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Research Article

TO STUDY THE EFFECT OF POSITIONAL STRETCH ON MOBILITY ASSESSED BY TIME UP AND GO TEST AMONG POST-STROKE PATIENTS

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ABSTRACT

Background & Objective: Stroke is a disease caused by the disruption of blood vessels in the brain, such as ischemic and hemorrhagic. It is the second most common cause of death and disability worldwide. The Indian Council of Medical Research estimates that among the non-communicable disease, stroke contributes for 41% of deaths and 72% of disability adjusted life years.

Mobility as it is a critical part of maintaining independence and an essential attribute of quality of life. Prevention of abnormal muscle shortening is an important component of motor relearning programme of Carr and Shepherd. If this aspect is incorporated early in the rehabilitation programme, then the functional recovery in these patients will be better.

Aim: The present study aimed to find out the effect of positional stretch on mobility assessed by Time up and Go Test among Post-stroke patients.

Methodology: Sample size was 30.The assessment was focus on the Mobility using Time up and go test and degree of soft-tissue tightness of the four muscles include Iliopsoas, Rectus Femoris, Hamstrings and Gastrosoleus of both the side of body Pre- and Post- intervention.

Conclusion: This study shows that Positional soft tissue stretching along with conventional physiotherapy based on Motor Relearning Programme has significant improvement on Mobility in Post Stroke Patients and has significant reduction and correction of the tightness of all four muscles of both Affected and Non-affected side.

KEYWORDS: Stroke, Time up and go test (TUG), Soft tissue Tightness, Motor Relearning Programme.

INTRODUCTION

Stroke is a disease caused by the disruption of blood vessels in the brain, such as ischemic and hemorrhagic. It is the second most common cause of death and disability worldwide.[1] According to WHO stroke is defined as "acute onset of neurological dysfunction due to abnormality in cerebral circulation with resultant signs and symptoms that corresponds to involvement of focal area of brain lasting more than 24 hours".[2]

Based on the ICF model, neurological deficits from stroke are segregated into impairments of the body function, activity limitations and participation restriction.

Impaired mobility function is one of the earliest and most characteristic symptoms of wide variety of neurological dysfunction.[3] Mobility is a critical part of maintaining independence and an essential attribute of quality of life. When impairment in mobility restricts the ability of individual to move about the residence or the community to perform necessary activities of daily life, disability results.[4]

The timed up and go test (TUG-test) is an effective method of assessing mobility and quantifying locomotor performance.

The Motor relearning Programme was developed based on motor learning theory given by Carr and Shepherd. According to this theory there are main four Obstructions (1.diminished soft tissue extensibility, 2.impaired balance, 3.postural insecurity, 4.muscle weakness) which lead to Compensatory strategies. It is a critical mechanism that limits recovery following brain damage. Prevention of abnormal muscle shortening is an important component of the motor relearning programme. This is achieved by establishing appropriate postural alignment in bed, when sitting and standing in addition patients are instructed to follow daily routines to maintain muscle length through the practice of a variety of motor task.[5]

Although, there are a number of studies on the most appropriate intervention regimes in post-stroke patients, there have been very few studies on the importance of soft tissue extensibility in improving mobility function in these patients. Thus, this study aims to assess.

Methodology

An experimental study (without Pre- and Post-comparison groups) conducted to find out the effect of positional soft tissue stretching postures on functional mobility among Post-Stroke Patients. Ethical Clearance has been obtained from S.S.G Hospital, Vadodara. The study was started, after evaluation and explanation of the procedure to the patients. A written consent of all patients were taken, maintaining adequate privacy and

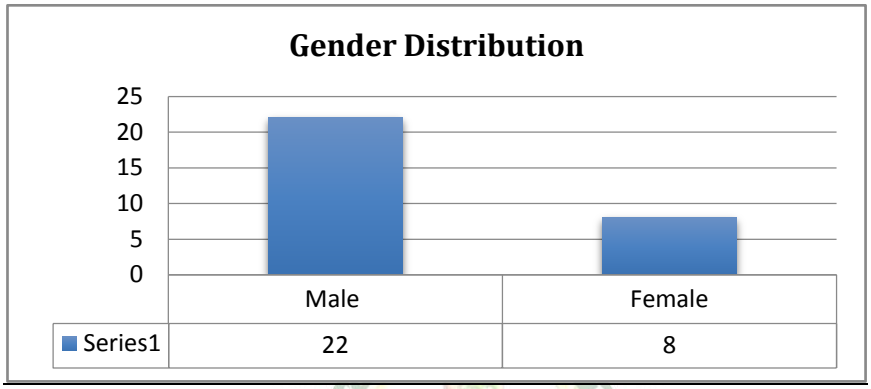
confidentiality will be taken from all patients included in the study.

30 male and female subjects aged 30-70 years having first episode of stroke with unilateral involvement and having Lower limb Voluntary Control (VC) Grade 3 and above according to Brunnstorm grading of VC were included whereas those having bilateral involvement, history of recurrent strokes, associated perceptual and cognitive deficits, aphasia and muscle tone of grade 4 according to Modified Ashworth scale were excluded. Outcome measures including TUG and muscle tightness of Iliopsoas, Hamstrings, Rectus-femoris and Gastrosoleus measured by ROM were taken pre-intervention and at 4 and 8 weeks and also after Post-intervention. All the subjects received conventional treatment along with five positional stretch postures - Prone Lying, Stride Long Sitting, Kneel Sitting, Half Kneeling and Modified Planti-grade position for 6 times a week for 8 weeks. Each posture was held for 30 seconds for 5 repetitions.

Results and discussion: All the tests and calculations were performed using MadCalc.v11.5.0.0

Table 1: Gender Distribution of Post-Stroke Patients

Gender	Male	Female	Total
Number of Patients	22	8	30



Graph: 1 Gender Distribution Of Post-Stroke Patients

Tables 2 display the statistics of Age Distribution among the 30 Post-Stroke Patients.

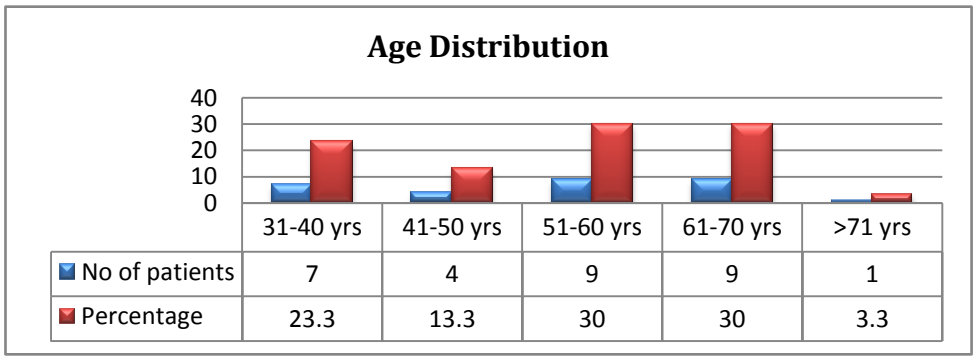
Mean Age distribution of 30 Post-Stroke Patients

Age	Mean	SD
Above 30 Years	52.867	12.053

The Mean age of all 30 Patients with 31 years onwards was 52.87 years with SD 12.05.

Table 2: Age distribution of 30 Post-Stroke Patients

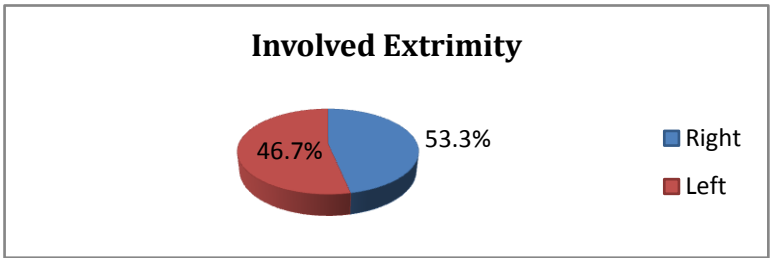
Age Group	31-40 Years	41-50 Years	51-60 Years	61-70 Years	>71 Years
Number of Patients	7	4	9	9	1
Percentage	23.3%	13.3%	30%	30%	3.3%



Graph:2 Age Distribution Of Post-Stroke Patient

Table 3: Involved Extremity Of Post-Stroke Patients

	Right	Left
Number Of Patients	14	16
Percentage	46.7%	53.3%

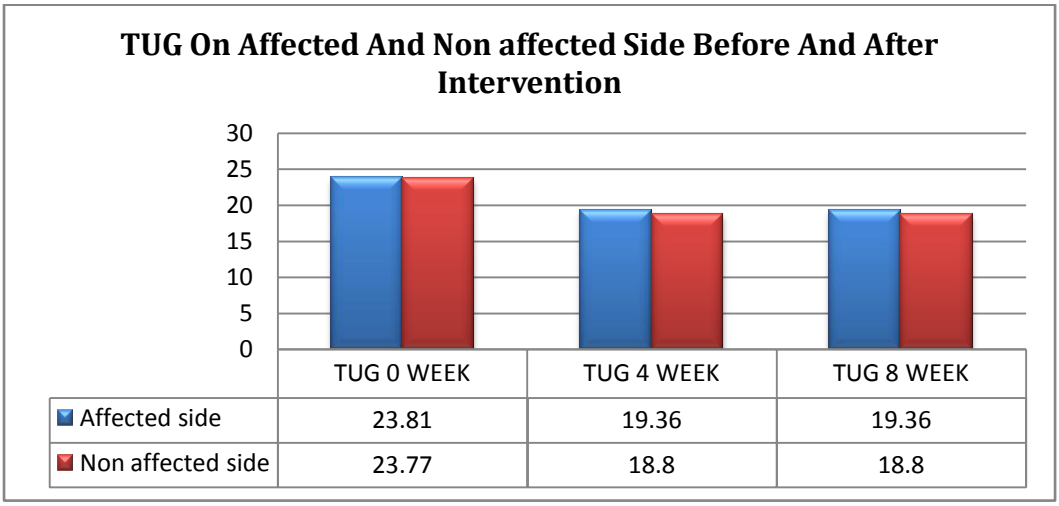


Graph:3 Involved Extremity Of Post-Stroke Patients

Table 4 A: Comparison of time up and go test on Affected and Non Affected Side Before and After The Intervention

	Affected Side			Non-Affected Side		
	0 Week	4 Weeks	8 Weeks	0 Week	4 Weeks	8 Weeks
Mean	23.81	19.36	19.36	23.77	18.8	18.8
SD	13.848	10.938	10.938	13.432	10.694	10.694
P Value	<0.001			<0.001		
Result	Significant			Significant		

Friedman test was applied for analyzing the difference of time up and go test on Affected Side and Non Affected Side Turning before and after 4 and 8 weeks. Above table shows differences in Mean and SD of Post Stroke Patients Pre-Intervention and Post-Intervention. Here, p – value is < 0.001 for Time Up and Go Test. This indicates there is highly significant improvement.



Graph: 4 Comparison of time up and go test on Affected and Non Affected Side Before and After the Intervention

Table 4 B: The Mean TUG Scores During the Intervention in Weeks Interval

TUG Score	Affected Side			Non-Affected Side		
	0-4 weeks	4-8 Weeks	0-8 weeks	0-4 Weeks	4-8 Weeks	0-8 Weeks
Mean	23.81	19.36	19.36	23.77	18.8	18.8
SD	13.848	10.938	10.938	13.432	10.694	10.694
P Value	0.0033	0.0001	<0.0001	0.0006	<0.0001	<0.0001
Result	Significant			Significant		

Wilcoxon test wasapplied for analyzing the difference of Time Up and Go Test before and at week's interval on Affected and on Non Affected Side. Above table shows differences in Mean and SD of Post Stroke Patients on Affected and Non Affected Side before and at week's interval. Here, p – value is < 0.001 for Time Up and Go Test. This indicates there is highly significant improvement.

Table: 4 C The Mean TUG Score On Affected And On Non Affected Side Turning

	0 Week		4 Weeks		8 Weeks	
Side of Turning	A	NA	A	NA	A	NA
Mean	23.81	23.77	19.36	18.8	19.36	18.8
SD	13.848	13.432	10.938	10.694	10.938	10.694
P Value	0.475		0.246		0.713	
Result	Not Significant		Not Significant		Not Significant	

Friedman test was applied for analyzing the difference of Time Up And Go Test on Affected and on Non Affected Side Turning. Above table shows differences in Mean and SD of Post Stroke Patients on Affected and Non Affected Side Turning. Here, p – value is not significant this indicates there is no statistically difference whether the turning given from Affected or Non Affected Side.

Table 5 A: Iliopsoas Muscles Tightness

	Affected Side Iliopsoas			Non-Affected Side Iliopsoas		
	0 week	4 Weeks	8 weeks	0 Week	4 Weeks	8 Weeks
Mean	11.93	9.57	9.10	13.46	9.07	7.42
SD	7.233	5.363	5.459	8.418	4.936	4.770
P Value	**<0.001**			**<0.001**		
Result	**Significant**			**Significant**		

Table 5 B: Rectus femoris Muscle Tightness

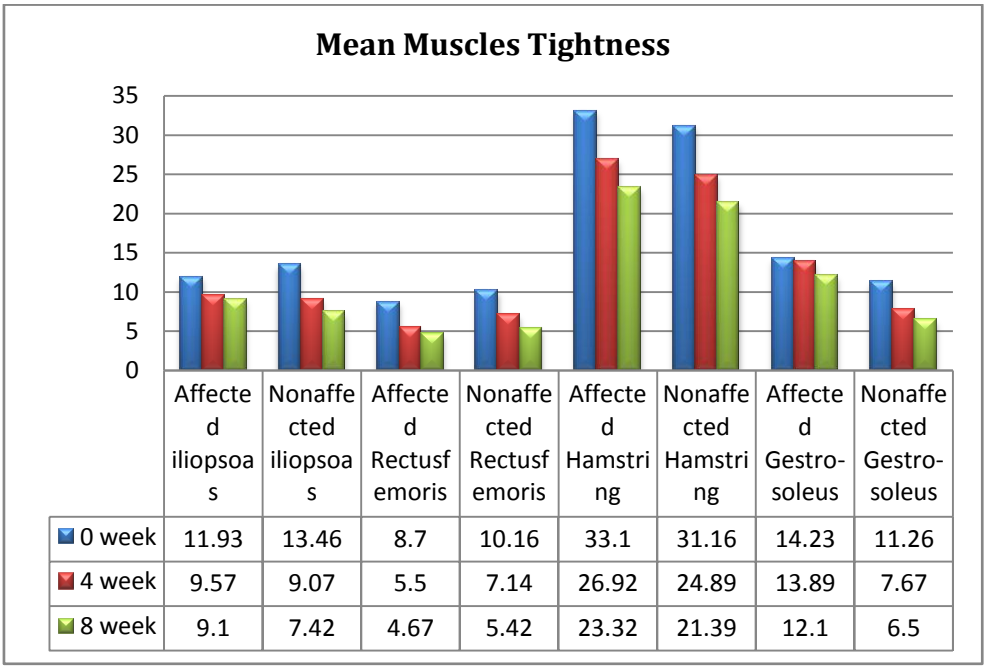
	Affected Side Rectus femoris			Non-Affected Side Rectus femoris		
	0 week	**4 Weeks**	**8 weeks**	**0 Week**	**4 Weeks**	**8 Weeks**
Mean	8.7	5.5	4.67	10.16	7.14	5.42
SD	7.211	5.029	4.414	7.884	6.867	5.439
P Value	**<0.001**			**<0.001**		
Result	**Significant**			**Significant**		

Table 5 C: Hamstring Muscles Tightness

	Affected Side Hamstring			Non-Affected Side Hamstring		
	0 week	**4 Weeks**	**8 weeks**	**0 Week**	**4 Weeks**	**8 Weeks**
Mean	33.1	26.92	23.32	31.16	24.89	21.39
SD	13.448	13.941	12.820	12.967	13.062	12.401
P Value	**<0.001**			**<0.001**		
Result	**Significant**			**Significant**		

Table 5 D: Gastro-soleus Muscles Tightness

	Affected Side Gastro-soleus			Non-Affected Side Gastro-soleus		
	0 week	**4 Weeks**	**8 weeks**	**0 Week**	**4 Weeks**	**8 Weeks**
Mean	14.23	13.89	12.10	11.26	7.67	6.5
SD	6.765	6.762	6.745	6.269	6.766	6.420
P Value	**<0.001**			**<0.001**		
Result	**Significant**			**Significant**		



Graph 5: Mean Muscles Tightness

Table 6 A: The Correlation between Iliopsoas and Tug Score on Affected And Non Affected Side Before And After Intervention

	0 Week		4 Weeks		8 Weeks	
	A	**NA**	**A**	**NA**	**A**	**NA**
Rho value	0.140	-0.146	-0.0356	-0.101	0.292	-0.147
p value	0.4604	0.4427	0.8572	0.6092	0.1316	0.4567
Correlation	+	-	-	-	+	-
Result	NS	NS	NS	NS	NS	NS

Table 6 B: The Correlation Between Rectus Femoris and Tug Score on Affected and Non Affected Side Before and After Intervention

	0 Weeks		4 Weeks		8 Weeks	
	A	**NA**	**A**	**NA**	**A**	**NA**
Rho value	-0.457	-0.237	0.0250	-0.138	0.00838	-0.183
p value	**0.0111**	0.2074	0.8993	0.4849	0.9663	0.3513
Correlation	-	-	+	-	+	-
Result	S	NS	NS	NS	NS	NS

Table 6 C: The Correlation Between Hamstring and Tug Score on Affected and Non Affected Side Before and After Intervention

	0 Weeks		4 Weeks		8 Weeks	
	A	**NA**	**A**	**NA**	**A**	**NA**
Rho value	0.0974	0.0540	0.457	0.205	0.457	0.260
p value	0.6088	0.7768	**0.0145**	0.2948	**0.0146**	0.1814
Correlation	+	+	+	+	+	+
Result	NS	NS	S	NS	S	NS

Table 6 D: The Correlation Between Gestro-soleus and Tug Score On Affected And Non Affected Side Before And After Intervention

	0 Weeks		4 Weeks		8 Weeks	
	A	**NA**	**A**	**NA**	**A**	**NA**
Rho value	0.04580	0.225	0.477	0.266	0.381	0.143
p value	0.8101	0.2322	**0.0102**	0.1719	**0.0455**	0.4664
Correlation	+	+	+	+	+	+
Result	NS	NS	S	NS	S	NS

Results of Correlation between the Tightness of all four muscles include Iliopsoas, Rectus Femoris, Hamstrings and Gastrosoleus and Time Up and Go Test before and after intervention in which

Hamstrings and Gastrosoleus Muscles of Affected Side showed Positive correlation which is statistically significant while non-affected side showed Positive correlation with not significant value.

Iliopsoas Muscles of Affected Side at 0 and 8 week showed positive correlation and at 4 week showed negative correlation with no significant value and of Non-Affected Side showed negative correlation with no significant value.

Rectus-Femoris Muscle on Affected Side at o week showed negative correlation with significant value, at 4 and 8 week showed positive correlation but no significant value and Non-Affected Side at 0 week and 4 week showed negative correlation and at 8 week showed Positive correlation with not significant value.

Hence, Null Hypothesis of no effect of positional stretch with conventional physiotherapy can be rejected and Alternate Hypothesis of there is an effect of positional stretch with conventional therapy can be accepted in post-stroke patients.

DISCUSSION

In present study the conventional therapy was given in form of exercises to reducing muscle tone, for improving sensory function, for improving muscle force, flexibility & joint integrity, range of motion, improving strength & upper extremity function, Training in functional activities such as sit to stand, standing, reaching, weight transfers were given.

This study was conducted to find out the effect of positional soft tissue stretching on Mobility assessed by Time up and go Test among post- stroke patients.

In this study all patients received conventional therapy along with additional “Five Positional Stretch Postures”. The result of analysis for the present study showed significant reduction in Tightness of four muscles

namely Iliopsoas, Rectus Femoris, Hamstrings and Gastrosoleus and time up and go test on affected and non affected side before and after intervention (at 4 and 8 weeks) ($p<0.0001$).

Certain neuromuscular mechanisms acting on muscles influence 'tension' and have important implications for the value of stretching. These mechanisms include the stretch reflex, autogenic inhibition and reciprocal inhibition.

Held static stretches are done so that the joints are placed in the outer limits of the available range. This type of stretching is ideal to stretch the connective tissue/non-contractile elements since it makes use of the viscoelastic properties to cause elongation of the tissue. Furthermore, it makes use of autogenic inhibition to trigger a relaxation in the muscle.[6]

Given interventions worked on these neuromuscular mechanisms and hence showed reduction in tightness.

Present study shows that there is no differences in time taken by patients in Time up and go test whether the turning is given from affected or non affected side which is supported by the study Faria CD et al in 2009 concluded a study "Effects of the direction of turning on the timed up & go test with stroke subjects." Twenty-two hemiparetic and 22 matched control subjects performed the TUG twice, with each one turning in both directions. no significant correlations were found, that the larger differences between the two TUG trials for the stroke subjects illustrated the impact of the turning direction on test performance. These differences were not related to hemiparesis, but to the fear of falling.

Results of Correlation between the Tightness of all four muscles include Iliopsoas, Rectus femoris, Hamstrings and Gastrosoleus and Time Up and Go Test on affected and non affected side before and after intervention in which

Hamstrings and Gastrosoleus Muscles of affected side showed Positive correlation which is statistically significant while non-affected side showed Positive correlation with not significant value. In one correlation study done by Shah Chaitali in 2013 "The effect of Hamstring and Calf Tightness on Static, Dynamic Balance and Mobility" in which 30 subjects between age group of 40–60 yr were selected. Tightness of calf and hamstring were measured. Time Up and Go test for mobility (TUG), measure was taken to find the correlation with the tightness. And concluded that Hamstrings and calf tightness shows highly positive correlation with mobility.

Therefore the present study suggests that the correlation exists between tightness, and mobility.

Iliopsoas muscle of affected side at 0 and 8 week showed positive correlation and at 4 week showed negative correlation with no significant value and of non-affected side showed negative correlation with no significant value.

Rectus Femoris muscle on affected side at o week showed negative correlation with significant value, at 4 and 8 week showed positive correlation but no significant value and non-affected side at 0 week and 4 week showed negative correlation and at 8 week showed Positive correlation with not significant value.

This study is on the basis of Motor relearning programme. According to this theory there are main four Obstructions (1.diminished soft tissue extensibility, 2.impaired balance, 3.postural insecurity, 4.muscle weakness) which lead to Compensatory strategies. It is a critical mechanism that limits recovery following brain damage. Prevention of abnormal muscle shortening is an important component of the motor relearning programme. This is achieved by establishing appropriate postural alignment in bed, when sitting and standing in addition patients are instructed to follow daily routines to maintain muscle length through the practice of a variety of motor task.[5]

Which is also supported by the study done by Dora YL Chan, Chetwyn CH Chan in 2006 "Motor relearning programme for stroke patients: a randomized controlled trial" Concluded that The motor relearning programme was found to be effective for enhancing functional recovery of patients who had a stroke.

Study emphasize on positional stretch postures which lead to stretching and that will improve mobility in post stroke patients. Terms such as static, sustained, maintained, and prolonged are all used to describe a long-duration stretch. Static stretching is well accepted as an effective form of stretching to increase flexibility.[7,8] Mobility as it relates to functional ROM is associated with joint integrity as well as the flexibility.[9]

Daniel S. Marigold, MSc, Janice J. Eng ,et al in 2005studied "Exercise Leads to Faster Postural Reflexes, Improved Balance and Mobility, and Reduced Falls in Older Persons with Chronic Stroke" concluded that Group exercise programs that include Agility or Stretching/ weight shifting exercises improve postural reflexes, functional balance and mobility and may lead to a reduction of falls in older adults with chronic stroke.

Stacy L. Fritz, MSPT, PhD, Ashlee L. Pittman, DPT, Anna C. Robinson, DPT, Skylar C. Orton, DPT, Erin D. Rivers, DPTin 2007 studied "An Intense Intervention for Improving Gait, Balance, and Mobility for Individuals With Chronic Stroke: A Pilot Study" provided over-ground walking, sit to stand, stair-climbing, various balance activities (tandem stance, single leg stance), proprio-ceptive activities, range of motion, stretching activities, strengthening activities, coordination tasks, and motor re-education Concluded the result suggests that positional soft tissue stretching can improve the Mobility among post- stroke patients.

CONCLUSION

The null hypothesis of no significant effect of soft tissue stretching on a functional Mobility among Post-stroke patients is rejected. This study provides good evidence that Positional soft tissue stretching along with conventional physiotherapy based on Motor Relearning Programme has significant improvement on Mobility in Post Stroke Patients.

This study also showed that Five Positional Stretch Postures with conventional physiotherapy has significant reduction in the tightness of all four muscles

which include Iliopsoas, Rectus Femoris, Hamstrings And Gastrosoleus in both affected and non-affected side and improvement in Time up and Go Test in 4 weeks and 8 weeks of duration.

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