

Effect of Ankle Dorsiflexors Facilitation on Gait in Cerebral Palsy

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Abstract

Background- Cerebral palsy is a permanent and non-progressive group of disorders in the development of movement and posture causing functional and activity limitations. Children with cerebral palsy have dorsiflexor weakness and ankle deformity, which negatively affect their gait. This study mainly focuses on facilitation of dorsiflexors to improve gait. Facilitatory techniques are useful for facilitation and enhancement of muscle activity to achieve improved motor control.

Objective: To find effect of ankle dorsiflexors facilitation on gait in cerebral palsy.

Material and Methodology- In this pre-post interventional study 25 cerebral palsy children with gait abnormalities were included. Treatment protocol including facilitatory techniques was set for 6 weeks. After pre-post assessment data was analysed by using appropriate statistical techniques.

Result- According to this study there is an improvement in gait parameters and ankle joint range of motion with P value <0.0001, which considered extremely significant. This indicates an overall improvement in gait of children with cerebral palsy.

Conclusion- This study concludes that facilitation of dorsiflexors is beneficial for improving gait in cerebral palsy children.

Key Words- Cerebral palsy, ankle dorsiflexors, facilitatory techniques, gait.

Introduction

Cerebral palsy is a group of permanent movement disorders caused by abnormal development or damage to the brain. It occurs during pregnancy, during childbirth or shortly after birth¹. It is the most prevalent physical disability originating in childhood^{2, 6}. A diagnosis of cerebral palsy is often made based on the abnormal muscle tone or posture, delayed motor milestones, or the presence of gait abnormalities^{3, 4}.

Signs and symptoms can vary greatly in cerebral palsy children. Movement and coordination problems associated with cerebral palsy includes- abnormal tone, involuntary movements, lack of balance, rigidity, delayed milestones, excessive drooling, difficulty with fine motor skills, difficulty in walking, etc.⁵ However, as child gets older some symptoms might become more or less apparent. And muscle shortening and muscle rigidity can worsen if not treated properly. The hallmark of cerebral palsy is a motor control deficit that differs in distribution, presentation, as well as severity across children. Promoting, improving or restoring the ability to walk is the most common goal in neurological physical therapy^{5, 6}.

Cerebral palsy children show complex and heterogeneous motor disorders that causes gait deviations. They are primarily related to deficits such as

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muscle spasticity, muscle weakness and loss of selective motor control, and secondary deficits such as muscle contractures and bony deformity⁹. Foot drop and toe walking are among the most frequent clinical problems in children with cerebral palsy. The main underlying cause of these problems is reduced force in the ankle dorsiflexors and reduced motor control^{7, 8}.

Management of gait deviations in cerebral palsy is complex and requires early identifications and better understanding of the gait deviations⁹. Cerebral palsy present various possible combinations of impairments that can be managed by numerous types of treatments. Physiotherapy is certainly the most common treatment^{9, 10}.

One of the major goals of physical therapy for children with cerebral palsy is to promote independent mobility. To accomplish this, children must have adequate active range of motion which is not hindered by spasticity, dystonia or contracture, sufficient strength to maintain body weight support, and motor control abilities to allow them to advance their limbs forward to take steps in an effective and efficient manner. The speed and energy costs of walking are also major factors in how functional the gait pattern will be for an individual child⁹. Intense task specific training has been shown to be effective in several neurological populations as well as cerebral palsy^{6, 11}.

Walking is essential for activities of daily living and social participation⁹. Depending on the severity of gait impairment children with cerebral palsy are subject to different types of functional limitations and these functional limitations pose adverse effects on their health related quality of life^{12, 13}. Because of the impact of gait abnormalities on participation and quality of life, the main focus of physical therapy interventions is often on improving gait^{14, 15}.

Equinus or foot drop is a common deformity in children with cerebral palsy which occurs due to reduced motor control of ankle dorsiflexors¹⁶. Facilitation and enhancement of muscle activity to achieve motor control are the key to many of the techniques used in

neurological rehabilitation, it is a system of therapeutic exercises enhanced by cutaneous stimulation for patients with neuromuscular dysfunctions¹⁷.

Facilitation of dorsiflexors can be done to achieve improved motor control of ankle joint and to improve or initiate gait. It includes various proprioceptive manoeuvres like positioning, joint compression, stretch and resistance, the more emphasis is given on exteroceptive applications such as tapping, brushing, icing, pressure and vibration in order to achieve optimal muscular action^{17, 18}.

Material and Methodology

An experimental study was conducted with a sample size of 25. An ethical clearance certificate was obtained by Institutional Ethical Committee. The population under study is the cerebral palsy children with gait abnormality and/or dorsiflexor weakness. The study sample included individuals within the age group of 5 to 15 years. Subjects were chosen according to the inclusion and exclusion criteria. The motive and procedure of the study was thoroughly explained to them. Appropriate consent was taken from the guardians of the participants. A pre-assessment was taken by using gait parameters and range of motion. The patient underwent treatment using facilitatory techniques to ankle dorsiflexors to improve motor control and to train the gait, which included joint positioning, joint compression, stretch, resistance and various exteroceptive applications such as tapping, brushing, icing, pressure and vibration. The treatment was given for 6 weeks, 3 days/week for duration of 40min/session. After 6 weeks of treatment protocol, post assessment was taken by using outcome measures to study the level of improvement. According to the result obtained a conclusion was given.

Statistical Analysis and Results

Statistical analysis of the recorded data was done. Study design is pre and post. Arithmetic mean and standard deviation was calculated for each outcome measure. Paired T test was done. The study has P value <0.0001 and is extremely significant.

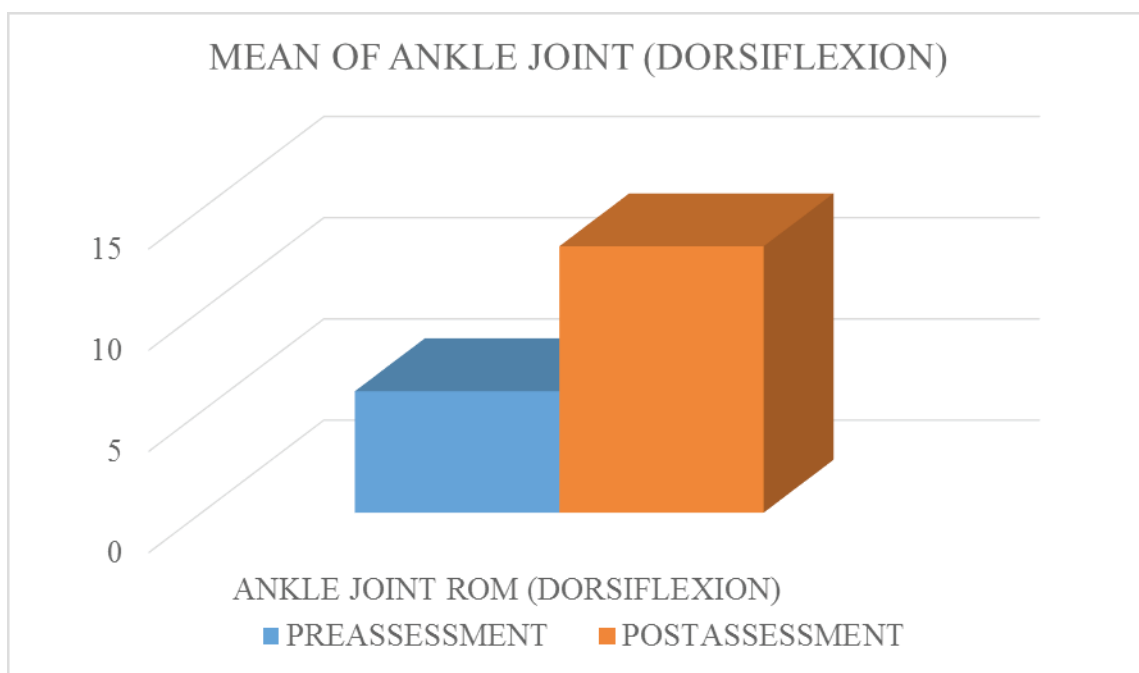


Figure 1:

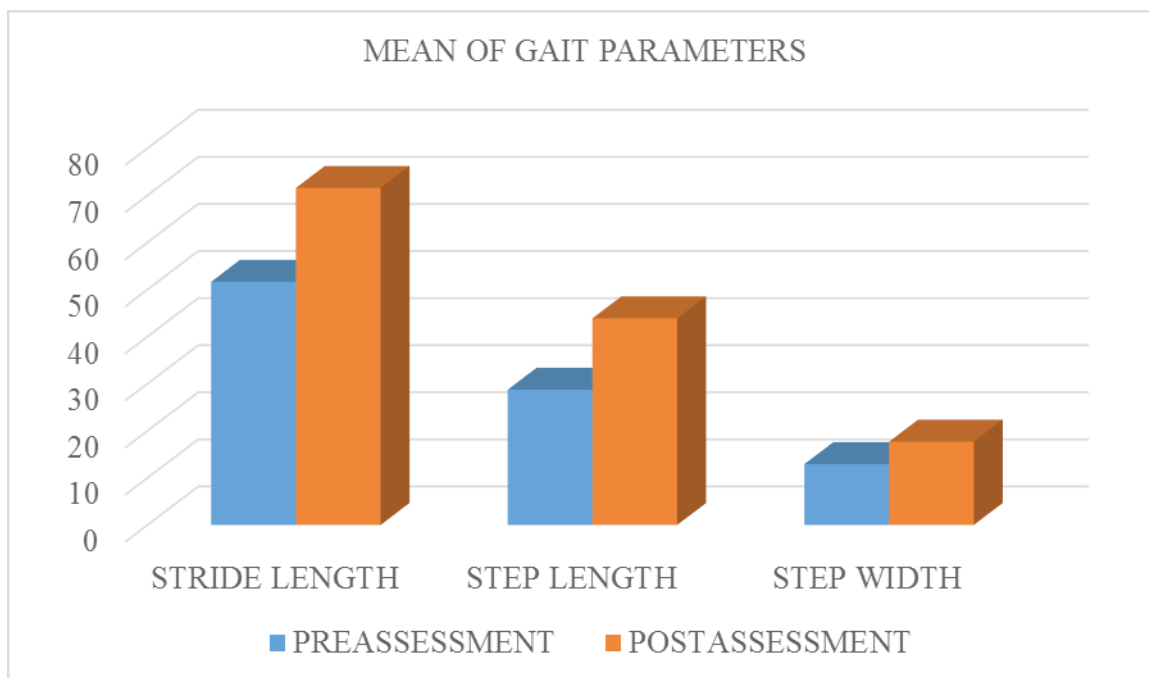


Figure 2:

Discussion

Cerebral palsy is one of the prevalent movement disorder originating in childhood. Although the condition is non-progressive, the musculoskeletal impairments and functional limitations associated with cerebral palsy are indeed progressive if not treated. Equinus or foot drop is one of the common deformity in cerebral palsy

children and also a cause for the gait abnormalities. This deformities occurs due to loss of motor control, muscle shortening and contractures of ankle dorsiflexors. Improving gait and promote independent mobility is most common motor goals in neurorehabilitation. To achieve this, children must have adequate range of motion, muscle strength to maintain body weight.

Facilitation of dorsiflexors can be performed to improve ankle joint range of motion, to correct the deformity, to gain motor control and to improve or initiate gait.

In this study we wanted to determine whether facilitation of ankle dorsiflexors is effective for improving gait in cerebral palsy children. This study was completed with 25 cerebral palsy children of both sexes who were between the age group of 5 and 15 years with dorsiflexor weakness.

Applying facilitatory techniques to ankle dorsiflexors might have improved motor control and gait, which included various proprioceptive manoeuvres such as joint positioning, joint compression, stretch, resistance and exteroceptive applications such as tapping, brushing, icing, pressure and vibration.

Facilitatory techniques is useful to achieve improved motor control. Joint positioning is used widely to prevent joint contracture and to depress unwanted reflex activity. Proprioceptors are involved with the awareness of joint position and movement which are stimulated by joint compression. Joint compression facilitates posture extensors which are needed to stabilise the body. Stretching achieves its effect via stimulation of muscle spindle primary endings which results in reflex facilitation of the muscle. Resistance is used to improve strength and achieve sustained muscle contraction.

The maximum importance is given on exteroceptive applications. Three to five taps over muscle belly is used to assess reflex activity with brisk muscle contraction. While brushing and icing are used to facilitate movement response and enhance static hold. By using vibration and pressure sustained muscle contraction can be achieved.

The ankle range of motion assessment and gait parameter assessment score as shown in figure 1 and 2 respectively indicates improvement in gait with P value <0.0001, which considered extremely significant. According to the data analysis study concludes that ankle dorsiflexors facilitation is beneficial for gait in cerebral palsy children.

Conclusion

This study concludes that facilitation of dorsiflexors is beneficial for improving gait in cerebral palsy children. The data analysis shows an improvement in gait parameters and ankle joint range of motion, thus resulting in an overall progression in gait.

Conflict of Interest: The authors declare that there is no conflict of interest.

Ethical Clearance: An ethical clearance certificate was obtained from the Institutional Ethical Committee Krishna Institute of Medical Sciences Deemed to be University, Karad.

Acknowledgement: The authors would like to express their special gratitude towards all the patients that participated in the study. We would also like to thank our families and institution for their everlasting support which enabled us to continue our research activities.

Source of Funding: Self.

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