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Comparison of the Effectiveness between Tendinous Pressure and Maintained Stretch in Roods Inhibitory Techniques on Reduction of Upper Limb Spasticity in Patients with Stroke

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ABSTRACT

Background: Spasticity following stroke is often associated with pain and decreased quality of life, increased treatment cost, and increased caregiver burden. Inhibition techniques like tendinous pressure are also useful in reducing tone by reducing spasticity in which manual pressure is applied to the tendinous insertion of the across long tendons to produce an inhibitory effect in the tendinous pressure technique. Stretching is currently the most commonly used technique in the physical management of spasticity. This study aims to compare the immediate effect of tendinous pressure technique versus maintain stretch in reducing spasticity among stroke patients.

Methodology: Pre-test post-test study design was chosen for the study. 18 patients were selected and were randomly divided into group A and B, each group having 9 patients. In group A tendinous pressure was given to biceps brachii and group B participants received maintained stretch. MAS was used to take pre and post intervention.

Results: Within groups analysis showed significant improvement in MAS score in both the groups but inter group analysis showed no significant difference between group A and B with p value0.52 which is >.05.

Conclusion: The study concluded that tendinous pressure technique and maintained stretch were equally effective in reducing spasticity among stroke patient.

Keyword: Stroke, Spasticity, MAS, Tendinous pressure, Maintained stretch.

INTRODUCTION

Stroke is also called cerebrovascular accident[1] which is a sudden onset of neurological impairment caused by damage to the cerebrovascular arteries. Vascular damage in the brain can be due to sudden changes of blood pressure and oxygen deficiency leading to the death of brain cells. It is 2nd leading cause of mortality in most countries around the globe.[2]

It is estimated that about 80% of stroke pertains to ischemic, whereas 20% is due to primary haemorrhage. The clinical staging of stroke is generally accepted as follows: the first 2 weeks are defined as the acute stage; 3–11 weeks post stroke is termed the subacute stage in which most changes occur; 12–24 weeks post-stroke is the early chronic stage; and more than 24 weeks post-stroke is the chronic stage.[3]Across the world, 15 million people suffer from stroke every year, and five million people suffer from permanent disabilities. About 66% of strokes occur in adults aged 65 years or older.[4]

Incidence of stroke in Iran is more than the other regions of the world.[5]In a survey taken, nearly 7,50,000 individuals have stroke and 1,50,000 die from stroke every year, out of which 90,000 are men, and 60,000 are women, throughout the world. The remaining 6,00,000 individuals suffer from movement disorders.[6]According to the India stroke factsheet updated in 2012, the estimated age-adjusted prevalence rate for stroke ranges between 84/100,000 and 262/100,000 in rural and between 334/100,000 and 424/100,000 in urban areas.[7]Stroke is becoming important cause by premature death and disability in lower income and middle-income countries like India. As result developing countries exposed to double burden of both communicable and non communicable diseases. Majority of stroke survivors continue to live with disabilities, and cost of ongoing rehabilitation and long-term care are largely undertaken by family members, which impoverish their families.[8]

More than 80% of strokes survivors suffer from motor impairment, especially in the upper limb, in the first three months. Between 23% and 53% of people have complete or partial dependence for activities of daily living. Common abnormalities in the upper extremity include weakness or muscle paralysis, impaired muscular coordination, impaired proprioception and superficial sensation, and pain that may cause reduced range of motion and ultimately lead to permanent deformity in the upper extremity.[9] UMNS can be a result of stroke, brain injury or spinal cord injury (SCI), or neurological disorders including cerebral palsy and multiple sclerosis.[10]

Spasticity is one feature of positive phenomenon and is prominent part of upper motor neuron syndrome.[11]Spasticity which can be described by increased muscle tightness and stiffness, and a hyper excitability of the reflexes that causes involuntary contraction of the muscles or jerky movements and it can interfere with the daily activities, movement or speech of an affected person, and can cause discomfort or pain.[12] Approximately 42% of stroke patients develop spasticity within six months of the onset of stroke.[13] Spasticity is characterised by velocity-dependent increases in muscle resistance to passive stretch and is usually associated with exaggerated stretch reflexes and increased muscle tone.[14]

The onset of spasticity is highly variable in post stroke period and studies have shown that spasticity develops and peak at 1-3 month after stroke although neuronal components of spasticity peak 3 month after stroke, the muscular through over activation of spindle afferent and increase spasticity.[15]

Rood's approach is a neuro physiological approach developed by Margaret Rood in 1940 based on reflex or hierarchical model of the central nervous system. Rood's basic concept was that motor patterns are developed from primitive reflexes through proper sensory stimuli to the appropriate sensory receptors in normal sequential developmental pattern to improve motor performance. Basic principles of Rood's approach are normalization of tone, ontogenetic developmental sequence, purposeful movement and repetition or practice.[16]

The Rood approach is a very common therapeutic approach to rehabilitation of people with neurological diseases, introduced by Rood in1950.[17]

One of the goals of the Rood method is to increase or decrease muscle tone; therefore, sensory stimulation is used to produce a muscle response. Some examples of this approach are the following: fast brushing, stretch pressure, gentle shaking, quick stretch, and icing.[18]

Roods advised a technique developed for facilitation and inhibition of movement through various stimuli. Patients with neurologic dysfunction may have muscle tone ranging from hypotonic to hypertonic. Inhibition techniques are mainly used in spastic patients. Inhibition techniques are mainly used in spastic patients.[19]

Roods inhibitory techniques are Neutral Warmth, Gentle Shaking or Rocking, Slow Stroking, Slow Rolling, Light Joint Compression, Tendinous Pressure and Maintained Stretch.[20]

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.[21]

Stretching is currently the most commonly used technique in the physical management of spasticity. In static stretching, there is usually only one repetition, while dynamic stretching involves more than one repetition.[22, 23] 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.[24]

This study aimed and designed in such a way that it helps therapist to choose appropriate technique of roods while giving treatment in clinical practise. So, the purpose of the study was to evaluate the effectiveness between two Roods technique i.e., tendinous pressure and maintained stretch in reducing spasticity of upper limb in patients with stroke.

METHODOLOGY

A comparative study was done in the physiotherapy department of Maharashtra Institute of Physiotherapy, Latur. Approval was obtained from the institutional ethical committee (Ref No: IEC/2022/UG-18/2022), before recruiting participants for the study. A prior written informed consent was taken from each participant.

PROCEDURE

18 participants from the out-patient department, having subacute and chronic stroke were selected based on inclusion criteria detailed below and were randomly divided into group A (Tendinous Pressure Technique) and group B (Maintained Stretching), with 9 participants in each group by an independent collaborator by using a coin method. Both male and female individuals, aged between 35 and 70 years, diagnosed with stroke who had spasticity in bicep brachii (elbow flexor) of grade 1 to grade 3 according Modified Ashworth scale (MAS) with mini mental status examination scale having score 24 or more were included for the study. The participants who were receiving drug to reduce spasticity, frequently epilepsy, hypersensitivity of skin, serious complication such as heart failure were excluded.

All participants then went through a primary assessment. They were evaluated with the MAS (Modified Ashworth Scale) for the biceps 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 immediately after the intervention. On the side being tested the rate stabilizes the arm proximal in the elbow with one hand and other hand grasp the forearm just proximal to the wrist. The forearm is in neutral supination. The elbow is moved from a position of maximal possible flexion to maximal possible extension. Test position of elbow flexor in supine lying with head in midline and arm in 90-degree abducted position.[25]

Group A participant received tendentious pressure. The participant was positioned in supine lying and the therapist standing beside the participant's affected side. 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.[26]

Group B received maintained stretch. The participant was positioned in supine lying with head in midline and arm in 90-degreeabducted position. Therapist standing beside the affected side of participant. Static stretching was given to the participant's biceps brachii 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 biceps. 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.

STATISTICAL ANALYSIS

The data was collected by using a structure Proforma. Data entered in MS Excel Sheet and analysed by using SPSS 24.0 version IBM USA. Qualitative data was expressed in terms of proportions. Quantitative data was expressed in terms of mean and standard deviation. Comparison of mean into group was done using paired t-test. Comparison of mean between two groups was done using unpaired t-test. A p value of <0.05 was considered as statistically significant whereas a p value <0.001 was considered as highly significant.

RESULTS

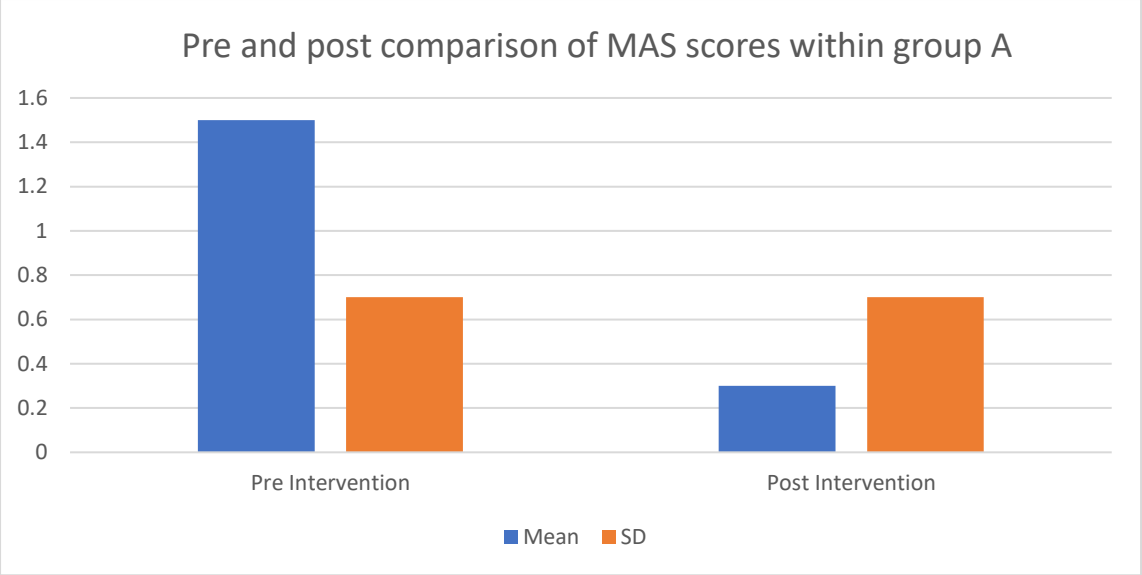
Table-1. Pre and Post intervention scores comparison within Group A

Result between pre and post intervention using paired test and data showed statistical significance for MAS value (p <0.05) 0.0003 when comparison within group A. i.e., Tendinous pressure

The table-1 shows the Pre and Post intervention scores comparison within Group A

Group A	Pre intervention	Post intervention	P value	Highly significant
	Mean + SD	**Mean + SD**		
MAS	**1.5+0.7**	**0.3+0.7**	**0.00003**	

Figure 1. Pre and post comparison of Modified Ashworth Scale scores within group A.



The Figure 1 shows the Pre and post comparison of Modified Ashworth Scale scores within group A.

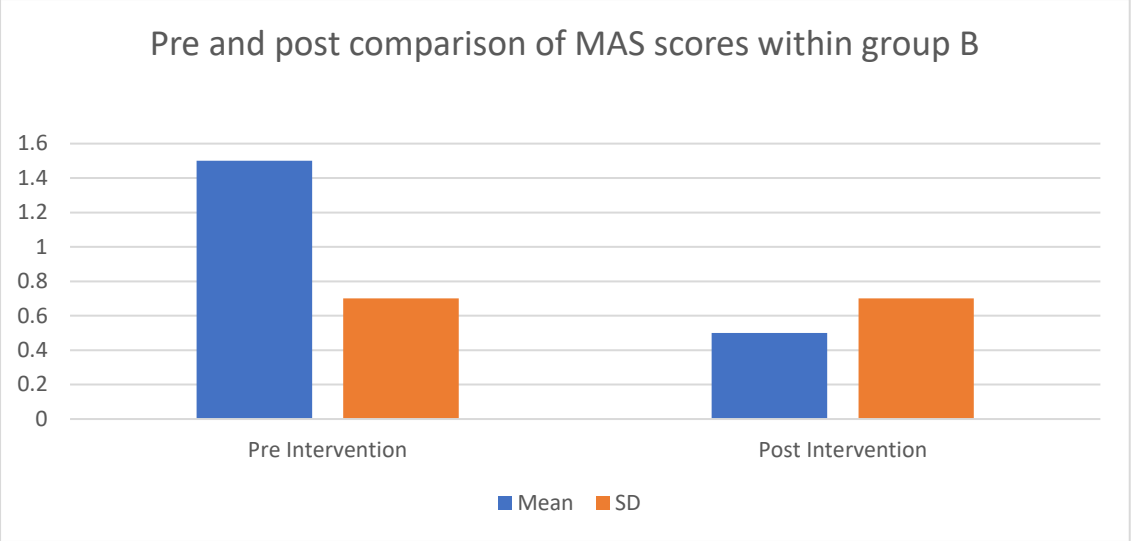
Table-2. Pre and Post intervention scores comparison within Group B

Result between pre and post intervention using paired test and data showed statistical significance for MAS value ($p < 0.05$) 0.0007 when comparison within group B i.e., Maintained stretch

The table-2 shows the Pre and Post intervention scores comparison within Group B

Group B	Pre intervention	Post intervention	P value	significant
	Mean + SD	**Mean + SD**		
MAS	**1.5+0.7**	**0.5+0.7**	**0.00007**	

Figure 2. Pre and post comparison of Modified Ashworth Scale scores within group B.



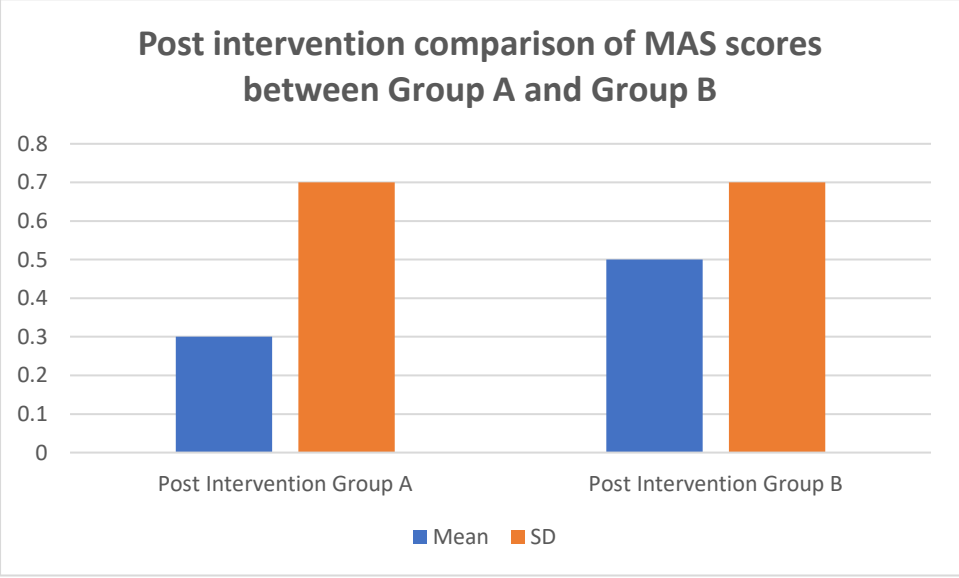
The Figure 2 shows the Pre and post comparison of Modified Ashworth Scale scores within group B.

Table-3. Post intervention comparison between Group A and Group B

COMPARISON BETWEEN GROUP A AND B POST INTERVENTION	Post intervention **Mean + SD**	Post intervention **Mean + SD**	P value	Not significant
MAS	**0.3+0.7**	**0.5+0.7**	**0.52**	

Result between post intervention data of group A and B, P value was 0.52 i.e., P>.05 which was not significant. The table-3 shows the Post intervention comparison between Group A and Group B

Figure 3. Post intervention comparison of Modified Ashworth Scale scores between group A and B.



The Figure 3 shows the Post intervention comparison of Modified Ashworth Scale scores between group A and B.

DISCUSSION

The present study was carried out to become immediate effect of tendinous pressure versus maintained stretch in reducing spasticity among stroke patients. The biceps brachii muscle was considered in this study as people after stroke usually have spasticity in the muscle. Comparing immediate effects between the groups showed no difference between tendinous pressure and maintained stretch in reducing spasticity according to MAS.

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 biceps 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.[15]

Normalization of muscle tone by facilitation or inhibition by using 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 motor neuron excitability. Manual pressure is applied to the tendinous insertion of the muscles or across long tendons producing an inhibitory effect. So, in this study tendinous pressure was applied for a hold duration of 30 seconds and repeated for 4 sets of repetitions.

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.[27]

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 were more effective than static stretching, as static stretching causes an increase in the elasticity of the non-contractile viscoelastic component. So, in this present study static stretching was given for a 30-second hold followed by 10 seconds of relaxation.[22]

According to a study done by Emily Patric in 2006, the Tardieu Scale can identify the presence of spasticity more effectively than the Ashworth Scale in both an upper and lower limb muscle. 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 take into account the main factor to which the stretch reflex is known to be sensitive, which is the velocity of stretch.[28] This

velocity-dependence of the stretch reflex has been well established, with several studies reporting no stretch reflex during slow passive movements.[29]

CONCLUSION

The study concluded that, the tendinous Pressure and maintained stretch techniques were equally effective in the reduction of spasticity immediately after the intervention, in stroke patients.

LIMITATION

The major limiting factor of the study was a small sample size, so the future study can be done by taking a larger sample size. Future study can be done to see the long-term effect. Effect scan be evaluated on other affected muscles. 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.

DATA AVAILABILITY

The dataset generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

FUNDING: Self.

CONFLICT OF INTEREST: The authors confirm that they have no conflicts of interest.

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AUTHORS CONTRIBUTION:

Salim Shaikh: Conceived and designed the analysis and contributed data analysis tools.
Gaurav Bhatnagar: Wrote the paper.
Aditi Bhilwade: Performed the data analysis.
Apeksha Deshmukh: Collected Data.

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