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EFFECTIVENESS OF A BALANCE RETRAINING PROGRAMME IN IMPROVING FUNCTIONAL BALANCE OF MILD TO MODERATE STROKE PATIENTS

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ABSTRACT

Background *: Balance is frequently disturbed following stroke. The balance retraining programme with a structured and progressive level helps in early training in stroke patients that improve the outcome and helps in recovery.*

Aim: *To study the effectiveness of balance retraining programme to improve balance in mild to moderate stroke patients.*

Methodology: *Population includes mild to moderate stroke patients with right and left middle cerebral artery involvement. A total of 30 patients, sampled into two groups of 15 each using random sampling. Group A receives conventional physiotherapy and group B receives balance*

retraining programme and conventional physiotherapy. Treatment was given once daily, six days in a week for four weeks and each session lasted 40 minutes. The outcome measure used was Berg balance scale. The pretest value (day 1) before the treatment commenced and post test value after the last day of treatment (day 28).

Result: *On BBS, Experimental group showed a significant gain of 20.59%(p<0.01). The control group also showed a significant gain of 13.45% (p<0.01). Statistical analysis of the post test mean values of BBS between the two groups showed that group received balance retraining programme is having a significant high effect when compared to control.*

Conclusion: *BRP could be used as an adjunct to conventional physiotherapy, provides a effective treatment for balance retraining in mild to moderate stroke patients. BRP also prevent secondary problems due to balance impairments. BRP is simple to practice and is cost effective*.

Keywords: Balance Retraining Programme, mild to moderate stroke patients, berg balance scale

Introduction: Stroke is an acute onset of neurological dysfunction due to abnormality in cerebral circulation with resultant signs and symptoms, which corresponds to involvement of focal areas of brain . In terms of disability adjusted life years (DALY), in 1990 stroke ranks as the sixth highest cause of burden of disease worldwide and in accounting 52% of total death cerebro -vascular disease include 4.4 million. By the year 2020 stroke will hold fourth place in the world health organization's list of leading cause of disability. Balance is diminished in people with stroke which leads to impairment in steadiness, symmetry and dynamic stability. Symmetry of weight bearing is impaired in stroke with patient bearing as much as 61% to 80% of their body weight through their non paretic lower extremity. The restoration of balance reactions plays an important role in successful stroke rehabilitation. Even patients who show little return of voluntary muscle activity in the arm and leg can relearn the balance reactions remarkably well and recover the ability to take quick steps to regain balance when standing or walking. Post stroke exercise programme showed improvement in measure of neurological impairments, lower extremity function and balance retraining programme improves balance and prevents falls in elderly. There are many interventions to improve balance in stroke patients, but most of them lack a structured and progressive level of exercise programme. Balance retraining programme uses exercise with progression from level one the easiest to level four the most

difficult. The balance retraining programme helps to strengthen postural control mechanisms and early training in stroke patients that improve the outcome and helps in recovery.

METHODOLOGY

Study Approach: Experimental

Sampling method : Random Sampling

Study Settings:1. Mid Town Medical center, Kakkanad.

2. Upasana Hospital , kollam

Sample size:30

Duration of study : 6 months

Inclusion criteria: Diagnosis of first episode of stroke, in left and right middle cerebral artery territory resulting in left and right hemi paresis.

gender : both males and females.

Age group : 50-65years.

Duration of condition : 2 to 8 weeks post stroke.

Orpington Prognostic Scale Score-2.0 to 5.2.

Berg balance Scale below 45.

Stroke – haemorrhagic or Infraction.

. Patient should be able to sit and stand with or without support.

. Patient with informed consent

Exclusion criteria;

. Other vascular tertiary stroke- ACA,PCA.

Chronic stroke, Cerebellar lesions, Recurrent stroke, Bilateral hemispheric stroke, Brainstem stroke, Demyelinating disease, Myelopathy, Traumatic head injury, vestibular dysfunction, peripheral neuropathy, Cognitive impairment, perceptual dysfunction, Wernicke's aphasia, Global aphasia, Severe cardio vascular conditions, Severe pulmonary conditions.

PROCEDURE

Thirty patients who fulfill inclusion criteria were included. Purpose of study and procedure was explained to the patient. Ethical approval from ethical committee and written consent from patients was taken .Patients were randomly divided into two groups. Prior to the treatment all the patients were assessed using BBS to obtain the pre test value of the outcome measurement.

Group A; control group= Only conventional physiotherapy treatment

Group B ; Experimental group=Conventional physiotherapy treatment and Balance Retraining Programme.

Conventional physiotherapy treatment given to both groups Included- 1. Active Assisted range of motion exercise of right upper and lower extremity for left MCA stroke and left upper extremity and lower extremity for right MCA stroke, 2. Functional mobility exercises,3.Peg board activities for right and left upper limb, 4.Wooble board with support 5.Forward stepping, backward stepping, Braiding.6.Manual perturbations.

Experimental group treatment included –in addition to conventional physiotherapy ,Balance retraining programme was given.

Treatment was given once daily, six days in a week for four weeks and each session lasted 40 minutes.Prior to the treatment individuals were assessed using BBS to obtain the pretest value of the outcome measurement. Post test value for the outcome measurement was obtained in the 28 th day.

Tools and materials used:

- Stop Watch
- Ruler
- Inch tape
- Chalk
- Recording sheet (for evaluation of subject)
- Data collection sheet(to record score of BBS)
- Standard arm chair(seat height of 46 cm)

- Step(stool 23cm, slipper 1inch height)
- Consent form used

BRP- The BRP consists of four levels. Level one is administered to the patient during 1st week, level two is administered to the patients during 2nd week, level three is administered to the patient during the 3rd week and level 4 during 4th week. For each exercise give rest to the patients after 20 repetitions. Support is given to the patient by the therapist or the patient can hold the parallel bar while doing exercises as prescribed in BRP. Assistance were given to the patients to do exercises in the 1st and 2nd and 3rd levels of exercise programme. Approximately it will take 40 minutes to complete one level.

BALANCE RETRAINING PROGRAMME

Excercise	Details	LEVELS			
		1	2	3	4
Knee bend (Flexion and extension of affected lower extremity)	42 repetitions	Hold Support,repeat	No support or hold support,repeat	No support,repeat	No support
Backward walking	10 steps, 9 times		Hold support		No support
Walking and turning around	Make figure of 8,28 repetitions for each circle		Hold Support	No support	No support
Sideways walking	10 steps, 9 times		Hold support	No support	
Tandem stance	10 seconds, 9 times	Hold support	No support		
Tandem walk	10 steps, 9 times			Hold support	No support
Heel walking	10 steps, 9 times			Hold support	No support
Toe walking	10 steps, 9 times			Hold support	No support
Sit to stand	+/- hand for support 6 repetitions	5 stands, two hands, repeat	5 stands, one hand or 10 stands two hands ,repeat	10 stands, no support or 10 stands, one hand,repeat	10 stands, no support ,repeat

Statistical analysis

Student` t' test was used to compare balance between the groups and with in groups.Control and Experimental groups responses to the treatment were analyzed using paired `t' test.

Presentation of clinical parameters of the stroke patients-Demographic presentation of Age,Sex,Side and Post stroke duration.

		Control group	%	Experiment group	%
Age	50-55	3	20%	4	26.7%
	55-60	5	33.3%	6	40%
	60-65	7	46.7%	5	33.3%
Sex	Male	8	53.3%	7	46.7%
	Female	7	46.7%	8	53.3%
Side	Right	6	40%	8	53.3%
	Left	9	60%	7	46.7%
Duration in days	14-28 days	3	20%	4	26.7%
	28-42 days	7	46.7%	6	40%
	42-56 days	5	33.3%	5	33.3%

Analysis and interpretation.

a) BERG BALANCE SCALE.

Group	Pre test mean	Independent 't' test value	Post tset mean	Independent 't' test value	Dependent 't' test value	% of increase in Balance from initial value
Group A	41.53333	0.122^{NS}	49.06667	8.32*	23.41713	13.45238
Group B	41.46667		53		45.1	20.59524

NS-Not Significant

* -Significant at $p<0.01$

The mean pre test balance score of both control and experimental group(41.53 and 41.47) is found to be homogenous ($p>0.05$).

When comparing the posttest mean values(49.07 and 53) of the balance scores, it is found that there is significant difference between the two groups($p<0.01$).

Using dependent `t' test.

Comparing 1^{st} week and 4^{th} week value of BBS in group A.

The mean pretest BBS value is 41.53333 and post test value is 49.06667.Using the paired t test , the mean change in balance score is found to be significant ($p<0.01$).

Comparing 1^{st} week and 4^{th} week values in group B

The mean pretest BBS value is 41.46667 and post test value is 53.B group found to be significant.($p<0.01$).

Using independent `t' test.

Comparing pre test BBS values of group A and B.

Pre test mean BBS of group A is 41.53333 and group B IS 41.46667. using independent t test,The pre test mean balance scores showed no significant difference.($p>0.05$). which shows patients in both groups were homogenous in the pre term test.

Comparing post test BBS values of group A and B.

Post test mean BBS of group A is 49.06667 and group B is 53. Using independent t test comparison of the mean post test BBS scores showed a significant difference ($p<0.01$), which shows that balance retraining program is having high effect when compared to control.

Discussion:

The study is an experimental research which aims to study the effectiveness of BRP in improving functional balance of mild to moderate stroke patients. The post stroke duration and age of the subjects was almost similar in both groups. The individuals selected for the study were between 2-3 weeks of post stroke duration. The individual selected were selected according to the score obtained from OpingtonPrognostic Scale. The outcome measure used is BBS. The BBS

actually reflects the functional activity and is used, easy to administer and yield measurements that are reliable and valid. The total of BBS is 56.The control group was given conventional physiotherapy which consisted of active assisted range of motion exercises, functional mobility exercise, upper limb activities,Wooble board with support,Forward stepping, backward stepping, braiding and Manual perturbations. Experimental group was given BRP in addition to the treatment given to the control group. BRP uses balance exercise which are closely related to life style and function and repetitions was approximately thousand times. The significant improvement of balance in experimental group may be due to following factors.

Knee bends(ie knee flexion and extension) improves control of knee function and provides proprioceptive inputs.

Backward and sideways walking improves anticipatory postural control and weight bearing of affected side. .Combination of hip extension with knee flexion is useful for patients with hemiplegia. Walking and turning around stimulates and challenges vestibular system. Tandem stance improves weight distribution to the affected lower limb and reduces the centre of gravity with in the limited base of support. Tandem walking ability to walk with in the limited base of support and their by improving anticipatory postural control. Heel walking improves ankle strategy. Toe walking decreases the base of support and improves ankle strategy. Sit to stand ; In erect standing the base of support is small with high centre of gravity, requires maximum balance control. Initiates symmetrical weigh bearing and controlled response to trunk. Each exercises are repeated approximately thousand times. Studies suggested that thousands of repetitions are required to improve performance during neurological rehabilitation. Animal studies show that several thousand repetitions to middle three fingers to obtain food was followed by an expansion of the area of cortex that serves the middle finger. Studies found out that average stroke patients stood up and sat down approximately thousand times as they progressed from two on the standing up item of the motor assessment scale to 4,5,or 6 on the scale. .

LIMITATIONS

The sample size was small, which reduces generality. This study assessed only short term progress of the patient. Long term follow up is needed to evaluate the difference in condition of

the patient from current status. The study was limited to mild to moderate stroke patients. Here the changes in the upper extremity is not included .Further study can be done which includes mobility as an outcome measure. In future balance impairment in severe stroke patients with BRP is also a research scope.

CONCLUSION

The study provides BRP as an effective treatment for balance retraining in mild to moderate stroke patients .It helps in improving functional balance by postural control mechanism.BRP is considered as an essential component in stroke rehabilitation and to prevent secondary problems due to balance impairements.BRP is simple to practice and is cost effective adjunct to physiotherapy treatment in stroke rehabilitation.

Conflict of interest; None.

Source of funding; self.

Ethical clearance; The procedure followed was in accordance with the ethical standards and after the attainment of informed consent from patients.

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