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Influence of Myofacial Release Versus Maintained Stretch on Wrist Flexors Spasticity Measured with Modified Tardieu Scale in Patients with Stroke – A Pilot Study

Dr. Maheshwari Harishchandre[1] , Dr. S. Tungikar[2] ,Dr. Suvarna Ganvir[3],Dr. Satish Mahajan[4]

[1](Associate Professor, Neurophysiotherapy department, D.V.VP.F'S College of Physiotherapy, Ahmednagar, India),
[2](Prof.& Head, Department of Medicine, RMC, Loni, Ahmednagar, India)
[3](Professor and H.O.D, Neurophysiotherpy department, D.V.V.P.F's College of Physiotherapy, Ahmednagar, India),
[4](Prof.& Head, Department of Medicine, RMC, Loni, Ahmednagar, India)

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ABSTRACT

Background: Stroke is defined as a neurological deficit due to an acute focal injury of the central nervous system caused by a vascular aetiology, including infarction, intracerebral haemorrhage or subarachnoid hemorrhage. One-sided weakness can affect arms, hands, legs and facial muscles; may have trouble performing everyday activities such as eating & dressing. One-sided weakness in arms, hands, face, chest, legs or feet can cause loss of balance. There are so many studies conducted on wrist flexors and spasticity but no one compare the effect of myofascial release and maintained stretch inhibitory technique in stroke patients by using Modified Tardieu scale as a outcome measure.

Methodology: A Pilot study was conducted on 12 chronic stroke patients in tertiary care Hospital; with purposive sampling techniques. Patients were divided into 3group by envelop method. Both 20 to 55 years old males & females, subacute & chronic first ever stroke patients, patients with increased tone in wrist flexors, who have normal cognitive function patients were included in study & hemiplegic stroke, sensory loss patients who have any other musculoskeletal deformity, cardiac vascular related conditions, patients on oral medication to release spasticity were excluded from the study.

Result: Comparison between Myofascial Release, Stretching & Conventional treatment were helped to relieve wrist muscles spasticity in stroke patients. Mean value of Post score of R2-R1 was 15±4.08 for Group A, for Group B it was 11.25 ± 4.78 & for Group C it was 3.5±3.10. Within group it was not shown any significant difference.

Conclusion: Myofascial Release, Stretching & Conventional shows slight improvement in reducing spasticity but comparing other techniques Myofascial Release is more helpful to reduce wrist flexor spasticity in patients with stroke.

Key Words: Stroke, Spasticity, Myofascial Release, Stretching, Modified Tardieu Scale.

Introduction:

A stroke is defined as a sudden focal neurological deficit caused by an abnormality, which depends on the affected area of the brain[1] or a vascular aetiology, including infarction, intracerebral haemorrhage or subarachnoid haemorrhage. It is a well-known cause of morbidity and mortality all over the world. Injury of the pyramidal and parapyramidal fibres in stroke results with upper motor neuron syndrome, which includes negative and positive features. Spasticity is one of the positive features such as spastic dystonia, extensor or flexor spasms, clonus and exaggerated deep tendon reflexes. According to the definition of Lance, spasticity is defined as a velocity-dependent hyperexcitability of muscles to stretch and is characterized by exaggerated deep tendon reflexes,

increased resistance to passive movement and hypertonia resulting from loss of upper motor neuron inhibitory control.[2] The prevalence of spasticity after a first stroke has been inconsistent, ranging between 18% and 38%.[3-8].

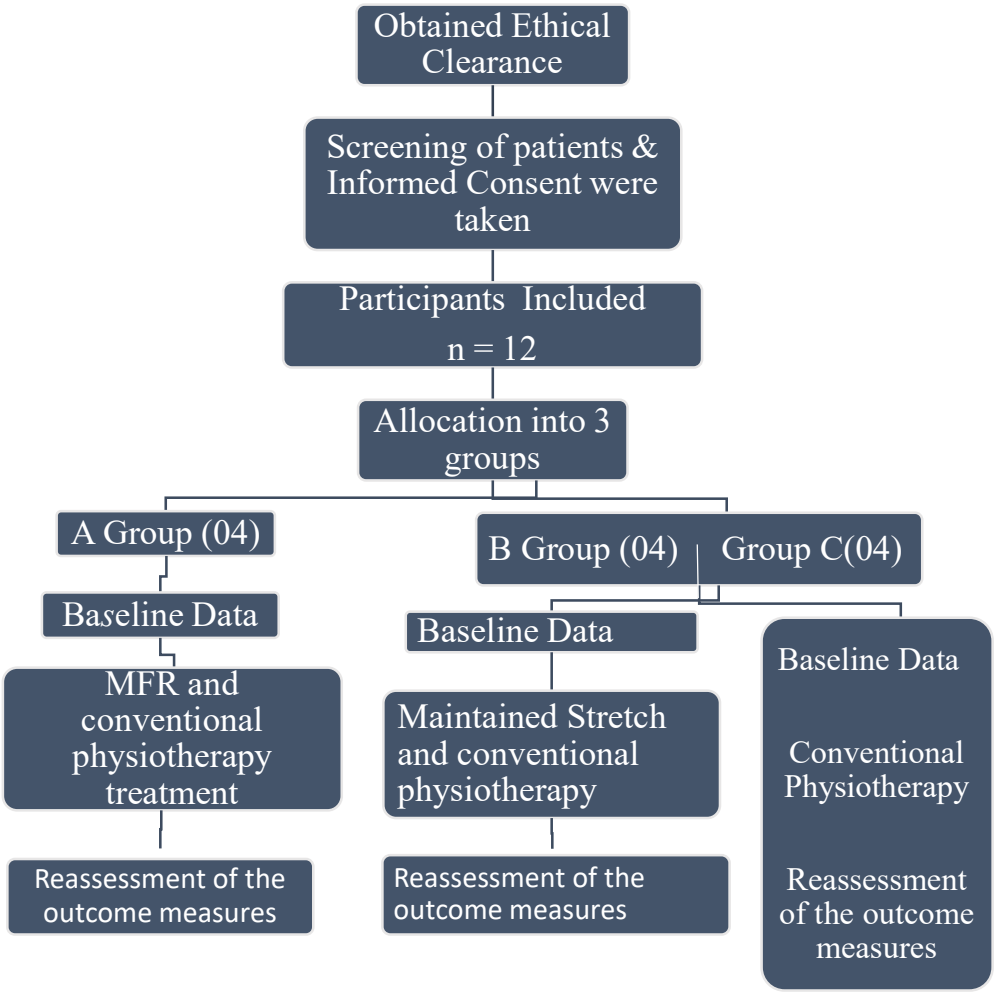
A recent study has reported that 30% of patients with stroke have spasticity. Spastic symptoms may cause pain, joint stiffness, tendon retraction and muscle weakness and thus interfere with success of rehabilitation and daily activities. Stroke occurrence approximately 700,000 individuals each year; about 500,000 are new strokes & 200,000 are recurrent strokes. A recent community survey in the eastern Indian city of Kolkata showed the prevalence rate of stroke to be 545 per 100000 populations & 60% to 70% traumatic brain injury results from road accident.[9,10]

There are several assessment methods developed for spasticity. The most commonly used ones are the Modified Ashworth scale (MAS) and the Modified Tardieu Scale (MTS)[11]. The other methods are neuroimaging techniques and electrophysiological studies, but they are not practical in daily routine for spasticity assessment. The clinical investigation of the nature and treatment of spasticity has been greatly impeded by the lack of any simple and precise method of measurement of the increased resistance to passive movement of the limbs.

Conventionally there are number of techniques are used to reduce the spasticity like static or slow icing, positioning, neural warmth, different orthosis which maintained the muscles in prolong stretch position. Myofascial release (MFR) techniques is rarely used in stroke condition to reduce the spasticity. The purpose of deep myofascial release is to release restrictions (barriers) within the deeper layers of fascia. This is accomplished by a stretching of the muscular elastic components of the fascia, along with the crosslinks, and changing the viscosity of the ground substance of fascia.[12] There are so many studies conducted on wrist flexors and spasticity but no one compare the effect of myofascial release and maintained stretch inhibitory technique in stroke patients by using Modified Tardieu scale as a outcome measure.

Methodology: A Pilot study was conducted on 12 chronic stroke patients at tertiary care hospital; with purposive sampling techniques. Patients were included according to the selection criteria's & were divided into 3group like Group A (MFR), Group B (Stretching) & Group C (Conventional) by envelop method. Both 20 to 55 years males & females subacute & chronic first ever stroke patients, patients with increased tone in wrist flexors, who have normal cognitive function patients were included in the study & hemiplegic stroke, sensory loss patients who have any other musculoskeletal deformity, cardiac vascular related conditions, patients an oral medication to release spasticity were excluded from the study. Collected data was analyzed by using descriptive statistical analysis test.

Procedure:



Result Analysis:

Descriptive statistics for all outcome measures were expressed as mean, standard deviations and paired 't' test used for comparing data within each group and One way ANOVA test for comparing between the groups. The confidence interval set as at 95% & data was considered statistically significant with $p< 0.05$.

Demographic Details-

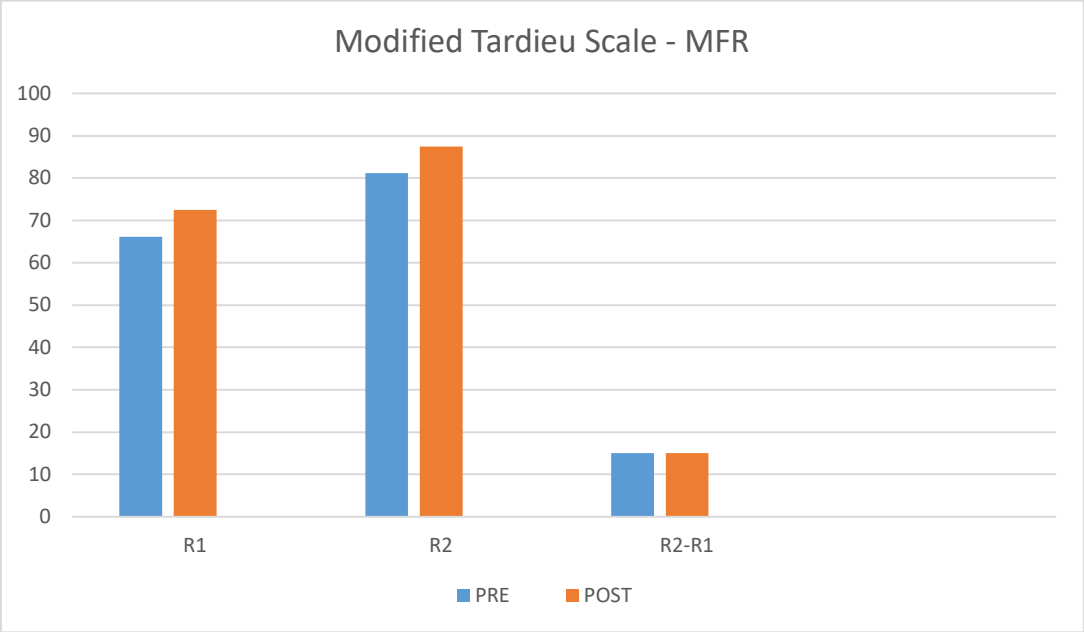
Table no. 1 Shows: Demographic details of the participants.

Details	**Group A**	**Group B**	**Group C**
	Mean ± SD	**Mean ± SD**	**Mean ± SD**
Age	43 ± 8.7	40.5± 14.6	35.5 ±10.5
Gender - Male	25%	50%	75%
Female	75%	50%	25%
Duration of Stroke	6.5±7.0	15.1±21.9	9.7±9.8
Type of Stroke – Ischemic	25%	50%	75%
Haemorrhagic	75%	50%	25%
Side Affected – Rt. Side	100%	75%	50%

Lt. Side	0%	25%	50%

Table no. 2 Shows: Pre & Post value of Group A -Myofascial Release by assessing Modified Tardieu Scale

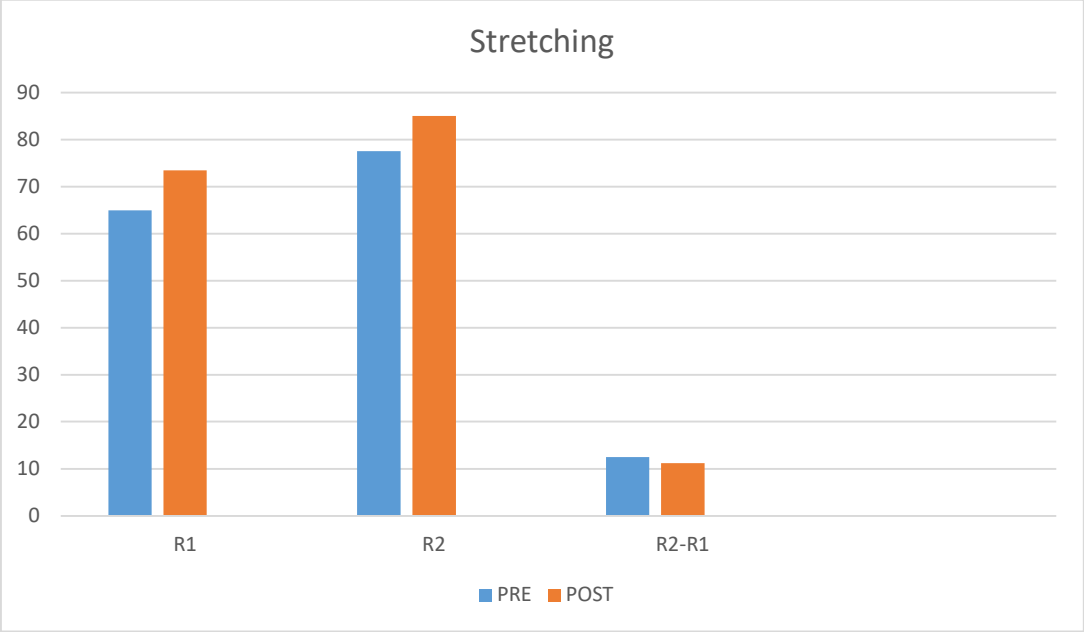
Modified Tardieu Scale	Pre (Mean ± SD)	Post (Mean ± SD)	"P" Value	Significance
R1	66.2±4.7	72.5±6.4	0.99	Not Significant
R2	81.2±2.5	87.5±2.8		
R2-R1	15±4.08	15±4.08		



Graph No.1: Shows within group difference for Myofascial Release i.e Group A

Table no.3 Shows: Pre & Post value of Group B- Stretching by assessing Modified Tardieu Scale

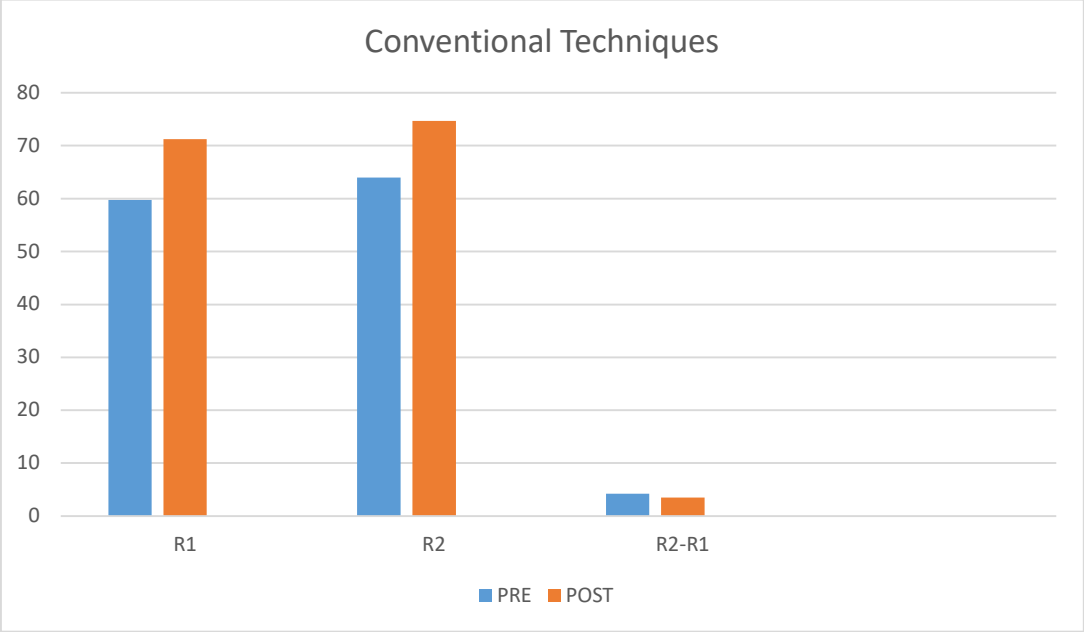
Modified Tardieu Scale	Pre (Mean ± SD)	Post (Mean ± SD)	"P" Value	Significance
R1	65±.57	73.7±4.7	0.76	Not Significant
R2	77.5±8.6	85±7.07		
R2-R1	12.5±6.4	11.2±4.7		



Graph No.2: Shows within group difference for Stretching i.e Group B

Table No.4 Shows: Pre & Post value of Group C- Conventional by assessing Modified Tardieu Scale

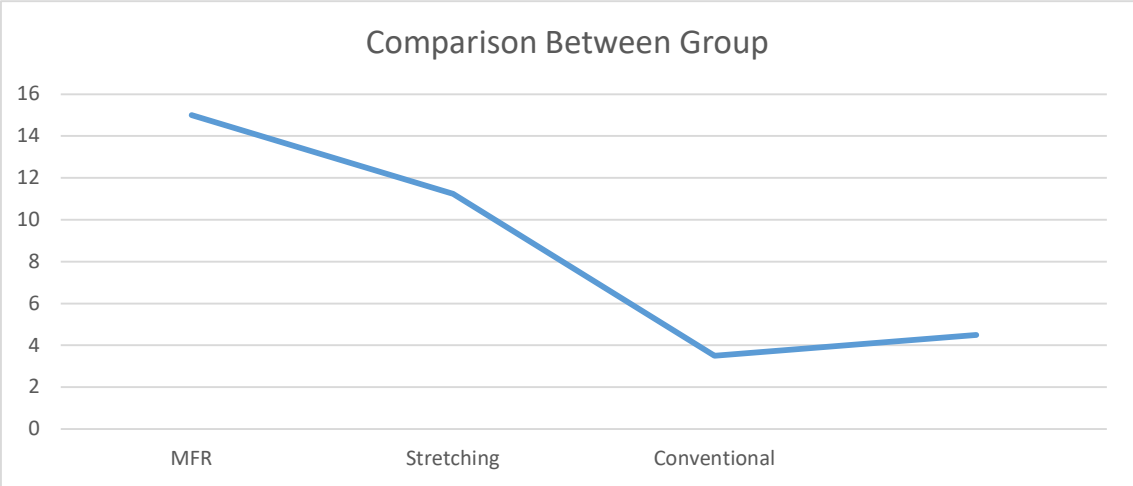
Modified Tardieu Scale	Pre (Mean ± SD)	Post (Mean ± SD)	"P" Value	Significance
R1	59.7±**9.5**	71.2±**8.5**	0.84	Not Significant
R2	64±**12.7**	74.7±**8.6**		
R2-R1	4.2±**4.3**	3.5±**3.1**		



Graph No.3: Shows within group difference for Conventional group i.e Group C

Table No.5 Shows: Comparison of Post value between Group A, Group B & Group C by assessing Modified Tardieu Scale

Group	Post (Mean ± SD)	F Value	"P" Value	Significance
MFR (Group A)	15± 4.08	8.38	0.008	Very Significant
Stretching (Group B)	11.25± 4.78			
Conventional (Group C)	3.5 ±3.10			



Graph no.4 : Shows comparison between all three groups i.e (MFR, Stretching & Conventional Group)

Discussion:

The current pilot study aimed to evaluate and compare the effects of Myofascial Release (MFR) and Stretching techniques on wrist flexor spasticity in stroke patients, using the Modified Tardieu Scale as a primary outcome measure. The study also included a conventional therapy group for comparison. The results of this pilot study provide insights into the neurophysiological responses of spastic muscles to these interventions.

Myofascial Release:

Myofascial Release (MFR) has been shown to be an effective manual therapy for reducing spasticity, likely through neuroreflexive changes[13]. The application of pressure during MFR stimulates the afferent receptors within the musculoskeletal system. The resulting afferent input is processed in the spinal cord and cortical layers of the brain, leading to efferent inhibition, which relaxes the muscle [14]. This mechanism is key to the success of MFR in reducing muscle tone, as supported by studies like those of Barnes, which emphasize the therapist's role in modulating both neuromuscular and fascial tension[15]. Author Vijal M et al, said that the MFR and conventional treatment had significant effect in reducing spasticity and improving functional activities of the subjects. The treatment had significant effect in group A(experimental group) as compared to group B (controlled group)[16]. The present study showed significant improvements in spasticity reduction in the MFR group (Group A), with a marked increase in range of motion (R1 and R2 values) post-intervention. The results suggest that MFR's ability to modulate the afferent and efferent pathways plays a significant role in reducing hyperexcitability of the stretch reflex in spastic muscles.

Stretching:

Passive stretching presents potential benefits in patient with stroke with spasticity, although the intervention should be individualized and adapted to each patient and situation by the therapist, measuring both the duration

of the stretching and the repetitions and sessions[17].

Stretching changes in fiber size and distribution, proliferation of extracellular matrix, and changes in stiffness in both spastic muscle cells and extracellular material in spastic muscle[18]. Stretching has been extensively studied for its role in managing spasticity. Previous research, such as that by Sanjana Rao, demonstrates that even a single session of stretching can significantly reduce spasticity by affecting both reflexive and non-reflexive components. Stretching passively elongates the muscle, which may result in short-term reductions in muscle tone.

In this study, the stretching group (Group B) also showed a significant reduction in spasticity, although the magnitude of the effect was less than that observed in the MFR group. This suggests that while stretching is beneficial in spasticity management, MFR may offer superior results, possibly due to its combined neuroreflexive and mechanical effects. According to Bhalara A & Talsaniya D et al; they stated that stretching alone and stretching along with MFR showed significant improvement in R1 value of MTS, not in R2 value of MTS and MAS 4 weeks after intervention[19].

Conventional Therapy:

The control group receiving conventional therapy (Group C) showed minimal changes in the Modified Tardieu Scale scores. This finding highlights the need for more specific and targeted interventions, like MFR and stretching, to effectively reduce spasticity in stroke patients.

Modified Tardieu Scale :

One of the strengths of this study is the use of the Modified Tardieu Scale, which differentiates between spasticity and contracture. Unlike the Modified Ashworth Scale, which combines neural and peripheral factors, the Tardieu Scale accounts for the velocity-dependence of the stretch reflex, making it a more precise tool for assessing spasticity. The findings from this study reaffirm that interventions like MFR and stretching primarily target the velocity-dependent increase in muscle tone, as captured by the Tardieu Scale[20].

Experimental evidence suggested that increased resistance to movement is not exclusively dependent on the 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 because it does not differentiate spasticity from contracture, whereas Tardieu Scale identifies the presence of spasticity as well as the 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, which is 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[21-23]**.** In this study we found that stretching and Myofascial Release both are effective on wrist flexors spasticity.

Study Limitations and Future Research:

As a pilot study, the sample size was small, limiting the generalizability of the results. Future studies should aim for larger sample sizes and longer follow-up periods to confirm the sustained benefits of these interventions. Additionally, exploring the combined use of MFR and stretching could provide insights into synergistic effects on spasticity reduction.

Conclusion:

The study was conducted to found the effect of Myofascial release, Stretching & Conventional treatment on wrist flexor spasticity in Patients with Stroke. It has not showed significant findings within the group. Comparing with the group Myofascial release techniques was more helpful than stretching & conventional treatment.

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