

MOTOR RELEARNING APPROACH : THE EFFECT OF POSITIONAL STRETCH POSTURES ON TRUNK FUNCTION AMONG POST-STROKE PATIENTS

Physiotherapy

Dr Purvi Shah*

(PT), Assistant Professor, BITS Institute of Physiotherapy, Varnama, Vadodara.
*Corresponding Author

Dr Nilima Patel

(PT), I/C HOD and Principal, Government College of Physiotherapy, SSG Hospital, Faculty of Medicine, Vadodara.

ABSTRACT

Good trunk stability is essential for balance and extremity use during daily functional activities and performance of higher-level motor tasks and remains impaired after Stroke. It is also strongly related with measures of Balance, Gait and Functional ability after Stroke. There are a number of studies on various approaches used in Stroke. But there have been very few studies available relating Motor Relearning Approach which concentrates on the importance of Positional Stretch Postures with Conventional therapy in improving Trunk function among the Post-stroke patients. Thus this study aims at assessing the effectiveness of the Positional Stretch Postures in improving the Trunk function. This experimental study conducted on 30 stroke patients were assessed on trunk function using Trunk Impairment scale and degree of soft-tissue tightness of four muscles namely Iliopsoas, Rectus femoris, Hamstrings and Gastrosoleus of both sides pre- and post- intervention

KEYWORDS

Post- Stroke, Motor Relearning approach, Trunk function, Positional stretch postures, Conventional physiotherapy, Tightness, Trunk Impairment Scale

I. INTRODUCTION

WHO defines Stroke 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". Early rehabilitation optimizes the patient's potential for functional recovery.² There are many interventional strategies used in stroke including Motor Relearning Approach.³ Impairment of Trunk Control in hemiplegic or paretic patients has been documented and characterized by asymmetry in performance of rotatory and side bending activities.^{4,5} A systematic review of clinical tools designed to evaluate trunk performance after stroke has concluded Trunk Impairment scale developed by Verheyden et al has found to be with essential psychometric properties in stroke.⁶

Most literature concerning rehabilitation after Stroke focuses on the hemiplegic upper and lower limbs, while the trunk receives little attention.^{6,7} Further, decreased extensibility of connective tissue, not the contractile elements of muscle tissue, is the primary cause of restricted ROM in both healthy individuals and patients with impaired mobility as the result of injury, disease, or surgery. Prevention of abnormal muscle shortening is an important component of Motor Relearning Programme (MRP).^{8,9}

11. MATERIALS AND METHODS

This experimental study aimed to assess the effect of Soft tissue stretching in improving the trunk function among Post-stroke patients. Ethical clearance was obtained after which study was started, followed by evaluation and explanation of procedure. 30 male (22) and female (8) 30-70 years old patients having 1st episode of stroke with unilateral involvement and lower limb Voluntary control Brunnstorm grade 3 or above were included in the study. Patients with bilateral, recurrent strokes and associated perceptual, cognitive deficits, aphasia were excluded. Outcome measures including TIS and muscle tightness of Iliopsoas, Rectus femoris, Hamstrings and Gastrosoleus

measured by appropriate tests were taken pre- and post-intervention. All the subjects were given a daily exercise regime that included Conventional Physiotherapy (Mat activities and functional training) with an additional emphasis on 'Five' Positional Stretch Postures that included Prone Lying position, Long Sitting position, Kneel Sitting position, Half Kneel Stand position, Modified Plantigrade position. for 6 times a week for 8 weeks. Each posture was held for 30 secs for 5 repetitions.

III. RESULTS

All the tests and calculations were performed using Med Calc. v11.5.0.0

The Trunk Impairment Scale scores (TIS scores) were compared before and after intervention using the Wilcoxin Signed Rank Test which showed highly significant difference in the scores ($P < 0.0001$).

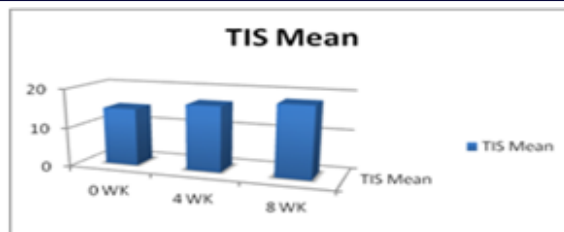


Table 1 : Mean TIS scores before and after the intervention

TIS scores	Pre-intervention	Post-intervention (4 weeks)	Post-intervention (8 weeks)
Mean	14.7 +/-2.6	16.7 +/-2.2	18.1 +/-1.8
	0-4 wks	4-8 wks	0-8 wks
Z value	-4.45	-4.01	-4.2
P value	P<0.0001	P<0.0001	P<0.0001
Result	significant	significant	significant

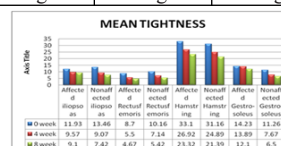
The differences in the soft-tissue tightness' of the four muscles before and after intervention (at 4 and 8 weeks) were analyzed using Friedmann's Test which were found to be statistically significant ($P < 0.0001$).

Table 2 - Mean tightness of Iliopsoas & Rectus femoris before & after intervention

Weeks	Iliopsoas		Rectus femoris	
	A	NA	A	NA
0	11.9	12.7	8.8	10.3
4	9.6	9.07	5.5	7.14
6	9.10	7.4	4.7	5.4
Result	P<0.01	P<0.01	P<0.01	P<0.01
	Sig.	Sig.	Sig.	Sig.

Table 3 - Mean tightness of Hamstrings & Gastrosoleus before & after intervention

Weeks	Hamstrings		GastroSoleus	
	A	NA	A	NA
0	32.8	30.1	14.0	11.0
4	26.9	24.9	13.9	7.7
8	23.3	21.4	12.07	6.5
Result	P<0.01	P<0.01	P<0.01	P<0.01
	Sig.	Sig.	Sig.	Sig.



The Correlation between the soft-tissue tightness' of the four muscles and the TIS scores, before and after intervention, was found out by **Rank Correlation**.

Table 4 - Correlation between Iliopsoas (IP) tightness of muscles and TIS scores

IP	0week		4 weeks		0 weeks	
	A	NA	A	NA	A	NA
Rho	0.2	-0.2	0.2	-0.3	-0.08	-0.19
P value	0.3	0.11	0.1	0.08	0.6	0.3
Significance	NS	NS	NS	NS	NS	NS
Correlation	+	-	+	-	-	-

Table 5 - Correlation between Rectus Femoris (RF) tightness of muscles and TIS scores

RF	0week		4 weeks		0 weeks	
	A	NA	A	NA	A	NA
Rho	-0.001	-0.2	0.01	-0.009	0.01	0.01
P value	0.9	0.2	0.9	0.9	0.9	0.9
Significance	NS	NS	NS	NS	NS	NS
Correlation	-	-	+	-	+	+

Table 6 - Correlation between tightness of Hamstrings (Hams) muscles and TIS scores

Hamstrings	0week		4 weeks		0 weeks	
	A	NA	A	NA	A	NA
Rho	-0.1	-0.1	-0.2	0.01	-0.4	-0.13
P value	0.3	0.5	0.2	0.95	0.01	0.4
Significance	NS	NS	NS	NS	NS	NS
Correlation	-	-	-	+	-	-

Table 7 - Correlation between tightness of Gastrosoleus (GS) muscles and TIS scores

GS	0week		4 weeks		0 weeks	
	A	NA	A	NA	A	NA
Rho	-0.4	-0.2	-0.5	-0.3	-0.5	-0.2
P value	0.01	0.18	0.002	0.05	0.006	0.17
Significance	NS	NS	NS	NS	NS	NS
Correlation	-	-	-	-	-	-

IV. DISCUSSION

The results of analysis for this study showed highly significant improvements in **Tightness'** of the Ilio-Psoas, Rectus Femoris, Hamstrings and Gastrosoleus for almost all the patients. ($p < 0.0001$).

In addition to it, significant effects of the intervention was also seen on the Trunk function which was measured by the **Trunk Impairment Scale scores** ($p < 0.0001$).

The **correlation** between the Tightness and the Trunk function showed significant reduction in tightness that improved the trunk function. Significant negative correlation of Trunk function with **Gastrosoleus** muscles correlates well with the literature. A study says that the Calf muscles control three dimensional motions at the foot, at the knee, at the hip and at the trunk.¹⁰ and that the Calf controls the trunk and thoracic spine in all three planes of motion. An institutional article mentions that some biomechanical issues such as multifidus, abdominal oblique and serratus weakness, hallux limitus, foot pronation, and quadriceps or gastroc-soleus tightness imbalance the setter's sagittal trunk musculature.¹⁰

In the present study, **Hamstrings** also show significant correlation with the Trunk Impairment Scale scores. **Sherry MA et al 2004**, mentions the trunk as one of the drivers of the hamstrings with respect to function and that Hamstrings dominate over the entire posture of the body.¹¹ Furthermore, **Anthony S. Kulas et al in 2010** found that trunk-control strategies affect knee joint forces through alterations in muscle forces, specifically the biarticular hamstrings and that Tightness in Hamstrings muscle limits motion in the pelvis corrupting correct posture.¹²

Though, the present study did not show a significant correlation of trunk function with **Iliopsoas** and **Rectus Femoris**, the available literature shows some relation.

Limitations of the study includes limited sample size and drop-outs. Longer follow-up can be undertaken to quantify the improvement in a better way. A control group may also be included for better comparison.

V. CONCLUSION

From this study, one can state that Conventional Physiotherapy with an additional emphasis on Positional Stretch Postures have a positive effect on Tightness prevention and correction as well as Trunk function. In other words, this intervention is helpful in reducing the soft-tissue tightness as well as in improving the Trunk function.

It should be included in the early phase of rehabilitation of the stroke patients when the ability of the neural plasticity in C.N.S. is highest. Maximum gains can be achieved in a longer training period.

The Motor Relearning Approach, is thus an effective approach which should be incorporated with Conventional Physiotherapy program in order to reduce the Soft-tissue tightness of the four muscles and Trunk function. This will further improve the functional status of the patient.

REFERENCES:

1. World Health Organization, Cerebrovascular Disorders Geneva: World Health Organization, 1978. 1. World Health Organization, Cerebrovascular Disorders Geneva: World Health Organization, 1978.
2. Adams H, et al (Eds): Management of patient with Acute Ischemic Stroke. American Heart Association, Dallas, 1994.
3. Hayes S & Carroll S: Early intervention care in the acute stroke patient. Arch Phys Med Rehabilitation 1986; 65: 319.
4. Karatas M, Cetin N Bayramoglu M, Dilek A. Trunk muscle strength in relation to balance and functional disability in unihemispheric stroke patients. Am J Phys Med Rehabil 2004; 83:81-87.
5. Bohannon RC, Recovery and correlates of trunk muscle strength after stroke Int J Rehabil Res 1995; 18:262-67.
6. Verheyden G, Nieuwboer A, Feys H, Thijs V, Vae K, De Weert W. Discriminant ability of trunk impairment scale : a comparison between stroke patients and healthy individuals. Disabil Rehabil 2005; 27:1023- 1028
7. Tanaka S, Hachisuka K, Ogata H. Muscle strength of trunk flexion- extension in post-stroke hemiplegic patients, Am J Phys Med Rehabil. 77, 1998, 288-290.
8. Carr JH, Shepherd RB. A motor relearning programme for stroke. Butterworth-Heinemann Physiotherapy, 1987.
9. Carr, J. H., & Shepherd, R. B. (1987). A motor relearning programme for stroke (2nd ed.). Oxford: Butterworth-Heinemann.
10. Gary Gray, 2002 'A Traditional Approach Versus A Functional Approach to Understanding the Calf and its Relationship to the Rest of the Body'
11. Sherry MA, Best TM. A comparison of two rehabilitation programs in the treatment of acute hamstring strains. J Orthop Sports Phys Ther 2004 Mar 34: 116-25
12. Anthony S. Kulas, Tibor Hortobágyi, and Paul DeVita The Interaction of Trunk-Load and Trunk-Position Adaptations on Knee Anterior Shear and Hamstrings Muscle Forces During Landing J Athl Train. 2010 Jan- Feb;45(1):5-15. doi: 10.4085/1062-6050-45.1.5.