Effect of High Voltage Pulsed Galvanic Stimulation on Head Control in Spastic Diplegic Cerebral Palsy

Abdel Aziz A. Sherief [*] and Somaia A. Hamed[**]

* Department of Physical Therapy for Growth and Development Disorder in Children and its Surgery,, Faculty of physical Therapy, Cairo University, Egypt.
**Department of physical Therapy Disease (Pediatric), Faculty of Physical Therapy, 6 October University, Egypt.
aabdelazez10@yahoo.com

Abstract: The purpose of this study was to evaluate the effect of high voltage pulsed galvanic current in spastic diplegic cerebral palsy on head control. Thirty children participated in this study; they were assigned in two groups of equal number, group A&B. Their ages ranged from fourteen to eighteen months. Group A (10 males and 5 females) with mean age of 15.6± 1.5 months, received only selected physical therapy program for sixty minutes. The program included neuro-developmental techniques, Rood approach, conductive education and sensory integrative therapy to establish head control, group B (11 males and 4 females) with mean age of 15.86± 1.5 months. They received selected physical therapy program for thirty minutes as in control group combined with high voltage pulsed galvanic stimulation for 30 minutes for two months. Children were evaluated pre and post treatment for their head control. Results: revealed that there were statistically significant differences in group B regarding the improvement in head control as compared to group A. Conclusion: Adding high voltage pulsed galvanic to physical exercises significantly improved head control. The selected physical therapy program alone was not sufficient to improve head control.

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1. Introduction

Cerebral palsy refers to a group of posture and movement disorders occurring as a result of non-progressive lesion of the developing central nervous system. Generally, the diagnosis is mad before the age of two years [1].

The demographic presentation of cerebral palsy (CP) recorded from one to seven per thousand children throughout most of the world, theoretically being more common in geographic regions where prenatal maternal and prenatal infants cares are poor.[2] .

Cerebral palsy is a description, not a specific diagnosis that covered a number of neurological conditions resulting in abnormal development of movement and posture. A recent definition of CP is an umbrella term covering a group of non-progressive, but often changing , motor impairment syndromes secondary to lesions or anomalies of the brain arising in the early stages of its development Impaired postural control is one of the main problems for children with CP, consequently, these children spend much time in a seated position because the small support surface when standing imposes high demands on their ability to control their posture[3].

Children with cerebral palsy usually suffer from neurological deficits that interfere with motor functions [4].

Children with cerebral palsy may show a delay in the acquisition of gross motor function such as postural control, so they developed lack of head and trunk stability [5].

Neuromuscular electric stimulation (NMES) is used as an adjunct to physical therapy to increase strength, range of motion (ROM), motor control and co-ordination and to temporarily reduce spasticity. Studies on the effect of NMES on spasticity and function have shown varied results. Neuromuscular electric stimulation has been used most often on the antagonist of spastic muscle to produces a reciprocal relaxation effect, but it has also been used directly on spastic one for the purpose of fatiguing them [6].

A relatively recent modality in physical therapy is high voltage pulsed galvanic stimulation (HVPG), which is characterized by generators having more than 150v and producing a monophasic twin peak end wave form with effective phase durations of 20 to 45 μsec also this is current has extremely short pulsed durations (5-100 μsec) and a low current (1.5 mA), little or no electrochemical pain during stimulation [7]

2. Subjects, instrumentation and procedures

This study was conducted at the out-patient clinic of the Faculty of Physical Therapy, Cairo University to investigate the effect of HVPG in sitting position on head control in spastic diplegic cerebral palsy.

They were assigned in two groups of equal number, group A&B. Their ages ranged from fourteen to eighteen months. Control group(10 males and 5 females) with mean age of 15.6± 1.5 months, received only selected physical therapy program for 60 minutes. The group A engaged in physical therapy program composed of neurodevelopmental techniques, Rood approach, conductive education, sensory integrative therapy to establish head control.

Group B (11 males and 4 females) with mean age of 15.86± 1.5 months. They received selected physical therapy program for 30 minutes as in control group combined with high voltage pulsed galvanic stimulation for 30 minutes for 2 months. Children were evaluated pre and post treatment for their head control.

Instrumentation

The following instrumentations were used during the study: 1- A Camera : was used to record the head position from lateral profile for each patient (Cinematographic assessment).2-Myrin OB goniometer consist of small fluid filled box fixed to a plate upon which it can be rotated . In the box ,there is a compass needle which is affected by earth magnetic field and inclination needle which is affected by gravity .3- A computer for the analyzing the results by using AutoCAD program

Procedures for evaluation:

All children were evaluated before and after two months of treatment as follows**:**

- Reflective dots was used for the Cinematographic assessment). The dots placed on the following Landmarks on : 1-Tragus of ear 2-Seventh cervical vertebrae process 3-Acromion. The measured angle was formed by intersection of a straight line passing over the tragus of ear and C7 with straight line passing over the lateral point of acromion and C7 [8] The angle was measured in maximum active head control in prone position for three trails and average was taken

B- OB goniometer:

-Starting position: the child is prone lying position . The head and neck in flexion position .-Goniometer placement : The strap is placed around the level of the forehead . The dial is placed on the lateral aspect of the head –Stabilization: the examiner stabilize the trunk to prevent flexion or extension – End position : the child encouraged to extend the neck.

For treatment

1. Procedures for treatment:

Both groups (study group and control group) will be engaged in physical therapy program composed of neurodevelopmental techniques, Rood approach, conductive education ,sensory integrative therapy to establish head control ,the study group receive the same program in addition to the application of HVPG stimulation over the neck muscles in sitting position for thirty minutes three times per week for two months .

3. Results:

The raw data of OB goniometer and AutoCAD test in spastic diplegic cerebral palsy children were treated to determine the mean and standard deviation of the measuring variable for the two groups before and after two months of treatment .student t-test was applied to examine the significant of treatment procedures conducted in each group. As revealed from table 1 and Fig. (1) was observed in mean values of OB goniometer measured in group A at the end of treatment as compared with the responding mean values before treatment (P>0.01).

Also table (1) and figure (1) showed significant improvement in mean value of OB goniometer measured in group B at the end of treatment as compared with the responding mean values before treatment (P>0.01).

As revealed from table (2) and Fig. (2) was observed in mean values of AutoCAD measured in group A at the end of treatment as compared with the responding mean values before treatment (P>0.01).

Also table (2) and figure 2 showed significant improvement in mean value of AutoCAD measured in group B at the end of treatment as compared with the responding mean values before treatment (P>0.01).

Table 1: Comparison between the pre and post treatment mean values of head control measured by OB goniometer in both groups

	Group A		Group B	
	Pre	Post	Pre	Post
X`	4.5	9.5	4.6	11.5
t-test	5.4		6.3	
±D	±1.8	±3.9	±.7	±.8
P-value	0>0.01		0>0.01	
Sig.	Significant		Significant	

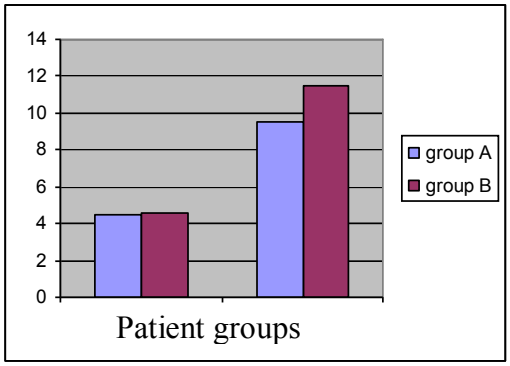

Fig. (1): The pre and post treatment mean values of the goniometer measures groups A&B.

Table 2: comparison between the mean values of head control measured by AutoCAD in the both groups

	Group A		Group B	
	Pre	Post	Pre	Post
X`	49	76	48.5	95
t-test	5.2		5.6	
±D	±1.2	±2.2	±1.7	±3.8
P-value	0>0.01		0>0.01	
Sig.	Significant		Significant	

Data are expressed as mean±SD.

P: probability value

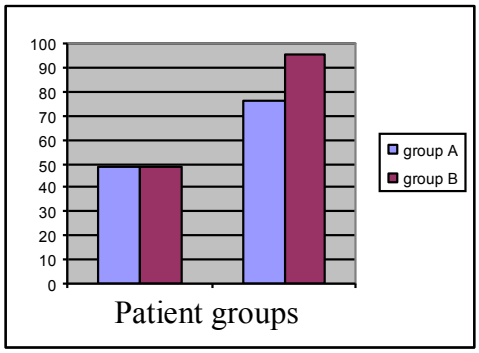

Fig.(2): The pre and post treatment mean values of the AutoCAD measures groups A&B.

4. Discussion:

This study included spastic diplegic CP, which constitutes a major form of CP type with incidence as high as 70 % to 80 % of the premature infant with had difficulty maintaining active head control in a vertical orientation. Such head control is necessary for attending to learning tasks in the classroom and activities of daily living in the clinic[9]

Children with CP are known to have deficits in head stability during dynamic tasks and to have deficit in postural control during sitting. Our results confirm and expand these findings by providing evidence that children with CP have deficits in head stability even during quiet sitting and that these deficits are modulated by external postural support [10]

The pre-treatment results in the current study may be clarified by **Anderson and Winter[11]** Who attribute it to musculoskeletal and neuromuscular system impairments found in children with spastic diplegic CP these impairments include motor skills delay, decreased strength, decreased activities and poor eye hand coordination.

Pre treatment data of children included in the tow groups as regards the age sex difference and head control showed no statistical significant difference between group A, group B .

Post treatment results of children include in group A as regarded to head control showed statistical difference between the pre and post treatment. Improvement of head control in this group could result from the use of NDT program which emphasizes the inhibition of abnormal postural patterns , facilitation righting and equilibrium reactions , and sensory stimulation furthermore, this come in agreement with… **Anderson and Winter[11]**

[11]who reported that the most frequently used technique for the spastic diplegic child is neurodevelopmental therapy, which aims at reduction of the abnormal tone and postures and at helping the child to attain more normal movement pattern. Neurodevelopmental approach is targeted to improve disturbed postural. Reactions which are present in many patients with neurological deficits and can affect functional skills. [12].

The ultimate goal of our neuro-developmental program is targeted to improve disturbed postural reactions which are present in many patients with neurological deficits and can affect functional skills [13]

Lack of head control in CP patients was attributed to damage of vestibular system which diminishes the sense of verticality and makes it difficult for the patient to maintain the head easily oriented in the upright position [14]

Our study focused on an achievement of head stability, which is considered the most important prerequisites for development of gross and fine motor functions by application of HVPG on neck muscles to increase muscles power and improve head control in spastic diplegic CP children [15]

These finding come in an agreement with [16] who investigated the effect of HVPG on trunk muscles to improve trunk control in hemipartic cerebral palsy children

5. Conclusion:

On the bases of the present data, it is possible to conclude that the combined application of the HVPG application is an effective therapeutic modality for facilitation of head control.

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