ijcrr
Vol 04 issue 16
Category: Research
Received on:12/06/12
Revised on:30/06/12
Accepted on:11/07/12

IMMEDIATE EFFECT OF MYOFASCIAL RELEASE ON SPASTICITY IN SPASTIC CEREBRAL PALSY PATIENTS

Akta Bhalara

Swaminarayan Physiotherapy College, Okha state highway, Naghedi, Jamnagar, Gujarat

E-mail of Corresponding Author: akta207@gmail.com

ABSTRACT

Introduction: In CP, the lesion in CNS frequently results in spasticity of various muscle groups. Spasticity causes relative failure of muscle growth and deformation of joints over which spastic muscles work and may produce functional problems. Various techniques of soft tissue mobilization are adopted. In clinical setting slow and sustained static stretching is commonly followed, though MFR is also beneficial.

Aim of Study: To study the immediate 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 6 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 immediately after the intervention by taking MAS and MTS. Results: Results of within group analysis, showed significant improvement in MTS R1 and MAS for both the groups, A and B at 5% level of significance, and showed no significant improvement MTS R2. 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.

Keywords: Myofascial release, Stretching, Spastic cerebral palsy

INTRODUCTION

Cerebral palsy is 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. 1

CP is the leading cause of childhood disability; the reported incidence varies, but is generally 2 to 3 per 1000 live births.1

One study done in north India reviewed one thousand children with cerebral palsy (CP) to study their clinical profile, etiological factors and associated problems. In that, spastic CP constituted the predominant group (83 per cent). Dyskinetic CP was present in 7.8 per cent of the cases. Acquired CP, particularly secondary to nervous system infections, constituted a significant proportion of cases. The clinical spectrum of CP is different in developing countries compared with developed countries. Associated problems were present in a majority (75 per cent) of cases[2].

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[3].

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. Early recognition of progressive deformity in patients with cerebral palsy allows timely treatment and prevention of irreversible change[4].

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[5].

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[3].

There are three potential aims of treating the spasticity —to improve function, to reduce the risk of unnecessary complication and to alleviate pain[6].

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"[7].

Myofascial Release techniques are utilized in a wide range of settings and diagnoses; pain, movement restriction, spasm, spasticity, neurological dysfunction, ie, cerebral palsy, head and birth injury, cardiovascular accidents (CVA), scoliosis[8].

Though both Static stretching and Myofascial release are expected to have an effect on the spastic/tight muscles, there is the need to establish efficacies of these methods of soft tissue elongation in clinical practice. Moreover, there are insufficient published evidences available for effect of MFR technique on spasticity, so need of the present study is to evaluate the immediate effect of stretching and MFR on calf muscle spasticity in spastic diplegic patients and to compare the immediate effect of stretching and MFR with stretching alone on calf muscle spasticity in spastic diplegic patients.

MATERIALS AND METHODOLOGY

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 6 months.

Materials:

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

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:

- Patients who had undergone prior orthopedic surgery,
- Patients who had received Botulinium toxin injection in the past 6 months,
- Patients who had undergone serial casting in past 6 months
- Patients taking oral or intrathecal myorelaxant drugs
- Patients who had severe limitations in passive range of motion at lower extremities
- Patients who were having systemic or localized infections
- Patients who were having surgical incisions and open wounds
- Patients who were having healing fractures
- Patients who were having acute inflammation-Rheumatoid conditions
- Patients who had cancer or tumors conditions

Outcome Measures:

Modified Ashwarth scale[9]

Modified Tardieu scale[10]

Procedure:

All the patients from specified source of data were assessed and those who fulfilled inclusion criteria were taken up for the study. The procedure was explained to parents of all the patients and 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 immediately after intervention.

In Group A MFR, followed by static stretching, was given to the calf muscles of bilateral lower limb of nine spastic diplegic patients.

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[11].

Following MFR, static stretching was given to all the 9 patients in form of static weight bearing at different dorsiflexion angles for 30 minutes[12] in standing frame, with dynamic AFO.

In Group B only stretching was given, in same manner as given to Group A.

Immediate effect of intervention was seen by taking MAS and MTS after giving the intervention in one session.

Data for MAS and MTS was recorded and analyzed using appropriate stastical 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.

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 MAS and R1 value of MTS, not in R2 immediately 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, where as no significant improvement was seen in MAS and R2 value of MTS.

Thus according to the results, null hypotheses of no difference between stretching and MFR group and stretching alone group in reducing spasticity in spastic cerebral palsy patients, was rejected and the alternate hypotheses of stretching and MFR is more effective in reducing spasticity, than stretching alone in spastic cerebral palsy patients, was accepted.

DISSCUSSION

The probable mechanism for results could deal with neuroreflexive change that occurs with the application of manual force on the musculoskeletal system while giving MFR. 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[13].

In present study, after achievement of relaxation through MFR, stretching in form of SWB for 30 minutes[12, 14], was given.

SWB was believed to reduce spasticity by inhibiting motor neuron excitability through prolonged stretch and compression on the muscle spindles, GTOs, cutaneous receptors and joint receptors[14].

It is thought that lengthening the hypertonic muscle, produces tension in the tendon, which stimulates the Ib endings, causing them to fire. The discharge synapses with an inhibiting interneuron causing the homonymous muscle to be relaxed, known as autogenic inhibition[15].

Another possibility explained by Tremblay and Richard was the II afferent fiber: in this case, the muscle spindle of the calf muscle would be fired while the muscle is stretched. The impulse would be transmitted by the II afferent fiber through the spinal cord, thus, inhibiting the neuron excitability of alpha motor neuron[16, 17, 18].

One of the article published in PT Today, 1995, by John F. Barnes had shown the effects of MFR. According to that the therapist giving the MFR is concerned with releasing and reorganizing the body’s fascial restrictions, mechanically and reorganizing the neuromuscular system. The reorganization occurs by supplying the central nervous system with new information (awareness) that allows for change and improved potential and consciousness[8].

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

One previous study done by Burris Duncan in 2008 0n “effectiveness of osteopathy in the cranial field and MFR versus acupuncture as complementary treatment for children with CP”, concluded that, a series of treatments using osteopathy in the cranial field, MFR, or both improved motor function in children with moderate to severe spastic CP[19].

In their study 11 outcome variables were taken, out of which statistically significant improvement in two mobility measures was found, in patients who received OMT. These measures were GMFM and mobility domain of FIM for children. But they didn’t get improvement in spasticity which was measured by MAS, which they themselves have proved subjective to be of value.

In accordance with this study, in present study also improvement in spasticity in form of MAS was not significant

But in present study significant improvement in spasticity was seen according to R1 value of MTS, which is a valid and a reliable tool to measure spasticity[34]. R1 values of MTS have smaller increments than MAS and therefore have the potential to represent more precise measure of technical changes[3].

Moreover, according to results of 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[20].

In addition MAS was tested in children with CP in context of a blinded randomized trial and found to be less effective in detecting the changes in spasticity than MTS[3].

Thus in Burries' study, functional improvement was seen through giving OMT with MFR, where as in present study improvement in spasticity was seen through giving stretching with MFR.

Seeing the results of both the studies, it may be commented that, there can be a correlation between improvement in spasticity and function.

In the present study, SWB was taken as a form of static stretching of calf muscle, because 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[14].

One systemic review was done on "effectiveness of SWB exercises in children with CP" by Tamis Wai-Mum Pin in 2007, in that, 2 studies with level 1 evidence, used SWB exercises as a method of prolonged muscle stretching to reduce muscle tone in children with CP. In summary of this systemic review, some favorable evidences were there indicating that SWB exercises through the lower extremity may temporarily reduce spasticity, as prolonged stretch, in children with CP[14].

In another 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[12].

So, in present study, in accordance with above systemic review, static stretching in form of SWB was given for 30 minutes and it was proved to be effective.

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[11].

So in present study MFR was given with 120 second of hold.

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 immediate effect of MFR on spasticity have been studied, so future study can also be done to see the short term and 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

Results of present study for between group analysis showed stastically 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, immediately after the intervention, So conclusion can be made from this result that, stretching can be used along with MFR in reducing spasticity in spastic CP patients rather than using stretching alone.

ACKNOWLEDGMENT

I am sincerely grateful to my mentor and guide Ms. Maya J. Chauhan and all the staff members of Government Physiotherapy College, Ahmedabad who has guided me in a right path and support throughout my work. I am also thankful to Dr. Atul Trivedi, Assistant Professor, PSM Department, B.J. Medical College, Ahmedabad, to guide me in my data analysis. I thank all my friends who helped me throughout my study.

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.

REFERENCES

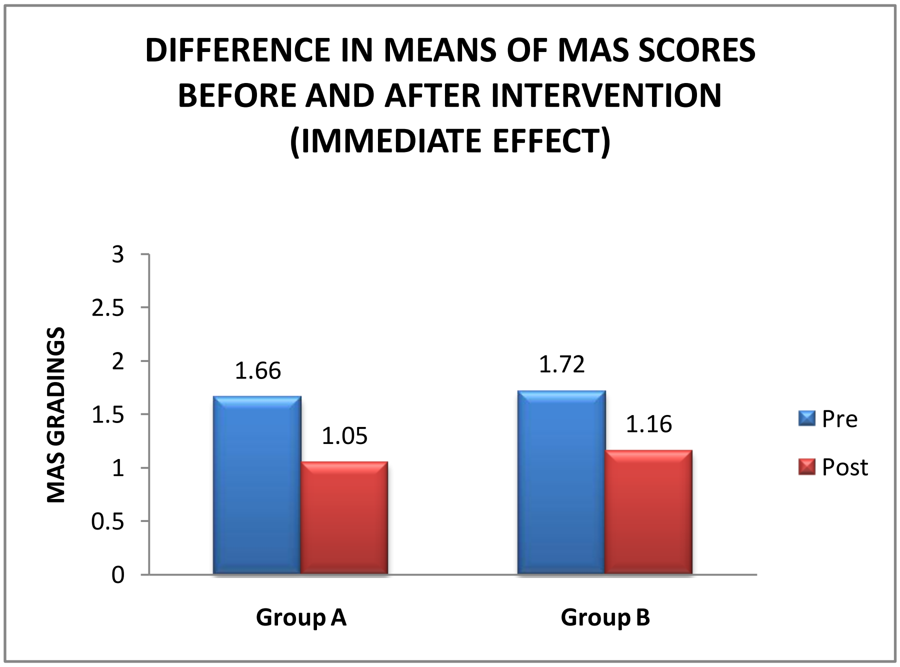
1. Liza b. Green, edward a. Hurvitz, md, cerebral palsy, phys med rehabil clin n am 18 (2007) 859–882
2. Pratibha D. Singhi, Munni Ray and Gunmala Suri: Clinical Spectrum of Cerebral Palsy in North India—An Analysis of 1000 Cases, Journal of Tropical Pediatrics 2002, 48(3):162-166;
3. S. C. Love, J. P. Valentineb, E. M. Blairc, C. J. Priced, J. H. Coled and P. J. Chauvel, The effect of botulinum toxin type A on the functional ability of the child with spastic hemiplegia a randomized controlled trial, European Journal of Neurology 2001, 8 (Suppl. 5): 50±58
4. David S. Morrell, j. Michael pearson, and donald d. Sauser, Progressive bone and joint abnormalities of the spine and lower extremities in cerebral palsy, radiographics. 2002 ; 22:257-268.
5. Christina Andersson, Eva Mattsson, adults with cerebral palsy: a survey describing problems, needs, and resources, with special emphasis on locomotion, developmental medicine & child neurology,volume 43 issue 2 , pages 76 – 82
6. Michael R Barnes , review management of spasticity, age and ageing 1998; 27: 239-245
7. Carol J. Manheim, The Myofascial Release Manual, 3rd edition, 2001, pg no. 2.
8. John F. Barnes, Myofascial Release The ""Missing Link"" in Your Treatment, PT Today, 1995
9. Bohannon, R and Smith, M : Interrater reliability of a modified ashworth scale of muscle spasticity. Phys Ther, 1987; 67 : 206.
10. Roslyn N. Boyd and H. Kerr Graham: Objective measurement of clinical findings in the use of

botulinum toxin type A for the management of children with cerebral palsy, Europenn Journul of Neurology 1999, 6 (suppl 4):S23-S35

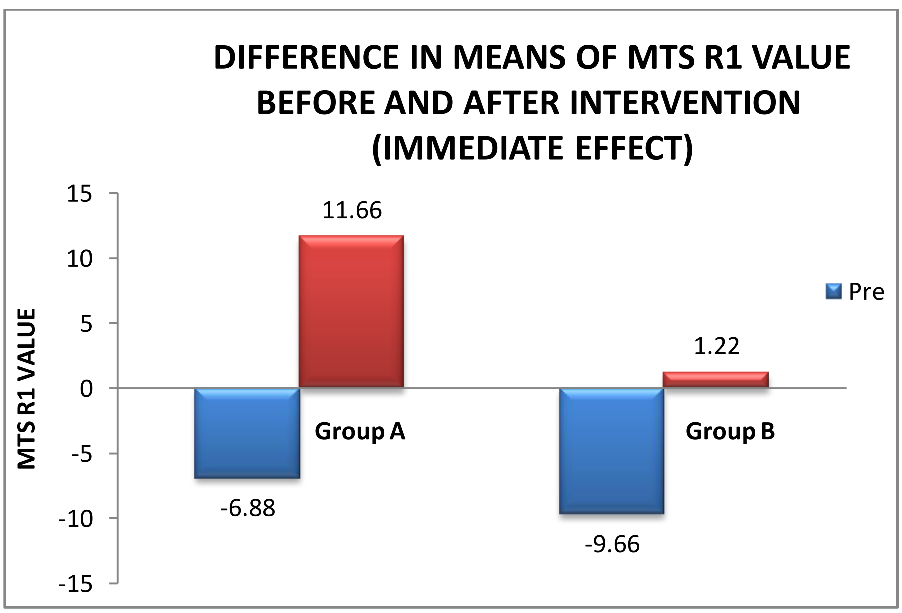
11. Regi Boehme, Johm Boehme, Myofascial Release and its Application to Neuro-Developmental Treatment, 1991, pg. no. 5-8, 11-16, 80.
12. Tamis Pin, Paula Dyke, Michael Chan: The effectiveness of passive stretching in children with cerebral palsy, Developmental Medicine & Child Neurology (2006), 48: 855-862
13. Ph. E. Greenman, Principles of Manual Medicine, 3rd edition, 2003, pg. no. 157.
14. Tamis pin: effect of weight bearing exercise in children with cerebral palsy, Pediatr Phys Ther 2007; 19:62–73
15. Darcy A. Umphred, Gordon U. burton, Ralando T. Lazaro, Margaret L. Roller: Neurological Rehabilitation, 4th edition, pg. no. 119.
16. Kuen-horng tsai, Chun-yu yeh, Hui-yi chang and Jia-jin chen, Effects of a Single Session of Prolonged Muscle Stretch on Spastic Muscle of Stroke Patients, Proc. Natl. Sci. Counc. ROC(B) Vol. 25, No. 2, 2001. pp. 76-81
17. Tremblay F, Malouin F, Richards CL, Dumas F, Effects of prolonged muscle stretch on reflex and voluntary muscle activations in children with spastic cerebral palsy, Scand J Rehabil Med. 1990;22(4):171-80.
18. Richards CL, Malouin F, Dumas F: Effects of a single session of prolonged plantarflexor stretch on muscle activations during gait in spastic cerebral palsy, Scand J Rehabil Med. 1991, 23 (2) : 103-11
19. Burris Duncan; Sharon McDonough-Means; Katherine Worden, DO; Rosa Schnyer; Jennifer Andrews; F. John Meaney, Effectiveness of Osteopathy in the Cranial Field and Myofascial Release Versus Acupuncture as Complementary Treatment for Children With Spastic Cerebral Palsy: A Pilot Study, JAOA • Vol 108 • No 10 • October 2008 • 559-570
20. Emily Patrick and Louise Ada: The Tardieu Scale differentiates contracture from spasticity whereas the Ashworth Scale is confounded by it ,Clin Rehabil 2006; 20; 173

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

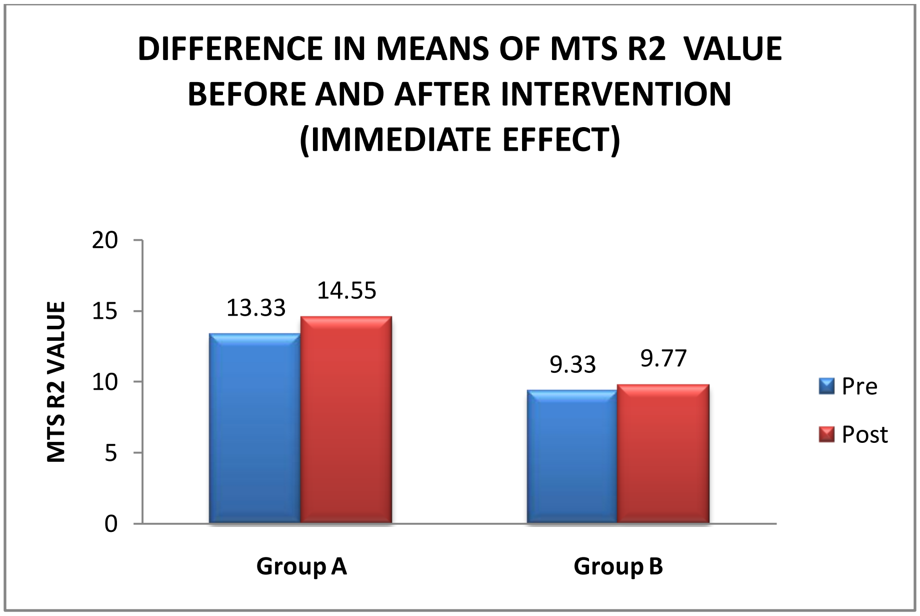
	Group A	**Group B**
Age (Mean ± SD)	**3 ± 1**	**2.88 ± 0.78**
Sex (M/F)	**5/4**	**6/3**
MAS (Mean ± SD)	**1.66 ± 0.25**	**1.72 ± 0.26**



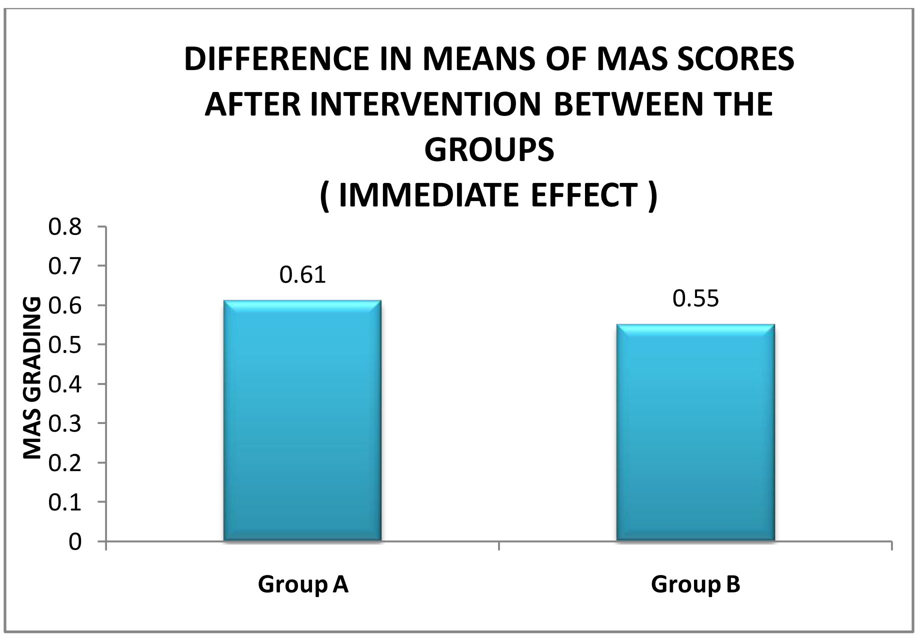
Graph 1: Means for MAS scores pre and post intervention of Group A and Group B



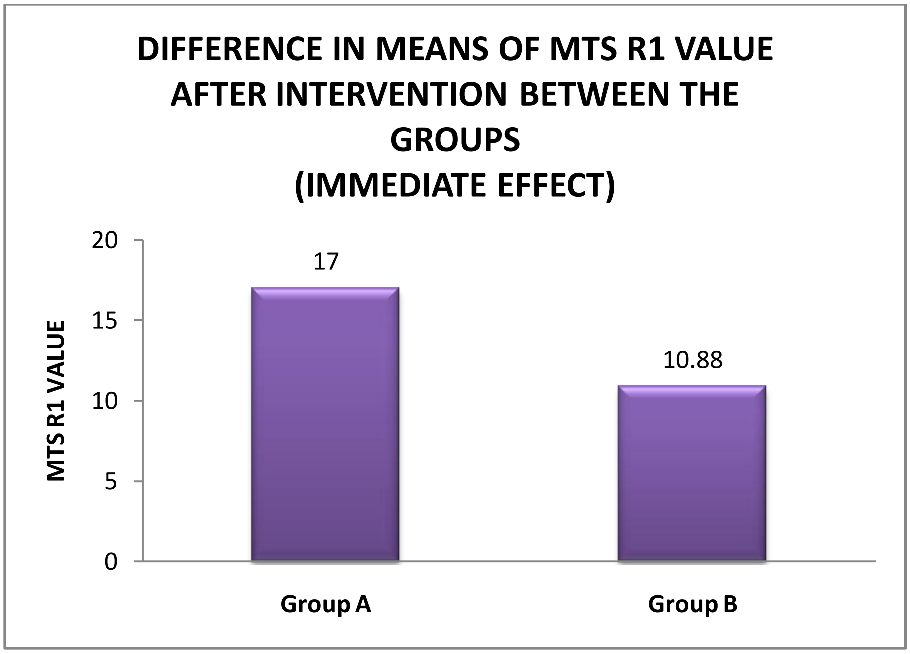
Graph 2: Means for MTS R1 value pre and post intervention of Group A and Group B



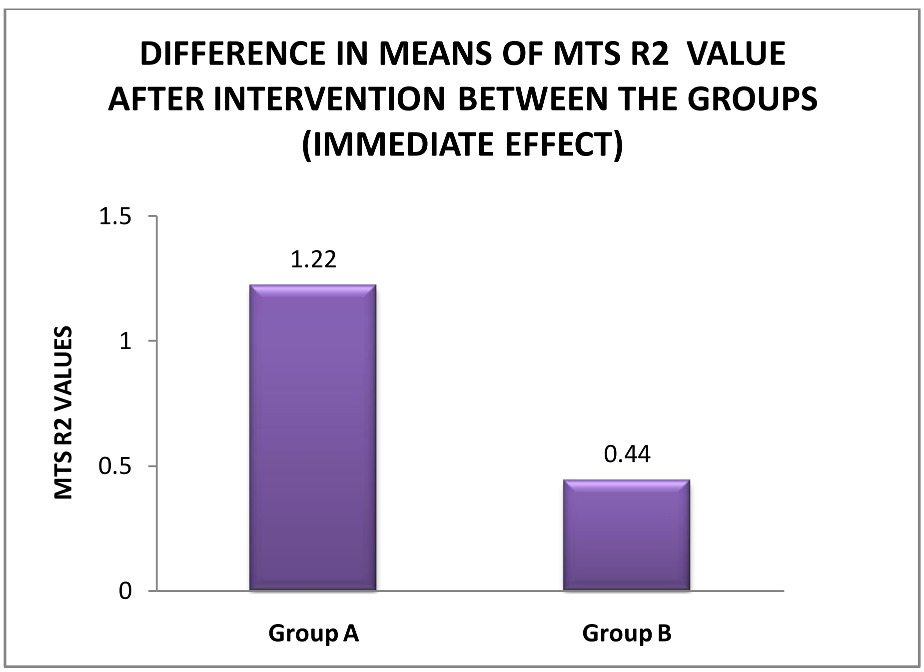
Graph 3: Means for MTS R2 value pre and post intervention of Group A and Group B



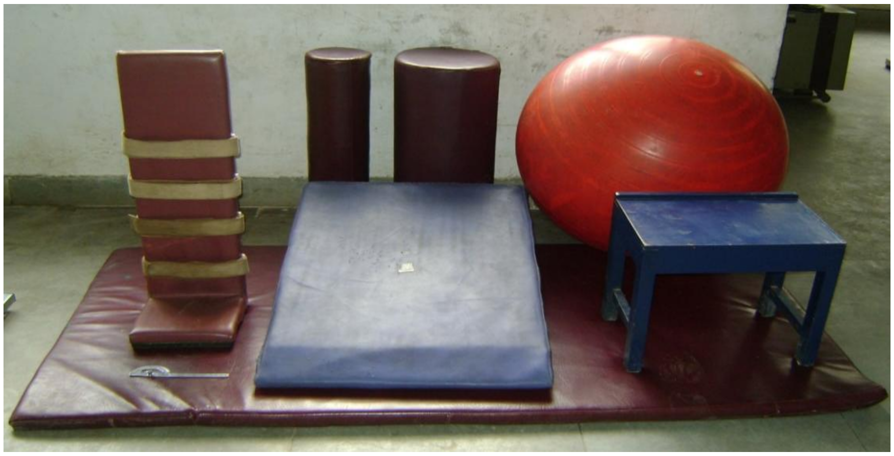
Graph 4: Means of differences of MAS scores pre and post intervention for Group A and Group B



Graph 5: Means of differences of MTS R1 value pre exercise and post exercise for Group A and Group B

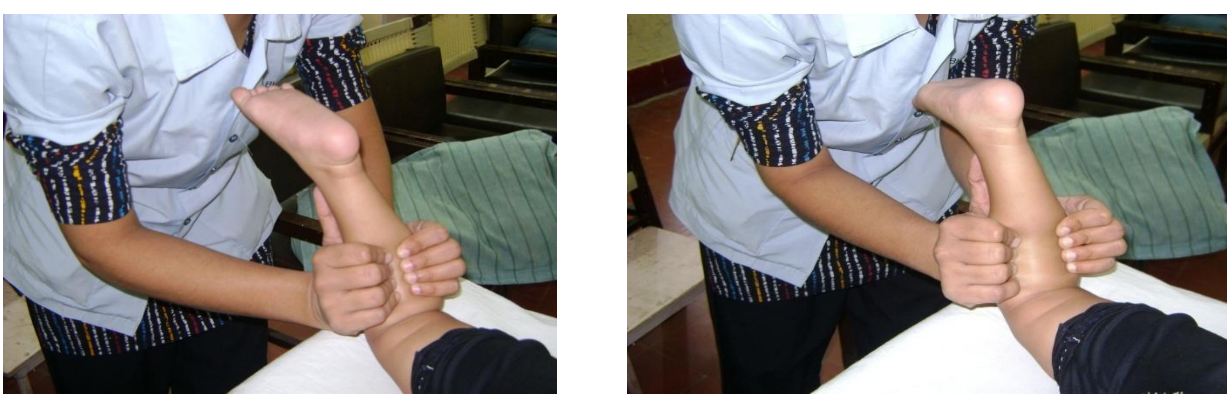


Graph 6: Means of differences of MTS R2 value pre exercise and post exercise for Group A and Group B



Photograph 1: Materials used

Photograph 2: Stretching by static weight bearing (SWB)



Photograph 3: Myofascial release of calf muscle