patients with cerebral palsy [6].

Aim and Objective

1. To assess Ocular abnormalities in patients with Cerebral palsy.
2. To determine the visual impairments seen in patients with cerebral palsy.

3. To assess the ocular mobility seen in patients with Cerebral Palsy.
4. To assess the Anterior segment and Posterior Segment pathologies.

Materials and Method

- A cross-sectional, non-interventional, descriptive study conducted in Justice K.S. Hegde Charitable Hospital.
- Institutional ethical committee approval was obtained for this study.
- The study was conducted from October 2016- August 2018
- Study involved 40 eyes of 20 patients who were diagnosed cases of CP referred to Ophthalmology department from Pediatrics.
- Informed Consent was obtained from parent of every child.

Inclusion criteria

- All patients diagnosed with a motor disability consistent with a diagnosis of cerebral palsy
- Age group 18 months – 18 years

Exclusion criteria

All patients with acquired neurological disorder.

Brief Explanation of procedure

A detailed history, both ocular and medical was elicited from all patients including birth- antenatal, natal, postnatal; developmental, immunization and family history.

General examination including physical condition of the patient and basic vitals were also recorded and documented.

The patients underwent a detailed ophthalmic examination including visual acuity testing with cycloplegic refraction.

Vision assessment was done using Snellen's chart. Patient was seated at a distance of 6 meter from snellen chart and was made to read with one eye from top letters and the other eye being closed gently with occluder in the trial frame.

Patient was asked to read the snellen chart and depending upon the smallest line which the patient can read from distance of 6mts, vision is recorded as 6/6, 6/9, 6/12, 6/18, 6/24, 6/36, 6/60. If patient was not able to read the top line, he was asked to count fingers of examiner and his vision was recorded as CF3m, CF2m, CF1 m OR CFCF. If patient was not able to count examiner finger close to face then examiner waves or moves his hand as asked whether he is able to see hand movement or not, visual acuity then recorded as HM+. When patient cannot distinguish this, the examiner notes whether the patient can perceive light (PL) or not.

If patient was not cooperative or not comprehending, vision assessment was done on the basis of fixation pattern with torch light and it was graded as following.

- Uncentral, unsteady and Unmaintained fixation - B
- Central, Steady fixation, but will not hold fixation when the cover removed from the other eye- C
- Central, steady fixation, but will hold fixation with deviating eye when the cover is removed, but prefers fixation with other eye- D
- Alternates spontaneously, hold well with both eyes both fixation- E [7].
- Cycloplegic refraction was also done if needed using homatropine (2%) and retinoscopy was repeated after 90 mins.

The ametropic meridian was obtained for each eye and refractive errors were categorized according to the following classifications [8]

- Emmetropia: > -0.75 to +1.00 D
- Low to moderate hypermetropia: > +1.00 to + 4.00 D
- High hypermetropia: > + 4.00 D
- Low to moderate myopia: - 4.00 to > - 0.50 D
- High myopia: > - 4.00 D

Astigmatism and anisometropia were defined as

- Significant astigmatism: ≥1.00 DC
- Significant anisometropia: ≥ 1.00 D between the corresponding meridians of both eyes.

Ocular Mobility- tested by having the child fixate on light or small toy and having the child follow the object into 6 cardinal positions.

Ocular Alignment assessed by

- **Hirschberg test:** A torch light was shone into the child's eye from arm's length and corneal reflection of the light was noted. The distance from the centre of pupil to the corneal light reflection was noted. Each millimetre of deviation is approximately equal to 7° (1° ≈ 2 prism dioptres).

Cover test – uncover test

Here the normal and deviating eye is covered alternatingly and movement of eye is noted. No movement indicates orthophoria.

Anterior segment examination using torchlight and slit lamp biomicroscopy.

Fundus examination was done by direct or indirect ophthalmoscopy using +20 D lens.

Statistical analysis

- The results were statistically analysed.
- Statistical analysis was performed on SPSS version 17.0 for Windows.
- Descriptive statistics such as frequency and percentage for qualitative data and mean with standard deviation for quantitative data were used
- Fishers exact test, Chi square test were used for analysing the data.
- A probability value ('p' value) of <0.05 was considered as statistically significant.

Results

- A total of 20 patients of CP were included.
- The sample size in each type of CP was as follows: spastic, 13 cases (65%); Hypotonic, 6 cases (30%); Mixed, 1 case (5%).
- The commonest cause of CP was Birth asphyxia in 60%, followed by neonatal hyperbilirubinemia in 35% and post meningitis sequelae in 5%.
- The male: female ratio in total was 1:1.
- Age distribution ranged from 20 months to 18 years.

In our study population, we had 3 children who could read snellen's chart and visual acuity in these children could be done accurately. In rest of the study population, vision assessment was done on the basis of fixation pattern. Therefore the best corrected visual acuity also couldnot be assessed in these children.

Hypermetropia was the most common refractive error noted in our study population in both eyes. Among the hypermetropes, 3 children had a high grade of hypermetropia and rest of the children were low to moderate grade.

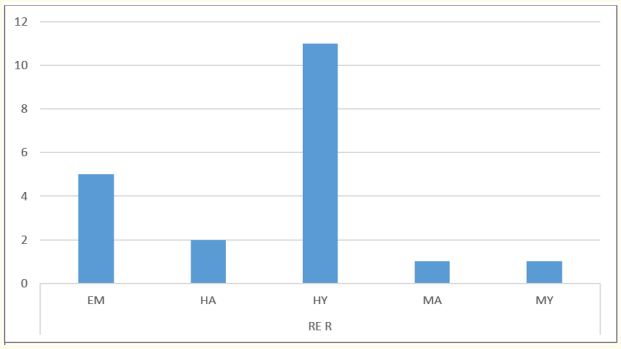


Figure 1: Refractive Error in the Right Eye.

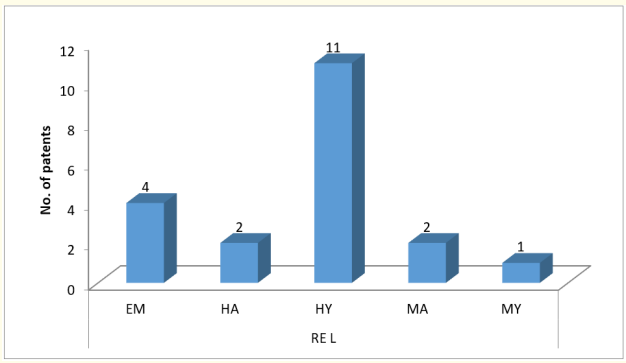


Figure 2: Refractive error in the Left eye.

Ocular Alignment	Count	Column N %
Alternating Convergent Squint	5	25.0%
Esotropia Left eye	1	5.0%
Exotropia Left eye	1	5.0%
Normal	13	65.0%
Total	20	100.0%

Table 1: Ocular Alignment in the study population.

Not significant, P- 0.55, using chi square and fischer's exact t test.

No significant ocular alignment abnormalities were noted in the study population.

		Count	Column N%
Ocular motility	Normal	20	100.0%
	Total	20	100.0%

Table 2: Ocular motility in the study population.

Anterior Segment	Count	Column N %
Normal	20	100.0%
Total	20	100.0%

Table 3: Anterior Segment pathologies in the study population.

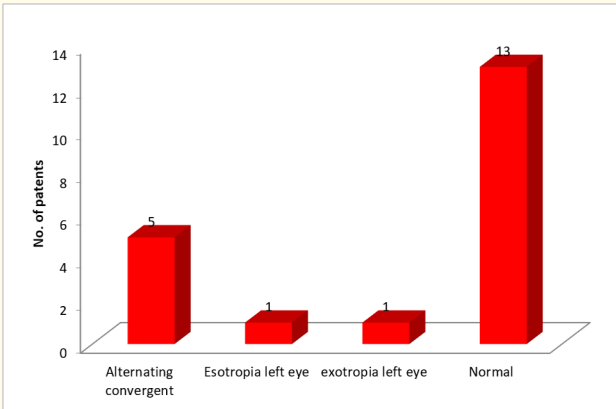
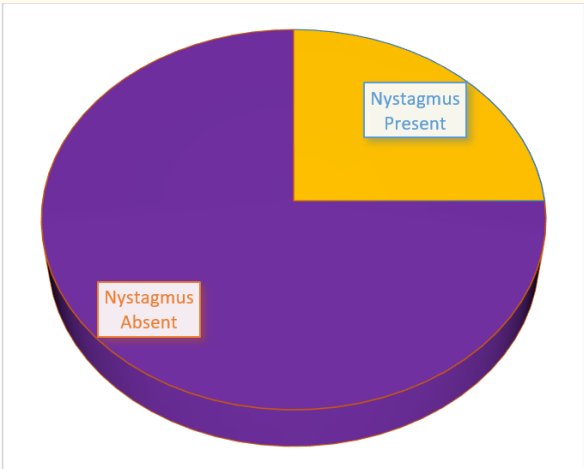


Figure 3: Ocular alignment in the study population.



Fishers exact test p -0.748, NS

Figure 4: Nystagmus in the study population.

Ocular motility and anterior segment examination was done mainly using torch light, expect for 3 children, as these children was not cooperative for a slit lamp examination. It was found to be normal in all cases.

Posterior segment	Count	Column N %
Normal	9	45.0%
Disc cupping	4	20.0%
Fundus Albipunctatus	1	5.0%
Optic Atrophy	3	15.0%
Optic Atrophy with Tigroid Fundus	1	5.0%
Tigroid Fundus	2	10.0%
Total	20	100.0%

Table 4: Posterior segment pathologies in the study population.

Not significant, P- 0.133, using chi square and fischer's exact t test.

Discussion

Cerebral palsy is a static encephalopathy that occurs due to the damage in immature brain tissue. In our study, male: female ratio in CP is 1:1 which is not similar to the worldwide data and different studies [9].

The most common type of CP in our study is spastic (60%) followed by hypotonic (30%) and mixed (5%), which is in consistent with the study done by Olubunmi., *et al* [10].

In our study, the major causes of CP were found to be Birth asphyxia (60%) and perinatal hyperbilirubinemia (35%) followed by post meningitis sequelae (5%). This could be compared with study done by Taylan., *et al.* [11] where birth asphyxia was the commonest etiological cause. Other causes included prematurity, early membrane rupture, intrauterine infection, imminent abortus, kernicterus and febrile convulsion, cortical dysplasia of varying degrees.

The age group in our study varied from twenty months to eighteen years, out of which 50% of the patients were below 5 years of age, which is in harmonious with the study done by Olubunmi., *et al* [10].

77.5% of total eyes had refractive error, of which hypermetropia had a higher incidence rate of 55% followed by astigmatism (17.5%) and myopia (5%). This is not in accordance with the study

done by Sabita Katoch., *et al*. [9], where the commonest refractive error was astigmatism (34%), followed by hypermetropia(20%) and myopia(13.5%).

Hypermetropia was more frequent in Spastic CP which was 61.5% in our study. This was not similar to study done by Sabita Katoch., *et al*. [9] were Myopia was predominated in Spastic CP. In our study, among the total hypermetropes, 27.2% had high hypermetropia and rest were low to moderate and the 5% of myope was low to moderate myopia.

Best corrected visual acuity of 6/6 could be attained with refraction in 3 eyes and glasses were prescribed to these children.

In our study, the prevalence of strabismus is 35%, which is similar with study done by Sanjay Marasini., *et al.* [4], where the prevalence was 36%. Alternating convergent squint was the common, which accounted up to 25%, followed by exotropia (5%) and esotropia (5%).

25% of the patients had nystagmus which was more when compared to other study done by Amita Govind., *et al.* [12] where the incidence was 10%.

Ocular motility was found to be normal in all children, which did not correspond to a study done by Elisa Fazzi., *et al.* [13] where ocular motility disorders was 57.3%.

Anterior segment was also found to be normal in all eyes, which was inconsistent with study done by P D Black14, where cataract, heterochromiairidis, coloboma, corneal abnormality were seen in 2.6% each. A study done by Olubunmi., *et al.* [10] found vernal conjunctivitis and bilateral corneal scar with lower lid ectropion each in 2.7% case.

In our study, 45% had a normal fundi. Optic disc cupping 20% was the most common posterior segment finding. Optic atrophy 15% was the next common cause followed by tigroid fundus in 10%. However, both Optic atrophy and tigroid fundus together was seen in 5%. In a study done by Taylan., *et al.* [11], disc pathologies were paleness, cupping, hypoplasia and optic atrophy seen in 18.3%, 10.3%, 4.9% and 5.7% respectively. Another study done by Landau., *et al.* [3] showed optic atrophy and macular degeneration in 6.9% each, retinitis pigmentosa and chorioretinitis in 4.1% and 2.7% respectively. We also had a rare finding of Fundus Albipunctatus seen in 1 child with spastic CP. Fundus albipunctatus is a rare form of hereditary chorioretinal dystrophy which is characterized by the presence of myriad symmetrical round white dots in the fundus.

The limitation of our study was a short sample size and difficulty in testing children with CP. Hence affecting the reliability of the findings obtained.

Conclusion

This study was an attempt to assess the ocular manifestation associated with CP. Most common Ocular manifestation was Refractive error. Exotropia and hypermetropia are the most common type of strabismus and refractive errors, respectively. Anterior segment was normal in all cases. Major ocular posterior segment findings included Cupped disc and optic atrophy.

Vision plays an important role in all kinds of development in a child. Our study demonstrated that, visual pathologies have a higher prevalence among patients diagnosed with CP. Hence, routine ocular examination is warranted in patients with CP, which should include vision assessment with refraction, Ocular alignment, anterior and posterior segment evaluation, as vision plays a major role in the overall development of a child.

However a larger study size and follow up is needed to demonstrate its probable significance.

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