

# Effects of Manual Stretching and Joint Mobilization with Neurodevelopmental Treatment in Improving Functional Mobility Among Stroke Patients

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## Author's Contribution

<sup>2</sup> Conception and design, Collection and assembly of data, Analysis and interpretation of the data, <sup>1&2</sup>Critical revision of the article for important intellectual content, Statistical expertise <sup>1&2</sup>Final approval and guarantor of the article.

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## ABSTRACT

**Background:** Stroke is classically characterized as a neurological deficit attributed to an acute focal lesion of the central nervous system (CNS) due to a vascular cause, which includes cerebral infarction, intracerebral hemorrhage (ICH) and subarachnoid hemorrhage (SAH) and is an important cause of disability and death worldwide.

**Objective:** The main objective of the study was to determine the effects of manual stretching and joint mobilization with the treatment of neurological development to improve functional mobility among stroke patients.

**Methodology:** Twenty-four subjects from the Shalamar hospital aged between 35 and 65 were considered after 2 weeks of stroke. Manual stretching and joint mobilization techniques have been applied with neurodevelopment techniques to analyze functional improvement among stroke patients. The pre-evaluation was carried out using the Berg equilibrium scale, Ashworth scale and Time up and Go (TUG). Each patient underwent 30 treatment sessions, 5 days a week. Patients were re-evaluated on the same scales after treatment. Data was analyzed using SPSS.

**Results:** The paired sample t-test was used to see the effects of manual stretching and joint mobilization with neurodevelopment treatment to improve functional mobility among stroke patients. 24 patients received treatment with 30 sessions, 5 days a week. There was a significant improvement in their functional mobility. Their spasticity was also reduced. There was also a significant improvement in their cognitive abilities.

**Conclusion:** The study concluded that techniques of manual stretching and joint mobilization with neurological development treatment show a significant improvement in functional mobility among stroke patients.

**Keywords:** Stroke, Manual stretching, joint mobilization, neurodevelopmental techniques, functional mobility

## Introduction

Stroke is defined as a neurological insufficiency due to a sharp central injury of the brain which can be due to decreased blood supply of the brain, any injury to the vessels of the brain, or maybe due to bleeding in the subarachnoid or intracerebral area of the brain. A major cause of disability and death is stroke worldwide.<sup>1</sup>

The approach of neurodevelopmental treatment provides a model in which an individual is treated as a whole instead of parts. It is a multidisciplinary practical approach in which an individual is treated according to the latest and developing treatment protocols. These techniques emphasize the management of treatment of

the patients with neurological pathologies for their rehabilitation and for the improvement of their quality of life.<sup>2</sup> Accessory movements of the joints can be restored by Joint mobilization techniques. Joint mobilization techniques have an effect on improving the restrictions of capsules.<sup>3</sup> Muscle stretching can increase range of motion in healthy individuals as well as those who are undergoing rehabilitation.<sup>2</sup> The main purpose of neurological rehabilitation is to minimize the disabilities and deficiencies of patients suffering from severe stroke so that they can return to their normal personal care and perform their activities of daily living as independently as

possible.<sup>4</sup> The main purpose of this research was to find out the effects of manual stretching and joint mobilization with neurodevelopmental treatment technique in improving functional mobility among stroke patients.

To see the effects of neurorehabilitation on the muscle tone of the upper limb and functional status of patients suffering from ischemic stroke, Kubsik conducted a study. The study consisted of 40 patients after an ischemic stroke. The patients were having upper limb muscle tone problems and motor control problems. The investigator divided them in two groups, each with 20 subjects. The upper limb in group I was treated with kinesiotherapy exercises. However, group II received kinesiotherapy exercises along with neurodevelopmental treatment, the Bobath method. After receiving treatment of 5 weeks, group II showed a marked decrease in muscle tone and there was an improvement in the functional status of the upper limb. However, in group I muscle tone was also decreased and there was an improvement in functional status also, but with less impact than group II. This showed that when classical kinesiotherapy exercises are combined with NDT Bobath method then it gives better results in functional improvement of patients after ischemic stroke, rather than the use of kinesiotherapy exercises only.<sup>5</sup>

The relation between the results of post stroke Bobath rehabilitation technique using NDT in improving functions of hand, activities of daily living and walking abilities were studied by Mikolajewska. The main aim of the study was to assess the correlations- statistical associations between the results of hand functions. ADL and gait parameters after the therapy of patients after ischemic stroke according to the NDT method of Bobath for grown persons.<sup>60</sup> patients were taken into account after ischemic stroke. NDT-Bobath therapy was provided through 10 sessions in 2 weeks. Correlations were calculated based on parameter changes. Bobath scale was used to evaluate functions of hand. Barthel index was used to assess daily activities, stride length, pace and walking speed. Measurements were taken on each patient twice, before and after treatment session. Statistically noteworthy and positive changes were observed in patient's well-being status defined by activities of daily living, changes in performance of hand activities and walking abilities. On the basis of existing

relationship results it was hypothesized that it is difficult to attain improvement in the areas of manual function, walking parameters and ADL's simultaneously in two weeks of rehabilitation.<sup>6</sup>

The effects of mobilization of ankle joint with movement on ankle joint power and flexibility, movement and carrying capacity in paralyzed patients with prolonged stroke were estimated by An, C.-M and S.-O. Jo. Patients were divided into two groups. 26 participants with prolonged hemiplegia (more than 6 months after stroke) were taken into account. One group was MWM group in which there were 13 participants and the other was a control group with 13 participants. Both groups were given treatment manually for five weeks with three days per week session time. Also, the mobilization with movement group was subjected to ankle joint mobilization for five weeks with three days per week treatment sessions. Gait parameters, resistive exercises for ankle joint, load capacity including a limit of stability (LOS) and DF-PROM were analyzed earlier and afterward the treatment sessions. This study showed that when mobilization techniques are applied with movement on ankle joint, they produce a greater effect on power of ankle muscles, mobility, and the capability to support weight in patients with persistent stroke with restricted ankle movement when added to manual therapy.<sup>7</sup>

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## Methodology

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It was a quasi-experimental trial conducted at Shalamar Hospital Lahore. The duration of the study was six months after approval of synopsis. The sample size was 24 and it was measured by using g power analysis taking effect size 0.7 with 95% confidence interval with margin of error 5%, and 0.95 actual power <sup>(8)</sup>. Non probability convenient sampling technique was used. Patients between the age of 35-65 years after 2 weeks of ischemic stroke, showing mild to moderate spasticity according to Ashworth scale were included. There was absence of bone degeneration or any orthopedic damage e.g osteoarthritis, fractures.

Patients with unstable neurological condition or presence of cardiorespiratory alternations e.g Asthma, COPD were excluded. Patients who used high dosage of medication other than dantrolene, baclofan, trizinadine to treat spasticity were also excluded.

The investigator completed a medical history, a complete physical examination was performed. The Berg scale and the Time up and go scale were used to assess balance and mobility. The Ashworth scale was used to assess spasticity. Neurodevelopmental techniques were applied on patients with manual stretching and joint mobilization techniques. Each patient underwent 30 treatment sessions, 5 days a week. Patients were re-evaluated on the same scales after treatment.

The data was analyzed by the statistical package for social sciences (SPSS) version 20. The Shapiro Wilk Test presented that data was not normal ( $p$  value=0.000) so non parametric Wilcoxon Sign rank test was performed to assess the effect of treatment. The nonparametric Wilcoxon Signed Rank test was performed to assess the effect of treatment. A  $p$  value less than 0.05 was considered as significant.

## Results

Demographics includes age and gender were illustrated in pie charts (Figure 1 & 2). Out of 24 patients, 23 patients were in the category of high-risk fall, 1 was in medium risk fall and no individual was in the grouping of low risk fall. But after treatment through neuro developmental techniques with joint mobilization and manual stretching 0 patients were in the category of high-risk fall, 2 were in medium risk fall and 22 were in low risk fall. Ashworth scale showed that 3 patients were in the category in which the affected part was rigid in flexion or extension, 11 patients were showing significant increase in muscle tone in which passive movement was problematic, 10 patients were showing additional increase in muscle tone but their effected part was moved easily, there were 0 patients in the category in which there was slight increase in muscle tone followed by minimal resistance when effected part was moved in flexion or extension. 0 patients were in the category in which there was no increase in muscle tone. But after treatment through neurodevelopmental techniques with manual stretching and joint mobilization 0 patients were in the category in which the effected part was rigid in flexion or extension. There were 0 patients in the category in which there was significant increase in muscle tone and passive movement was difficult. There were 0 patients in the category which were having more marked increase in

muscle tone but their effected part was moved easily. 16 patients were having slight increase in muscle tone followed by slight resistance when effected part was moved in flexion or extension. 8 patients out of 24 were falling in the category in which there was no increase in muscle tone. Time up and go scale showed that before treatment, out of 24 patients, only 1 patient was falling in the category which was having problem with mobility and he required gait aid for mobility. 23 patients were falling in category which were having good mobility and they were mobile without gait aid. There was 0 patient who was having normal mobility. After treatment session, 0 patient was there who was having problems with mobility and he required gait aid for mobility. 17 patients were those who were having good mobility and they were mobile without gait aid and 7 patients fall in the category of normal mobility.

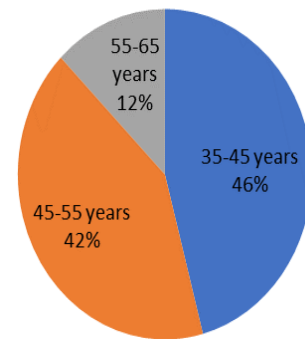


Figure No 1. Pie chart showing percentage of age groups of both genders

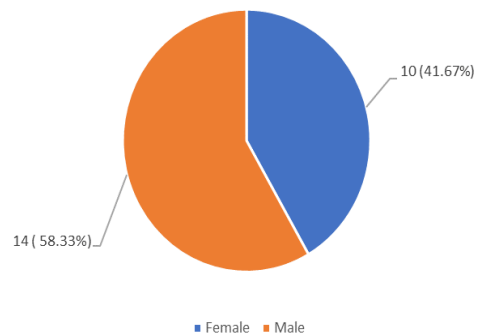


Figure 2. Pie chart representing gender

**Table No.1: Pre and Post Treatment Frequency of the Stroke Patients on Different Scales**

Scales	Description of scales	Pre-Treatment (Frequency)	Post-Treatment (Frequency)
<b>Berg Balance Scale</b>	High fall risk (0-20)	23	0
	Medium fall risk (21-40)	1	2
	Low fall risk (41-56)	0	22
<b>Ashworth scale score</b>	Affected part rigid in flexion or extension (4)	3	0
	Considerable increase in muscle tone, passive movement difficult (3)	11	0
	More marked increase in muscle tone but effected part easily moved (2)	10	0
	Slight increase in muscle tone followed by minimal resistance when effected part is moved in flexion or extension (1)	0	16
	No inc in muscle tone (0)	0	8
<b>Time up and go test</b>	<30 sec=problems, requires gait aid	1	0
	<20=good mobility, mobile without gait aid	23	17
	<10 sec=normal	0	7
	Total	24	24

The table showed that before treatment the mean score of Berg balance Scale was 8.42 with 6.64 SD. After treatment the mean score for Berg Balance Scale was increased to 48.63 with 6.19 SD. There was significant improvement in the mobility of patients after treatment. (P value = 0.000). Similarly, pre mean score on Ashworth scale was 2.7083 with 0.69 SD. However after treatment the mean score for Ashworth scale was reduced to 0.666 with SD of 0.48 (p value 0.000). Also before treatment the mean score value of Time up and Go test was 16.58 with SD of 2.63 and after treatment session the mean score for Time up and go test was reduced to 9.95 with 1.12 SD showing that there was improvement in the mobility of patients. (p value 0.000)

**Table No II: Pre and post score values of Mean, SD, Median, IQ and P value**

Variables		Mean $\pm$ SD	Median(IQ)	P value
<b>Berg Balance scale</b>	Pre score	8.42 $\pm$ 6.46	8 (4.75)	0.000
	Post score	16.58 $\pm$ 2.64	17(-6.25)	
<b>Ashworth scale</b>	Pre score	2.71 + 0.69	3 (1)	0.000
	Post score	0.67 + 0.48	1(1)	
<b>Time up and go test</b>	Pre score	48.63 + 6.20	50 (3.75)	0.000
	Post score	9.96 + 1.12	10 (2)	

## Discussion

The study determines the effect of manual stretching and joint mobilization with the treatment of neurological development to improve functional mobility among stroke patients. Manual stretching and joint mobilization have been applied with neuro techniques to improve their functional mobility. Neurological development techniques included the practice of bridge, rolling, sitting and vice versa, skill transfer and positioning. After an adequate treatment session, there was a significant improvement in the scale scores. A comprehensive work was done by Smedes and his fellows on the physical mobilization of the wrist. They conducted a pilot study on the treatment of patients with chronic hemiplegic hand post stroke. They took 18 subjects and treated them 2 times in a week for a time duration of 6 weeks. There were major differences in the treatment group related to the Frenchay arm test and active and passive extension of the wrist. This development was not found in the control group. The study showed that physical mobilization of the wrist has a positive influence on the recovery of the hemiplegic hand.<sup>8</sup>

Santamato compared the effects of adhesive tape with daily muscle stretching and manual immobilization after botulinum toxin type A injection for

spastic hyperactivity of the fingers and wrist in stroke patients. They took 70 patients with spasticity after upper limb stroke. Botulinum toxin type A injection was given to the adult stroke patients for the spasticity of the flexor muscles of the wrist and fingers. Results showed that there was much improvement in finger and wrist flexors of patients with adhesive taping technique combined with Botulinum type A injection. There was less improvement in patients with daily muscle lengthening combined with passive joint movement and palmer splint after Botulinum type A injection.<sup>9</sup>

The effects of neurodevelopmental treatment on quality of life and functional status after one year of stroke onset were evaluated by A. Algra. There were 223 individuals in the experimental group on which nurses and physiotherapists applied the neurodevelopmental treatment in neurological rooms. Conventional treatment was used in six control rooms on 101 patients. The primary result was unfavorable, defined as Barthel index <12 or death after one year. Quality of life was assessed with the 30-element version of the disease impact profile (SA-SIP30) and the visual analogue scale. The treatment approach was not found effective in the management of patients with stroke in hospitals. There was large area for reconsideration for health professionals regarding this approach.<sup>10</sup>

## Conclusion

The study concluded that when manual stretching and joint mobilization techniques are applied with neurodevelopmental techniques including transfers, sit to stand, walk and balance activities, they show improved outcomes in terms of functional mobility and activities of daily living among stroke patients.

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