

Homonymous Hemianopia in Cerebral Palsy children with Abnormal Head Posture

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¹Conception and design, Collection and assembly of data, ²Analysis and interpretation of the data, ³⁻⁶Critical revision of the article for important intellectual content, Statistical expertise ¹⁻⁶ Final approval and guarantor of the article.

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A B S T R A C T

Background: Cerebral palsy occurs if brain does not develop normally or due to damage of brain before, during or just after birth caused by any infection in pregnancy, genetic disorders or trauma causing different visual problems (homonymous hemianopia) instead of developmental issues.

Objective: To assess homonymous hemianopia in cerebral palsy children with abnormal head posture.

Methodology: A descriptive cross-sectional study with non-probability purposive Sampling technique conducted in six months from September 2019 to February 2020. The sample size was 60 and data was collected from Ghurki Trust Teaching Hospital, Children Hospital Lahore and Amin Maktab special education center. Spastic hemiplegic Cerebral palsy children with abnormal head posture aged 1.5 to 17 years were included. Children with hearing or visual loss were excluded. The Behavioral visual field screening test (BEFIE) was used to assess homonymous hemianopia.

Results: Out of 60 CP children with postural abnormalities 60% (n=36) presented with homonymous hemianopia while 40% (n=24) were without hemianopia. In accordance with presence of hemianopia in CP, most common postural adaptation was 'turning away of head' 26.67% (n=16) while children with 'head rocking, flapping' showed lowest results with 6.67% (n=4) when looking at peripheral stimulus.

Conclusion: Vision plays a specific role in controlling head position in CP children. Homonymous hemianopia was present in more than half cerebral palsy children with abnormal head posture.

Key Terms: Abnormal head posture, Cerebral Palsy, Homonymous Hemianopia.

Introduction

Cerebral palsy occurs if brain do not develop normally or due to damage of brain before, during or just after birth caused by any infection in pregnancy, genetic disorders or trauma.¹ Different risk factors of cerebral palsy are prolonged pregnancy, use of steroids by mother expecting prematurely, use of caffeine and hypothermia.² According to classification, Cerebral palsy is of different types, like spastic cerebral palsy (can be diplegic, hemiplegic or quadriplegic), dyskinetic cerebral palsy (can be dystonic or choreoathetoid), ataxic or

mixed types.^{3,4} Almost (77.9%) of children present with spastic type of cerebral palsy.⁵ Severity of CP is classified according to gross motor function classification system that is presented by I to V levels.⁶

The overall prevalence of cerebral palsy in the world is 2.11 per 1000 live births.⁷ It is also a common condition in Pakistan. According to the study conducted in Faisalabad, out of 160 cases of abnormal movement and muscle tone, 120 (7.5%) were diagnosed with Cerebral palsy.⁸

The early signs that shows a child can have CP are delayed milestones (e.g. sitting, standing, rolling over or walking).⁹ Due to damage of brain the patients of cerebral palsy present with different problems like neurological problems e.g. muscle weakness, behavior problems, loss of sensation, loss of control, musculoskeletal problems e.g. (contractures, deformities) and others e.g. (visual, hearing, respiratory and speech problems).^{10, 11} Child with CP also show decreased response to society and have low quality of life which effect their level of participation in society due to these problems.¹²

Visual system dysfunctions are the common findings seen in children with cerebral palsy. It is mostly caused by cerebral lesion.¹³ Because Cerebral palsy occur due to damage of any part in cerebellum and vision is also controlled by occipital lobe in cerebellum so it is most frequent that visual impairments can occur in cerebral palsy. About 40 to 75% of children with CP show visual dysfunctions or impairments.¹⁴ It includes Refractive errors (Myopia, Hyperopia), ocular disorders (esotropia, exotropia, nystagmus), visual field defects and blindness.^{15,16}

Visual field defects caused by damage to brain are mostly seen in children with CP and it is most common in spastic type of CP.¹⁷ The incidence of visual field defects is 60% to 70%.¹⁸ Visual field defects which are commonly present in children with CP are Homonymous hemianopia (31%), tubular vision (20%), quadrantanopia (11%) and temporal restriction (7%).¹⁹ Visual field defects occurs mostly behind the optic chiasm and it may involve the anterior part (both eyes optic nerves up to the optic chiasm) or a posterior part (optic tracts, lateral geniculate nucleus, optic radiations and occipital cortex).²⁰

Homonymous hemianopia is a most common visual field defect in children with CP. It is the loss of half side of visual field of eyes.²¹ In case of child with CP, peripheral visual field loss occurs due to hemianopia and patient cannot see from his peripheral side and in this way he may compensate his vision to see objects by turning his face and neck towards the stimulus and may develop abnormal posture and with prolonged abnormal posture of neck, patient may develop neck stiffness.²² Visual field defects can affect daily life activities and performance which can lead to secondary problems like; postural dysfunctions, mobility, balance and coordination problems.²³ Poor postural control is the key problem in cerebral palsy.²⁴ Vision plays an important role in controlling posture mainly head and neck posture. Stability of head is important for the vision because it helps in focusing image on retina. Because of visual field defects, Child with CP adopt abnormal

head posture which creates difficulty in performing activities and in this way he shows participation restriction.²⁰

The rationale of present study is to determine visual field defects affecting the abnormal head posture in children with cerebral palsy. As many ophthalmologists and physical therapists focus on correcting the head posture instead of instigating the problem.

Methodology

A descriptive cross-sectional study with non-probability purposive sampling technique in six months from September 2019 to February 2020 was conducted on sample size of 60 Cerebral Palsy children. The study was conducted after approval from ethical board of Lahore College of physical therapy. Sample size was calculated by using WHO sample size calculator, with prevalence being 2-2.5 per 1000 live births (28). Data was collected from Ghurki Trust Teaching Hospital, Children Hospital Lahore and Amin Maktab special education center. Gross motor function classification system (GMFCS) was used to see that which level of gross motor function limitations of cerebral palsy patients were more involved in this study, as single level of GMFCS was not easy to find in relation to match all category of current study. Spastic hemiplegic Cerebral palsy participants aged 1.5 to 17 years with abnormal head postures like turning away of head, withdrawal of upper body, looking away and head rocking were the most common postural behaviors which they have adopted in their life due to visual field defect, were taken in inclusion criteria.²⁵ Children with hearing or visual loss were excluded. The (BEFIE) Behavior Visual Field Screening Test as used to assess homonymous hemianopia. In order to check visual field defect examiner was standing behind the patient while patient was sitting on a stool. Straight fixation stick was placed in front of the patient and asked him/her to focus. Parents were asked to hold the head if patient cannot maintain focus on target. Examiner showed round arc stick from back to the peripheral side on which he is standing. Peripheral visual field degrees were mentioned on the round arc stick of BEFIE tool, which were marked and noted according to the head movement of the children and obtained degree measurements were compared according to the degree chart instructions given with the tool. According to that, Peripheral visual field was believed to be 'normal' homonymous hemianopia is absent (when it extended >40 degrees nasally and >70 degrees temporally). PVF was taken 'abnormal' homonymous hemianopia is present if peripheral limits reach (<20 degree nasally or <30 degrees temporally). Patient with homonymous hemianopia responded to stimulus by showing abnormal head postures which he had accommodated in his/her life like turning away, looking away or

overlooking, withdrawal of head and head rocking/flapping in order to focus any stimulus from periphery. Observer noticed any change in behavior and mentioned it in data sheet.

Data was analyzed using Statistical package for social science (SPSS) version 23 software was used for data analysis. The results were presented in the form of descriptive statistics (tables, graphs, and percentages). Permission from the Ethics Committee of LCPT was obtained (Ref. no LCPT/6421). The nature and purpose of the study was explained and consent was taken.

Results

Out of 60 cerebral Palsy children, 55% (n=33) were male and 45% (n=27) were female. The age of the children was between 1.5 to 17 years with a mean age of 6.22 ± 3.25 . According to Gross motor function classification system (GMFCS), greatest frequency of CP children falls in level III with (31.0%) and level IV with (23.8%). The peripheral visual field was believed to be 'normal' homonymous hemianopia (when it extended >40 degrees nasally and >70 degrees laterally). PVF was taken as an "abnormal" homonymous, which is present if peripheral limits are reached (20 degrees nasally or 30 degrees temporally). o, in accordance with results that showed hemianopia. Out of 60 children, homonymous hemianopia was present in 60% (n = 36), while it was absent in 40% (n = 24) CP children. (Table I)

Table I: Frequency of Homonymous Hemianopia in Children with Cerebral Palsy.

Homonymous Hemianopia	Frequency	Percent
Present	36	60%
Absent	24	40%
Total	60	100.0

Results for postural abnormalities show that out of 60 CP children 36 patients had homonymous hemianopia with abnormal head posture. From which 16 (26.67%) presented with 'turning away of head', n=10 (16.67%) showed 'withdrawal of upper body', while n=6 (10.00%) presented with 'looking

away, overlooking' and n=4 (6.67%) presented 'head rocking or flapping'. While 24 patients presented with no homonymous hemianopia but abnormal head posture was present in them due to stiffness of neck muscles or due to other reasons related to cerebral palsy. Out of 24 patients, n=8 (13.3%) showed 'turning away of head', n=6 (10.00%) showed 'withdrawal of upper body', while n=7 (11.67%) presented 'looking away, overlooking' and n=3 (5.00%) presented head rocking, flapping. (Table II)

Discussion

A study conducted by Yvonne Koenraads et al in 2015, in which he used Behavior visual field screening test (BEFIE), which included round arc tool for stimulus and a straight stick for observing visual field defects and his results showed that BEFIE was a valuable test to check visual field defects in neurological impaired children like CP (26). This reveals that Homonymous hemianopia can only be checked by BEFIE tool and Current study results are consistent with previous study in order to check homonymous hemianopia by BEFIE tool.²⁷

According to G. Porro et al. which was most accurate and relevant study conducted in 2005 in which he used Behavior visual field screening test (BEFIE) to check visual field defects and its relationship with postural issues in spastic cerebral palsy children. The results of his study showed that more than 50% of CP children presented with homonymous hemianopia and abnormal head posture.¹⁹ Their main focus was on homonymous hemianopia and its types which were affecting posture and our main focus was on postural abnormalities related to homonymous hemianopia which are being ignored by therapist during therapy and results of present study showed that more than half of CP children were found with homonymous hemianopia. These children with hemianopia showed abnormal head posture like 'turning away of head' or looking away/ overlooking in response to a peripheral stimulus as they had accommodated this abnormal behavior of posture in trying to fixate the vision on any stimulus.

The purpose of this study was to observe Visual

Table II: Frequency of Abnormal head Postures presented with or without Homonymous Hemianopia.

		Abnormal Head posture				Total
		turning away of head	withdrawal of upper body	Looking a way, overlooking	Head rocking, flapping	
Homonymous Hemianopia	Present	16	10	6	4	36
		26.67%	16.67%	10.00%	6.67%	60.0%
	Absent	8	6	7	3	24
	(Stiffness present)	13.33%	10.00%	11.67%	5.00%	40.0%
Total		24	16	13	7	60
		40%	26.7%	21.7%	11.6%	100.0%

Field Defect in children with cerebral palsy with relation to posture abnormalities. According to this, children with more severe CP level were at greater risk of visual impairments.²⁸ During current course of the study, according to GMFCS level's severity with relation to visual field defects in children with spastic hemiplegic, level III and level IV were mostly seen in present study, so this is consistent with the previous study.

In 2016, Cecilia Lidbeck et al. conducted a study on role of visual stimulus in children with cerebral palsy, recorded that how defects in visual stimulus affect the posture and behavioral activity in CP and concluded that the vision highly affects the behavior as well as the posture of the child. Present study also concluded that visual stimulus defects affect postural behavior of child with CP. So, current study is also in accordance with previous study.²⁹

Conclusion

This study concluded that homonymous hemianopia present in more than half patients of spastic cerebral palsy children with abnormal head posture. So, vision provides a basic role in maintaining head posture.

RECOMMENDATION: It is recommended to the future therapist that another study can be done on the application and finding of outcomes of sensory integration therapy for the treatment of visual field dysfunctions in CP children.

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