Original Article

A COMPARATIVE STUDY ON QUANTITY OF CAREGIVER SUPPORT FOR UPPER LIMB FUNCTIONAL RECOVERY IN POST STROKE

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ABSTRACT

Background: Stroke is the major cause of disability more than 70% of individuals experience upper limb paresis post stroke. Use of the upper limb is vital to the completion of many activities of daily living and health-related quality of life. Increased time spent in therapy improves outcome of the upper limb in post stroke. **Objectives:** To find optimal quantity of caregiver support in stroke rehabilitation to improve upper limb function. **Materials and Methods:** A comparative study with pre and post design carried out at the Rehabilitation unit of ESI, KCG Hospital and Padmashree clinic, Bangalore. 30 subjects including both gender with sub-acute stroke were randomly divided into three groups. **Intervention:** Subjects of Experimental group A, were treated with GRASP protocol by caregiver for 90 minutes and Conventional Physiotherapy, subjects of Experimental Group B were treated with GRASP protocol by caregiver for 60 minutes and Conventional Physiotherapy and subjects in Control Group C were treated with Conventional Physiotherapy only. **Results:** In all the three groups, statistically it was found that the pre-post assessment score using descriptive statistical analysis were significant ($p<0.001$) with both FMUE and CAHAI. Group A showed more significant difference compared to other two groups. **Conclusion:** Thus, 90 minutes can be an optimum duration of caregiver support for upper limb functional recovery in stroke.

KEY WORDS: ACTIVITIES OF DAILY LIVING (ADL); GRASP protocol; FMUE scale; POST STROKE.

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INTRODUCTION

Stroke is defined by the National Institute of Neurologic Disorders and Stroke (NINDS), USA as a sudden loss of brain function resulting from an interference with blood supply to the brain.[1]

Three quarters of strokes occur in the region supplied by the middle cerebral artery. More than 70% of individuals experience upper limb paresis poststroke.[2]

The upper limbs are of special concern because the impact of upper-extremity impairments on disability and health is so marked but limited attention has been given to upper-extremity rehabilitation after stroke. Use of the upper limb is vital to the completion of many activities of daily living (ADL), as well as to socialization and health-related quality of life (HRQOL).[3,4]

Advances in neuroscience and clinical research are beginning to merge and demonstrate that the human brain is capable of significant recovery after stroke, provided that the correct treatment and stimuli are applied in adequate amounts and at the right time.[5] One major component of stroke rehabilitation is exercise therapy to minimise the effects of the brain cell damage and optimise re-learning. It is well recognised that for cortical re-organisation to occur after stroke, high levels of repetition of tasks and exercises that are both challenging and engaging are required.[6,7]

The most common and widely recognised impairment following stroke is motor impairment, and much of the focus of stroke rehabilitation is on the recovery of impaired movements and related functions. In the rehabilitation context, both physiotherapists and occupational therapists have traditionally been the mediators of motor recovery following stroke. Nonetheless, it has been suggested that the duration of exercise therapy that is delivered after stroke is, at best, homeopathic, and uncertainties still remain about the most appropriate level of therapy input.[8]

The ability to predict upper-limb recovery is important for rehabilitation planning, as treatment can be focused on those aspects that promote upper-limb function. Several outcome variables have been shown to be predictive of upper limb function post stroke. Active finger extension is found to be reliable early predictor of recovery of arm function in stroke patients.[9]

Factors that can be influenced by therapy for improved outcome post stroke have been investigated in the literature, the most prevalent being increased time spent in treatment. Systematic reviews have shown that greater intensities of physical therapy and occupational therapy during stroke rehabilitation is associated with enhanced improvement of the performance of functional activities after stroke.[10,11]

Studies that have examined this factor exclusively for upper-limb function have shown conflicting results. In their evidence-based practice guidelines for stroke, they concluded that there was uncertainty in the literature as to whether enhanced therapy results in improved upper-extremity functioning.[12] One study found that a 46% increase in physiotherapy during the first three months after stroke appeared to lead to better recovery of the range of active movement in the arm and leg.[14] A meta-analysis conducted on increased time spent in therapy found positive results for ADL and walking speed, but not for dexterity.[13] In contrast, two studies in their systematic reviews reported statistically significant results for increased time spent in treatment on ADL and upper-limb function scores.[14,15]

It is estimated that 25-74% of stroke survivors require help with activities for daily living from informal care givers, often family members. Although the physical, psychological, emotional, and social consequences of care giving and its economic benefit to society are well recognised, care givers' needs are often given low priority in the management of stroke. Training care givers in skills essential for the day to day management of disabled stroke survivors is likely to have a role in reducing the burden of care.[16]

Additionally, the role of family members in stroke rehabilitation has gained attention as a method for clinicians to increase treatment time and as a potential factor in improved functional outcome.[10,17] Physical therapists reported that support for family involvement could help maintain treatment gains and be an avenue for family management of stroke-related disability.[18] Caregiver support was defined as verbal encouragement, actively participating in activities with the participant, and helping to organize the equipment and exercise booklet.[19]

In the majority of studies, therapist have delivered additional exercise intervention but the cost of therapy adds burden to family members.[10] A study which concluded that involvement of caregivers was a determinant of improved upper limb function in stroke reported that 1 hour duration of caregiver support has improved 5% to 9% of upper limb function and they have also stated that further research is required for intensive care giver support for better outcome[19].Evidence from two systematic reviews has suggested that a more intensive therapy is associated with enhanced improvement of the performance of functional activities after stroke, although the exact dose of practice required for significant functional improvements to take place is lacking.[20,21]

Hence, this study is undertaken to find optimal quantity of caregiver involvement in stroke rehabilitation.

MATERIAL AND METHODS

Design: A comparative study with pre and post design.

Setting and Participants: Participants were recruited by convenience sampling from rehabilitation unit of ESI, KCG Hospital and

Padmashree clinic, Bangalore. 30 subjects including both gender with sub-acute stroke were randomly assigned to either a control group (n=10) or one of the two experimental groups, Group A (n=10) or Group B (n=10).

Subjects diagnosed by Neuro-physician as having stroke and who fulfill inclusion criteria were taken in the study. Informed consent was taken from the subjects.

Inclusion Criteria: Subjects with sub-acute MCA stroke diagnosed by Neuro-physician on CT scan or MRI, FMUE scale score between 10 and 57[22], Age- 45 to 65 years, Both genders.

Exclusion Criteria: Mini Mental Status Examination (MMSE) score < 20[23], Subjects with visual/auditory impairments, Presence of any other neurological diagnosis other than stroke or any other major co-morbidity, Unstable cardiovascular status, Non co-operative patients

Intervention: Participants were explained about the procedure and were assessed using CAHAI and FMUE scales.

Experimental Group A: Education program, additional exercise (GRASP protocol) for 90 minutes/day by caregiver along with Conventional physiotherapy,

Experimental Group B: Education program, additional exercise (GRASP protocol) for 60 minutes/day by caregiver along with Conventional physiotherapy,

Control Group C: Education program and Conventional physiotherapy.

Exercise was continued for 5 days/week for 4 weeks. Prior to commencement of the study, participants were asked whether one caregiver could assist them in the treatment program. One caregiver was selected and explained about the additional exercise program (GRASP protocol). Exercise booklet, kit and one log sheet was provided to caregiver where daily exercise in minutes were recorded over a period of 4 weeks. A log sheet was provided to each participant to record the total number of minutes completed per day. At weekly meetings with the participants, therapist reminded them to record exercise time if the log sheet was not complete. Caregiver could approach for any follow-up questions.

The GRASP protocol consisted of the use of an exercise booklet and a kit tailored according to motor impairment level. Each exercise book contained written and pictorial instructions for each exercise, and the kits contained inexpensive equipment (eg, ball, bean bag, towel, paper clips) to complete the exercises. Each exercise was graded by varying repetitions to meet each participant's need. Exercises included strengthening of the arm and hand (small wrist weight, putty, hand gripper), range of motion (stretching, active exercises), and gross and fine motor skills (eg, blocks, Lego, pegs). Repetitive goal and task oriented activities were designed to simulate partial or whole skill sets required in ADL (eg, folding, buttoning, pouring, and lifting).

Education program contained information on stroke recovery and general heath which was given to all the three groups. The GRASP protocol is a self-administered upper-limb exercise program aimed at improving upper-limb recovery.

Outcome measures:

Fugl-Meyer Upper-Limb Motor Impairment Scale [FMUE Scale]: 33 movements that assess quality of movement, reflex activity and coordination. Scoring is based on a 3-point ordinal scale (0-2) with higher scores indicating less impairment (maximum score = 66)[22].

Chedoke Arm andHand Activity Inventory [CAHAI]: The 9-item version of CAHAI evaluates the performance of the paretic upper limb in the completion of ADL task. Scoring is based on the percentage of contribution to each task with higher scores meaning greater use[24].

Data Analysis: Statistical analysis was performed by SPSS (version 17) for windows; á value was set at 0.05. Descriptive statistics was assessed using Mean, SD and Range for demographic variable and outcome variable. ANOVA was used to analyze age difference and duration among the group at the baseline. Chi square test was performed to find out gender difference, dominance and side of stroke among the groups. Wilcoxon's test was used for the outcome variable within the groups. Kruskal Wallis test was used for the outcome variable at baseline and after intervention. If its significant a Post hoc analysis was carried out to find out the better

group using Bonferroni correction method for p value (with the help of Mann Whitney U test for multiple comparison).

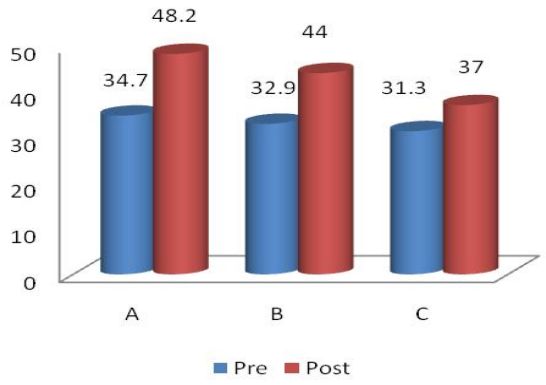
RESULTS

Baseline measurements: In this study, 30 stroke subjects were included with mean age of 55 years, out of which 19 were males and 11 were females with mean of 3.6 months post stroke. The mean FMUE score was 33.0 and mean CAHAI score was 21.9, indicating a moderate level of upper extremity severity.

Variable	Group A	Group B	Group C	Þ-value
Age (years)	55.80±4.10	55.70±6.24	55.20±6.12	>0.967
Gender (M/F)	07-Mar	05-May	07-Mar	>0.563
Duration (months)	3.50±1.08	3.70±1.34	3.50±1.08	>0.908
Dominance R/L	09-Jan	10/0	08-Feb	>0.329
Side of stroke R/L	07-Mar	06-Apr	08-Feb	>0.621
FMUE	34.70±7.96	32.90±4.65	31.30±4.27	>0.523
CAHAI	24.40±11.67	21.00±2.00	20.30±2.50	>0.575

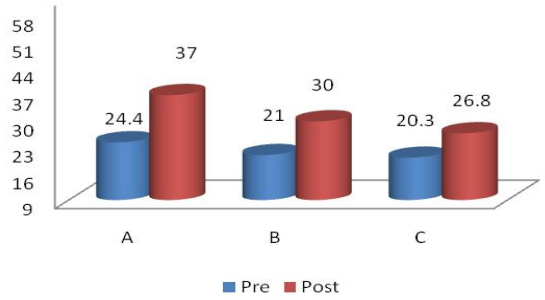
Table 1: Baseline data for demographic and outcome variable.

Group difference: In Group A, the pre mean FMUE score of 34.70 increased to post mean FMUE score of 48.20 and group B the pre mean FMUE score of 32.90 increased to post mean FMUE score of 44.00 and group C the pre mean FMUE score of 31.30 increased to post mean FMUE score of 37.00 which was statistically significant (p<0.0001).



Graph 1: Pre-post difference of FMUE within the groups.

In Group A, the pre mean CAHAI score of 24.40 increased to post mean CAHAI score of 37.00 and group B the pre mean CAHAI score of 21.00 increased to post mean CAHAI score of 30.00 and group C the pre mean CAHAI score of 20.30 increased to post mean CAHAI score of 26.80 which was statistically significant (p<0.001).



Graph 2: Pre-post difference of CAHAI within the groups.

A post hoc analysis revealed that group A was better than group B and group B was better than group C. In conclusion, group A was better among the three groups.

DISCUSSION

In the present study, Group A improved from pre to post score of FMUE and CAHAI which was found to be statistically significant (p<0.005). The 90 minutes session of additional treatment were well tolerated by all subjects. This was in accordance to the study done by Duncan et al where 90 minutes of supervised home exercise program given for 8 weeks in experimental group showed statistically significant improvement on FMA, Barthel index and gait score and the change score for only FMUE was significantly greater (p<0.05) for experimental group. The reason for this effect was type of intervention and difference in amount of treatment session.[25]

Group B improved from pre to post score of FMUE and CAHAI which was found to be statistically significant (p<0.005). This was in accordance to the study by Harris JE et al where additional 60 minutes of caregiver support in the experimental group resulted in 5 to 9% greater improvement in upper limb function. The reason for the improvement was not only increased time of treatment but also caregiver involvement which enhances patient participation in rehabilitation as involving

caregiver increases patients confidence, motivation and satisfaction and decreases stress and depression[19]. Also, Group C improved from pre to post score of FMUE and CAHAI which was found to be statistically significant ($p<0.005$). As conventional therapy was given which contributed to some improvement in upper limb function along with spontaneous recovery which occurs in all patients till 6 months of stroke.

Group A showed more improvement than group B as the post mean FMUE score was 48.20 for group A and 44.00 for group B. Also, the post mean CAHAI score was 37.00 for group A and 30.00 for group B. The reason group A showed more improvement than group B may be due to additional exercise of 30 minutes received by group A subjects compared to group B. As it has been hypothesised that more the duration of exercise received that is more the repetition, better the motor learning and cortical reorganization occurs. Also, both groups A and B showed statistically greater improvement than group C. The reason may be as both groups received some form of additional intervention combined with conventional physiotherapy in comparison to only conventional physiotherapy received by group C.

Recovery of upper limb not only depends on amount of treatment time but also on type of exercise given to patients. As both groups A and B received same exercise program (GRASP protocol) which might have resulted in significant improvement in upper limb function. As technique used in this protocol is based on the concept of repetitive task-oriented practice which requires interaction between the right and left hemisphere and cortical and sub-cortical structures, thus reflecting the importance of both in the coordination, planning and execution of movement in turn contributing to motor learning and thus motor recovery takes place[26].

CONCLUSION

Outcome of the study showed statistically significant improvement in Experimental group A which received 90 minutes of caregiver support and results in better improvement than the other two groups. Thus, 90 minutes can be an optimum duration of caregiver support for upper limb functional recovery in stroke and can be used clinically for better functional outcome. Further studies can be done by comparing GRASP with other approaches. By increasing duration of caregiver support more than 90 minutes and to find its effectiveness in chronic subjects.

Limitations: Inability to monitor patient's compliance with the home exercise program which might have influenced the study. The study was done with small sample size. Long term effects of the treatment were not assessed. Involvement of side in terms of dominance is not considered which might have influenced the study.

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