International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Original Research Article

Short Term Effect of Myofascial Release on Calf Muscle Spasticity in Spastic Cerebral Palsy Patients

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Received: 17/07//2014 *Revised: 07/08/2014* *Accepted: 07/08/2014*

ABSTRACT

Introduction: CP is the leading cause of childhood disability; the reported incidence varies, but is generally 2 to 3 per 1000 live births. The lesion in CNS frequently results in spasticity of various muscle groups. Spasticity produces functional problems. Various techniques of soft tissue mobilization are adopted. In clinical setting slow and sustained static stretching is commonly followed. MFR is also used to affect the spasticity.
Aim of Study: To study the short term effect of stretching and MFR/ stretching alone on calf muscle spasticity in spastic diplegic patients. To compare the effect of stretching and MFR / Stretching alone on calf muscle spasticity in same population.
Methodology: Study Design: Experimental study, Sample size: 18 Patients: Each group-9, Study setting: B1 Physiotherapy department, Civil Hospital, Ahmedabad. Duration of Study: Total duration of the study was 9 months. In the group A MFR, followed by static stretching in the form of SWB was given to the calf muscles, where as in group B only stretching was given. Outcome measures: Effect of intervention was seen after 4 weeks of intervention by taking MAS and MTS.
Results: Results of within group analysis, showed significant improvement in MTS R1 for both the groups, A and B at 5% level of significance, and showed no significant improvement MTS R2 and MAS. Results of between the group analysis showed no significant improvements in MAS and MTS R2 but showed significant improvements in R1 value of MTS in Group A than group B at 5% level of significance.
Conclusion: Stretching can be used along with MFR in reducing spasticity in spastic CP patients rather than using stretching alone.

Key words: Myofascial release, Stretching, Spastic cerebral palsy

INTRODUCTION

Cerebral palsy (CP) has been defined as: A group of disorders affecting the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant 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. [1]

CP is the leading cause of childhood disability; the reported incidence varies, but is generally 2 to 3 per 1000 live births. Although the prevalence is higher in infants, symptoms may resolve as children age. The prevalence has remained stable since the 1950s, despite the fact that prenatal and perinatal care has improved dramatically. This stability is probably partially explained by the fact that more immature, smaller infants are surviving at higher rates. Prematurity and low–birth weight significantly increase an infant's chance of developing CP. [1]

CP has been classified based on the type of movement disorder as spastic, athetoid, ataxic, and mixed and based on the area of the body involved as hemiplegia, diplegia, quadriplegia. [1]

In CP the lesion in the central nervous system frequently results in spasticity of various muscle groups. [2]

Spasticity is defined as a velocity-dependent resistance to stretch. Spastic CP is caused by damage to the pyramidal parts of the brain. [1]

Bone and joint changes in cerebral palsy result from muscle spasticity and contracture. The spine and the joints of the lower extremity are most commonly affected. Scoliosis may progress rapidly and may continue after skeletal maturity. Progressive hip flexion and adduction lead to windswept deformity, increased femoral anteversion, apparent coxa valga, subluxation, deformity of the femoral head, hip dislocation, and formation of a pseudoacetabulum. In the knee, flexion contracture, patella alta, and patellar fragmentation are the most commonly seen abnormalities. Progressive equinovalgus and equinovarus of the foot and ankle are associated with rocker-bottom deformity and subluxation of the talonavicular joint. Early recognition of progressive deformity in patients with cerebral palsy allows timely treatment and prevention of irreversible change. [3]

One of the survey describing problems in adult CP reported that 77% of CP children were having problems with spasticity, 80% had contractures and 18% had pain every day. [4]

The increase in muscle tone is responsible for relative failure of muscle growth and may produce functional problems. Spastic deformities of the lower limbs affect ambulation, bed positioning, sitting, chair level activities, transfers, and standing up. [2]

There are three potential aims of treating the spasticity - to improve function, to reduce the risk of unnecessary complication and to alleviate pain. [5]

Traditionally the treatment of tightness in children with spasticity has consisted primarily of techniques which involve static stretching, strengthening of the antagonistic muscles, use of orthosis and postural education etc. Some authorities also recommend Myofascial release to cause elongation of the spastic muscle with a component of tightness.

Myofascial therapy can be defined as "the facilitation of mechanical, neural and psycho physiological adaptive potential as interfaced by the myofascial system". [6]

Myofascial release and Static stretching are expected to have an effect on the spastic/tight muscles, efficacies of these methods need to be established in clinical practice. There are insufficient published evidences available for effect of MFR technique on spasticity, so present study focus on Short term effects of Stretching and MFR on calf muscle spasticity in spastic diplegic patients and compare its effect in the same population.

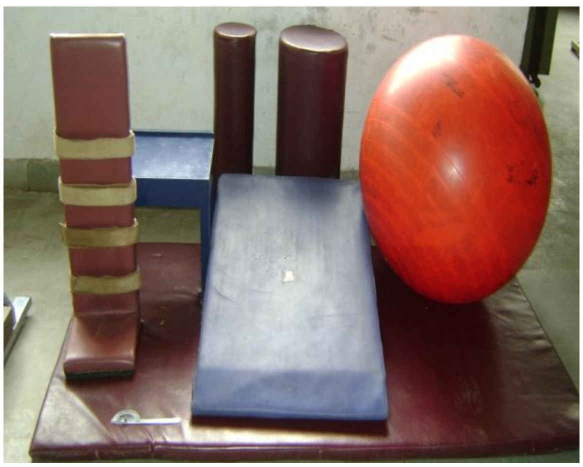
MATERIALS AND METHODS

Study Design: Experimental study

Sample size: 18 Patients

Group A- 9 (stretching and MFR)
Group B- 9 (Stretching only)
Study Setting: B1 Physiotherapy department, Civil Hospital, Ahmedabad.
Duration of study: Total duration of the study was 9 months.
Materials:

- Plinth
- Floor mats
- Stool
- Vestibular ball
- Bolsters of different sizes
- Wedge
- Standing frame
- Goniometer


Photograph: 1. Materials used.

Inclusion Criteria:
Spastic diplegic type of CP patients
Age group: 2 – 8 years
Both genders
Modified Ashworth scale 3 and less than 3.
Exclusion Criteria:

- Prior orthopedic surgery,
- Botulinium toxin injection in the past 6 months,
- Serial casting in past 6 months
- Taking oral or intrathecal myorelaxant drugs
- Severe limitations in passive range of motion at lower extremities
- Having systemic or localized infections
- Having surgical incisions and open wounds
- Having healing fractures
- Having acute inflammation-Rheumatoid conditions

Outcome Measures:
Modified Ashwarth scale [7]
Modified Tardieu scale [8]
Procedure:

From specified source of data those patients who fulfilled inclusion criteria were taken up for the study. The procedure was explained to parents of all the patients. Written informed consent from the parents was taken.

All eighteen patients were randomly allocated in to two groups, Group A (stretching and MFR) and Group B (Stretching only), with 9 patients in each.

All the patients were evaluated with MAS and MTS for calf muscle, in supine position, at two instances viz, on day one before intervention and at the end of four weeks.

In Group A MFR, followed by static stretching, was given to the calf muscles of bilateral lower limb of nine spastic diplegic patients, 6 days a week for four weeks.

MFR was given with patient in prone position with 120 second hold.

For giving the MFR, finger pads were allowed to sink in to the central portion of the calf. It was held for 120 seconds to allow the tissue to soften and then myofascial structures were spread in a lateral direction until feeling of first fascial barrier. Again the position was held till the release of barrier and procedure was continued to follow the tissue through each subsequent barrier. [9]

Photograph: 2. Myofascial release of calf muscle

Following MFR, static stretching was given to all the 9 patients in form of static weight bearing at different dorsiflexion angles for 30 minutes [10] in standing frame, with dynamic AFO.

Photograph: 3. Stretching by static weight bearing (SWB)

In Group B only stretching was given, in same manner as given to Group A. Treatment was given 6 days a week for four weeks.

Data for MAS and MTS was recorded and analyzed using appropriate statistical test.

RESULTS

18 patients, 9 in each group, were taken in the study. Group A: stretching and MFR Group B: stretching only Table 1 displays Clinical Data of age, sex and MAS among all 18 patients.

Table 1: Clinical data of patients in Group A and Group B

	Group A	Group B
Age (Mean $\pm$ SD)	3 ± 1	2.88 ± 0.78
Sex (M/F)	5/4	6/3
MAS (Mean $\pm$ SD)	1.66 ± 0.25	1.72 ± 0.26

All the statistical analysis was done with the help of Graph Pad Demo version. (For statistical analysis in MAS, 1+ is equated to 1.5)

For within group analysis, comparison of data for MAS was done using Wilcoxon Sign Rank Test, and for MTS was done using paired t test.

For between groups analysis, comparison of data for MAS was done using Mann Whitney U test, and for MTS was done using unpaired t test.

The results showed that, both the treatment groups that is stretching alone and stretching and MFR showed significant improvement in R1 value of MTS, not in R2 value of MTS and MAS 4 weeks after intervention.

Results for between the group analysis showed that stretching and MFR was giving more effect, in reducing spasticity than stretching alone according to

R1 value of MTS, whereas no significant improvement was seen in MAS and R2 value of MTS.

Table 2 Difference in means of MAS scores before and after intervention (short term effect)

MAS				
	Pre	**Post**	**WValue**	**P Value**
Group A	**1.66 ± 0.25**	**1.5 ± 0.35**	**3**	**0.25**
Group B	**1.72 ± 0.26**	**1.61±0.22**	**15**	**0.50**

Table 3: Difference in Means of MTS R1 Value before and After Intervention (Short Term Effect)

MTS (R1)				
	Pre	**Post**	**t Value**	**P Value**
Group A	**-6.88 ± 6.29**	**3.66 ±4.06**	**7.22**	**<0.0001**
Group B	**-9.66 ± 6.06**	**-3.44 ±7.14**	**9.39**	**<0.0001**

Table 4: Difference in Means of MTS R2 Value before and After Intervention (Short Term Effect)

MTS (R2)				
	Pre	**Post**	**t Value**	**P Value**
Group A	**13.33±9.2**	**14.44 ± 9.66**	**2.29**	**0.05**
Group B	**9.33 ± 9.92**	**10.88 ±10.41**	**1.23**	**0.25**

Table 5: Difference in Means of MAS Scores after Intervention between the Groups (Short Term Effect)

MAS				
	Group A	**Group B**	**U Value**	**P Value**
Mean±SD	**0.16±0.25**	**0.11±0.22**	**36**	**0.71**

Table 6 Difference in Means of MTS Values after Intervention between the Groups (Short Term Effect)

MTS				
	Group A	**Group B**	**tValue**	**PValue**
R1(Mean±SD)	**10.55±3.97**	**6.22±1.98**	**2.92**	**0.009**
R2(Mean±SD)	**1.33 ± 1.22**	**1.55±3.77**	**0.16**	**0.868**

DISSCUSSION

The present study was conducted to see the short term effect of stretching and MFR versus stretching on spasticity in spastic diplegic cerebral palsy patients.

The results showed that, both the treatment groups that is stretching alone and stretching and MFR showed significant improvement in R1 value of MTS, not in MAS and R2 value of MTS.

Results for between the group analysis showed that stretching and MFR was giving more effect, in reducing spasticity than stretching alone according to R1 value of MTS, whereas no significant improvement was seen in MAS and R2 value of MTS.

MFR was proposed to work on neuroreflexive change. The hands on approach offers afferent stimulation through receptors, which require central processing at the spinal cord and cortical levels for a response. Afferent stimulation frequently results in efferent inhibition. This principal is used in MFR technique when the afferent stimulation of a stretch is applied and the operator waits for efferent inhibition to occur so that relaxation results. [11]

Reduction in spasticity with SWB occurs by inhibiting motor neuron excitability through prolonged stretch and compression on the muscle spindles, GTOs, cutaneous receptors and joint receptors. [12]

So, relaxing the muscle through MFR, before giving stretching in form of SWB, could be the reason for enhancing the effects of inhibition of spasticity, in present study.

One study done on MFR by Burris Duncan in 2008 showed that MFR could improve motor function in children with moderate to severe spastic CP, but they didn't get improvement in spasticity which was measured by MAS, which they themselves have proved subjective to be of value. [13]

In present study also improvement in spasticity in form of MAS was not significant, but significant improvement in spasticity was seen according to R1 value of MTS, which is a valid and a reliable tool to measure spasticity. [14] R1 values of MTS have smaller increments than MAS and therefore have the potential to represent more precise measure of technical changes. [2]

According a study done by Emily Patric in 2006 the Tardieu Scale is able to identify the presence of spasticity more effectively than the Ashworth Scale in both an upper and lower limb muscle.

Experimental evidence suggests that increased resistance to movement is not exclusively dependent on stretch reflex activity but is also due to increased stiffness as a result of contracture. Therefore, by quantifying the resistance to passive movement, the Ashworth Scale measures a combination of neural and peripheral factors, that is, it does not differentiate spasticity from contracture, whereas Tardieu scale identifies presence of spasticity as well as presence of contracture, by differentiating both of them from each other. This is most likely because the Tardieu Scale takes into account the main factor to which the stretch reflex is known to be sensitive - the velocity of stretch. This velocity-dependence of the stretch reflex has been well established with several studies reporting no stretch reflex during slow passive movements. [15]

As SWB was assumed to prevent tightness or contracture of soft tissue and restore the length of muscles by prolonged stretching and was believed to reduce spasticity also, [12] SWB was taken as a form of static stretching of calf muscle in present study.

In a systemic review, done on, " The effectiveness of passive stretching in children with CP" by Tamis Wai-Mum in 2006, there was some evidence to indicate that sustained stretching was preferable to manual stretching in improving range of movement and reducing spasticity in targeted joints and muscles in studies of children with spasticity. Moreover, duration of 30 minutes stretching was the most commonly chosen in studies, [10] so in present study, static stretching in form of SWB was given for 30 minutes and it was proved to be effective.

MFR was given with 120 second of hold in present study as according Regi Boehme, while giving MFR one can expect to hold the traction in MFR for at least 90 to 120 sec before the tissues will begin to soften and lengthen. [9]

The major limiting factor in present study was smaller sample size. So future study can be done by taking a larger sample.

However, according to the results of present study, stretching can be used along with MFR in reducing spasticity rather than using stretching alone.

In present study short term effect of MFR on spasticity has been studied, so future study can also be done to see the long term effect of MFR on spasticity.

In present study improvement in calf muscle spasticity was seen, so future study can also be done to see the effect of MFR and stretching on all affected muscles of CP patients and by taking functional scale to see the functional improvement secondary to reduction in spasticity.

CONCLUSION

So conclusion can be made from the result of present study for between group analysis which showed statistically significant improvement in spasticity according to R1 value of MTS, in Group A i.e. stretching and MFR, than Group B i.e. Stretching alone, after 4 weeks of intervention, that stretching can be used along with MFR in reducing spasticity in spastic CP patients rather than using stretching alone.

ACKNOWLEDGMENT

I feel very happy at this opportunity to express my heartiest sense of gratitude towards my respected teacher Ms. Maya J. Chauhan and all the staff members of Government Physiotherapy College, Ahmedabad, who support throughout my work.

My heartfelt appreciation goes to all the patients and their parents without whom this study would not have been possible.

Author acknowledges the immense help received from the scholars whose articles are cited and included in references of this

manuscript. The author is also grateful to authors/editors/publishers of all those articles, journals and books from where the literature for this article has been reviewed and discussed.

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How to cite this article: Bhalara A, Talsaniya D. Short term effect of myofascial release on calf muscle spasticity in spastic cerebral palsy patients. Int J Health Sci Res. 2014;4(9):188-194.

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