

# Surge Faradic Stimulation of Dorsiflexors with Wobble Board exercises for improving Weight Bearing and Balance in spastic unilateral Cerebral Palsy: A Case Report

Mansi Subhedar<sup>1</sup>, Dr. Pallavi Palaskar<sup>2</sup>, Dr. Rinkle Hotwani<sup>3</sup>

<sup>1</sup>Intern, MGM school of Physiotherapy Aurangabad, Maharashtra, India

<sup>2</sup>Assistant Professor, MGM school of Physiotherapy Aurangabad, Maharashtra, India

<sup>3</sup>Professor and Principal, MGM school of Physiotherapy Aurangabad, Maharashtra, India

[\\*manasisubhedar22@gmail.com](mailto:*manasisubhedar22@gmail.com)

[\\*ratnaparkhipallavi@gmail.com](mailto:*ratnaparkhipallavi@gmail.com)

[\\*drinklemalani@gmail.com](mailto:*drinklemalani@gmail.com)

## Abstract

**INTRODUCTION:** - Cerebral palsy is the most common neurological disorder affecting pediatric age group. In present study, a 6year male patient with hemiplegic cerebral palsy who has been operated for Tendoachilies lengthening by Z plasty was having severe pain at operated side and he was having weakness in Tibialis anterior muscle as well as he has reduced weight bearing on the left lower limb and affected balance.

**METHODOLOGY:** - Surge faradic stimulation was given to Tibialis anterior muscle for strengthening and a visual feedback was also given to him. During stimulation he was asked to get the visual feedback of his foot moving in dorsiflexion and he was also encouraged to do active dorsiflexion during surge faradic stimulation. After stimulation, wobble board exercises were also given in addition to conventional physiotherapy treatment. The outcome measures were pediatric functional reach test and foot prints

**CONCLUSION:** -After comparison of pre and post treatment outcome measures, it was found that surge faradic stimulation may show improvement in promoting weight bearing and improving balance in the children with hemiplegic cerebral palsy.

## KEYWORDS

Surge faradic current, Wobble board exercises, Cerebral palsy

## Introduction

“The cerebral palsy describes a group of disorders of development of movement and posture, causing activity limitation that is attributed to non-progressive disturbances that occurred in the developing fetal or infantile brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication, perception, and/or behavior, and/or by a seizure disorder.”<sup>1</sup>

In the Cerebral Palsy population, postural deficit varies with impairment level. Aside from the severity of the impairment, biomechanical limitations, such as the base of support, affect the child's ability to maintain his or her posture. The small base of support in standing causes a more pronounced deficiency than the postural deficit seen in sitting, which has greater stabilitylimits.<sup>2</sup> Postural reactions are the base for postural regulation and balance. Postural responses are either incomplete or underdeveloped in children with Cerebral Palsy. The range of motion of the dorsiflexion mostly affects the dynamic balance.<sup>9</sup>

Dorsiflexion movement, which is required for dynamic balance, is aided by the dorsiflexors, especially the Tibialis anterior muscle. In addition to weak dorsiflexors, children with equinovarus deformity have poor dynamic control, poor balance, and a fear of falling.

**Clinical description:** A 6-year-old male boy, one of twins, with spastic left sided unilateral cerebral palsy had presented to the pediatric physiotherapy OPD with symptoms of trouble walking and fear of falling for one and a half months and needed continuous help while walking. He was born prematurely at 32 weeks gestational age and spent time in the Neonatal Intensive Care Unit (NICU) after birth. All milestones were postponed, but walking was significantly delayed. He used to walk on his toes and around the lateral edge of his foot, with his foot in plantar flexion and inversion. He had Tendoachilles lengthening surgery using the Z plasty technique about a month and a half ago. He presented with decreased weight bearing on the left side, hiking of the pelvis on the left side, 15 0 flexion at the left knee, ankle in plantar flexion, and inversion. His gait velocity was significantly reduced. He required continuous support while walking, and his heel never touched the ground. He also had a bad left-side stance and little weight

bearing on the left lower extremity. According to his mother, he avoided weight bearing on his left lower extremity after surgery, possibly due to pain.

1. Range of Motion—Using a goniometer, the active and passive ranges of motion were measured, and the following ranges were affected on the left side. Hip flexion and extension were restricted to 40 and 25 degrees, respectively. The ankle was in neutral, with no active dorsiflexion.
2. Coordination and balance –Both static and dynamic balance was affected.

### Material(s) and methods

- The patient and his parents were explained in detail about the procedure and informed consent was taken from the parents.
- Then pre-treatment Pediatric Berg Balance Scale scoring was recorded. Test -retest reliability for PBS is ICC- 0.998 and interrater reliability ICC- 0.997<sup>5</sup>, Validity –  $r = 0.797$ ,  $p < 0.05$ <sup>5</sup>
- Then following treatment was given along with the conventional physiotherapy treatment.

TREATMENT INTERVENTION	BENEFIT
Surge faradic stimulation	Strengthening post surgery <sup>8</sup>
Tilt board exercises	Promote weight bearing and improve postural reactions
Conventional physiotherapy	To improve overall flexibility, balance and gait pattern.

Surge faradic stimulation –

Surge faradic stimulation was given to the left dorsiflexors.

Frequency- 30 contraction each day were given

Intensity- as tolerable by and the patient

Duration-treatment of 10 minutes was given each day along with 10secs on and 3 secs off period for 10 consecutive days.

Positioning and placement — The patient was positioned in long sitting and the inactive electrode was placed on lateral side of the knee or on the head of fibula and the active pen electrode was placed on the lateral side of the shin of tibia to facilitate the contraction of Tibialis Anterior muscle.

Procedure – the patient was asked to perform active dorsiflexion along with the stimulation and get the visual feedback of it.

Tilt board exercises –These exercises were performed with external support to the patient and giving visual feedback with the help of mirror.

Frequency- 10 repetitions – 5sets<sup>11</sup>

Exercises -

- Tilt the wobble board back and forward in sagittal plane [Anterior- Posterior direction]<sup>11</sup>
- Tilt the board side to side in frontal plane [Medial- Lateral direction]<sup>11</sup>
- Keep trying to keep outer part of the wobble board in contact with the floor while rotating in clockwise direction [Clockwise Rotation]<sup>11</sup>
- Keep trying to keep part of outer border of wobble board in contact with floor while rotating it in clockwise direction [Counterclockwise Rotation]<sup>11</sup>

### Conventional Physiotherapy-

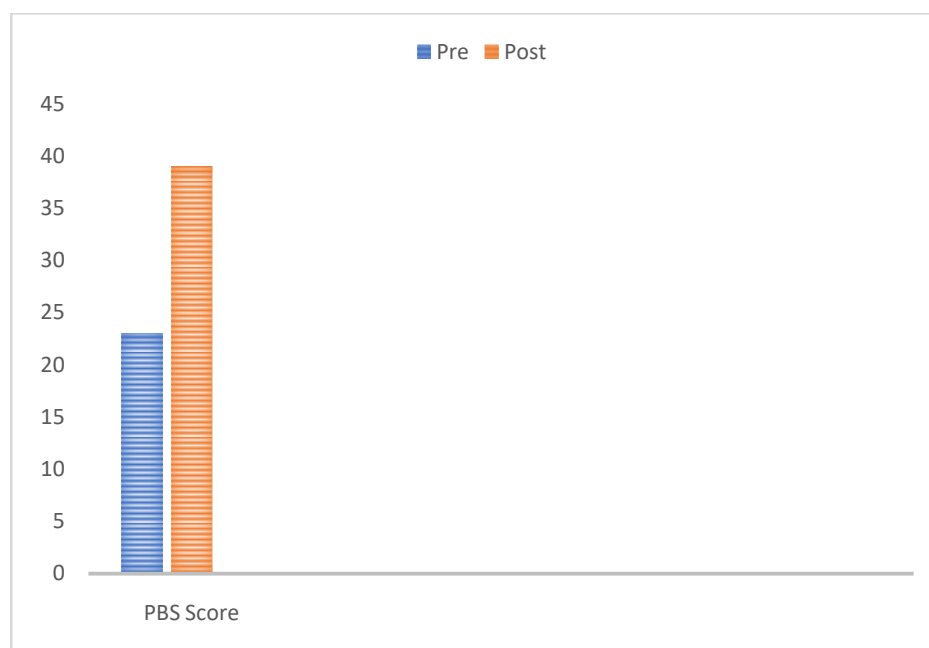
The patient was given –

- Stretching of TA, Hamstrings, Iliopsoas and Trapezius was given – 3reps with 30sec hold
- Scar mobilization technique – It was given around the scar on the left ankle to promote mobility of the healed scar
- Curl ups and Obliques- To strengthen the Abdominal muscles
- Treadmill training- To improve the gait pattern and gait velocity.
- Peg board exercises- To improve fine motor activities of upper limb.

Then post treatment pediatric berg balance scale was recorded.

### Results

	Pre-Treatment Score	Post-Treatment Score	Difference
Pediatric Balance Scale (PBS)	23/56	39/56	16



The figure 1 shows that change was observed in the scores of pediatric balance scale before treatment and after treatment.

Major changes were observed in the following components of the pediatric berg balance scale-

- Standing unsupported
- Standing with eyes closed
- Standing with feet together
- Turning 360 degrees
- Turning to look behind

- Retrieving object from floor
- Placing alternate foot on stool

## Discussion

This case report shows successful outcome in case of a postoperative TA lengthening patient. Due to the surgical procedure the patient had pain at the suture sight and so there was decrease in weight bearing on affected limb which resulted in inequality and hence balance was affected. The patient used to walk with support and did not touch the heel on the ground. There was complete loss in the dorsiflexors range of motion. Evidence suggest that Health conditions associated with a loss in DROM may experience deleterious alterations in certain aspects of dynamic postural control.<sup>9</sup> So due to reduced. DROM there were balance issues in this case. To assess balance and weight bearing, pediatric balance scale was recorded, the score was 23/56.

A study suggests that tetanic faradic stimulation was effective in improving aspects of ankle function, decreasing muscle tone and increasing range of motion in children with hemiplegic cerebral palsy during a physical therapy program.<sup>10</sup> A study showed that an increase in Dorsiflexor range of motion significantly improved dynamic balance of that patient.<sup>9</sup> Taking this concept into consideration the patient was given surge faradic stimulation. A complete protocol of 10 days was set in which the patient was given surge faradic stimulation to the left dorsiflexors that is Tibialis Anterior. Along with the patient was asked to actively dorsiflex his foot during the surge of the current and get the visual feedback of DROM. This made the strengthening process faster. Ultimately this caused strengthening of the muscles leading to improved balance of the patient.

Many studies suggested that the wobble board-based intervention programs show improvements in neuromuscular function.<sup>11</sup> Wobble board exercises have improved weight bearing on the left foot and ultimately improved the balance. 10 days post treatment patient was assessed with pediatric balance scale and the score was 39/56. There was significant change in balance. The score was improved by 16 points. There was a change in following components of the Pediatric Berg Balance Scale - standing unsupported, standing with eyes closed, standing with feet together, turning 360 degrees, turning to look behind, retrieving objects from floor and placing alternate foot on stool.

So, by this study it can be concluded that by giving surge faradic stimulation with wobble board exercises, the dorsiflexors can be strengthened and promote weight bearing on the affected side. Hence ultimately improving balance of that patient.

## Conclusion

Surge Faradic Stimulation along with wobble board exercises can strengthen the dorsiflexors and promote weight bearing on the affected side in case of post TA lengthening hemiplegic cerebral palsy patient and ultimately improving the balance of that patient.

## Acknowledgements

We would like to thank our patient, our colleagues for motivating us during our research study.

## References

1. Batra M, Sharma V, Malik G, Batra V. Targeting postural reaction deficits in children with cerebral palsy: a case report. Sri Lanka Journal of Child Health. 2011 Jun 8;40(2).
2. Carlberg EB, Hadders-Algra M. Postural dysfunction in children with cerebral palsy: some implications for therapeutic guidance. Neural plasticity. 2005 Jan 1;12(2-3):221-8.
3. de AC Duarte N, Grecco LA, Franco RC, Zanon N, Oliveira CS. Correlation between Pediatric Balance Scale and functional test in children with cerebral palsy. Journal of physical therapy science. 2014;26(6):849-53.
4. Fitzgerald D, Trakarnratanakul N, Smyth B, Caulfield B. Effects of a wobble board-based therapeutic exergaming system for balance training on dynamic postural stability and intrinsic motivation levels. journal of orthopaedic& sports physical therapy. 2010 Jan;40(1):11-9.
5. Franjoine MR, Gunther JS, Taylor MJ. Pediatric balance scale: a modified version of the berg balance scale for the school-age child with mild to moderate motor impairment. Pediatric physical therapy. 2003 Jul 1;15(2):114-28.
6. Gowda VK. Recent advances in cerebral palsy. Karnataka Pediatric Journal. 2020 Sep 9;35(1):4-18.

7. Hoch MC, Staton GS, McKeon PO. Dorsiflexion range of motion significantly influences dynamic balance. *Journal of Science and Medicine in Sport*. 2011 Jan 1;14(1):90-2.
8. Kavlak E, Cavlak U, Sahiner T. Indirect effect of electrical stimulation of tibialis anterior on gastro-soleus muscles in children with spastic hemiplegic cerebral palsy. *Neurosciences*. 2005 Oct 1;10(4):291-6.
9. Kramer JF, Mendryk SW. Electrical stimulation as a strength improvement technique: a review. *Journal of Orthopaedic& Sports Physical Therapy*. 1982 Oct 1;4(2):91-8.
10. Nanivadekar P, Kar S. Microcontroller based Rehabilitation Stimulator. *International Journal of Computer Applications*.;975:8887.
11. Robertson V, Ward A, Low J, Reed A, MCSP D. *Electrotherapy explained: principles and practice*. Elsevier Health Sciences; 2006 May 1.