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EVALUATION OF WEIGHT BEARING AND VISUAL RELIANCE WITH POSTURAL SWAY IN STROKE SUBJECTS-CROSS SECTIONAL STUDY

Medical Science

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ABSTRACT

OBJECTIVE: To determine whether the asymmetrical weight bearing is related to postural sway and vision in patients with stroke.
DESIGN: A CROSS SECTIONAL STUDY
Method: 62 Subjects were taken from S.D.M College of Medical Sciences and Hospital, Dharwad. Demographic information, Body Mass Index (BMI), Modified Ashworth Scale (MAS) Berg Balance Scale (BBS) were calculated. Further, participants were asked to stand bare feet on Nintendo Wii Balance Board (NWBB) with eyes open (EO) and eyes closed (EC) to calculate the weight bearing asymmetry. The data was recorded and sent for analysis.
Results: Results showed that men are more prone to stroke than women. The commonest age group affected age of 50 ± 8 years. Weight bearing asymmetry was seen in all stroke patients and in eyes closed condition (EC) weight bearing asymmetry increased, which was statistically significant for left sided hemiplegic subjects (right hemisphere lesion)p=0.02 compared to right sided hemiplegia (left hemisphere lesion) p=0.13.
Conclusion: There was WBA (with increased weight on unaffected side) and hence increased postural sway in all stroke patients (EO condition). This asymmetry in weight bearing and postural sway increased when vision was occluded (EC condition) and was statistically significant in left sided hemiplegic subjects (right hemisphere lesion). The above findings conclude to say that patients with hemiparesis had unequal weight bearing and are dependent on vision for controlling postural sway.

KEYWORDS

cerebrovascular accident, balance, weight bearing asymmetry, vision.

Introduction:
Stroke is a global health problem and is the second leading cause of death and the Third leading cause of disability worldwide. It is assumed that the average age of patients with stroke in developing countries is usually 15 years younger than those in developed countries. In India, nearly one-fifth of patients with first-ever stroke admitted to hospitals has been estimated to be aged 40 years or less.1 For postural control in quiet standing, an individual requires to maintain their center of mass (COM) within the base of support (BOS) or limits of stability.[2]

Impairments related to stroke or CVA may result in disturbed postural control and underlie the large number of falls experienced by these individuals. Studies have shown that postural sway is one of the factors to distinguish between fallers and non-fallers among older adults taking part in the community.3some studies have also shown that increase in postural sway is also related with falls in individuals with stroke[4]

We as a therapist, often target the strategy to encourage more weight bearing on patients' paretic limb to a greater extent. This technique may help in facilitating a more symmetric weight-bearing posture. However, whether a standing asymmetric weight-bearing posture (i.e. greater loading on non-paretic limb) results in greater postural sway is not clear.

If asymmetric weight-bearing during standing contributes to increased sway and instability, individuals with stroke must find ways of adapt to this deficit to maintain their COG within the stability limits (BOS) and thus, maintaining normal standing balance. As proprioceptive deficits are common in individuals with stroke 5, there is need to find ways to compensate for the altered sensory information. Vision has been shown to play an important role in maintaining standing balance 6-7. In healthy older adults, Studies have also shown that sway is increased when vision is removed.[6]

Considering these factors, whether individuals with stroke compensate for this Instability with a greater utilization of vision to maintain postural control during Standing compared to healthy older adults is not clear. Furthermore, if asymmetrical weight-bearing is related to increase in sway in those exhibiting greater asymmetry during quiet standing may have a greater dependence on vision.

Therefore, there is need for the study to determine whether individuals with stroke have greater visual dependence for the control of postural sway compared to healthy older adults. The contribution of asymmetrical weight-bearing on postural control in individuals with stroke can be calculated. Understanding of the interactions between asymmetry of weight bearing, postural sway, and vision will also help in some clinical guidance for balance training in individuals with stroke.

Method:
Participants – sample size was derived using the formula $n=4pq/L^2$ where n=sample size, p= positive character, q=1-p, L = allowable error i.e, % of p. according to prevalence reported previously, the total sample size will be 62 subjects, 31 in each group at 15% error. There were 62 participants divided into 2 groups of 31 in each group selected from SDM College of medical sciences and Hospital, Dharwad. Group 1 consisted of stroke subjects with inclusion criteria of (a) Sub-acute or chronic stroke. (b) Able to stand for at least 5 minutes. (c) Able to open and close eyes on command. The exclusion criteria were (a) Patients with associated musculoskeletal or any other neurological disorder. (b) Patients with hemi spatial neglect. (c) Patients with visual or cognitive involvement. (d) Patients on active physiotherapy intervention or who has already taken a physiotherapy treatment. Participants aged from 30-65 years (Group 1:50.19±8.72 years, Group 2: 48.94±9 years). BMI of group 1 was 24.50± 2.34 and that of group 2 was 23.85±2.25. Participants in group 1 were having post stroke duration of 20.06± 34.62 months.

PROCEDURE:
Written informed consent was taken from subjects in both groups. Demographic data, post stroke duration, side of affection, Body Mass Index (BMI) were taken from stroke subjects. After getting the basic information, participants were asked to stand bare feet on Nintendo Wii Balance Board (NWBB) with their feet shoulder width apart and arms relaxed at the sides. They were allowed to choose amount of weight bearing load on each limb and were asked to look straight ahead where their weight bearing on each LE was displayed on the television. Three trials of 10s each with eyes open (EO) and eyes closed (EC) were given and after each trial WBA were recorded. Rest time was given between each trial to minimize fatigue, if needed. Therapist was present beside participant to ensure safety during testing. The average of 3 trials was taken as a final measure which was recorded on the data collection sheet. The weight bearing asymmetry with EO and EC of stroke subjects was compared to that of subjects in control group. This recorded data was then sent for statistical analysis.

DATAANALYSIS:
SPSS 20.0 version was used for the analysis of data. Comparison of

demographic data between 2 groups was done using chi square test. For the assessment of weight bearing asymmetry with eyes open and eyes closed, t test was used. Level of significance was kept at **p≤0.05.**

RESULTS:

Table 1: Comparison of group 1 and group 2 with mean age, BMI and Post stroke duration (months) by t test.

Variable	Groups	n	Mean	SD	SE	t-value	P-value
Age	Group 1	31	50.19	8.72	1.57	0.5586	0.5785
	Group 2	31	48.94	9.01	1.62		
Weight (kg)	Group 1	31	65.23	5.25	0.94	2.3381	0.0227*
	Group 2	31	62.16	5.07	0.91		
Height (meter)	Group 1	31	1.63	0.08	0.02	0.8674	0.3892
	Group 2	31	1.62	0.06	0.01		
BMI	Group 1	31	24.50	2.34	0.42	1.1120	0.2706
	Group 2	31	23.85	2.25	0.40		
Post stroke duration (months)	Group 1	31	20.06	34.62	6.22	-	-
	Group 2	31	-	-	-		

*p<0.05

Table 2: Comparison of left and right sides in group 1 and controls with Nintendo Wii Balance Board scores by t test

Side affected	EYES OPEN %				EYES CLOSED %				t value EYES OPEN	t value EYES CLOSED	t value EYES OPEN	t value EYES CLOSED
	Right LL		Left LL		Right LL		Left LL					
	Mean	SD	Mean	SD	Mean	SD	Mean	SD				
Left	51.98	6.56	48.02	6.56	55.74	5.78	44.29	5.79	1.168	-3.834	0.26	0.02*
Right	45.80	8.14	54.20	8.14	46.03	10.14	53.98	10.14	-2.064	-1.568	0.05*	0.13
Controls	50.65	3.27	49.35	3.31	50.61	3.25	49.39	3.24	1.099	1.068	0.28	0.29

DISCUSSION:

Table 1 shows anthropometric measurements which were similar in both the groups and mean duration of post stroke which was 20.06

Table 2 shows scores of Nintendo Wii balance board between stroke subjects and Control group. This table shows % of weight distribution on both lower limbs in quiet standing task in all the participants with eyes open (EO) followed by eyes closed (EC).

In control group of normal healthy individuals, there were 31 participants in total. During quiet standing task with eyes open (EO) condition, distribution of weight on their lower extremities was 50.65% on right lower limb and 49.35% on the left lower limb which changed to 50.61% on right lower limb and 49.39% on the left lower limb during eyes closed (EC) condition. This shows that there was not a significant statistical difference in weight bearing between eyes open (EO) condition and eyes closed (EC) condition. This finding suggests that the non-paretic limb is compensating for the paretic limb.

In stroke group, there were 15 participants with left sided hemiparesis and 16 participants with right sided hemiparesis. In the left sided hemiparesis subjects, during quiet standing task with eyes open (EO) condition, distribution of weight on their lower extremities was 51.98 % on right lower limb and 48.02% on the left lower limb which changed to 55.74% on right lower limb and 44.29% on the left lower limb during eyes closed (EC) condition. This shows that during quiet standing task, left sided hemiplegics were standing with more weight on their right lower limb that is on their normal side. Further when the visual input was blocked by closing the eyes, their weigh bearing asymmetry increased. (p=0.02*). However in the right sided hemiparesis subjects during the quiet standing task with eyes open (EO) condition, distribution of weight on their lower extremities was 45.80 % on right lower limb and 54.20% on the left lower limb which changed to 46.03% on right lower limb and 53.98% on the left lower limb during eyes closed (EC) condition. This shows that during quiet standing task, right sided hemiplegics were standing with more weight on their left lower limb that is on their normal side. The difference between EO-EC of right hemiparetic subjects was not statistically significant i.e., in EO situation, their weight bearing on left LE was 54.20% and on right LE was 45.80% which changed to 53.98% and 46.03% on left and right LE respectively. This shows that patients with right hemiparesis had WBA in standing with EO but when they closed their eyes, WBA did not changed significantly.

Patient's with right hemispheric lesion (or left sided hemiplegia) had more postural instability in terms of excessive weight on normal side and less weight on affected side, this finding is similar to a study by gillesrode et al on "predominance of postural imbalance in left hemiparetic patients" where they found that hemiparetic subjects showed a greater displacement of center of pressure towards the side of lesion compared to normal subjects. In addition they also found that left hemiparetic patients showed greater lateral displacement towards the side of lesion compared to right hemiparetic patients. Gilles et al suggest that recovery of posture in hemiparetic patients depends not only on recovery of motor, sensory and visual deficit, but also on spatial cognition means integration of visual, proprioceptive and vestibular information about position of eyes, head and body. All this information is used by the brain to produce multiple high-order representation of space, necessary for accurate spatial behavior. Such spatial representation could be disrupted by unilateral cerebral damage, particularly following a right hemisphere lesion. [8]

It was found in our study that in patients with left hemiplegia patients weight bearing asymmetry increased with eyes closed condition both in right and left hemiplegia but was statistically significant for left hemiplegia (right hemisphere lesion)- this finding is in accordance with the study by Isabelle V Bonan et al "Reliance on visual information after stroke part I : balance on dynamic posturography where postural imbalance after stroke were checked in 6 sensory conditions and results showed that patients with hemiplegia seem to rely on visual input and more so for patients with right hemisphere lesions. It was indicated that right hemisphere lesions (left hemiplegia patients) rely more on visual input than do patients with left hemisphere lesions.[9]

References :

1. Pandian, et al. Stroke Epidemiology and Care Services in India Journal of Stroke 2013;15(3):128-134.
2. Shumway – Cook. Wallcot MH, Motor control. Theory and application. Ed 2001.
3. Maki BE, Holliday PJ, Topper AK. A prospective study of postural balance and risk of falling in an ambulatory and independent elderly population. J Gerontol A Biol Sci Med Sci. 1994; 49:M72–M84.
4. Sackley CM. Falls, sway, and symmetry of weight-bearing after stroke. Int Disabil Stud. 1991; 13:1–4. [PubMed: 1917796]
5. Carey LM, Matyas TA, Oke LE. Sensory loss in stroke patients: effective training of tactile and proprioceptive discrimination. Arch Phys Med Rehabil.1993; 74:602–611. [PubMed: 8503750]
6. Brooke-Wavell K, Perret LK, Howarth PA, Haslam RA. Influence of the visual environment on the postural stability in healthy older women. Gerontology. 2002; 48:293–297. [PubMed: 12169794]
7. Lord SR, Menz HB. Visual contributions to postural stability in older adults. Gerontology. 2000;46:306–310. [PubMed: 11044784]
8. Rode G, Tilket C, Boisson D, "predominance of postural imbalance in left hemiparetic patients, Scand J Rehab Med 29: 11-16, 1997
9. Bonan I.V, Colle F.M, Guichard J.P, Vicaut E, Eisenfisz M , P. Tran Ba Huy, Alain P. Yelnik, Reliance on Visual Information After Stroke. Part I: Balance on Dynamic Posturography, Arch Phys Med Rehabil Vol 85, February 2004, 268-73