INTI JOURNAL | Vol.2023:15
eISSN:2600-7320

To Compare the Effectiveness of Sustained Slow Stretch and Pressure Application in Spastic Diplegic Cerebral Palsy

Fazia banu, Prathap Suganthirababu, Vinodhkumar Ramalingam,
Vignesh Srinivasan, Kumaresan Abathsagayam , Jagatheesan Alagesan

Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai, India

Email: prathap.scpt@saveetha.com

Abstract

Background: The most common kind of cerebral palsy, which affects between 70 - 80 % of those diagnosed, is spastic cerebral palsy. Treatment options include surgery, medicine, and physical therapy. This illness impairs the coordination and regulation of motor function. In turn, the spinal cord's and the nerve's responses are affected, resulting in the stiffness and spasticity of the muscles. The present study aimed to find the effectiveness of sustained slow stretch and pressure application in spastic diplegic cerebral palsy.
Methodology: Based on inclusion and exclusion criteria, a comparative experimental study was carried on. 20 samples were divided into interventional (n=10) and conventional groups (n=10) and the samples were sampled according to convenient sampling. Interventional group received an inhibitory pressure application of about 35 to 50mmHg for 20 minutes with the help of sphygmomanometer over the hamstring muscle for 4 weeks. Conventional group received sustained slow stretch over the hamstring muscle for about 20 minutes per session for 4 weeks and the results will be interpreted.
Results: There was only minor difference between the groups when compared statistically and was clinically significant.
Conclusion: The result of this investigation allows us to draw the conclusion that both types of therapies, gradual continuous stretching and application of pressure, is effective.

Keywords

Spastic cerebral palsy, pressure application, sustained slow stretch

Introduction

Cerebral palsy is a lifelong disability that has an impact on the individual, their family, and their immediate community. Poor coordination, rigid muscles, weak muscles, and tremors are among symptoms of cerebral palsy, which affects children in their early years. Furthermore, symptoms may include seizures, hearing and speaking issues, tone reflexes, motor development and coordination, deformities in general, and static deformities such as joint contractures, which cause gait pattern abnormalities (Nelson & Grether 1999; Alagesan, & Shetty 2011). Although the majority of the causes are unknown, there are a number of risk factors that can be identified. (Bax et al. 2005). In Uganda and Egypt, the prevalence of CP

Submission: 2 June 2023; **Acceptance:** 3 July 2023

was roughly 3.6 and 2.9 cases per 1000 children, respectively, while in the United States, Europe, and Australia, the prevalence was 1.8 to 2.3 cases per 1000 children (El-Tallawy et al. 2014). Cerebral palsy disorders are further divided into types, such as spastic, ataxic, dyskinesia, mixed. Spastic cerebral palsy is the most frequent type of total cerebral palsy, accounting for more than 80% of all cases (Bangash et al. 2014).

Muscle spasticity is caused by a lesion of the upper moto neuron, which commonly results in muscle contractures that limit range of motion and induce muscle stiffness. The neuromuscular system may adjust muscle tone spontaneously when a muscle stretches. This stretch reflex modulation is critical for motion control and balance. Excessive and incorrect muscular activation occurs as a result, which can contribute to muscle hypertonia. Spasticity is the most prevalent motor disability in people with CP. Knee flexion deformity, induced by hamstring muscular contracture, is a frequent lower extremity disease in children with spastic diplegic CP. Crouching or jumping postures/gaits result from this flexion (Smith et al. 2011).

Patients with CP have been documented to exhibit changes in gait, balance, and force production. With CP, the knee extensor force declines, which can considerably limit the movement. In general, voluntary force output is reduced. There is also evidence that with CP, there is more cocontraction, which is also the simultaneous activation of a muscle and its antagonist. Contractures form in spastic CP muscles, limiting joint range of motion and making muscles appear functionally "short" (Mathewson & Lieber et al. 2015).

When a muscle is stretched for a long period of time, it is stretched to a mild tension rather than pain. The activation of muscle spindles or stretch receptors is prevented by using a slow, prolonged stretch. Muscles rest and do not contract when the spindles of the muscles are not engaged, promoting muscular lengthening (Halbertsma et al. 1999).

Splinting is mostly applied to knee contractures. In this study sphygmomanometer is used as a pressure splint. Splints are believed to function by opposing the spastic muscle action, applying a line of mechanical pull to favor rotation and decreasing spasticity through prolonged stretch and cutaneous stimulation from tight skin contact and stimulating mechanoreceptors to improve joint positioning sense and body awareness (Kumar & Senapoti 2012).

Methodology

Inclusion criteria included an age group of 3-12 years of spastic diplegic type, both male and female, children diagnosed by neurologist and pediatrician to be cerebral palsy subjects excluded was ambulatory patients, subjects not willing to collaborate in the study, mentally retarded. 20 children with the consent of their parents\ caregivers were included for the study.

All parent/caretakers received information regarding the study’s findings and methodology. After receiving informed consent, the individuals were split into two groups using convenient sampling method. The hospital protocol of the subjects is not disturbed. Interventional group (GROUP-A) received an inhibitory pressure application of about 35 to 50 mmHg for 20 minutes with the help of sphygmomanometer over the hamstring muscle for 4 weeks under supervision. Conventional group (GROUP-B) received sustained slow stretch over the hamstring muscle for about 20 minutes per session for 4 weeks under supervision.

Pre and post-test values of tone was measured using Tardieu scale and the results were interpreted. Tardieu scale is used for measuring spasticity, the scale ranges from 1-5 where the spastic muscle was examined.

All parameters were averaged and subjected to mean and standard deviation. A paired t-test was conducted to ascertain whether there were any significant variations between pre- and post-test measurements, and an unpaired t-test was conducted to determine whether there was a significant difference between the two groups. A *p*-value of 0.0001 was utilized as the statistically significant cut-off.

Results and Discussion

From statistical analysis made with the quantitative data revealed that there is significant difference between slow stretch group and pressure application group. The post test mean value of slow stretch group was 2.80 and pressure application group was 1.80. This shows that there was only slight difference between the groups and it was statistically significant there was only minor difference between the groups when compared statistically and it was clinically significant. Hence both the groups are clinically significant, and it is reliable and applicable for the condition.

Table 1: Pre and post-test values slow stretch group

Subjects	**Mean**	**SD**	***t* value**	***p* value**
Pre-Test	3.80	1.23	3.873	0.0038
Post Test	2.80	0.79		

Table 2: Pre and post-test values of pressure application group

Subjects	**Mean**	**SD**	***t* value**	***p* value**
Pre-Test	3.70	1.16	8.1429	0.0001
Post Test	1.80	0.79		

The goal of the study was to determine whether slow stretch or pressure application using a sphygmomanometer, induces length over the hamstring muscle. A total number of 20 participants were included in the study with the consent of their parents\caregivers. The normal hospital protocol, i.e the ongoing treatment of the participant was not disturbed. The samples were divided into two categories interventional and conventional groups, interventional group (10) received slow stretch and the conventional group (10) received pressure application as a splint using sphygmomanometer. On statistical view in, Table 1, it was noted that pre-test mean value of 3.80 $\pm$1.23 and a post test value, mean value of 2.80$\pm$ 0.79 which was statistically

significant. In Table 2, it was observed that in pretest value, mean of 3.70±1.16 and post-test value, mean of 1.80 ±0.79 which was considered statistically significant. On comparison of two group's Table 3, post-test value a mean of 2.80 ±0.79(slow stretch group) a mean of 1.80±0.79 (pressure application group) which was noted to be statistically significant. It had only minor difference. For further treatment it can be suggested that more orthoses, splints along with sustained slow stretch would give great results.

Table 3: Post test values of slow stretch and pressure application groups

Subjects	**Mean**	**SD**	**t-value**	**p-value**
Pre-Test	2.80	0.79	2.8347	0.0110
Post Test	1.80	0.79		

To achieve proper motor development, prevent postural anomalies and deformities, and boost functional ability, several physiotherapy treatments have been used. The foundation for CP is subjected on neurodevelopmental techniques, which differs depending on the clinical kinds. The goal of treatment is to improve corrective and balancing reactions, reduce excessive muscular tone, and increase postural tone by preventing aberrant muscle tone (Valvono & Long 1991 and Semans et al. 1995).

Herbert et al (2002) have stated that, in healthcare approach, the idea is that stretching repeatedly over the course of weeks or months can increase muscle length and decrease stiffness by providing the necessary stretch stimulus that causes the muscle to lengthen.

Conclusion

From this result it has been concluded that the effect of sustained slow stretch and pressure application using a sphygmomanometer over hamstring muscle shows slight variation, hence both the treatments are applicable for treating the condition.

References

Alagesan, J., & Shetty, A. (2011). Effect of modified suit therapy in spastic diplegic cerebral palsy-a single blinded randomized controlled trial. *Online Journal of Health and Allied Sciences*, *9*(4).

Bakheit, A. M., Fheodoroff, K., &Molteni, F. (2011). Spasticity or reversible muscle hypertonia? Journal of rehabilitation medicine, 43(6), 556-557medicine

Bangash, A. S., Hanafi, M. Z., Idrees, R., &Zehra, N. (2014). Risk factors and types of cerebral palsy. JPMA. The Journal of the Pakistan Medical Association, 64(1), 103-107.

Bar-On, L., Molenaers, G., Aertbeliën, E., Van Campenhout, A., Feys, H., Nuttin, B., &Desloovere, K. (2015). Spasticity and its contribution to hypertonia in cerebral palsy. BioMed research international, 2015.

Barrett, R. S., &Lichtwark, G. A. (2010). Gross muscle morphology and structure in spastic cerebral palsy: a systematic review. Developmental Medicine & Child Neurology, 52(9), 794-804.

Bax, M., Goldstein, M., Rosenbaum, P., Leviton, A., Paneth, N., Dan, B., ... &Damiano, D. (2005). Proposed definition and classification of cerebral palsy, April 2005. Developmental medicine and child neurology, 47(8), 571-576.

Bobath, K., &Bobath, B. (1964). The facilitation of normal postural reactions and movements in the treatment of cerebral palsy. Physiotherapy, 50, 246-262.

El-Tallawy, H. N., Farghaly, W. M., Shehata, G. A., Rageh, T. A., Metwally, N. A., Badry, R., ... &Kandil, M. R. (2014). Cerebral palsy in Al-Quseir City, Egypt: prevalence, subtypes, and risk factors. Neuropsychiatric Disease and Treatment, 10, 1267.

Halbertsma, J. P., Mulder, I., Göeken, L. N., &Eisma, W. H. (1999). Repeated passive stretching: acute effect on the passive muscle moment and extensibility of short hamstrings. Archives of physical medicine and rehabilitation, 80(4), 407-414.

Herbert, R. (1995). Adaptations of muscle and connective tissue. Musculoskeletal Physiotherapy–Clinical Science and Practice. Butterworth Heinemann, Oxford, 27-32.

Herbert, R. D., Moseley, A. M., Butler, J. E., &Gandevia, S. C. (2002). Change in length of relaxed muscle fascicles and tendons with knee and ankle movement in humans. The Journal of physiology, 539(2), 637-645.

Kerem, M., Livanelioglu, A., &Topcu, M. (2001). Effects of Johnstone pressure splints combined with neurodevelopmental therapy on spasticity and cutaneous sensory inputs in spastic cerebral palsy. Developmental medicine and child neurology, 43(5), 307-313.

Kumar, D. A., &Senapoti, D. A. (2012). Effect of soft splinting for upper extremity on manual ability in children with spastic cerebral palsy. The Indian Journal of Occupational Therapy, 44(1), 30-3.

Mathewson, M. A., &Lieber, R. L. (2015). Pathophysiology of muscle contractures in cerebral palsy. Physical Medicine and Rehabilitation Clinics, 26(1), 57-67.

Minear, W. L. (1956). A classification of cerebral palsy. Pediatrics, 18(5), 841-852.

Mozafari, J. K., Pisoudeh, K., Gharanizade, K., &Abolghasemian, M. (2019). Percutaneous versus open hamstring lengthening in spastic diplegic cerebral palsy. Archives of Bone and Joint Surgery, 7(4), 373.

Nelson, K. B., &Grether, J. K. (1999). Causes of cerebral palsy. Current opinion in pediatrics, 11(6), 487-491.

Phillips, W. E., &Audet, M. (1990). Use of serial casting in the management of knee joint contractures in an adolescent with cerebral palsy. Physical Therapy, 70(8), 521-523.

Smith, L. R., Lee, K. S., Ward, S. R., Chambers, H. G., &Lieber, R. L. (2011). Hamstring contractures in children with spastic cerebral palsy result from a stiffer extracellular matrix and increased in vivo sarcomere length. The Journal of physiology, 589(10), 2625-2639.

Sussman, M. D. (1983). Casting as an adjunct to neurodevelopmental therapy for cerebral palsy. Developmental medicine and child neurology (Print), 25(6), 804-805.

Taylor, C. L., & Harris, S. R. (1986). Effects of ankle-foot orthoses on functional motor performance in a child with spastic diplegia. The American Journal of Occupational Therapy, 40(7), 492-494.

Theis, N., Korff, T., Kairon, H., &Mohagheghi, A. A. (2013). Does acute passive stretching increase muscle length in children with cerebral palsy?. Clinical biomechanics, 28(9-10), 1061-1067.

Valvano, J., & Long, T. (1991). Neurodevelopmental treatment: a review of the writings of the Bobaths. Pediatric Physical Therapy, 3(3), 125-130.

Van der Krogt, M. M., Bar-On, L., Kindt, T., Desloovere, K., &Harlaar, J. (2016). Neuro-musculoskeletal simulation of instrumented contracture and spasticity assessment in children with cerebral palsy. Journal of NeuroEngineering and Rehabilitation, 13(1), 1-11.