Comparison of Immediate Effect of Autogenic Inhibition Versus Reciprocal Inhibition on Spasticity of Wrist Flexors in Chronic Hemiplegia – A Randomized Control Study

Dr. Riddhi M Sutariya, Dr Adyata
[1]*Assistant professor, MPT in neuroscience, Merchant physiotherapy college*
[2]*Assistant professor, M.PT in Neurological and Psychosomatic disorders, CM Patel College of Physiotherapy*

Abstract— **INTRODUCTION AND AIM OF THE STUDY: Stroke is defined by the World Health Organization as a clinical syndrome consisting of rapidly developing clinical signs of focal disturbance of cerebral function lasting more than 24 hours or leading to death with no apparent cause other than a vascular origin. Upper limb spasticity after stroke is about 50% in the first year after a stroke.1–3 In particular, wrist flexion spasticity. Aim of the study to compare immediate effect of autogenic inhibition versus reciprocal inhibition on spasticity of wrist flexors in chronic hemiplegia. METHODS: 30 Participants were analysed and distributed into 3 groups Group A (10), Group B (10) and Group C (10) according to selection criteria both males and females are included. In Group A, Autogenic inhibition, Group B Reciprocal inhibition and Group C Control group intervention was practiced. Modified Tardieu scale (MTS) and Fugl mayer scale (FMS) were taken before intervention as bassline data (pre data) and after intervention (post data). Treatment was given 1 day. CONCLUSION: Autogenic inhibition is more effective as compare to reciprocal inhibition in improving wrist extension in chronic hemiparetic patients.**

Index Terms **Chronic Stroke, Wrist Spasticity, Autogenic inhibition, Reciprocal inhibition, MTS scale, FMS scale**

I. INTRODUCTION

World Health Organization defines stroke as a clinical illness characterized by quickly increasing clinical indications of focal (or global in the case of coma) disruption of brain function lasting more than 24 hours or leading to death with no obvious cause other than a vascular origin.[1] Stroke is typically categorised into three types ischemic stroke, hemorrhagic stroke, and subarachnoid hemorrhage. Paresis and spastic stages are typical in stroke-induced hemiplegia. In the early stages of a stroke, the majority of the limbs exhibit flaccid hemiplegia.[2] Spasticity is more common in the upper limb flexor muscles (fingers, wrist, and elbow flexors) and lower limb extensor muscles (knee and ankle extensors). Spasticity and weakness (i.e., spastic hemiparesis) are primary motor deficits that complicate patient care. Spasticity is thought to affect 20-40% of all stroke survivors, but up to 97% of those with moderate to severe motor disability.[3] Muscle stretch refers to the phenomena of velocity-dependent stretch reflex reactions, often known as spasticity.[11] Spasticity is defined as a velocity-dependent increase in muscle tone caused by an exaggerated stretch response. It is merely one of the symptoms of upper motor neuron illness. (UMNS). Spasticity is more common in the upper limb flexor muscles. Autogenic inhibition mechanism will take place in the target muscle when the same muscle is contracted or stretched by reducing the excitability because inhibitory signal is fired from the Golgi tendon organ (GTO). The Fugl-Meyer Assessment (FMA) is considered by many in the field of stroke rehabilitation to be one of the most comprehensive quantitative measures of motor impairment following stroke, and its use has been recommended for clinical trials of stroke rehabilitation.

II. NEED OF STUDY

There are various studies available that determines the effect of three interventions on long term duration, but there are no evidences on the immediate effect of

autogenic inhibition and reciprocal inhibition on spasticity of wrist flexors in chronic hemiplegia. Therefore, there is a need for the study to be carried for finding the immediate effect of autogenic inhibition versus reciprocal inhibition on spasticity of wrist flexors in chronic hemiplegia.

III. AIM AND OBJECTIVE

AIM**:** - Aim of the study was to compare immediate effect of autogenic inhibition versus reciprocal inhibition on spasticity of wrist flexors in chronic hemiplegia.

OBJECTIVE**: -** To evaluate the immediate effect of autogenic inhibition in combination with faradic stimulation and prolong stretching on spasticity of wrist flexors in chronic hemiplegia.

To evaluate the immediate effect of reciprocal inhibition in combination with faradic stimulation and prolong stretching on spasticity of wrist flexors in chronic hemiplegia

To evaluate the immediate effect of faradic stimulation in combination with prolong stretching on spasticity of wrist flexors in chronic hemiplegia.

To compare the immediate effect of autogenic inhibition and reciprocal inhibition in combination with faradic stimulation and prolong stretching and with faradic stimulation and prolong stretching on spasticity of wrist flexors in chronic hemiplegia.

IV. MATERIALS AND METHODOLOGY

STUDY DESIGN: Randomized control study
STUDY POPULATION: Hemiplegia Patient
STUDY SETTING: Multicenter
DURATION OF STUDY: 1.3 Year
INTERVENTION DURATION: 1 Day
SAMPLING TECHNIQUE: Simple Random Sampling
SAMPLE SIZE: 40 subjects

SOURCE OF DATA COLLECTION: Data were collected from Neurological department of C M Patel college of physiotherapy and GMERS Civil Gandhinagar

TOOLS AND APPARATUS:

• Data collection instrument (pen, pencil, scales, consent form)
• Electrical stimulation (technomed)
• Universal Goniometer
• Stool

SELECTION CRITERIA

INCLUSION CRITERIA
• Diagnosis with Stroke confirmed by CT/MRI.
• Patient having chronic stroke (6 months to 2 year).
• Able to understand and follow the simple verbal instruction
• Wrist flexor MAS spasticity grading 1+ to 3
• Brunnstrom VCG of wrist joint 2-4

EXCLUSION CRITERIA
• Perceptual, Cognitive disorder.
• Upper Limb Subluxation.
• Any other Musculoskeletal Disorder in upper limb.
• High risk cardiac condition.
• Had undergone any fracture or orthopedic surgeries (Wrist)

OUTCOME MEASURE
There were two outcome measures; They were measured at baseline analysis and one day after the interventions were completed.

1) MODIFIED TARDIEU SCALE: (ICC :0.56 to 0.851 for inter-rater reliability :0.70 to 0.998 intrarater reliability: 0.627 to 0.815 for test–retest reliability)

2) FUGL MAYER SCALE: Upper extremity (ICC = 0.98), Motor sense (ICC = 0.98), Upper and Lower extremities PROM (ICC = 0.84 and 0.90).[16]

V. RESULT & INTERPRITATION

Characteristic *	Group A (n=10)	Group B (n=10)	Group C (n=10)	P value **
Gender				
Male (n=24)	7 (70%)	8 (80%)	9 (90%)	0.034
Female (n=6)	2 (20%)	2 (20%)	2 (20%)	0.987
MAS				
1 (N=17)	5	6	6	0.121
2 (N =13)	4	5	4	0.810
Brunnstrom				
2 (n=12)	5	3	4	0.442
3 (n=11)	4	4	3	0.548
4 (n=7)	2	2	3	0.980

	Group A	Group B	Group C
Skewness	0.34878	0.438062	0.578812
Excess kurtosis	-0.431111	-0.420741	0.432399
Normality	0.568	0.351	0.5972
Mean	10.1	7.7	9.25
S value	3.59678	2.29645	3.1602

	Group A	Group B	Group C
Skewness	-0.172214	0.182765	0.304537
Excess kurtosis	-0.451401	-0.103079	-0.488599
Normality	0.4581	0.3564	0.1828
Mean	8.8	10.15	9.15
S value	1.85245	1.56525	2.1095

	Group A	Group B	Group C
Skewness	0.128801	-0.100926	-0.451943
Excess kurtosis	-0.636588	-0.516938	0.595749
Normality	0.2506	0.2263	0.3003
Mean	5.7	7.3	7.35
S value	1.83819	1.41793	1.42441

Table: ANNOVA test for MTS, FMS wrist and fMS hand

MTS: The post analysis is done and it is evaluated that group A is more effective than Group B and Group C. It means autogenic inhibition is more effective than Reciprocal inhibition. P value: 0.0409 (significant)

FMS wrist: The result shows that the group C, control group, the therapy causes no significant benefits than other groups with p value 0.6609, statistically not significant.

FMS hand: As the result is statistically significant. The post analysis is done and it is evaluated that group A is more effective than Group B and Group C. means autogenic inhibition is more effective than Reciprocal inhibition. P value: 0.00171 (Statically significant)

VI. DISCUSSION

The present study compares the immediate effect of Autogenic inhibition versus reciprocal inhibitionon on spasticity of wrist flexors in chronic hemiplegia patients. Thus, the aim of the study was to improve wrist extension in chronic hemiplegia. Effects of autogenic inhibition and reciprocal inhibition. By using a Autogenic inhibition, reciprocal inhibition and control group wrist extension assessed to collect data before treatment and reassessed after intervention to observe the changes by measurement of the modified tardieu scale and fugl mayer scale (wrist and hand components) in three groups. The results of the study demonstrated marked changes that recovered the of the wrist extension of chronic hemiplegia patients. In this research study, 30 patients were taken. In Group-A (n=10), Autogenic inhibition technique, faradic stimulation, prolong stretching was done on patients. In Group-B (n=10), reciprocal inhibition faradic stimulation, prolong stretching and Group-C(n=10) faradic stimulation, prolong stretching was performed.

The usual duration of spasticity is seen after 6-12 months which increases gradually.26 In this study, these two outcome mesure MTS and FMS scales are used to analysis the data. Leire Santisteban (2016) Fugl Meyer assessment scale as the measurement of baseline analysis of motor function in the outcome.[19] A randomised controlled study Megan Banky et al 2022 did concluded that MTS scales were the most reliable tools, as supported by clinically feasible method than the used goniometer, to quantify a spasticity assessment using the MTS. In this study Autogenic inhibition technique is used which is reflex mechanism that involves the activation of sensory receptor called golgi tendon organs (GTO), which are located in the tendons muscles. When muscle contracts, the tension on its tendon increases, which activates GTOs. In response, the GTOs send inhibitory signals to the muscle, causing it to relax and reduce tension. In the case of wrist extension involves contracting the muscle without actually moving the wrist the send inhibitory signals to the wrist extensor muscle, causing them to relax and reduce their tension. Additionally, the activation of the GTOs can 56 also lead to an increased proprioceptive awareness of the wrist, which can improve overall coordination and control the joint.[21] A randomised controlled study which is given by Mohamed Serag Eldein et al. (2018), in which Autogenic inhibition versus reciprocal inhibition techniques on spastic children were checked and he concluded that autogenic inhibition PNF contract and relax improves the wrist extension.[21]

VII. CONCLUSION

This study concluded that Autogenic inhibition and reciprocal inhibition as a supportive tretment is effective to improve wrist extension in chronic hemiparetic patients. To reduce spasticity after stroke, this study depicts that autogenic inhibition shows better improvement than reciprocal inhibition during exerciseas per Modified Tardieu Scale and Fugl meyer

Assessment Scale. There is reduction on spasticity scales. The improvement in spasticity due to autogenic inhibition and reciprocal inhibitionis also higher than control group.

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