

To Compare the Effect of Antispastic Positioning and Passive Stretching in Spastic Diplegic Cerebral Palsy

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Abstract

Cerebral palsy is a non progressive condition not a disease caused by damage to the brain usually occurring before, during or shortly following birth. Cerebral refers to brain and palsy refers to a disorder of movement or posture. Symptoms may vary from total inability to control body movements, to only slight impairment. Participants who reported to latika vihar foundation karuna vihar school vasant vihar dehradun, with diplegic cerebral palsy with duration than 5 weeks months were screened for their eligibility depending on inclusion and exclusion criteria to participate in this study. The Results of this study says that the treatment given to Group A is better than Group B. Conclusion of the study is that both the interventions are effective therapeutic options in the treatment of diplegic cerebral palsy.

Keywords: Cerebral palsy, spastic diplegia, Sand bags, Stop watch, Toys and assessment sheet.

1. Introduction

CEREBRAL PALSY is a non progressive condition not a disease caused by damage to the brain usually occurring before, during or shortly following birth. Cerebral refers to brain and palsy refers to a disorder of movement or posture. Symptoms may vary from total inability to control body movements, to only slight impairment¹. The most common cause of cerebral palsy is an insufficiently amount of oxygen reaching the fetus or new born infants brain it is the most frequent cause of severe disability in children.

Types of cerebral palsy

- Spastic Cerebral Palsy.
- Athetoid Cerebral Palsy.
- Ataxic Cerebral Palsy.
- Mixed Cerebral Palsy.

SPASTIC CEREBRAL PALSY: - Muscles are tensed, contracted and resisted to movement. This makes muscle movement jerky and uncertain. These individuals have exaggerated stretch reflex that causes them to respond to rapid passive stretching with vigorous muscle contractions. Spastic cerebral palsy characterized by hypertonic muscle tone occurring during voluntary movement.

ATHETOID CEREBRAL PALSY:- Cause involuntary movement of the part affected. The hands may twist and turn and often there is facial grimacing, tonguing and drooling. Because of presence of primitive reflex and inability to control muscles, posture is unpredictable. Athetoid cerebral palsy is the second most common type of cerebral palsy characterized by fluctuating muscle tone i.e. sometimes hypertonic sometimes hypotonic, generally the term athetosis and dystonia are synonymous.

ATAXIC CEREBRAL PALSY:- Disturbance or lack of balance and coordination . Child may sway when standing have trouble maintaining balance and may walk with feet spread wide apart to avoid falling. Ataxic cerebral palsy is the least common type of cerebral palsy characterized by poorly condition and hypotonic muscle tone.

MIXED CEREBRAL PALSY:- It is a combination of spastic, Athetoid, ataxic type of cerebral palsy.

CAUSES OF CEREBRAL PALSY are Pre natal cause -Genetic factor and prematurely, Natal cause- cerebral anoxia due to difficult labors, Post natal cause - infection like meningitis and encephalitis causing cerebral damage.²

EPIDEMOLOGY:

The reported prevalence rate of cerebral palsy is 4/ 1000 live birth. Birth asphyxia was uncommon cause of cerebral palsy moreover; most high risk pregnancies resulted in neurologically normal children. Although a cause for cerebral palsy could not be identified in most cases a substantial no. of children with cerebral palsy had congenital anomalies external to the central nervous system which may have placed them at increased risk for developing asphyxia during the prenatal period. An Australian study comparing children with spastic cerebral palsy with a group of matched controls had similar findings. Less than 10% of children with cerebral palsy had evidence of intra partum asphyxia. Although the increased survival of premature infants from improved per natal care has resulted in more children with cerebral palsy the rate did not increase. These studies suggested that future development aimed at enhancing peri natal care will have minimal impact on the incidence of cerebral palsy that researches might be directed more profitable to the field of developmental biology in order to understand the pathogenesis of cerebral palsy.

SPASTICITY:

Spasticity is a neuromuscular problem. Muscles show slow physiological resistance to passive motion which is called tone. Spasticity is a velocity dependent, faster the passive movement greater the resistance of muscle increase the muscle tone cause loss of trunk balance and difficult of active movement in extremities. Spasticity is a component of upper motor lesion may originate within the brain or within the spinal cord. A cerebral lesion may be Cortical, Sub cortical, Internal capsule, Brainstem. Owing to the wide surface distribution upper neuron in the cerebral cortex. a cortical lesion of a given size will involve fewer such fibers then at any lower level consequent upper motor neuron lesion usually produce a monoplegia i.e. paralysis of the face or one limb only without or with only slight implication of adjoining cortical area. Since precentral cortex contain the bodies of the pyramidal cells, a cortical lesion in this region may leads to excitation of the corticospinal fibers which express as itself as a Jackson an convulsion.

Sub cortical lesion: - in the corona radiate the upper motors are converging towards the internal capsule and are closer together then in the cortex. Sub cortical lesion tends these forces to involve more fibers then cortical lesion of equal size and it usually to find that though the weakness may predominant in one limb, the whole of the body opposite side of the body is some to extent involved.

Lesion in the internal capsule here upper motor neuron are more closely crowd together Then at higher level and a lesion in this situation is therefore likely to produce a crossed hemiplegic. Lesion in brain stem such lesion are likely to produce a hemiplegic or since both Corticospinal tracts here lies near to each other a tetraplegia. Hemiplegic due to lesion of the brain stem can be distinguished from capsular. In case of the brainstem particularly the cranial nerve nuclei and their motor and sensory pathway at the various levels and also the long ascending sensory tracts.

QUNTIFICATION THE SPASTICITY

Spasticity can be measured by clinical examination mechanical instruments and electrophysiological techniques. Tardieu scales are commonly used for clinical evaluation. These measure tone intensity but do not evaluate the effect of spasticity on function. Mechanical instrument measure the resistance of the muscle to passive stretch and electrophysiological measures showing hyper extensibility of the stretch reflex are used only for research purpose.

ANTISPASTIC POSITIONING: Anti spastic positioning is to keep a muscle in a position for as long as it can be tolerated. It is that position the child to stretch the spastic muscle and decrease sensitivity of the stretch and the brain stem reflex that triggers spasticity. The therapist should teach this position to the family so that the child lies and sits this way most of these times at home. Head supports may improve tone in the trunks muscle by providing a sense of safety and inhibiting the tonic neck reflexes. Anti spastic positioning is generally used for to prevent contracture, spasticity and limitation and deformities.⁶

STRETCHING: It is therapeutic technique designed to lengthen the shortened soft tissue structure and thus increased joint range of motion. Stretching is done to increase mobility and flexibility of muscle, ligaments that surrounds the joint and are necessary for normal joint range of motion. A shortened of these soft tissues can be caused by Prolonged immobilization, Restricted joint mobility, Neuromuscular disease, Connective tissue pathology, Congenital or acquired boney deformity.

2. Methodology

Data was taken from LATIKA VIHAR FOUNDATION (KARUNA VIHAR SCHOOL) DEHRADUN. The method of data collection used for this study was a primary method. The study design used for this research was randomized comparative study. The sample size used for this research study was 20. Sample selected was heterogeneous. The study sample consisted of both male and female participants referred to the karuna vihar school vasant vihar with diagnosis of diplegic cerebral palsy. Sampling design used for this research was random sampling (Envelope method) with allocation to 2 study groups. There were 20 participants with Provisional diagnosis of diplegic cerebral palsy. Inclusion Criteria Spastic diplegic type of cerebral palsy, No limitation in ROM at ankle, Severity of spasticity of gastro- soles muscle must be three according to modified ash-worth scale, Age (4 -13 years). And EXCLUSION CRITERIA Not taking any oral drugs for reducing spasticity, Not taking any intra the cal myo relaxant drugs, Not to have had any orthopedic surgery for ankle. Materials used in this study were Sand bags, Stop watch, Toys, Data collection sheet and assessment sheet. VARIABLES are Independent includes Passive stretching and Anti spastic positioning and Dependent includes Ashworth scale. **MAIN OUTCOME MEASURES are Intensity of Spasticity:** By modified ash worth scale – A scale of 4 no of scores where 0 represents no muscle tone and 4 represents sever hyper tonus. **Physical Function outcome:** The Modified ash worth scale includes 4 items with score ranging from 0-4 where better function is indicated by lower score.

Participants who reported to latika vihar foundation karuna vihar school vasant vihar dehradun, with diplegic cerebral palsy with duration than 5 weeks months were screened for their eligibility depending on inclusion and participate in this study. After finding their suitability, they were requested to participate in the study. Then the informed consent was obtained. Following this, a standardized history which consisted of demographic information including age, gender, body weight, height, nature of the participant. Initial evaluation of the spasticity profile was done using Modified ash worth Scale. The spasticity was recorded by another physiotherapist items with score ranging from 0-4; where better function is indicated by lower scores. This scoring has been designed to give information as to how as affected his ability to manage in everyday life. Thus the data collected was taken for further analysis. After this initial evaluation, they were randomly allocated to one of the two study groups A and B.

Table 1: Procedure followed in Group A and Group B

Group A	Group B
ANTISPASTIC POSTIONING	PASSIVE STRETCHING
1. Participants were treated with antispastic positioning for 20 minutes.	Participants were treated with passive stretching giving for 30 sec to 60 sec with 5 repetitions)
2. Patients are supported by a physiotherapist at a straight sitting.	Patient is in supine lying.

3. Patient's position of hips were abducted at nearly 45 ° angles and externally rotated.	Therapist is on the side of the patient
4. The knees were extended to 90° of the ankles.	Passive stretching is archived by having an external force by applied in order to attain and hold the end position and achieve greater ROM
5. Patients were kept at this position for 20 minutes without changing degree of support.	Target specific muscle is adductor, internal rotator, flexor and planter flexor of ankle.
6. The head was held neutral position in order to prevent asymmetrical tonic neck reflex	Manual stretch with 5 repetition for each joint hold for 20 sec having 5 days a week for 5 weeks

3. Results And Discussion

OBSEVATION AND DATA ANALYSIS

Statistics are performed by using SPSS 13. Results are calculated using 0.05 level of significance.

ANOVA – Analysis of variance (ANOVA) is used when we have more than two samples and we are to test for significance of difference between their means. ANOVA may be taken as an extension of t- test for the case of more than two sample means.

The Analysis of variance is mainly carried on under following two classifications-

- (1) One- Way ANOVA
- (2) Two- Way ANOVA

In One- Way ANOVA we have only one main source of variation i.e. treatment. In one –way ANOVA the various sum of squares involved in the computation of F- statistics are-

Total variation = variation due to treatment + variation due to experimental error But sum of square of deviation taken from mean is the measure of variation i.e.

Total sum of square = Sum of square due to treatment + Sum of square due to error

$$T.S.S. = S.S.T. + T.S.S (1)$$

Where (2)

$$T.S.S. = \sum X^2 - C.F. \text{ (Correction Factor) } C.F. = G^2/n$$

$$G = \text{Grand Total } n = r \times t$$

r = No. of rows

t= No. of columns (Treatments)

$$S.S.T. = \sum T^2/r - C.F. (3)$$

Now

Ti = ith treatment

$$T.S.S. = S.S.T. + S.S.E.$$

$$S.S.E.=T.S.S.-S.S.T (4)$$

Table 2: ANOVA TABLE

S.V. (Source of variation)	S.S. (Sum of squares)	d.f. (Degree of freedom)	M.S.S. (Mean sum of squares)	Fcal	
Treatment	S.S.T. (Sum of square due to treatment)	d.f. = t - 1	M.S.T. = S.S.T / t - 1 (Mean sum of square due to treatment)	F cal = M.S.T / M. S. E	F tab
Error	S.S.E. (Sum of square due to error)	n - t	M.S.E. = S.S.E. / n-t (Mean sum of square due to error)		
Total	T.S.S (Total sum of square)	n - 1			= F t -1, n-t, 5%

DECISION: (1) If $F_{cal} \leq F_{tab}$, The Null Hypothesis is accepted.

2) If $F_{cal} \geq F_{tab}$, The Null Hypothesis is rejected.

Results:

For both the groups, Group A and Group B the Mean \pm SD values were calculated. Groups were compared by Using ANOVA (Analysis of variance)

The results of the study suggest that f - values for Modified Ashworth Scale on different days are 1.8,3.6 and 10.12 and p- values are 0.016, 0.02and 0.005 This shows that the treatment given to both the groups are effective

But the mean \pm SD values of Modified Ashworth scale are decreasing in Group A (Antispastic position) in comparison to Group B (Passive stretching). From these Results we conclude that the treatment given to Group A is better Than Group B.

Table 3: Comparison of mean values of Modified Ashworth scale between Group A (Antispastic position) and Group B (Passive Stretching) on 15.02.11

	Group A		Group B	
	Mean	SD	Mean	SD
Modified Ashworth scale	3.3	0.48	3.67	0.51
f-value	1.8			
p-value	0.016			

Table 4: Comparison of mean values of Modified Ashworth scale between Group A (Antispastic position) and Group B (Passive Stretching) on 04.03.11

	Group A		Group B	
	Mean	SD	Mean	SD
Modified Ashworth scale	3.2	0.4	3.68	0.5

f-value	3.6
p-value	0.026

Table 5: Comparison of mean values of Modified Ashworth scale between Group A (Antispastic position) and Group B (Passive Stretching) on 18.03.11

	Group A		Group B	
	Mean	SD	Mean	SD
Modified Ashworth scale	2.2	0.42	2.89	0.41
f-value	10.12			
p-value	0.005			

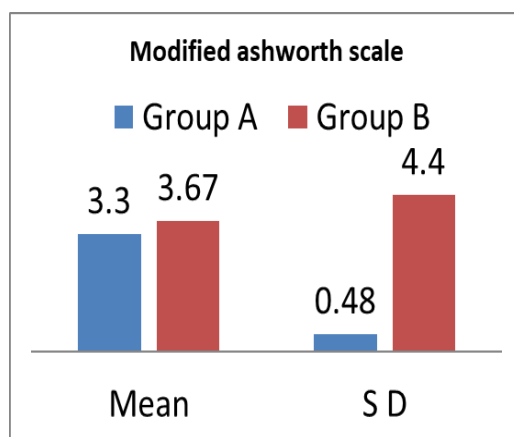


Fig 1. Comparison of mean values of Modified Ashworth scale between Group A (Antispastic position) and Group B (Passive Stretching)

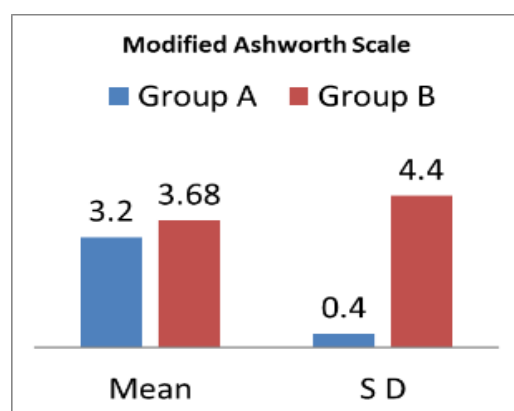


Fig 2. Comparison of mean values of Modified Ashworth scale between Group A (Antispastic position) and Group B (Passive Stretching)

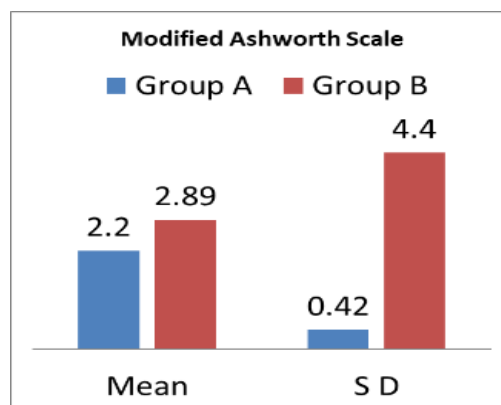


Fig 3. Comparison of mean values of Modified Ashworth scale between Group A (Antispastic position) and Group B (Passive Stressing)

Discussion

This study was formulated to determine the effectiveness of ant spastic positioning versus passive stretching in spastic diplegia cerebral palsy. 20 patients with spasticity aged 4-13 yrs were taken in this study. 10 patients had received antispastic positioning and other 10 patient had received passive stretching. The measurement protocol was designed to find the change in spasticity. After 5 weeks of anti spastic positioning, The improvement was found in spasticity in the group 1. For the predominant cerebral palsy associated with spasticity having more clinical approach in the finding of Turkan akbayrak et al: ant spastic positioning can be used with neurodevelopment treatment approaches when it is required. Antispastic positioning to prevent muscle contracture and joint limitation children with long term spastic diplegia.

In the finding of Gracies JM positioning the child to stretch the spastic muscle and decrease the sensitivity of the stretch and brainstem reflex that triggers spasticity. The therapist should also teach these positions to the family so that the child lies and sits this way of the time at home. Head supports may improve tone in the trunk muscles by the providing a sense of safety and inhabiting the tonics neck reflexes. Advise use of the tailor sitting position to reduce adductor spasticity. Good seating provides a stable platform and facilitates good extremity function.

Ganesh Abdicate et al (2010): Concluded that “positioning is to prior to implantation of any physical therapy it is essential to look the position of child. When seated the child should be fully supported and comfortable and it also prevents contracture²² Application of antispastic positioning in subject with diplegic cerebral palsy produce a significant and immediate improvement in reduce spasticity as compared to other subject who have received passive stretching. Though the data analysis – shows significant difference between group A & B suggest that antispastic positioning proves more effective in treating spasticity commonly found in spastic diplegic cerebral palsy.

Hence in this study the part of experimental is proved.

Limitation of the study

1. The basic limitation of this study is small sample size consists of only 20 subjects.
2. Duration of Treatment session can be applied for less session.
3. In this study no comparison was drawn in treatment responsive between the stages of spasticity

Scopes of future study

Study can be carried on a large sample size. Relevance to clinical significance. This study provides some evidence for the antispastic positioning as effective treatment for reducing the spasticity used in clinical setup.

4. Conclusion

In conclusion, this randomized clinical trial which was performed on 20 participants consisting of males and females with a diagnosis of diplegia cerebral palsy with interventions in the form of ant spastic positioning (Group A) and passive stretching (Group B) showed that, both the physical therapy regimen can be useful in alleviating the cerebral palsy in reduction of spasticity and improvement in functional ability in terms of modified ash worth scale respectively.

Hence, it can be concluded that both the interventions are effective therapeutic options in the treatment of diplegic cerebral palsy. In addition, results supported that antispastic positioning is of great value which can be useful in improving quality of life as spastic diplegic cerebral palsy heterogeneous condition. Thereby accepting the experimental hypothesis & rejecting null hypothesis.

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