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EFFICACY OF SWISS BALL TRAINING AND TENS IN UNILATERAL NEGLECT AMONG STROKE PATIENTS – AN EXPERIMENTAL STUDY

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ABSTRACT :

Objectives: *To identify the effect of TENS & Swiss Ball in improving left unilateral neglect, to relate the effect of unilateral neglect on gait of stroke patients with unilateral neglect, and to understand the impact of neglect in functional activities.* ***Method:*** *Study Design: Experimental Design, 300 patients allotted to three groups (Swiss ball training, TENS, Conventional PT). Inclusion criteria: sub acute stroke with unilateral neglect, age between 30-60 years, both genders are included, left hemiplegia or hemiparesis, able to understand the verbal instruction. Exclusion criteria: significant impairments in visual acuity caused by cataract, diabetic retinopathy and neuropathy, hemianopia, history of other neurological diseases such as psychotic disorders or alcoholism. Study setting: JDT Islam Physiotherapy and Rehabilitation Center, SRI ARM Physiotherapy Clinic, Trichy, Selva Physiotherapy Clinic, Thanjavur, Sivam Physiotherapy Clinic, Salem, Nasa Neuro hospital, Punjab.* ***Result:*** *The pre test and post test scores reveal that significant difference in Swiss ball training compared to others.* ***Conclusion:*** *This study suggests that Swiss ball training shows a greater improvement in unilateral neglect. Their balance and gait disturbances reduced which are associated with unilateral neglect.*

KEYWORDS : *Stroke, Left Hemiplegia, Transcutaneous electrical nerve stimulation.*

INTRODUCTION

Unilateral Neglect (ULN) has been defined as "the failure to report, respond or orient to novel or meaningful stimuli presented to the side opposite a brain lesion, when this failure cannot be attributed to either sensory or motor deficits" (Swan, 2001). Unilateral neglect is commonly produced by the right hemisphere lesion and also it involves inferior parietal lobe but it may occur in frontal and subcortical lesion (Pernai et al.,1993).But the parental lobe involvement is not only the reason but same form of symptoms may produce from right temporal lobe lesion. Visual neglect was first reported by Brain's case report. This is a first case with characteristics features and classified as visual disorientation. Brain's finding makes an opening for further investigation of analysis of unilateral neglect

with perceptual disturbance. Robertson (1999) identified there is a strong relation between right poster hemisphere lesion and unilateral neglect. Neglect is a commonest symptom which is associated with stroke (Li, & Malhotra 2015). There are various other lesion which predisposes to unilateral neglect are traumatic brain injury, temporo– parietal lesion and occipital frontal fasciculus (Buklina2002, Aparicio et al 2016), superior parietal region (Vallar,&Pernai 1993) fronto parietal lesion (Corbetta, & Shulman 2002), inferior occipital frontal area (Karnath et al., 2001). The reported unilateral neglect following right brain damage ranged to the maximum of 80 per cent and mostly the reported cases are in acute stage of stroke (Li, & Malhotra 2015). Based on available data, 33 -85 per cent of stroke patients are affected with unilateral neglect (Stone et al. 1993). In literatures the unilateral neglect has been identified as various terminologies such as visual inattention, unilateral spatial agnosia, left side fixed hemianopia, hemi-inattention, hemi-neglect, unilateral neglect, (Brain,2000), (Weinstein &Freidland, 1977) Perceptual dysfunction of one half of the external space (Critchley, 1953), left side fixed hemianopia (Luria,&Skorodumova, 1950), Hemi neglect (Kinsbourne, 2013). There is a great chance that injury (Ugur et al., 2000)will be there for unilateral neglect stroke patients that will reduce the functional outcome (Jehkonenet al., 2006). In this study, the following outcome measures were used: line bisection test, berg balance scale, dynamic gait index, care giver strain index and functional independence measure for the assessment of unilateral neglect, balance, gait, stress level, and ADLs respectively. Clinically, if a person is affected with unilateral neglect, ultimately there will be balance deficits and gait deviation. So, it is essential to document the balance and gait deviations. It is strenuous for the patient to do the activities of daily living (ADLs) while suffering from unilateral neglect. At times, they are unable to initiate and complete the ADLs. The unilateral neglect is deteriorating the overall outcome of the rehabilitation, which in turn causes stress to the care givers. Hence, it is essential to treat at this at earliest before it becomes habitual for the patient.Out of various dysfunctions in stroke, unilateral neglect is a severe form of symptom. In a systemic review on treatment approach for unilateral neglect after stroke from 1997 through 2012, Nicole Y.H. Yang et al. (2013) had concluded that there are fewer studies on this aspect of symptom and there is no standardized protocol for treating this type of patient. Dobkin et al. (1989)"numerous diagnostic methods are available for the confirmation of unilateral neglect whereas we suggested Computed tomography, magnetic resonance imaging and angiography are needed for confirmation. Parallel systems that cooperate to manage the diverse information necessary for the rapid, precise, and yet highly flexible control of multipoint movements. These circuits might contribute to spontaneous and training induced recovery of function". Strong motivation, supportive milieu (as well as assistive devices), and compensatory behavioural training are important factors in enhancing the rehabilitation (Carrière &Tanzberger, 1998). Hence, Swiss ball training is provided (a supportive milieu) as a treatment for unilateral neglect and thereby helping the patient regain balance and gait. Transcutaneous electrical nerve stimulation (TENS) is used widely in treating the pain disorders. TENS used in the right hemisphere lesion where spatial neglect is identified following a stroke and decreases the postural instability due to spatial neglect (Pérennou et al., 2001). Hence, in this research Swiss ball compared to transcutaneous electrical stimulation (TENS) and to identify the best and readily available and cost-effective treatment.

METHODOLOGY

Need for the Study: The persistence of ULN will decrease the recovery of stroke patients. It is necessary to analyse ULN and necessary measures to take to reduce the ULN thereby indirectly enhancing the balance and gait. The present study was carried out to explore the measures needed to take to reduce the symptoms of ULN, balance and gait found in hemiparetic patients. The cost-effective treatment method needs to identify to reduce the symptoms of ULN and then to compare the various treatment approach in ULN. *Objectives:* The main objectives of the study were to estimate the effect of Swiss ball training and TENS in improving the symptoms of left unilateral neglect following stroke and to examine the relation of unilateral neglect with balance and gait on stroke patients affected with unilateral neglect. *Population and Sampling*: The consent form has been collected from 300 patients who were included through purposive sampling divided in to three groups. Group A – 100 Swiss ball training. Group B – 100 TENS. Group C – control group

conventional physiotherapy. The Experimental research design was adopted in this study. *Inclusion criteria*: Subjects diagnosed with left unilateral neglectage between 40 to 60. Both Males and females, cerebral vascular disease diagnosed by CT scan or MRI in a medical report and compatible with unilateral hemispherical involvement, right hand dominant patients, acute and subacute patients and medically stable. *Exclusion criteria***:** Significant impairment in visual acuity caused by Cataract, Diabetic retinopathy, Glaucoma and Hemianopia. Besides Psychotic disorder and history of other neurological disorders such as Parkinson and chronic alcoholics. Study setting are JDT Islam Physiotherapy and Rehabilitation center, Selva Physiotherapy Clinic, Thanjavur, Sivam Physiotherapy Clinic, Salem, and Synapse Physio Pvt Ltd, Chandigarh. *Parameters:* Line Bisection test, Berg Balance scale, Dynamic Gait index. *Procedure:* Group A: The participants performed trunk muscle exercises by using Swiss balls, maintaining their balance. The exercise given to each patient was- weight shift in all the directions (anterior-posterior, side to side and in diagonal) and progression with reach outs in different directions. A stroke patient observes the movement of his paralysed arm. b. Moving the paralysed arm diagonally across the body while lifting the head may activate the weakened abdominal muscles. c. The patient can observe the movement of the paralysed leg when it is placed on a Swiss ball. The treatment was been given for 30 minutes along with conventional physical therapy. Group B: Transcutaneous electrical nerve stimulation was selected based on the stimulatory effect in perceiving touch sensation in case of perceptual dysfunction like unilateral neglect. The subject's consent was taken prior to the TENS intervention after explaining the possible improvements and adverse effects to the patient and caregiver. The subject was positioned in supine with neck rotated towards the right side. Skin resistance over posterolateral part of the skull and the sternocleidomastoid muscle area was decreased with the use of medicated spirit. The TENS electrodes were placed below the occiput just lateral to the spine and posterior part of sternocleidomastoid muscle contralateral (left side neck) to the lesion. This area is the emergence of superficial cervical plexus containing a subcutaneous network with high density of sensitive fibbers. TENS parameters used in the treatment included rectangular continuous waveform with a frequency of 100 Hz, pulse width of 200µSec and intensity less than 30 mA. Stimulation was delivered 20 minutes per day for 5 days of continuous sessions along with standard rehabilitation program. The abovementioned treatment given along with conventional physical therapy. *Conventional Protocol:*The standard care includes positioning, active and passive ROM exercises, bridging, rolling, cueing, environmental modification and early mobilisation activities.*Data analysis:*The data were analysed through SPSS version 17. Non-parametric test used as the data are non-normative in nature. K independent sample t test has been performed to find the difference of variance between the groups with the significant value of <0.05.

RESULTS

The study aims to determine the effect of Swiss ball training and TENS in unilateral neglect symptoms. The impact of unilateral neglect on balance, gait.

Table -1: Descriptive Statistics of different groups on 3 outcome measures

Variables	N	Mean	SD	Min.	Max.
Pre-Left LBT	300	21.39	2.17	15.48	26.23
Pre-Center LBT	300	9.45	2.30	0.00	17.42
Pre-Right LBT	300	4.04	1.49	1.93	7.56
Post Left LBT	300	3.41	2.53	0.33	9.42
Post Center LBT	300	1.32	0.97	0.17	4.04
Post Right LBT	300	0.56	0.31	0.00	1.72
Pre BBS	300	11.23	3.90	0.00	22.00
Post BBS	300	50.19	3.81	42.00	55.00
Pre DGI	300	7.14	3.96	0.00	12.00
Post DGI	300	20.36	4.26	09.00	29.00
Group	300	2	0.82	1.00	3.00

Kruskal Wallis test applied to identify the variance of difference between the groups. A Kruskal Wallis test H test showed that there was a statistically significant difference in unilateral neglect symptoms between the Swiss ball, TENS and conventional physical therapy treatment, $X^2(2)$ =220.203 for post left line bisection test, 212.740 for berg balance scale, 208.253 for dynamic gait index. With the mean rank of 128.68 for group A, 166.67 for group A in berg balance scale, 201.49 for dynamic gait index.

DISCUSSION

The reason behind the improvement in the unilateral neglect symptoms may be the trunk muscle activation in the Swiss ball training group will be like internally mechanism not though only external mechanism. The patients can try to regulate their postural and righting reactions. The equilibrium reactions in the unstable surface make the patient aware of the movement of body within the space. The study result show that the Swiss ball training helps in alleviating the symptoms of unilateral neglect. A recent study by Karthikbabu et al (2011) has found a greater improvement in trunk flexion in the Swiss ball training group than a training given in even surface. The results are like the present study which shows a greater improvement in unstable surface exercises. The TENS group also shows an improvement but comparatively less than Swiss ball training group.

Table - 2: Test Statistics [a,b]

Variables			Post Left LBT	Post Center LBT	Post Right LBT	Post BBS	Post DGI
Chi-Square			220.20	142.73	24.56	212.74	208.25
Df			2	2	2	2	2
Asymp. Sig.			.000	.000	.000	.000	.000
Monte Carlo Sig.	Sig.		.000[c]	.000[c]	.000[c]	.000[c]	.000[c]
	99% Confidence Interval	Lower Bound	.000	.000	.000	.000	.000
		Upper Bound	.000	.000	.000	.000	.000

a. Kruskal Wallis Test, b. Grouping Variable: Group, c. Based on 10000 sampled tables with starting seed 79654295. LBT - Line Bisection Test, BBS - Berg Balance Scale, DGI - Dynamic Gait Index

CONCLUSION

This study concluded that Swiss ball training is a cost effective in unilateral neglect and also superior in treating the unilateral neglect and have an impact on balance and gait. The randomised controlled trial need to uses to generalise the results. The long-term benefit needs to identify through follow up. The various forms of unilateral neglect can be differentiated and effect can be analysed separately.

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