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Influence of Myofacial Release and Stretching to Relieve Spasticity in Patients with Stroke – A Systematic Review

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Abstract:-
Background: Neuromuscular diseases can cause spasticity, which has an impact on the quality of life for persons who suffer it. A muscle tightness that depends on velocity is the outcome of spasticity. The goal of myofascial release, a type of manual treatment, is to restore ideal length, reduce discomfort, and enhance function by applying a low load, long duration stretch to the myofascial complex. Many people with spasticity utilise stretches in the hope that tightness or contracture of soft tissues can be reduced and prolonged.
Objective: To find out the research on the impact of myofacial release and stretching on wrist spasticity in stroke patients.
Methodology: Review contains latest literature, studies included within last 15 years. They were entered into PubMed & Google scholar. The population which was selected adults with spasticity developed after stroke. A systematic literature search was evaluated 74 articles with key words myofacial release & stretching. There are 10 studies are available on pubmed with the keywords of stretching, myofacial Release & stroke but only 3 studies are available on myofacial release and spasticity in last 15 yr. Studies written in English language were only included.
Conclusion: It is anticipated that myofascial release and static stretching will reduce spasticity in stroke patients. Myofacial Release is effective in reducing the spasticity along with conventional physiotherapy in stroke patients & the study as well suggested that stretching also helps to reduce the spasticity through prolonged muscle stretch.

Keywords:- *Myafacial Release, Stretching, Spasticity, Stroke, Physiotherapy.*

I. INTRODUCTION

An immediate focused injury to the central nervous system produced by a vascular aetiology, such as infarction, intracerebral haemorrhage, and subarachnoid haemorrhage, is known as a stroke. It is a well-known cause of morbidity and mortality all over the world. Injury of the pyramidal tract in stroke results with upper motor neuron syndrome, which leads to physical and mental disability. 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.[1] Reduced physical function may occur as a result of spasticity, which is a component of the upper motor neuron injury. Spasticity's effects on stroke recovery might not be immediately apparent, thus they are not usually addressed in the initial stages. Upper limb spasticity has been linked to decreased arm function, lower levels of independence, and a startling four-fold rise in direct care expenses in the first year following a stroke. It appears that upper extremity spasticity in stroke patients is more prevalent than lower limb spasticity. In the first 12 months, spasticity in the upper limb can occur anywhere between 7% and 38% of the time; it was discovered that 46% of patients with initially poor arm function experienced this condition.[2] Spastic symptoms may cause pain, joint stiffness, tendon retraction and muscle weakness and thus interfere with success of rehabilitation and daily activities. When the prevalence rates and the results of spasticity are taken into consideration, exact assessment and management of this disorder become more of an issue. Stroke occurrence approximately seven hundred thousands individuals each year; about five hundred thousands are new strokes & two hundred thousands are recurrent strokes. A recent survey in the Kolkata city showed the prevalence rate of stroke to be 545 per 100000 populations & 60% to 70% traumatic brain injury results from road accident. The average annual incidence rate of strokes is 145 per 100000 & 2.2 million people had a traumatic brain injury per year[3,4] . Even six months after the stroke, 50% of stroke survivors still have major functional issues with their hands and arms [5-6] and have limited arm function. These diminished upper limb functions limit the patient's daily activities, lower productivity, complicate social integration, and add financial hardship.[7.]

Myofascial release is a treatment method that attempts to lessen the degree of muscle activity pain, reduce spasticity, increase flexibility and sliding between layers of soft tissues,

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and enhance functional performance. [8] According to its definition, myofacial release "facilitates mechanical, neurological, and psychophysiological adaptive potential as interfaced by the myofascial system." Fascia is a continuous network of connective tissue that covers and connects the muscles, organs, and skeletal systems in our body. It is found between the skin and the underlying structure of muscle and bone. The myofascial system is made up of muscle and fascia. Deep myofascial release aims to remove obstructions (barriers) from the deeper fascial layers. 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.[9]

Stretching helps to normalize the tone, to reduce the pain, to increase the soft tissue extensibility and to improve function[7]. Stretching technique can be given in various forms which includes - passive stretching, active stretching, prolonged stretching, ballistic stretching, isokinetic stretching and isotonic stretching and also in various ways depending upon intensity of stretch that is amount of tension that can be applied to the structure which can kept constant or can be varied[10].Stretching leads to decrease stiffness, improves movement control, increases in motor neuron excitability, decreases development of contracture, increases range of motion, improves gait pattern and also reduces the energy during walking[9]. Children depends upon various factors such as age of the child, severity of spasticity and contracture, tolerance of the stretch, cognitive level of the child and functional outcomes of the child depending upon its Gross motor function classification score.[11] Though both Stretching and Myofascial release are expected to have an effect on the spasticity in stroke patients, there is the need to establish efficacies of these methods of soft tissue elongation in clinical practice.

II. METHODOLOGY

Review contains latest literature, studies included within last 15 years. They were entered into PubMed and Google scholar. The population which was selected adults with spasticity developed after stroke. A systematic literature search was evaluated 74 articles related to effect of Myofacial Release & stretching with key words Myofacial release & stretching. There are 10 studies are available on pubmed with the keywords of stretching, Myofacial Release & stroke but only 3 studies are available on myofacial release and spasticity in last 15 yr. Out of 74 articles 10 articles were selected which were found suitable for study. Out of 10 articles,7 articles were related to stretching studies and 3 articles were related to Myofacial Release studies. Studies in English language were only included in the systematic review.

III. RESULT ANALYSIS

Sr.no	Authors name	Design	Subjects and treatment	Outcome Measures	Conclusions
1.	Ana Paula Salazar et al	Systematic Review	Three studies on 57 patients were included in the spasticity meta-analysis and seven studies on 210 patients in the mobility meta-analysis	Range of Motion	Compared to no therapy, static stretching with positioning orthoses decreases wrist flexion spasticity after stroke. Furthermore, there is insufficient proof that static stretching with straightforward placement is any more effective at preventing loss of mobility in the shoulder and wrist than traditional physiotherapy.
2.	Jang et al 2016	RCT	Seventy-one hemiparetic stroke patients IG-11, CG-10 Treatment- IG- A apparatus for extending the hands and wrists was employed, and a 14-minute session was completed. For four weeks, there were three stretching sessions per day, six days a week. CG- Treatment was not given	MAS, Fugl Meyer motor assessment scale, AROM	stretching device is effective in spasticity reducing and motor function improvement
3.	Eun Hyuk Kim et al 2013	RCT	15- chronic hemiparetic stroke patient IG- 8, CG- 7 between 29 to 72 yrs og age. In treatment protocol hand splint with hand & thumb stretcher given to finger flexor	MAS	The modified stretching device along with stretching effectively relieved hand spasticity in patients with chronic stroke.

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			for 10 min twice daily for 4 weeks		
4.	Shilpa Khandare (2012)	Comparative experimental study	30 hemiplegic stroke patients having age group between 40 to 70 yrs were divided into two groups with 15 patients in each group. The affected side of the patient was considered as Study group A cooling was given and Study group B Sustained Passive Stretching was given along with routine rehabilitation.	H reflex	It is concluded that Cooling and Sustained passive stretching both are equally effective in reducing spasticity of tricep muscles in patient with hemiplegia.
5.	Thamar J Bovend Eerdt et al	Metaanalysis	10 RCT studies and 11 Clinical Trials were included. The quality of the RCTs was low, varying between 4 and 8 on the PEDro scale	ROM	Studies examining how stretching affects spasticity come in a wide variety. The necessity for agreement on a paradigm for stretching and for high-quality studies is acknowledged.
6.	Yeh et al 2004	Single group pre-test- post test	25 patients with spastic hemiplegia were included. Treatment- Ankle planter flexors stretched in one session for 30 minutes was given	MAS ROM	They concluded that MAS & PROM significantly improved.
7.	Hui-Yi Chang et al 2001	single group experimental study	17 Spastic hemiplegic patients with 33 to 79 yrs age group. In treatment stretch was given to triceps surae muscle in standing position with ankle dorsiflexion for 30 min on tilt table.	MAS H/M ratio of triceps surae, F/M ratio of TA PROM of ankle dorsiflexion	The result showed that passive ROM was increased significantly & 30 minutes of Prolonged muscle stretch was effective in reducing motor neuron
8.	Vijal Mewada et al	RCT	30 participants 15 (controlled group) and 15 (experimental group) who were treated with MFR and conventional treatment. MFR was given to hamstrings, calf, adductors and biceps muscles for 5 days a week for 12 weeks.	MAS, MTS, FIM, BBS	The study concludes that MFR along with conventional treatment has significant effect in reducing spasticity and improving the functional activities
9.	M.S.Ajimsha et al	Systematic Review	Articles were selected based upon the use of the term myofacial release in the abstract or key words; RCTs on MFR for various conditions and pain.		The quality and outcomes of the literature on the application of MFR were inconsistent. Even though the RCT trials' quality varied widely, the outcomes were positive, especially for the most recently published research. MFR is a technique with a strong evidence base and enormous potential.
10.	Dhanashree N. Marathe et al	Cross Over study	Study done on 27 stroke patients for a 6month period. Both techniques were applied on patients for two hours with given some interval period.	MTS	One can draw the conclusion that tendinous pressure is superior to MFR in lowering stroke patients spasticity.

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IV. DISCUSSION

This scientific review demonstrates the impact of myofacial release and stretching on stroke-related spasticity. Studies have been done that demonstrate the effects of stretching and myofacial release on spasticity. Stretching is a frequent therapy technique used by therapists to lessen stiffness and enhance motor abilities in stroke patients. Physical therapists can also utilise myofacial release to treat patients with a variety of neurological and musculoskeletal problems who are spastic. The general characteristics of stretching, particularly intensity, should be carefully analysed, including the duration, repetition, and frequency, as there are numerous stretching strategies that have been recommended. Our goal was to determine whether myofacial release and stretching could help stroke patients with their spasticity.

The neuroreflexive change that takes place when manual pressure is applied to the musculoskeletal system when performing Myofacial Release may be the most likely mechanism for results. The hands-on method provides afferent stimulation through receptors, but for a response, the spinal cord and cortical layers of the brain must analyse the information. Efferent inhibition typically follows afferent activation. When the afferent stimulation of a stretch is administered, the operator waits for efferent inhibition to happen so that relaxation ensues. This principle is used in the Myofacial Release technique.[12]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 [13,14,15]. One of the article published in PT Today, 1995, by John F. Barnes had shown the effects of Myofacial Release. According to that, the therapist doing the myofacial release is concerned with relaxing and mechanically reconstructing the neuromuscular system as well as the fascial constraints on the body.[16]

One of the author Yeh et al; conducted a study in 2001 on the effect of single session of prolonged muscle stretch on spastic muscle of stroke patients showed that there was a significant increase in the ROM of ankle dorsiflexion after 30 minutes of prolonged muscle stretching. There were changes seen in the H reflex values due to the Ib afferent fibers in this case, the Golgi tendon organ was fired while stretching the calf muscle. Then the impulse was transmitted by the Ib afferent fiber through the interneuron thus, inhibiting the α motor neuron and another reason was may be due to the II afferent fiber in this case, the muscle spindle of the calf muscle was fired during the muscle was being stretched which in turn causes the impulse to get transmitted by the II afferent fiber through the spinal cord, thus, inhibiting the neuron excitability of α motor neuron [17]**.** One more study conducted by Bakheit et al compared the impact of single session of isokinetic or isotonic muscle stretch on gait in patients with spastic hemiparesis; measure α motor neuron excitability by measuring the latency in the H-reflex and then the ratio of the amplitude of the maximum H-reflex to that of the maximum action motor potential of the soleus spastic muscles and he concluded that muscle stretching reduces spasticity by neurophysiological mechanisms rather than the direct effect on the excitability of α motor neuron.[18]

Myofacial Release and Stretching along with positioning, orthosis, passive exercise reduces hyperactive stretch reflexes, slowly sustained stretch helps in reducing the contracture and prolonged muscle stretch reduces the motor neuron excitability. It showed more effective on spasticity when combined with other conventional techniques comparing alone one.

V. CONCLUSION

It is anticipated that myofascial release and static stretching will reduce spasticity in stroke patients. Myofacial Release is effective in reducing the spasticity along with conventional physiotherapy in stroke patients & the study as well suggested that stretching also helps to reduce the spasticity through prolonged muscle stretch.

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