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EFFECT OF OTAGO EXERCISE PROGRAMME IN HEMIPLEGIC SUBJECTS

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ABSTRACT

***OBJECTIVE**: Balance problem is considered as a serious complication in rehabilitation of stroke patients. Stroke patients have falls risk due to the imbalance particularly elderly stroke patients have fracture risk due to osteoporosis and degeneration. Several techniques are utilised to prevent imbalance in stroke patients especially strength training programme are designed to prevent fall risk in elderly subjects. Otago Exercise Programme is well researched program to reduce falls among older people this study tries to find effect of Otago Exercise Programme in hemiplegic subjects. **METHOD**: 30 community dwelling hemiplegic subjects from Vadallur and Chennai aged <60 both male and female subjects were allotted in group - A (n=15) and group - B (n=15). Otago Exercise Programme was administered along with conventional physiotherapy in experimental group for a period of 12 weeks. Both the group patients were assessed with Tinetti Performance oriented mobility assessment, Time up and Go Test and Chair Stand Test before and after intervention of 12 weeks period. **RESULT**: There was significant difference with p < 0.001 at both Tinetti Performance oriented mobility assessment, Time up and Go Test and minimal significant difference in chair stand test in both the groups. **CONCLUSION**: The study concluded that there was a significant difference within each group but Group- A showed significant improvements in CRT, POMA and TUG test than Group- B.*

KEY WORDS

Otago Exercise, hemiplegia, Balance, Fall risk.

INTRODUCTION:

Muscle weakness is one of the major causes for impaired balance, altered gait and increase falls in elderly people. Cerebral vascular accident leads to neurological deficits whose natural recovery period varies according to the incident and extend of the insult occurred and the recovery of the deficits is not always complete. If neurological deficits due to CVA combine with elderly weakness balance becomes a great problem to the patient and treating balance problem becomes a challenge for therapist.

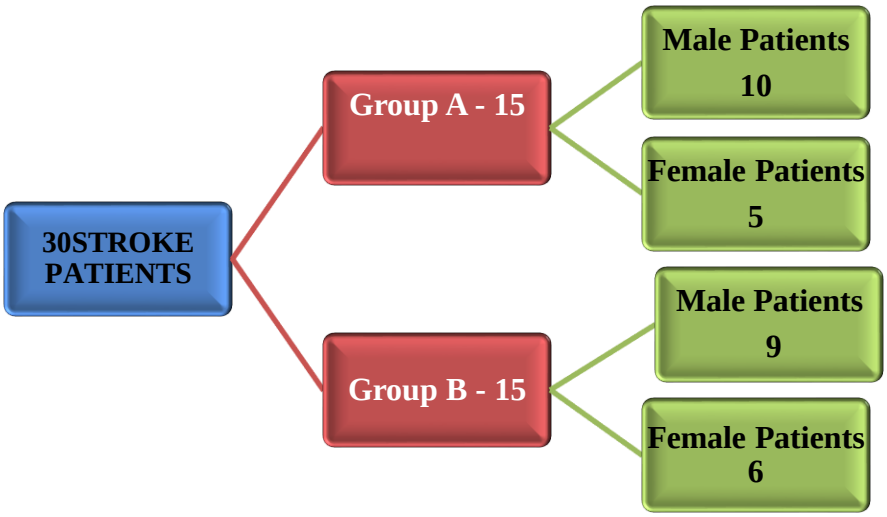
Psychological problem, difficulty in speaking or understanding speech; difficulty in seeing with one or both eyes; difficulty in walking, dizziness, loss of balance or coordination; severe headache with no known cause; fainting or unconsciousness, fear of fall, etc. are factors which reduce elderly stroke patient's independency. The physical inactivity results in reduced muscle mass and function, which parallels the decline that occurs with aging. The restricted movements of the muscle may lead to reduced muscle mass [cross sectional area] and function hence [1,2], there is a rapid denervation of the muscle after stroke which leads to weakness or paralysis. This renders the muscles unable to produce voluntary forces needed to create joint movement that will allow functional performance of daily task [3].

Reduced activities of daily living are also one of the major problems in stroke patients which occur due to muscle weakness most often on one side of the body. Studies have proved that strength training has large impact on maintain sub maximal muscle contraction following stroke [5]. Tatiana S. Ribeiro et al stated that patients walked faster and longer with paretic and non-paretic steps after treadmill training in stroke patients [4]. So therapeutic exercises play one of the most effective roles in training those weak muscles.

Otago Exercise Program is a strength & balance retraining program designed to prevent falls in older people [6] and studies have proved that this structured exercise program has improved the elderly patient's balance, lower limb strength, general fitness level, reduced the fear of fall and has improved their independency level. Studies related to this Otago program for hemiplegic subjects were not studied. As it focusses on Balance, Muscle strength, General fitness & General Well-being. Hence this study was done to know the effect of Otago Exercise Programme in hemiplegic subjects.

METHODOLOGY:

30 hemiplegic subjects from Vadallur and Chennai were included in the study based on inclusion criteria: Age <60 years, Both male and female subjects, Subjects with stroke < 6 months, Brumstrom grading 4 and 5 in paretic lower limb, subjects who were able to walk with support or without support, Subjects with MMSE score 24-30.Patients with open wounds in leg, Impaired sensory loss in leg, Any recent surgeries in lower limb, Deep Vein Thrombosis, Any disability other than stroke , like spinal cord lesion, polyneuropathy, peripheral nerve lesion, recent fractures in lower limb were excluded. Then informed consent was obtained from them and allotted to group A (experimental group) n= 15 and Group B (control group) n= 15 by convenient sampling method. Group A received Otago Exercise along with conventional physiotherapy. Group B received only conventional physiotherapy. Both the groups were informed that they have to do the exercise regularly and can withdraw from the study if they have any difficulty.



PROCEDURE:

Group A- Experimental Group:

There are 4 levels in Otago exercise program. They have to do warm up and cool down exercise before and after the exercise and walk regularly of their speed and distance of their comfort. Exercises were demonstrated to the subjects and before the start of the session were noted in the Otago exercise programme schedule. Otago book let was given to the subjects.

Warm Up Session includes chair march and arm swings for 30 secs, head movements, neck movements, back extension, trunk movements, ankle movements for 5 times and calf stretch for 8 secs.

The subjects started with level 1 exercise when they complete the first level next level training were given to them. Simultaneously all the levels were taught according to their ability. Subjects were followed up for a period of 12 weeks with intervention duration of 1 hour daily with rest period in between the session. Levels & Number of Repetitions for the Strengthening & Balance Retraining Exercises has given in Figure 1&2. Cool down session includes Calf stretch and Back of thigh stretch - hold for 8 secs

Figure 1: Levels & Number of Repetitions for the Strengthening & Balance Retraining Exercises

Balance Exercises	**Level A (With Support)**	**Level B**
Knee Bends	10 repetitions	10 repetitions
Backwards walking		10 steps, 4 times hold for support
Walking and turning		Walk & turn around twice
Sideways walking		10 steps, 4 times
Tandem Stance (Heel toe stand)	10 Seconds	10 Seconds, no support
One leg Stand		10 Seconds, no support
Sit to Stand	5 Stands, 2 hands for support	5 Stands, 2 hands for support
Balance Exercises	**Level C**	**Level D**
Knee Bends	10 repetitions	3 X 10 repetitions
Backwards walking		10 steps, 4 times
Walking and turning	Walk & turn around twice	
Sideways walking	10 steps, 4 times	
Tandem Walk (Heel toe walk)	Walk 10 steps, (with support)	Walk 10 steps, (No support)
One leg Stand	10 Seconds, no support	30 Seconds, no support
Heel Walking	10 steps, 4 times Hold support	10 steps, 4 times No support
Toe walking	10 steps, 4 times Hold support	10 steps, 4 times No support
Heel Toe Walking backwards		Walk 10 steps No Support, repeat
Sit To Stand	5 Stands, 2 hands for support	5 Stands, 2 hands for support

Figure 2: **Strengthening Exercises**

Knee Extensor Knee Flexor Hip Abductor	Ankle Cuff Weights Were Used to Provide Resistance 10 Repetitions	
Ankle Plantarflexors	Level C	Level D
	10 Repetitions, Hold Support	10 Repetitions, No Support
Ankle Dorsiflexors	Level C	Level D
	10 Repetitions, Hold Support	10 Repetitions, No Support

Group B- Control Group:

The subjects started with warm up exercises then followed by Standing up from a chair, walking four steps forward, walking backwards 4 steps, stepping forward, backward, and sideways on the exercise step, walking four steps forward, turning. Performing double-legged stance for 10 seconds. Performing tandem stance for 10 seconds. Rising from a chair without the use of the arms. Walking forward and backward with a tandem walking pattern. Performing single legged stance for 10 seconds. Flexibility and range of motion exercises were performed in a seated position.

Tinetti Performance oriented mobility assessment, Time up and Go Test and Chair Stand Test were used as outcome measures. These measures were assessed in both groups before the intervention i.e. first day and at end of 12 weeks

DATA ANALYSIS

Descriptive statistics of mean, standard deviations were used to describe the individual demographic data. Paired t- test was used to compare the pre and post values within group A and Group B in hemiplegic patients the result were considered if $p<0.05$. All statistical analyses were performed on an IBM compatible microcomputer using the Statistical Package for the Social Sciences (SPSS) (Windows version 17.0 Chicago IL, USA). The significance was set at $\alpha=0.05$ level. The results obtained from the analyzed data were tabulated and figured.

TABLE 1: **Demographic Data**

Characteristics	**Mean**	**Standard. Deviation**
Age(Yrs)	**51.4**	**4.59**

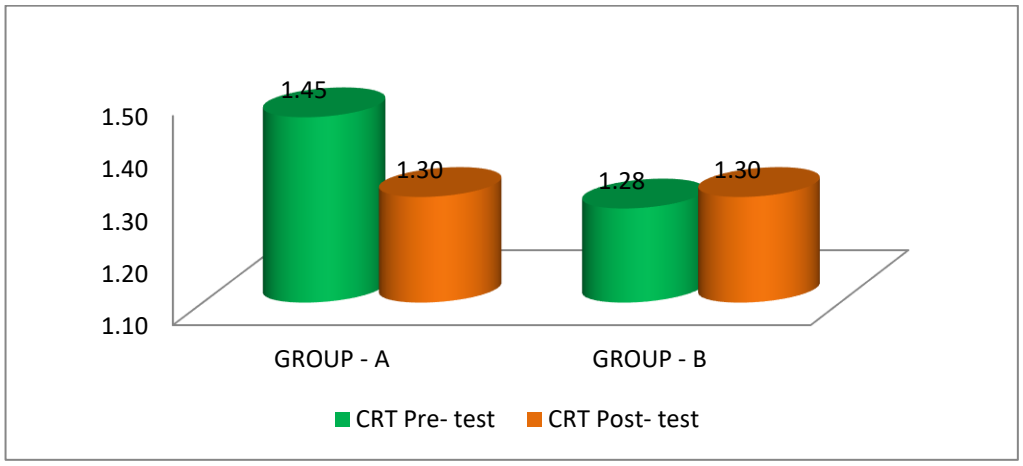
TABLE -2: Effect of Otago Exercise Programme in Hemiplegic Subjects in Experimental Group

		PAIRED DIFFERENCES			t- value	Sig. (2-tailed)
		Mean	Std.Dev	Std.Error Mean		
Pair 1	CRT PRE TEST - CRT POST TEST	-2.67	27.33	0.36	-7.391	.000
Pair 2	POMA PRE-TEST - POMA POST TEST	4.6	55.60	0.51	8.939	.000
Pair 3	TUG PRE-TEST - TUG POST TEST	-10.07	198.93	0.97	-10.343	.000

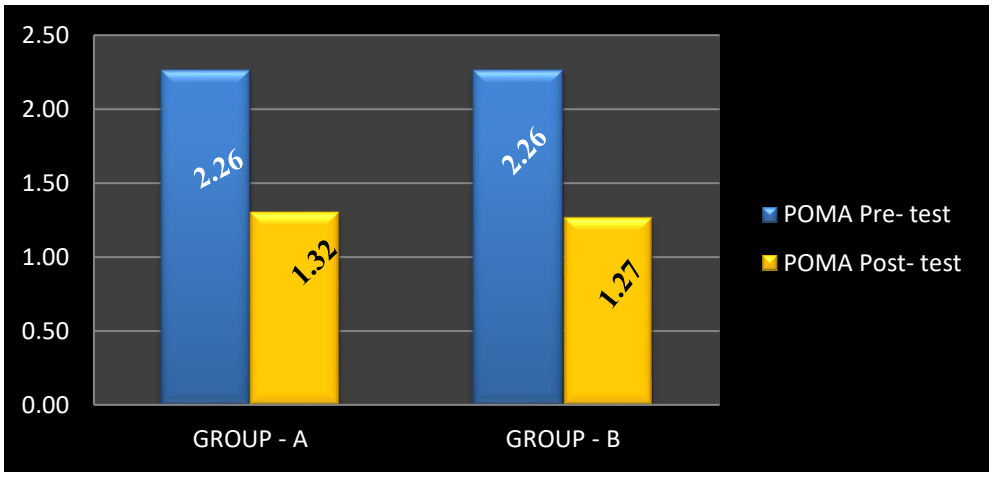
TABLE -3: Effect of Otago Exercise Programme in Hemiplegic Subjects in Control Group

		PAIRED DIFFERENCES			t- value	Sig. (2-tailed)
		Mean	Std.Dev	Std.Error Mean		
Pair 1	CRT PRE TEST - CRT POST TEST	-0.93	10.93	0.23	-4.090	.000
Pair 2	POMA PRE-TEST - POMA POST TEST	3.93	46.93	0.47	8.320	.000
Pair 3	TUG PRE-TEST - TUG POST TEST	-8.67	191.33	0.95	-9.080	.000

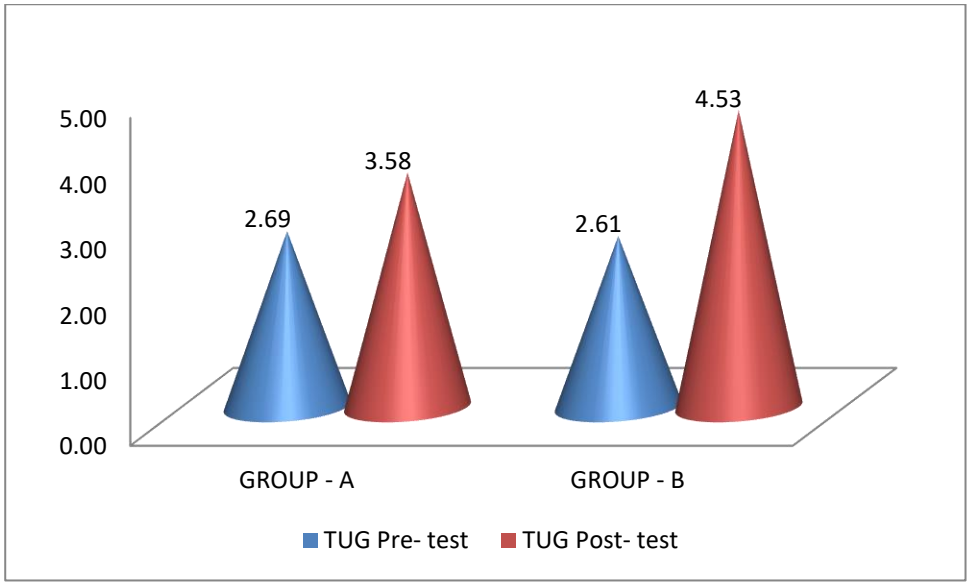
GRAPH 1: Comparison of Chair Raise Test Between Group –A and Group –B



GRAPH 2: Comparison of POMA Test between Group –A and Group –B



GRAPH 3: Comparison of Time Up Go Test between Group –A and Group –B



RESULTS:

Table – 1 presents the characteristics of the participants the mean age was 51.4± 4.59 years,

Table - 2 reveals that the pre and post values of CRT, POMA and TUG in group = A. The p-value shows that there was significant effect of Otago exercises program in group – A ($P< 0.05$).

Table - 3 reveals that the pre and post values of CRT, POMA and TUG in group = B. There was significant difference in group – B (control group) ($P< 0.05$).

DISCUSSION:

Otago exercise is a well-known exercise program for elderly people with balance problems. This study aimed to know the effect of Otago exercise programme in hemi paretic subjects. This was an attempt to find how effective Otago exercise in balance problems due to neurological deficit in CVA.

Results of this study shows there was significant difference within each group in performance before training and after 12 weeks of training in chair stand test, POMA and Time Up Go Test. Subjects in the Experimental group were motivated to do exercises as it takes extra time than control group who received only conventional exercises. They are asked to keep a record of daily exercise program.

Both groups showed good improvement within group this clearly shows that there is no difference in outcome between Otago exercise program and conventional physiotherapy. Even though Otago exercise proved to be effective in elderly people it doesn't have statistically significant effect on balance in hemi paretic patients. This may be due to the structure of Otago exercise program which is framed for normal elderly people but when applied to paralytic patients there are some practical difficulties such as Otago level –D was difficult for 50% of the subjects as it had more challenging task to be completed. The subjects felt comparatively easy for doing Level A, Level B & Level C.

Studies have proved that strength training has large impact on maintain sub maximal muscle contraction following stroke [5]. In control group conventional physiotherapy mainly concentrated on training static balance such as exercises in a posture or dynamic balance training such as training of functional tasks or part of task but strengthening exercises for lower limb was not concentrated this may be reflected in the small difference observed when compared with experimental group as Otago schedule as strengthening exercises.

60% of subjects in this study are from rural areas they merely had any knowledge about physiotherapy, so have not undergone any therapeutic exercises for the paretic limb before the commencement of study. This may also would have affected the results of study some patients were not treated with physiotherapy from the day of stroke this disparity might had an influence.

The subjects overall independency level improved significantly in both groups. Hence this study showed a significant improvement in balance due to Otago exercise program in hemiplegic subjects. Hence Otago exercise can be suggested to the stroke patients.

Otago Exercise Program is a strength & balance retraining program designed to prevent falls in older people [6] and various studies have proved that this structured exercise program has improved the elderly patients balance, lower limb strength, general fitness level, reduced the and has improved their independency level.

CONCLUSION:

The present study concluded that there was a significant difference within each group but Group- A showed significant improvements in CRT, POMA and TUG test than Group- B. Thus, Otago exercise programme can be taught to stroke for effective rehabilitation along with the other management.

LIMITATIONS:

Small sample size, frequency of falls was not considered, Activity level of the patients was not considered, height, weight and BMI was not analysed for correlation of these factors with balance improvement.

RECOMMENDATIONS:

Large sample size can be studied, Acute & chronic stroke patients can also be included in further studies, Influence of patient's activity level can be determined. Fall risk assessment and fear of fall can be assessed in patients. Long term follows up can be studied.

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