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# Trunk specified Asanas versus Proprioceptive Neuromuscular Facilitation Trunk Pattern on Trunk Balance and Posture In Stroke Patients

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## Abstract

**Background:** Stroke is a major cause disability among males and females, it majorly affects the trunk function and postural control. Common mal-alignment seen are ventral and lateral tilt of pelvis that leads to postural dysfunction which causes poor control of lower limb after stroke that influences the functional task and body positioning with disturbed balance. There are evidence that support PNF approach, which uses a set rule that any motion starts from proximal segment to distal body segment. There are beliefs that support Trunk specific training can significantly improve Postural control.

**Objective:** The objective of this study is to find out the effect of Trunk specified versus Proprioceptive neuromuscular facilitation Trunk Pattern on Trunk Balance and Posture in stroke patients

**Methods:** A total of 30 participants with a Score of at least 9 or maximum 30 in PASS scale and a Score of at least 20 or maximum 50 in TCMS were included in the study. Study group (Group A) consist of 15 subjects who received Trunk specific Asanas and Control group (Group B) consist of 15 subjects who received PNF therapy along with conventional therapy program for 30 minutes of duration.Total 16 sessions ( 4 sessions a week) were given. Prior to administration of Trunk exercises and PNF with conventional therapy.
Baseline measurement used were Postural assessment scale for stroke (PASS), trunk control measurement scale (TCMS) and balance master(BMLOS).
**Results:** Wilcoxon test was used for within group whereas Mann-Whitney test was used for between group comparison. The test reveals that both the treatments are having similar improvement in trunk instability and postural control ($p<0.05$), however Trunk specific Asanas group showed better results in terms of Trunk control measurement scale($p<0.05$)
**Conclusion:** Trunk specified Asanas and trunk PNF, both are equally effective for trunk control, Trunk stability improves mostly with Trunk specific Asanas in comparison with trunk PNF.

**Keywords:** Trunk specified Asanas, postural control, trunk instability, stroke and PNF

## Introduction

Interruption of the blood flow to the brain causes the sudden loss of neurological function which results in Brain attack or Stroke. Now a days major cause of disability in our society is a commonest neurological disorder. It is considered with the persistence of symptoms more than 24 hours, variety of symptoms including altered sensorium, disturbance in sensory profile, changes in motor behavior, language, perceptual and cognitive functions are the focal deficits[1].Incidence of stroke is approximately 700,000 individuals in United States each year. In which total percentage of new stroke are 500,000 and total percentage of recurrent strokes are 200,000. Incidence of stroke according to who was 130/100,000 individuals every year[5].
Pelvis behaves as functional and non-functional component as when sitting it is a part of lower extremity and useful integral of the lower limb when body working against gravity. Common mal-alignment seen in pelvis is exaggerated ventral and dorsal tilt after stroke, due to which erect loading

in between the feet is affected. Recently the studies done to find out the qualitative effect of yoga on stroke are very less however, two quantitative studies done previously on benefits of participation of stroke people in yoga programme. These studies have shown a great deal of benefit regarding mobility, coordination and balance recovery by providing the people with their yoga programmes. However, both the studies took a small sample sizes and they lacked in terms of data regarding feedback of people who received the therapy programmes. Studies done in past supported the yoga therapy in several ways, saying that it could be easily adapted by patients, will be cost effective and based on community. In our further study we try to find out the improvement in broader aspect like correction of posture, stability of trunk during reaching and reaction time for planning any movement. For that proprioceptive senses are applied to improve the motor senses through out the body including spine. When the proprioceptors are activated they are carried by an afferent system to the muscles, joint and skin receptors, which in turn will provide a feedback of the degree of muscular contraction, muscles shapes, where and how much joint movement is occurring. Proprioceptive neuromuscular facilitation (PNF) techniques are known to be effective at improving proprioceptive function[7].
We are using trunk patterns for strengthening of trunk muscles, some important uses for these are:
1) Irradiation- irradiation is provided with restriction of lower trunk patterns and Incidental treatment of the neck and scapular muscles
2) There is a sustenance in upper trunk patterns which moves the pelvis over femur and thus exercises the hip.
3) Giving resistance to trunk will also irradiate other extremity for e.g., giving resistance to lower extremity while doing trunk flexion and extension, arm muscles will act as stabilizers.
We have three outcome, Trunk Control Measurement scale(TCSM), Postural Assessment Scale for Stroke(PASS) and Balance Master component taken is Limits of Stability(LOS).
Trunk Control Measurement scale(TCSM) -: The aim of outcome measure is to measure trunk sitting capacity. This outcome measure is consistent with various parameters of testing such as sitting balance in stationary and movable aspect, which is having sub examining parameters such as dynamic sitting balance and selective movement control. This is a good reliable assessment tools in 8 to 15 years with spastic CP child[8].
Postural assessment scale for stroke (PASS): It is specifically designed to assess and monitor postural control after stroke. It contain 12 four- level items of varying difficulty for assessing ability to maintain or change a given lying, sitting and standing posture[9].
Balance master limits of stability (BMLOST): computerized systems developed to assess dynamic stability to measure balance in clinical or research settings. it is an automated standing platform in which the support surface and visual surround move to challenge the balance responses, it is reliable in assessing the static postural sway, dynamic weight shift and dynamic limits of stability on a stable platform[10].

## Materials & Methodology

After the institutional Ethical committee approval obtained.Total of 45 Stroke patients were screened. Paricipants were added in the process who satisfy the inclusion criteria were 1.Patient post stroke with medical stability. 2. First episode of either hemorrhagic or Ischemic stroke 3.Scoring at least 24/30 in MMSE scale 4.Score of at least 9 or maximum 30 in PASS scale 5.Score of at least 20 or maximum 50 in TCMS scale 6. Age: 40 to 65. No previous treatment of PNF given to pelvic region in past 6 month. The study was carried out in Dr D .Y. Patil College of Physiotherapy, Pimpri, Pune.
The participants were assigned randomly into two groups by simple random sampling method. Study group (Group A) consist of 15 subjects who received Trunk specific Asanas and Control group (Group B) consist of 15 subjects who received PNF therapy along with conventional therapy program for 30 minutes of duration. The study Group received 8 Asana which included 4 supine asana, 1. Single knee to chest 2. Knee down spinal twist, 3.Bridge pose, 4. Cobra pose and 4 seated Asana,1.Child pose, 2. Cat pose, 3. Cow pose, 4. Seated chair twist, each Asana performed for 3 times with hold time of 30 to 40 seconds.
Total 16 sessions ( 4 sessions a week) were given. Prior to administration of Yoga and PNF with

conventional therapy
Baseline measurement used were Postural assessment scale for stroke (PASS), trunk control measurement scale (TCMS) and balance master(BMLOS)

**INTERVENTION PROTOCOL FOR GROUP A:**
Elements of Trunk specified Asanas:
Body awareness and warm-up (5-1 0min)
Warm-up activities(seated in chair)
Yoga Asanas(30min): ·

**Supine/prone Exercises-**

| | | |
|---|---|---|
| 1. | Single knee to chest | Apanasana |
| 2. | Knee down spinal twist | Suptamatsyendrasana |
| 3. | Bridge pose | Setubandhasana |
| 4. | Cobra pose | bhujangasana |

**Seated Exercises-**

| | | |
|---|---|---|
| 1 | Child pose | Balasana |
| 2 | Cat pose | Marjriasana |
| 3 | Cowl pose | Bitilasana |
| 4 | Seated chair twist | Parivrtta Sukhasana |

**INTERVENTION PROTOCOL FOR GROUP B:**

**ELEMENTS OF PNF**: Position of patient, Grip, Elongated position, Stretch; Command, Movement, Resistance, End position

**SEQUENCE UNDER PATTERN1:**:
1. Lower trunk flexion (by bilateral lower extremity flexion, with knee flexion)

Each pattern is performed for total of 10 minutes including two minutes of rest interval. The participants position used in the study is supine lying position which allows free motion of the pelvis[2].

**SEQUENCE UNDER PATTERN2**:
2. Lower trunk extension (by bilateral lower extremity extension, with knee extension)

## Statistical Analysis:

A total of 30 subjects participated in the study (15 in group A and 15 in group B).Data analysis and interpretation was done using the statistical package: Winpepi software (version 11.65) and Primer of Biostatistics (version 7). Initially the normality of the data was analyzed using Shapiro Wilk Test in Win Pepi software. Then the difference between the pre and post reading of each component of one group was compared with the difference of the respective component of the other group. The intra-group comparison

was done by using Wilcoxan Signed Rank Test, whereas the inter-group comparison was done using the Mann-Whitney test for data that was not normally distributed. The level of significance was determined by $p<0.05$ at 95% confidence interval..

## Data Analysis And Interpretation

**Table 1: Demographic representation of age, gender and side affected**

| Group | Mean age | Gender | | Side affected | |
|---|---|---|---|---|---|
| | | male | Female | Right | Left |
| Group A | 58.4 | 12 | 3 | 5 | 10 |
| Group B | 51.6 | 10 | 5 | 3 | 12 |

**Table 2: Values of mean score and Comparison of PASS in group A and group B**

| GROUP | Mean score within group | Mean score Between group | SD for Within group | SD for Between Group | T value For Within group | T value For between group | P value For Within group | P value For between group | Interpretation |
|---|---|---|---|---|---|---|---|---|---|
| GROUP A PRE | 22.33 | 4.8 | ±2.35 | ±2.0 | 8.9 | 1.44 | 0.000 | 0.16 | Within group Statistically significant. Between group Statistically non-significant. |
| POST | 27.13 | | ±3.52 | | | | | | |
| GROUP B PRE | 25.27 | 3.8 | ±3.08 | ±1.4 | 10.6 | | 0.000 | | |
| POST | 29.13 | | ±2.56 | | | | | | |

**Table 3: Values of mean score and Comparison of TCSM in group A and group B**

| GROUP | Mean score within group | Mean score Between group | SD for Within group | SD FOR BETWEEN GROUP | P VALUE FOR WITHIN GROUP | P Value for Between group | INTERPRETATION |
|---|---|---|---|---|---|---|---|
| GROUP A PRE | 24.07 | 6.2 | ±4.5 | 5.4 | 0.000 | 0.901 | Statistically significant. |
| POST | 30.27 | | ±7.8 | | | | |
| GROUP B PRE | 22.2 | 5.5 | ±2.4 | 3.3 | 0.000 | | |
| POST | 27.8 | | ±3.6 | | | | |

**Table 4: Values of mean score and comparison of Movement velocity in group A and group B**

| GRP/MVL | FRWD | | | RT FRWD | | | RT | | | RT BKWD | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PRE | POST | P value | PRE | POST | P value | PRE | POST | P value | PRE | POST | P value |
| A | 2.6 | 2.4 | 0.7 | 1.4 | 1.9 | 0.003 | 3.5 | 4.4 | 0.2 | 5.1 | 3.5 | 0.2 |
| B | 2.0 | 2.8 | 0.2 | 1.9 | 2.1 | 0.2 | 3.9 | 4.2 | 0.8 | 1.6 | 4.2 | 0.000 |

| GRP/MVL | FRWD | | | RT FRWD | | | RT | | | RT BKWD | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean score | P value | T value | Mean score | P value | T value | Mean score | P value | T value | Mean score | P value | T value |
| A | 0.2 | 0.2 | 1.2 | 0.5 | 0.09 | 1.7 | 0.9 | 0.5 | 0.5 | 1.6 | 0.008 | 2.8 |
| B | 0.8 | | | 0.1 | | | 0.1 | | | 2.5 | | |

**Table 5: Values of mean score and comparison of Movement velocity in group A and group B**

| GRP/MVL | BKWD | | | LT BKWD | | | LT | | | LT FRWD | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PRE | POST | P value | PRE | POST | P value | PRE | POST | P value | PRE | POST | P value |
| A | 2 | 3.1 | 0.06 | 3.4 | 3.7 | 0.5 | 3.0 | 5.4 | 0.04 | 3.1 | 3.7 | 0.4 |
| B | 2.6 | 3.8 | 0.1 | 2.5 | 4.4 | 0.01 | 4.0 | 4.2 | 0.7 | 3.8 | 4.1 | 0.7 |

| GRP/MVL | BKWD | | | LT BKWD | | | LT | | | LT FRWD | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean score | P value | T value | Mean score | P value | T value | Mean score | P value | T value | Mean score | P value | T value |
| A | 1.1 | 0.3 | 0.8 | 0.3 | 0.7 | 0.3 | 2.4 | 0.08 | 1.8 | 0.6 | 0.8 | 0.2 |
| B | 0.4 | | | 0.6 | | | 0.1 | | | 0.2 | | |

## Results

**PASS** measurement in the Group A at the baseline was 22.33 with standard deviation of ±2.35 and at the end of 4 weeks measurement was 27.13 with standard deviation ±3.52, T value of 8.9 and ($p< 0.005$) showing high statistical significance. In Group B at the baseline was 25.27 with SD of ±3.08 and at the end of 4 weeks measurement was 29.13 with SD of ± 2.56, T value of 10.6 and ($p<0.005$) showing high statistical significance.

**TCSM** measurement in the Group A at the baseline was 24.07 with SD of ±4.5 and at the end of 4 weeks measurement was 30.27 with SD of ±7.8 and ($p<0.005$) showing high statistical significance. In Group B at the baseline was 22.2 with SD of ±2.4 and at the end of 4 weeks measurement was 27.8 with SD of ±3.6 and ($p<0.005$) showing high statistical significance.

**Table 4** shows significant improvement in Right forward direction in Group A with baseline difference of 1.4 to 1.9 post intervention. Whereas in Group B there is a statistically significant improvement ($p<0.005$) in Right backward direction with change in the baseline of 1.6 and 4.2 post 4 weeks of intervention in Movement velocity, rest all directions shows non-significant improvement.

**Table 5** shows a non-significant improvement in Movement velocity almost all directions in both the groups post intervention of 4 weeks.

## Discussion

In the present study, the demographic distribution of mean age in group A was 58.4 and that of group B was 51.6. In this study 80% of subject's percent had dominant side affected and 20% percent subjects had non dominant side affected. These results are consistent with the findings of Jocelyn E Harris et.al, who conducted an epidemiological survey on individuals with the dominant hand affected following stroke, found out that in between 45-50% of stroke patients who are having left hemisphere lesion are affected with right side paresis, but factually 80% of persons are right sided dominant, a good amount of patients will have dominant side affected.

Findings from the data analysis and results showed that the intervention promotes Postural control and Trunk instability in both the groups. There was significant improvement seen in PASS (postural assessment scale for stroke), with mean difference of 4.8 in group A and mean difference of 3.8 in group B, which suggest that there was more clinical improvement in control group i.e. Group B, but did not show statistical difference as stated by Dildip Khanal and colleagues in stroke patients, postural control system is affected by postural deviation of trunk and pelvis. Also inappropriate muscular activity pattern in lower limb causing spasticity and weakness along with soft tissue stiffness.PNF has shown a good effect in improving the truncal movements and initiating smooth and coordinated movement of extremities, So the benefit of PNF patterns were seen in group B regarding the PASS as baseline measurement.

Our study have also shown improvement in TCSM (trunk control measurement scale) we observed that both the groups improved significantly, there was a significant improvement in group A compared to group B with mean difference of 6.2 in group A and mean difference of 5.5 in group B, which suggest that incorporation of all asana on the patients create a remarkable effect. These results also shows that difference in TCSM score of Trunk specific Asanas is more when compared to control group, this is due to less effect of PNF technique on improving trunk control as it may be creating a local effect rather than gross and there might be a need for improvement in the technique of application which may improve overall effect. So there is an implementation of all the asana which are progressing the patients from the primitive stage through the developmental stage. These yoga poses reduces the excess tone and longer hold time promotes the lasting effect which supports our finding of difference in TCSM score of experimental group when compared to control group.

In a study done by by Robyne Garrett and colleagues yoga is derived from the Sanskrit root verb 'Yuj' which gives a simple meaning of union of mind, body and soul, the major purpose of these therapies were not just to progress ones physical health or quality of life but also to create a great effect on patients mental health.

Poor handling and positioning of the affected upper limb in stroke patients contribute toward shoulder pain, Handling, positioning, and transferring on a day-to-day basis can exert great stress on the vulnerable shoulder, due to such reasons patients become very reluctant for any treatment causing weight bearing on shoulder that made the patients reluctant for performing few asana.

## Conclusion

Trunk specific Asanas and trunk PNF, both are equally effective for trunk control, Trunk stability improves mostly with Trunk Asanas in comparison with trunk PNF.

## Limitation:

1.There were no longer follow up
2.Smaller sample size
3.Patients with previous history of shoulder pain faced difficulty in performing Asana with weight bearing on shoulders

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