EFFECT OF SUSTAINED WEIGHT IN CORRECTION OF DROP SHOULDER IN HEMIPLEGIC CEREBRAL PALSY CHILDREN

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Abstract:

Purpose: This study was done to investigate the effect of sustained weight on correction of drop shoulder in hemiplegic cerebral palsy children.

Participant and Methods: Thirty children with spastic hemiplegia enrolled in this study, their age ranged from 3 to 8 years and being assessed by posture zone software.They were randomly assigned into two groups of equal numbers 15 children each.The control group (A) received a designed physical therapy program and the study group (B) received the same therapy program in addition to sustained weight (2% out of the total body weight)placed on top of the dropped affected shoulder.

Results: Comparison of post treatment results between the control and study groups revealeda significant difference between post treatment mean values of shoulders level angle in favour of the study group.

Conclusion: From the obtained results it could be concluded that sustained weight of about 2% of the total body weight has a beneficial effect on drop shoulder in children with spastic hemiplegia.

Key Words: Hemiplegia, Spastic children, Drop shoulder, Sustained weight.

Introduction:

Cerebral palsy (C.P) is defined as "a group of permanent disorders of movement and posture, causing activity limitation that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain." While the central feature of CP is a

disorder with movement, difficulties with thinking, learning, feeling, communication and behavior often occur along with cerebral palsy. Those with CP, 28% have epilepsy, 58% have difficulties with communication, at least 42% have problems with their vision, and 23–56% have learning disabilities[1].

Hemiplegia is a form of spastic cerebral palsy that affects one side of the body. Spastic hemiplegic cerebral palsy (SHCP) is the most common syndrom in children born at term, and the second in frequency only to spastic diplegia among preterm infants. Children with this serious condition may have varying combinations of weakness and spasticity, involving the arm and leg of either side of the body. In addition; they exhibit asymmetry between the paretic and the non-paretic sides, with decreased muscle volume in the paretic side and significant leg length discrepancy[2].

The prevalence of spastic hemiplegia accounted for about 0.6 per 1000 live births and it did not change significantly over time[3].

Proprioception is the sense of the relative position of one's own parts of the body and strength of effort being employed in movement. In humans, it is provided by proprioceptors (muscle spindles) in skeletal striated muscles and tendons (Golgi tendon organ) and the fibrous capsules in joints. It is distinguished from exteroception, by which one perceives the outside world, and interoception, by which one perceives pain, hunger, etc., and the movement of internal organs[4].

Proprioception is obtained through structures surrounding the joint, such as the muscle and skin mechanoreceptors. The afferent impulse from peripheral receptors travel to the central nervous system and is processed centrally. Muscle mechanoreceptors have the greatest influence on proprioception[5].

Posture Zone is the software program for analyzing and assessment. The easy to use Posture Zone assessment software generates a postural analysis using a digital image of the patient's posture (posture picture). Posture assessment is an effective tool for assessing posture distortion, demonstrating postural improvements with clinical treatments, and wellness assessment[6]

Ideal posture, on examination the body should be viewed from three planes (frontal, sagittal, coronal planes)[7].

In this present study, examination would be as 2D assessment from frontal plane only to detect the amount of shoulder drop in the affected side.

Material and methods:

The research design of this study was a randomized control study design. Ethicscommittee approval was obtained from the institutional review board at Faculty of Physical Therapy, Cairo University before study commencement with number (No. P.T. REC/012/001864). Informed written consent was signed from each parent after explaining the nature and purpose of the study.

Participants:

Thirty children with spastic hemiplegia participated in this study and they were selected from the outpatient clinic, Faculty of Physical Therapy, Cairo University. Their ages ranged from 3 to 8 years, both genders were included, spasticity ranged from grade 1 to 1+ according to modified Ashowrth scale, they were able to sit or stand without support, they were able to bring their hand to mouth and could understand and follow instructions. Children with visual or auditory problems or having surgical interference in upper limb were excluded. They were divided into two groups, group A (control), received a designed physical therapy program; and group B (study), received the same therapy program in addition to sand bag weight (2% out of total body weight) on the top of the dropped affected shoulder.

Methods of measurements:

Posture Zone is the software program for analyzing and assessment whichis an effective tool for assessing posture distortion, demonstrating postural improvements with clinical treatments, and wellness assessment.It was set up on laptop and used for recording drop shoulder in all children pre and post treatment.

To prepare the child,two reflected dots were placed on acromion process while the child standing bare feet with both arms at sides, the room must be well lighted to improve the quality of recording, the digital camera was placed on the stand to capture the scapular postural image from back view, the camera height was adjusted according to the height of each child (at shoulder level) and one meter away from center of the child body to allow full view of child back during capturing, then scapular posture was

captured for all children enrolled in this study before and after treatment and then the images were analyzed using postural zone software.

Methods of treatment:

1. **Physical therapy program**:Supine to sit to stand, Squatting on both leg, Squatting on affected leg, stoop and recovery, Step standing, kneeling exercises, Half kneeling exercises, Kneeling to half kneeling to stand, Back exercises, Abdominal exercises, Strengthening exercise for the upper limbs and lower limbs, Hand weight bearing on the affected limb, Vestibular exercise using large ball, Balance exercise and Gait training exercise.

2. **Sustained weight**: All children in this study group hold the sustained weight (2 % out of total body weight) as long as possible and removed at bed time for 3 successive months.

Data analysis:

Statistical analysis of the data was performed using SPSS software for medical statistics. The current test involved two independent variables. The first one was the (tested group); between subject factors which had two levels the control group A (n=15) received selected physical therapy program based on the evaluation findings and the study group B (n=15) received the selected physical therapy program conducted for group A besides sustained weight (2% out of the total body weight) on affected shoulder.The second one was the (evaluation times); within subject factor which had two levels (pre and post treatment). In addition, this test involved one tested dependent variable (Shoulder level).

Demographic data

Thirty children with spastic hemiplegic CP enrolled in this study, they were divided into two groups; the control group A consisted of 15 children (6 boys and 9 girls), their mean $\pm$ SD of ages were 5.8±1.28 years. The study group B consisted of 15 children (11 boys and 4 girls), their mean $\pm$ SD of age were 5.04±1.11 years. There was no statistically significant difference (P>0.05) between subjects in both groups concerning age. Also, Chi square revealed no significant differences between both groups in sex distribution (p>0.05) (Table 1)

Table (1): Demographic characteristics of both groups:

Demographic Data	Group A	Group B	Comparison		
	Mean ± SD	Mean ± SD	t-value	P-value	
Age (years)	5.8±1.28	5.04±1.11	1.277	0.222	
Gender			X^2		P-value
Girls	9	4			
Boys	6	11	0.6		0.439

SD: Standard Deviation, P: probability, X^2: Chi -Square.

Shoulders level angle between groups:

As shown in **table (2)**, the pre and post treatment mean ± SD of shoulder level angle (degrees) in group A were 3.676±0.486 and 3.414±0.459 (Degrees) respectively, which indicated a significant difference (P <0.05). The percentage of improvement is 7.18%. and; The pre and post treatment mean + SD of shoulder level angle (degrees) in group B were

5.314±1.215 and 2.525±0.347(Degrees) respectively, which indicated a significant difference (P <0.05). The percentage of improvement is 52.48%.

Table (2): Shoulder levels angles (Degrees) of both groups A and B:

Table (2): Shoulders level angles (Degrees) for both group A and B:

Shoulder levels angels	**Means ± SD**	**Means ± SD**	**% of change**	**T value**
	Pre	**Post**		

(Group A)	3.676±0.486	3.414±0.459	**7.18**	**4.75**
(Group B)	5.314±1.215	2.525±0.347	**52.48**	**6.706**
Between groups	**0.05**	**0.026***		
P- value	**P =0.05**	**P <0.05**		

*Significant level is set at alpha level <0.05

As demonstrated in **table(2)** and**figure(1);**When comparing the pre-treatment mean values regarding the shoulders level angle (Degrees) for both groups A and B, There was no significant difference (p=0.05). Also, There was a significant difference between post treatment mean values of shoulders level angle for both groups A and B (p<0.05), table (2).

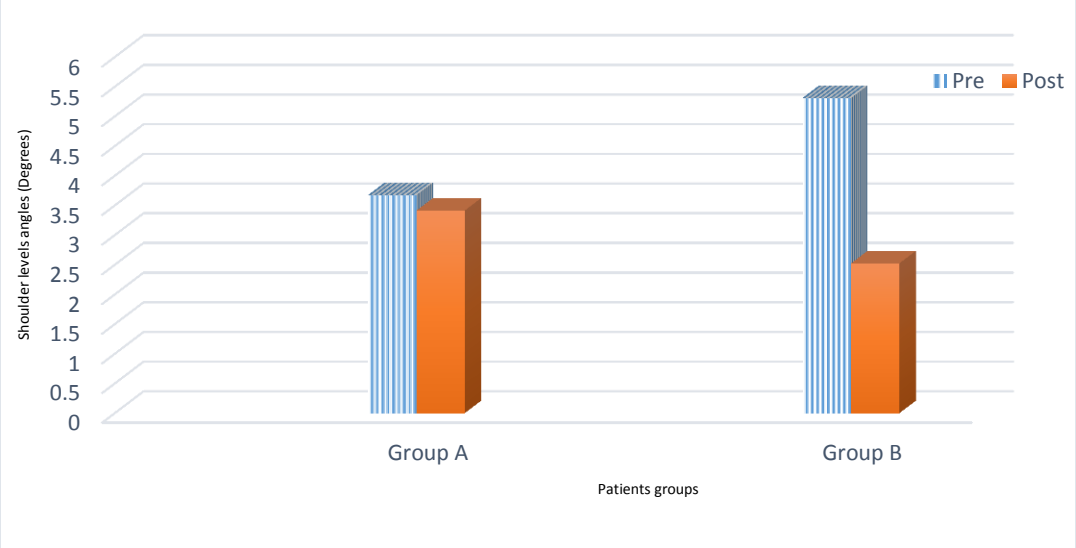

Fig. (1): *Pre and post treatment mean values of shoulders level angles (Degrees) of both groups A and B*

Discussion:

This study was designed to investigate the effect of sustained weight in correction of drop shoulder in hemiplegic cerebral palsy children.

Children with hemiplegic CP show increased spasticiy,coactivation of agonist antagonist muscles, muscle weakness and limited range of motion, all of which affect gross and fine motor functions[8]

Functional prognosis in hemiplegic children is good compared to other types because one side of the body is normal and they learn to walk by the age of three[9]

The trapezius muscle is functionally separated into three parts. The upper occipital and cervical part acts to elevate the shoulder and hence its weakness causes shoulder-drop deformity. The middle and lower trapezius weakness or damage will result in a more prominent medial border and inferior angle[10]

The upper portion of the trapezius muscle elevates the scapula. One of the functions of all the three portions is to draw the scapula towards the midline. The upper and lower trapezius together with the levator scapulae, the rhomboids and the serratus anterior muscles control the rotatory movement of the scapula, without which the abduction of the arm is limited to 80°. As a result of the paralysis of the trapezius muscle a drop shoulder with rotation of the angle of the scapula towards the midline and restricted abduction of the arm is caused. The muscular imbalance results in anterior and rotatory displacement of the scapula[11]

Comparing the results of the two groups before application, there was no statistically significant difference which support the validity of the sample, the results revealed a statistically significant difference when comparing post treatment mean value of shoulder level for the control group and study group, induced by the effect of sustained weight on upper fiber of trapezius, this is confirmed by**Bech et al., (2017)**[12]who stated that The trapezius muscle is a prime mover for shoulder elevation so this come in agreement with **Symes and Ellis(2005)**[13] who concluded that Upper Trapezius weakness or damage will result in dropping of the shoulder as the scapula is translated laterally and rotated downwards; their neckline will be asymmetric due to the lateral end of the clavicle dropping resulting in a more prominent clavicle superior border

In this study,Sustained weight is a new technique that used to provide kinesthetic improvement along with strengthening of the muscles that elevate the shoulder resulting in improvement of shoulder level, this come in agreement with

Blanche et al., (2012)[14]who stated that proprioceptive activities can be passive, where deep pressure is given to the child, or active, where the child actively takes part in a heavy work activity. Passive proprioception training is conducted by letting the child lie on a mat or folded blanket and pack pillows on top to make him into a pizza or sandwich. Weighted vests, weighted blankets and lap blankets are also effective ways to give passive proprioceptive input.

Also the result of current study are parallel with **Goble et al., (2005)**[15]stated that proprioception provides the basis for knowing where our extremities are in space and is comprised of both static (joint/limb position sense) and dynamic (kinesthetic movement sense) components. Sherrington conducted the first studies on this topics in 1906, he has been established that muscle spindles are a major source of proprioceptive feedback to the central nervous system and appear to mediate the conscious perception of movement and limb position for the proprioceptive information

Conclusion:

It can be concluded from the result of this clinical study supported by the relevant literature that sustained weight is effective in improving drop shoulder in children with spastic hemiplegia.

Reference:

1. **Smith M and Kurian M (2016):** The medical management of cerebral palsy. *Paediatrics and Child Health.* 26 (9): 378–382.
2. **Riad J, Finnbogason T and Brostrom E (2010)**: Leg length discrepancy in spastic hemiplegic cerebral palsy: a magnetic resonance imaging study.*JPediatrOrthop*; 30: 846-850.
3. **Green L and Hurvitz E (2007):** Cerebral palsy. *Phys Med RehabilClinN Am.* 18 (4): 859–82.
4. **Bastien R, Bohr T, Moulia B, et al., (2013):** Unifying model of shoot gravitropism reveals proprioception as a central feature of posture control in plants. *Proceedings of the National Academy of Sciences.* 110 (2): 755–760

5. **Aydin T, Yildiz Y, Yanmis I, et al., (2001):**Shoulder proprioception: a comparison between the shoulder joint in healthy and surgically repaired shoulders. Arch Orthop Trauma Surg.121:422-425.
6. **Weiniger S (2006):** Posture zone software and body zone
7. **Fortin C, Debbie E, Farida C, et al., (2011):** Reliability of a quantitative clinical posture assessment tool among persons with idiopathic scoliosis
8. **Chen Y.P. and Yang T.F. (2007):** Effect of task goals on the reaching patterns of children with cerebral palsy. Journal Motor Behavior; 39(4): 317-24.
9. **Brashear A (2010):** Spasticity: Diagnosis and Management. New York: Demos Medical
10. **Horch RE and Stark GB (2000):** The contralateral bilobed trapezius myocutaneous flap for closure of large defects of the dorsal neck permitting primary donor site closure. Head neck; 22(5):513–9.
11. **Modric J (2017):** Shoulder Muscles Functions.
12. **BechK.T., Larsen C.M.,Sjøgaard G., et al., (2017):**Voluntary activation of the trapezius muscle in cases with neck/shoulder pain compared to healthy controls, Journal of Electromyography and Kinesiology.
13. **Symes A and Ellis H (2005):** Variations in the surface anatomy of the spinal accessory nerve in the posterior triangle. *SurgRadiol Anat.*; 27(5):404–8.
14. **Blanche EI, Reinoso G, Chan MC, et al., (2012):** Proprioceptive processing difficulties among children with autism spectrum disorders and developmental disabilities. Am J OccupTher 66: 621-624.)
15. **Goble DJ, Lewis CA, Hurvitz EA, et al.,(2005):** Development of upper limb proprioceptive accuracy in children and adolescents. Hum MovSci 24: 155-170.