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Immediate Effect of Tendinous Pressure Technique Versus Myofascial Release Along with Static Stretching in Reducing Spasticity Among Stroke Patients- A Comparative Study

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ABSTRACT:

Introduction: Spasticity following stroke is a common complication that affects the active and passive functions of the paretic limb and thus functional independence. Myofascial release and static stretching are used to reduce spasticity. Inhibition techniques like tendinous pressure are also useful in reducing tone by inhibitory effect. This study aims to compare the immediate effect of tendinous pressure technique versus myofascial release along with static stretching in reducing spasticity among stroke patients.

Methodology: Study design- pre-test post-test two groups experimental study, Sample size- 30 patients: In each group- 15 patients, Study setting- OPD JRP Subharti College of Physiotherapy and CSS Hospital, Meerut. Duration of Study: Total duration of the study was 6 months. In group A MFR followed by static stretching was given to the bicep brachii, whereas in group B tendinous pressure was given. MAS and MTS were used to take pre- and post-intervention measurements (immediately after the intervention).

Results: At a 5% level of significance, results of the within-group analysis showed significant improvement in MTS R1 and MAS scores for both groups, A and B. Results of between the groups analysis showed significant improvement in MTS R1 values in group B than in group A, while no significant improvement seen in MAS values and MTS R2 values.

Conclusion: So, the conclusion can be made that the tendinous pressure technique is more effective than myofascial release along with static stretching in reducing spasticity among stroke patients**.**

Keywords: Stroke, Spasticity, Myofascial release, Static Stretching, Tendinous pressure

INTRODUCTION:

Stroke is a globally recognized neurological disorder. It is a major reason for mortality, serious long-standing disability, and disease burden in most countries [1]. Stroke or cerebrovascular accident (CVA) is the sudden loss of neurological function caused by an interruption of the blood flow to the brain. To be classified as a stroke, neurological deficits must last at least 24 hours [2].

Spasticity is a motor disorder characterized by a velocity-dependent increase in tonic stretch reflexes as well as excessive tendon jerks caused by stretch reflex hyperexcitability. When a muscle is stretched more quickly, its resistance to spasticity increases. Spasticity impairs function and limits physical activity [3].

Spasticity is common in stroke patients, but it is not an unavoidable condition. Spasticity after a stroke is frequently associated with pain, soft tissue stiffness, and joint contracture, and it can result in abnormal limb posture, decreased quality of life, increased treatment costs and increased caregiver burden.

Spasticity has been reported to occur in 27% of the paretic patients at one month, 28% at three months, 23% and 43% at six months, and 34% at 18 months after stroke. Spasticity develops and peaks 1-3 months after stroke, according to studies. Although the neuronal components of spasticity peak three months after stroke, the muscular components of spasticity may increase over time. It is more common in the upper extremities than in the lower extremities, with the elbow joint being the most commonly affected (79%) [4].

Spasticity can range from a clinical sign with no functional impact to a severe increase in tone that interferes with mobility, transfers, and personal care. It can cause muscle and tendon shortening and contractures if left untreated [5].

Myofascial therapy can be defined as "the facilitation of mechanical, neural and psychophysiological adaptive potential as interfaced by the myofascial system". The goal of deep myofascial release is to release restrictions (barriers) within the fascia's deeper layers. This is accomplished by stretching the fascia's muscular elastic components, as well as the crosslinks, and changing the viscosity of the fascia's ground substance [6]. It's a safe, low-load stretch that relieves spasticity or emotional jerkiness, as well as muscle shortness and tightness [7].

Stretching is currently the most commonly used technique in the physical management of spasticity. It is the process of elongation where tension is applied to soft tissue structures (muscle, tendon, connective, vascular, and dermal tissues). In the case of spasticity, stretching aims of normalizing the muscle tone, maintain or increase soft tissue extensibility, decrease pain, and thus improve function. In clinical practice, static, dynamic, prolonged, and ballistic stretching are often used. In static stretching, there is usually only one repetition, while dynamic stretching involves more than one repetition [8,9].

In static stretching, spastic muscle is stretched to its available pain-free range and maintained until the feel of reduction of tone in muscle under stretch [10].

In 1950, Rood devised a technique for facilitating and inhibiting movement through various stimuli. According to this approach, motor functions and sensory mechanisms are interrelated. The utilization of sensory stimuli by Rood to normalize tone is a key aspect of motor rehabilitation. Patients with neurologic dysfunction may additionally have muscle tone ranging from hypotonic to hypertonic. Inhibition techniques are mainly used in spastic patients to normalize tone. Manual pressure is applied to the tendinous insertion of the muscle or across long tendons to produce an inhibitory effect in the tendinous pressure technique [5,11].

Stretching, myofascial release, and tendinous pressure techniques are all less cost-effective, safe, and have very few side effects than any medical or surgical treatment. These are easy to apply and can be implemented in regular tone reduction management to inhibit spasticity to interrupt regular treatment. Otherwise, spasticity may limit movements, recovery may be hindered. So, this study focused to compare the effectiveness of MFR along with Static Stretching versus Tendinous Pressure as they were expected to reduce spasticity. The result could be implemented in a regular tone management program, making it more effective and affordable for stroke patients.

There were fewer studies found regarding the immediate effect of MFR, Static stretching, and tendinous pressure technique. However, no studies were found comparing the immediate effect of MFR along with static stretching versus tendon pressure technique. Establishing this evidence will help to build a more targeted exercise program for patients with neurological dysfunction like stroke. So that, spasticity does not interrupt regular therapy.

MATERIALS & METHODS:

Study Design: Pre-test, post-test two groups Experimental study design
Sample Size: 30 subjects
Group A- 15 subjects (MFR along with Static Stretching)
Group B- 15 subjects (Tendon Pressure Technique)
Study Setting: OPD JRP Subharti College of Physiotherapy, CSS Hospital and Lokpriya Hospital, Meerut
Types of sampling: Purposive sampling method
Duration of Study: 6 months

Materials:
- Plinth
- Goniometer
- Assessment and consent forms

Inclusion criteria-
- Both Male and Female
- Age between 35 years to 70 years
- Subjects diagnosed with stroke who had spasticity in the elbow flexor (biceps muscle)
- Subjects with intact cognition
- Elbow flexor (biceps) spasticity grade-1 to grade-3 in MAS

Exclusion criteria-
- Patients who received pharmacologic drugs for reducing spasticity, myorelaxants, or botulinum toxin
- Frequent epilepsy and hypersensitivity of the skin, any other immobility
- Subjects who did not sign an informed consent

Outcome measures:
- Modified Ashworth scale (MAS) [12]
- Modified Tardieu scale (MTS) [13]

PROCEDURE:

All the subjects fulfilling inclusion criteria were selected by a purposive sampling method and taken up for the study. The procedures of tests and interventions were well explained to the patients and informed consent was taken prior to the study.

All 30 patients were then randomly allocated into two groups, Group A (MFR along with Static Stretching) and Group B (Tendinous Pressure Technique), with 9 patients in each group.

All patients then went through a primary assessment. They were evaluated with the MAS and the MTS for the bicep of the affected upper extremity, in supine lying, before intervention for pre-intervention data. In another instance, the post-intervention data were collected by evaluating with MAS and MTS immediately after the intervention.

In Group A MFR, followed by Static Stretching was given to the affected bicep brachii muscle of all 15 patients.

MFR was applied with the patient lying supine and the therapist on the affected side. The therapist used the cross-hand method to perform Myofascial Release. The therapist applied pressure for 120 seconds with the ulnar border of both hands to sink into the belly of the bicep, allowing the tissue to soften before spreading the myofascial structures away to release the fascial barrier. The position was maintained once more, and the procedure continued to follow the tissue through each subsequent barrier.

Following MFR, static stretching was given to the subject in a supine lying position. The upper arm of the patient was supported on the plinth. The therapist then grasped the distal forearm and took the elbow into extension gradually, just past the point of tissue resistance to lengthen the bicep. The stretch position was maintained for 30 seconds and followed by 10 seconds of relaxation. The stretching technique was given for 3 sets of repetition.

For Group B, tendinous pressure was given to the patient in a supine lying position. Firm pressure was applied at the musculotendinous junction or across the long tendon of the biceps brachii of the affected side with the therapist's thumb. The pressure was maintained for 30 seconds with 4 sets of repetitions.

For immediate effect, MAS and MTS data were recorded after giving the intervention in one session. In MAS, 1+ was recorded as 1.5 for statistical analysis.

STATISTICAL ANALYSIS:

All the statistical analyses were obtained with the help of EZR (V1.55) software and graphs and tables were generated using MS Office Excel 2019. The statistical tool used in this analysis was the 't-test'. For within-group analysis, a comparison of data for MAS and MTS was done using a 'paired t-test'. For between-group analysis, a comparison of data for MAS and MTS was done using an 'un-paired t-test'.

RESULT:

30 patients having spasticity in the biceps, 15 in each group, were taken in the study. Group A: MFR and Static Stretching and Group B: Tendon Pressure Technique. All the demographic data of age, sex, paretic side, and MAS among both group A and group B are shown in Table-1.

Table 1: All demographic data of patients

Demographic data	Group A	Group B
Number of subjects	n = 15	n = 15
Age (Mean ± SD)	61.67 ± 7.15	60.47 ± 9.41
Gender (M/F)	10/5	9/6
Side affected (Left/Right)	8/7	9/6
MAS (Mean ± SD)	1.63 ± 0.49	1.63 ± 0.49

Results between pre and post-intervention data showed a statistical significance for MAS and MTS R1 values ($p<0.05$), while MTS R2 values showed no statistical significance ($p>0.05$) when compared within Group A, as in table-2.

Table 2: Pre and post-intervention scores comparison within Group A

Group A		Pre	Post	p-value
		Mean ± S.D.	Mean ± S.D.	
MAS		1.63 ± 0.52	1.47 ± 0.55	0.019
MTS	R1	98.27 ± 20.13	106.47 ± 20.28	1.90E-11
	R2	171.67 ± 11.29	171.87 ± 11.26	0.189

Results between pre and post-intervention data showed a statistical significance for MAS and MTS R1 values ($p<0.05$), while MTS R2 values showed no statistical significance ($p>0.05$) when compared within Group B, as in table-3.

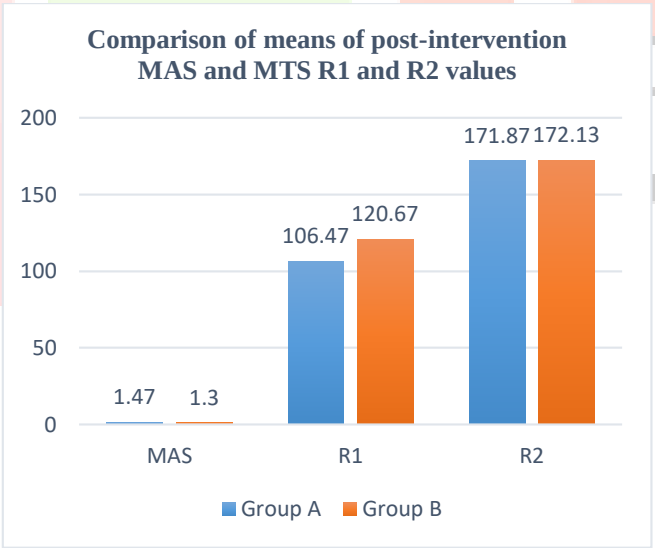
Table 3: Pre and post-intervention scores comparison within Group B

Group B		Pre	Post	p-value
		Mean ± S.D.	Mean ± S.D.	
MAS		1.63 ± 0.52	1.3 ± 0.37	0.003
MTS	R1	99.33 ± 15.99	120.67 ± 16.26	3.104E-08
	R2	172 ± 10.56	172.13 ± 10.37	0.164

Results between post-intervention data showed a statistical significance for MTS R1 values ($p<0.05$), whereas MAS and MTS R2 values showed no statistical significance ($p>0.05$) when compared between Group A and Group B, as per table-4 and shown in graph-1.

Table 4: Post-intervention scores comparison between Group A and Group B

		Group A	Group B	p-value
		Mean ± S.D.	Mean ± S.D.	
MAS		1.47 ± 0.55	1.3 ± 0.37	0.338
MTS	R1	106.47 ± 20.28	120.67 ± 16.26	0.043
	R2	171.87 ± 11.26	172.13 ± 10.37	0.947



Graph 1: Post-intervention comparison of MAS and MTS R1 and R2 values between Group A and Group B

DISCUSSION:

The present study was carried out to compare the immediate effect of Myofascial release along with Static Stretching versus Tendon Pressure Technique in reducing spasticity among stroke patients, so that conventional treatment does not get interrupted because of spasticity. The Bicep Brachii muscle was considered for this study, as people after a stroke usually have spasticity in this muscle. A total of 30 subjects of the age group 35-70 years old male and female with spasticity in their bicep were selected for the study according to inclusion and exclusion criteria. They were divided into 2 groups with 15 subjects in each group. Group A was given MFR along with Static Stretching and Group B was treated with Tendon Pressure Technique.

The result showed that both MFR along with Static Stretch and Tendon Pressure were effective in reducing spasticity while compared within the group, according to MAS and MTS R1 values. Comparing immediate effects between the groups showed Tendinous pressure to be more effective in reducing spasticity according to the R1 value of MTS. Where the R2 value of MTS showed no significant improvement.

This is relevant to the previous study done by Dhanashri N Marathe in 2020, to find the immediate effect of Tendinous Pressure Technique versus Myofascial release in reducing spasticity in stroke patients. This crossover study was carried out on 27 patients who had bicep spasticity of both genders. The result suggested that the Tendinous Pressure Technique is more effective than Myofascial release according to the R1 value of MTS and muscle reaction testing (X) [5].

Normalization of muscle tone by facilitation or inhibition by using a sensory-stimuli is a basic principle of Roods. Muscle tone varies from hypotonic to hypertonic in patients with neurological dysfunction. Where an inhibition technique like Tendon Pressure Technique can be used to reduce spasticity and to reduce motoneuron excitability. Manual pressure is applied to the tendinous insertion of the muscles or across long tendons producing an inhibitory effect [5,11]. So, in this study tendinous pressure was applied for a hold duration of 30 seconds and repeated for 4 sets of repetitions.

A myofascial release is a hands-on approach that is based on an afferent stimulation resulting in an efferent inhibition. This stimulation through receptors results in a relaxation due to inhibition. This result could deal with neuro-reflexive changes that occur with the application of manual force on the myofascial system [6].

Burris Duncan in 2008 conducted a study on moderate to severe spastic cerebral palsy children to see the effect of MFR on motor function. But they did not find any improvement in spasticity measured by MAS [14].

An experimental study to check the effectiveness of Myofascial release (MFR) on spasticity and lower extremity function among diplegic cerebral palsy children was done by Chandan Kumar in 2014. The conclusion was made that MFR should be applied with conventional therapy according to a significant difference in MAS and R1 value of MTS [15].

One previous study done by Akta Bhalara in 2012 to find the immediate effect of stretching with MFR and stretching alone in reducing spasticity in spastic diplegic cerebral palsy children, concluded that stretching with MFR is useful in reducing spasticity rather than stretching alone. The conclusion was made according to MAS and MTS R1 values for within-group analysis [16].

Dafda Renuka H in 2021 did a study to find out the effect of Hold-Relax versus Static Stretching on Elbow flexors muscle Spasticity in Stroke Patients. Static stretching was given with conventional therapy to group A and Hold-relax technique was given to group B with conventional therapy. Static stretching was applied to the elbow flexors with 30 seconds of hold and 10 seconds of relaxation with 3 sets of repetitions per session for 3 weeks. The result found that Hold-relax was more effective than static stretching, as static stretching causes an increase in the elasticity of the non-contractile viscoelastic component [8]. So, in this present study static stretching was given for a 30-second hold followed by 10 seconds of relaxation.

According to Regi Boehme, while applying MFR the hold of traction can be expected for at least 90 to 120 seconds before the tissues will begin to soften and lengthen [17]. So, in the present study, MFR was given with 120 seconds of hold. Static stretching was applied after achieving muscle relaxation through MFR.

According to a study done by Emily Patric in 2006, the presence of spasticity can be more effectively identified by the Tardieu scale than the Ashworth scale in muscles of both upper and lower limbs. Tardieu Scale differentiates spasticity from contracture, whereas the Ashworth Scale does not. This is because the Ashworth scale measures neural and peripheral factors combined by quantifying resistance to passive movement, whereas the Tardieu Scale takes into account the velocity of stretch. As suggested by the evidence, increased resistance to movement is not only dependent on stretch reflex activity but also due to increased stiffness [18].

CONCLUSION:

Results of the present study for between-group analysis showed statistically a significant improvement in the reduction of spasticity according to the R1 value of MTS in Group B (Tendinous Pressure Technique) than Group A (MFR along with Static Stretching), immediately after the intervention. So, the conclusion can be made from this result that, the Tendinous Pressure Technique is better than Myofascial release along with Static Stretching in the reduction of spasticity immediately after the intervention, in stroke patients. MFR along with Static Stretching also found to be effective in reducing spasticity, according to the MTS R1 value and MAS, as they showed a statistical significance when compared within the group.

LIMITATIONS:

The main limitation of the study was a smaller sample size. So, a future study can be performed by taking a larger sample. The present study aimed to find and compare the immediate effect of MFR along with Static Stretching and Tendinous Pressure Technique in reducing spasticity. So, future studies can be done to see the short-term and long-term effects. Improvement in bicep spasticity was seen in the present study. So, a future study can also be done to see the effectiveness of MFR along with Static Stretching and Tendinous Pressure on all affected muscles of the upper and lower limbs in stroke patients. There was the absence of a control group in the present study. So, the inclusion of a control group can be recommended for future studies. In this present study patients, those who were cognitively not well were not included. So, a future study can also be done by including them.

Ethical Approval: Ethical clearance was taken from the ethics committee of Swami Vivekananda Subharti University, Meerut.

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Conflict of Interest: None

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