VIMS Journal of Physical Therapy

[ORIGINAL ARTICLE]

Variations in Shoulder and Pelvic Girdle Alignment in Patients with Stroke: A Cross Sectional Study.

Dr. Salim Shaikh (PT)[1], Dr. Suvarna Ganvir (PT)[2]
[1]Post Graduate Student, [2]Professor & HOD, Department of Neurophysiotherapy, D.V.V.P.F.'s College of Physiotherapy, Ahmednagar.

ABSTRACT :

Background: Shoulder and pelvic girdle plays an important role in day to activities of life. In patients with Stroke, one side affection of these girdles pose a major challenge in rehabilitation. However, there is scanty literature about the variations in alignment of girdles in patients with stroke. Aim: This study is aimed to analyse the abnormal changes in the Scapular, Acromion, Mastoid, Pelvis alignment in patients with stroke, as a baseline data.

Methodology: An observational study of Scapular, Acromion, Mastoid, Pelvis alignment in stroke survivors was conducted in a Tertiary care hospital. Stroke survivors were recruited from the Physiotherapy unit of VPMH hospital, Ahmednagar. Patients were included between the age group 30 to 70 yrs., Patients with unilateral stroke, patients with acute, subacute & chronic stroke and able to stand with or without support. A palpation meter is used to measure the Scapular, Acromion, Mastoid, Pelvis alignment in stroke survivors.

Results: When measured scapular protraction, people after stroke showed more protracted scapulae than the healthy individuals (mean 1.28> 0.42, P= <0.0001). Scapular height discrepancy (mean 1.50>0.55 P= 0.0003), PSIS alignment (mean 0.52>0.07 P= <0.0001) and Acromioclavicular joint alignment (mean 2.28>0.45 P= <0.0001) shows more significant difference found in stroke survivors group than the Healthy individuals

Conclusion: Our results indicate that people after stroke, in comparison with age-matched healthy comparison subjects, have altered Scapular, Acromioclavicular and pelvic alignment as evaluated by palpation meter.

Keywords: Stroke, Shoulder alignment, Pelvic alignment, Palpation Meter

Introduction

Stroke is defined by the World Health Organization as a clinical syndrome consisting of rapidly developing clinical signs of focal (or global in case of coma) disturbance of cerebral function lasting more than 24 hours or leading to death with no apparent cause other than a vascular origin. [1]

Following vascular occlusion, an ischemic cascade begins which includes energy and sodium potassium pump failure, an increase in intracellular calcium, depolarization, and generation of free radicals, blood brain barrier disruption, inflammation, and apoptosis leading to various impairments. [2],[16]

The normal biomechanics and stability of shoulder complex is compromise by loss of motor control and development of abnormal patterns due to beginning of hemiplegia

Hemi paretic patients had altered scapular and shoulder movement patterns which hamper the performance of ROM of shoulder joint.

Abnormal biomechanics of shoulder joint will alter the stabilization of scapula due to that Glenohumeral joint and scapula cannot function independently (Paine, 2013) [2]

Disturbance in scapulohumaral rhythm due to abnormal shoulder biomechanics leads to the altered acromion and mastoid process alignments.

The trunk along with the pelvis when optimally aligned is responsible for appropriate activation of

*Corresponding author
Dr. Salim Shaikh (PT)
Email : salimshaikhmip@gmail.com
D.V.V.P.F's College of Physiotherapy, Ahmednagar.

Copyright 2021, VIMS Journal of Physical Therapy. This is an Open Access article which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

the trunk muscles and this translates into the maintenance of a good trunk control. Impairment in trunk performance following stroke is considered to be associated with changes in the measures of balance, gait and functional ability seen with stroke. [3],[19]

Functional performance of upper limb and lower limb, balance, gait changes are directly depends on level of disturbed alignment of pelvis, scapula, AC joint and mastoid processes.[17]

These all alignments are need to be checked with the valid and reliable measurement tool so, recently developed Palpation Meter is considered as a reliable and valid measurement tool for assessment of different alignments.

A palpation meter (PALM; Performance Attainment Associates, St. Paul, MN, USA) is used to measure the distance and inclination between two bony landmarks of the body. The PALM consisted of an inclinometer and two caliper arms, and the inclinometer had a semi-circular arc that moved within the range 0–30° in either direction from the midline at 1° intervals [4]

In our Knowledge there is no any study done yet who analyse the postural changes and height discrepancy in shoulder, pelvis with valid measurement tool.

So, this study is aimed to analyse the abnormal changes in the Scapular, Acromion, Mastoid, Pelvis alignment in patients with stroke.

Methodology

An observational study of Scapular, Acromion, Mastoid, Pelvis alignment in stroke survivors was conducted in a Tertiary care hospital. 48 participants were included in the study out of which 28 Stroke survivors were recruited in Group A from the Physiotherapy unit of VPMH hospital, Ahmednagar. Patients were included between the age group 30 to 70 yrs., Patients with unilateral stroke, patients with acute, subacute & chronic stroke and able to stand with or without support. In Group B 20 healthy individuals were included with comparatively same age group.

A palpation meter is used to measure the Scapular, Acromion, Mastoid, Pelvis alignment in stroke survivors. The PALM consisted of an inclinometer and two caliper arms, and the inclinometer had a semi-circular arc that moved within the range 0–30° in either direction from the midline at 1° intervals.

To check the scapular alignment we measured scapular protraction/retraction and scapular height discrepancy. For measure the scapular protraction/retraction we kept two caliper arms over the bony landmarks; one over the inferior angle of the scapula and other on corresponding vertebral spinous process and marks the readings in centimetre, Compare it with the unaffected side; difference more than 1.0 cm is considered as abnormality.

The PALM calculator will display the height discrepancy of scapular, PSIS, AC joint, Mastoid alignment in centimetres and inches when the measured inclination angle displayed on the inclinometer scale, is lined up with measured distance displayed on the caliper dial.

Data Analysis

Statistical Analysis was performed by using SPSS version 20: Descriptive data analysis was performed for relevant variables. Comparison of mean and standard deviation between stroke survivors and healthy individuals group was done by using unpaired t-test. Results were interpreted based on the confidence interval set at 95% and were reported along with statistical significance ($p<0.05$).

Result

Table 1: Demographic Data of the Study

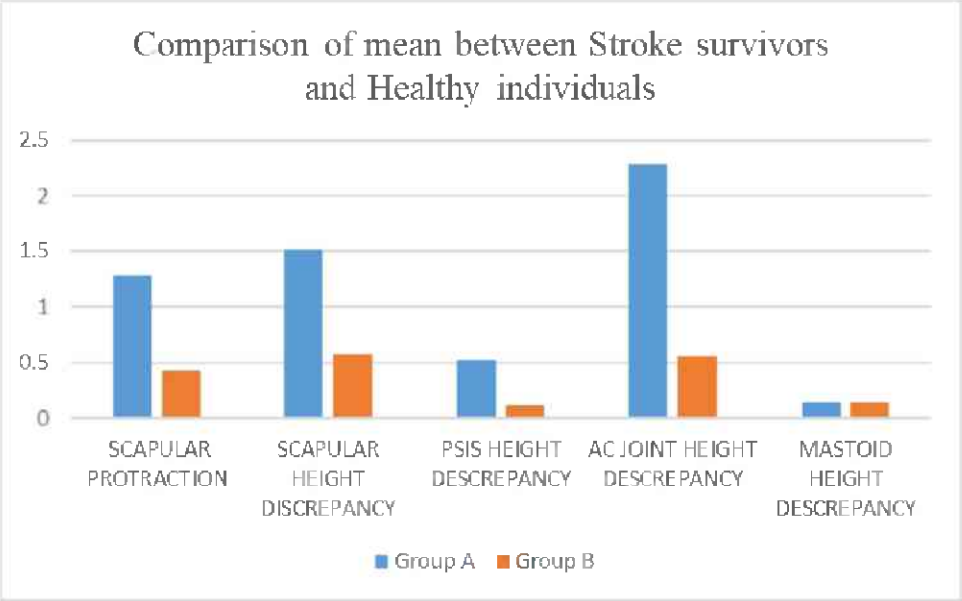
	Variable	Stroke survivors (28)	Healthy individuals (20)	Percentage (%)
Gender	Male	21	16	75
	Female	7	4	25
Side affected	Right	12		42.8
	Left	16		57.14
Duration	Acute	13		46.4
	Chronic	15		53.57
Type of stroke	Ischemic	22		78.57
	Hemorrhagic	06		21.42

Table 2 : Comparison of Mean and Standard Deviation Between Stroke Survivors and Healthy Individuals

		Stroke survivors ***Mean±SD***	**Healthy individuals** ***Mean±SD***	***P Value***
Scapular Protraction		1.282±0.6	0.425±0.42	<0.0001
Scapular Height Discrepancy	In (Cm)	1.503±0.95	0.555±0.57	0.0003
	IN (INCHES)	0.602±0.37	0.223±0.24	0.0002
Psis Height Descrepancy	In (Cm)	0.520±0.41	0.075±0.11	<0.0001
	IN (INCHES)	0.196±0.15	0.027±0.04	<0.0001
Ac Joint Height Descrepancy	In (Cm)	2.286±1.4	0.455±0.55	<0.0001
	IN (INCHES)	0.879±0.57	0.16±0.20	<0.0001

Table 1 summarizes the demographic variables of the study. 28 stroke subjects (21 males, 7 females) were recruited in the study with mean age 53.6± 11.16 years. With respect to type of stroke 22 subjects had ischemic lesions and 6 hemorrhagic and with duration of stroke, there were 13 subjects with an acute stroke, and 15 with a chronic stroke. Others side 20 healthy individuals (16 males, 4 females) were recruited in comparison group.

Table 2 summarizes the Comparison of mean and standard deviation of outcomes between group A (Stroke survivors) and group B (Healthy individuals). When measured scapular protraction, people after stroke showed more protracted scapulae than the healthy individuals (mean 1.28> 0.42, P= <0.0001). Scapular height discrepancy (mean 1.50>0.55 P= 0.0003), PSIS alignment (mean 0.52>0.07 P= <0.0001) and Acromioclavicular joint alignment (mean 2.28>0.45 P= <0.0001) shows more significant difference found in stroke survivors group than the Healthy individuals. Mastoid alignment does not shows any comparative difference between both the group (P= 0.2825).



Graph 1: Comparison of Mean between Stroke Survivors and Healthy Individuals

Discussion

We examined variations in shoulder and pelvic girdle alignment in 48 participants with stroke and healthy individuals which hypothesized that postural alignment would be altered in people with stroke.

Results showed that significant alteration of measured scapular protraction, scapular height, PSIS and Ac joint alignment is seen in Stroke survivors group.

Motor dysfunctions caused due to weakness of the muscles and hypertonicity along with the impairment of proprioception has been proposed as factors that may underlie the poor postural control observed in people with stroke. Beyond strength, coordination, and sensory function, alignment of the scapulae, spine, and pelvis may also have implications for postural control. Proper alignment of the scapulae, pelvis and spine is important for good balance between external loads on the trunk and adequate trunk muscle function.[4],[5]

Findings of our study supported by Verheyden et.al Which shows significant differences in postural alignment between people with stroke and comparison subjects in measurements of pelvic tilt and over-all spinal inclination in standing. The relationship between poor balance, trunk control, and an altered pelvic tilt may indicate a postural control deficit within the core stability of people with chronic stroke. Pelvic control is important for trunk stability, and the lack of active muscle stabilization might lead to poor control of lumbopelvic position. The deep trunk muscles, in particular, have been shown to contribute to the stability of the lower spine and as core stability requires the intrinsic control of musculature surrounding the sacral-pelvic region, so his results suggest that this control is lacking in the chronic phase after stroke and is reflected in postural control and movement deficits in his sample.[5],[21]

Messier et al, who suggested that the pelvis is more fixed after stroke and, therefore, there is less anterior tilt of the pelvis after trunk flexion. Stroke participants with a more forward leaning posture in upright standing had significantly lower scores on trunk control and functional balance.[6],[13]

Scapular alterations were evident in patients with stroke, this noted in study done by Dabholkar et.al. During the flaccid stage, the trunk tends to lean or shorten toward the hemiplegic side, which causes the scapula to descend from its normal horizontal level. The trapezius and the serratus anterior also become flaccid, causing the scapula to rotate downwardly. With altered tone, the rotator cuff can no longer maintain the integrity of the glenohumeral joint. These conditions contribute to a subluxing GHJ. During the spastic stage, the pectoralis major and minor, rhomboideus, elevator scapulae, and latissimus dorsi can become hypertonic, further rotating the scapula downward, causing GHS.[7],[11],[18]

Edward et al. stated that proprioceptive dysfunction, injury to joint can alter sensory information provided by mechanoreceptors etc., direct trauma and indirect trauma to be the causes for scapular dyskinesia.[10]

A possible mechanism for altered postural alignments was explained by Kibler in 2003 who stated that muscle imbalance or weakness, scapular muscle fatigue may lead to altered glenohumeral proprioception, muscular inhibition, and impaired coordination [8],[16] and this findings further supported by DePalma et.al. Who noted that the scapula is central in proficient shoulder activity, and rotator cuff muscles will not operate optimally if the scapula is poorly positioned. As has already been noted, the scapula can only be stabilized dynamically if the thoracic spine and the ribs can provide adequate anchorage or foundation for the relevant muscle groups.[9],[20]

Therefore, findings of this study should be considered while planning treatment protocol to promote better outcomes in patients with Stroke.

Conclusion

Our results indicate that people after stroke, in comparison with age-matched healthy comparison subjects, have altered Scapular, Acromioclavicular and pelvic alignment as evaluated by palpation meter. Mastoid alignment doesn't showed any significant alteration.

Funding: No funding sources

Conflict of interest: None declared

References

1) Dr. Avanee Vajar et al. 2019. "To compare the effect of scapular stability exercise versus scapular proprioceptive neuromuscular facilitation on function of paretic upper extremity of stroke patients", International Journal of Current Research, 11, (06), 4878-4880

2) Joshi D, Chitra J. Effect of scapular proprioceptive neuromuscular facilitation on shoulder pain, range of motion, and upper extremity function in hemiplegic patients: A randomized controlled trial. Indian J Health Sci Biomed Res 2017; 10:276-82.

3) Pathak S et al. "The relationship between pelvic alignment and trunk control in stroke subjects: a cross-sectional study". Int J Res Med Sci. 2014 Nov;2(4):1483-1487

4) B.R. da Costa et al. "Reliability of scapular positioning measurement procedure using the Palpation Meter (PALM)". Physiotherapy 96 (2010) 59–67

5) Geert Verheyden, PhD, Carolien Ruesen, MSc et. Al. Postural Alignment Is Altered in People With Chronic Stroke and Related to Motor and Functional Performance. JNPT 2014;38: 239–245

6) Messier S, Bourbonnains D, Desrosiers J, Roy Y. Dynamic Analysis of Trunk Flexion after Stroke. Arch Phys Med Rehabil 2004; 85(10):1619-24

7) Ajit Dabholkar, Devanshi Mehta, Sujata Yardi,Tejashree, Dabholkar. Assessment of scapular behaviour in stroke patients. International Journal of Health and Rehabilitation Sciences. June 2015, Vol 4 Issue 2.

8) Kibler WB,Ludewig PM,McClure PW et al.Clinical implications of scapular dyskinesis in shoulder injury:the 2013 consensus statement from 'scapula summit'.Br J Sports Med 2013;47:877-85

9) DePalm,MJ, Johnson EW. Detecting and treating shoulder impingement syndrome. The role of scapulothoracic dyskinesis. Phys Sports Med.2003; 31(7):25–32.

10) Isle JW, Nienhus B, Latour H, Geurts A. Posturographic assessment of sitting balance recovery in sub-acute phase of stroke. Gait Posture 2008; 28: 507-12.

11) Bujanda DE., Sylvie N., Daniel B., Dickstein Ruth. Associations between lower limb impairments, locomotor capacities and kinematic variables in the frontal plane during walking in adults with chronic stroke. J Rehabil Med 2003; 35: 259–64.

12) Karthikbabu S., Nayak Akshatha., K Vijayakumar.,Misri Z K., BV Suresh., Ganesan Sailaxmi., Joshua Abraham M. Comparison of physio ball and plinth trunk exercises regimens on trunk control and functional balance in patients with acute stroke: a pilot randomized controlled trial. Clin Rehabil 2011; 25(8): 709–719.

13) Petrone MR, Guinn J, et al. The Accuracy Of The Palpation Meter(PALM) For Measuring Pelvic Crest Height Difference And Leg Length Discrepancy. J Orthop Sports Phys Ther 2003; 33:319-25

14) Banerjee T, Kumar S. Epidemiology of stroke in India. Neurology Asia 2006; 11:1-4.

15) Ryerson S, Byl NN, Brown DA, Brown D, Wong R and Hidler J. Altered trunk position sense and its relation to balance functions in people post-stroke. J Neurol PhysTher 2008; 32: 14–20.

16) .W.Ben Kibler,John McMullen,Sapular dyskinesis and its relation to shoulder pain,J Am Acad Orthop Surg 2003;11:142-151

17) . Genthon N, Vuillerme N, Monnet JP, Petit C, Rougier P. Biomechanical assessment of the sitting posture maintenance in participants with stroke. Clin Biomech (Brisol, Avon). 2007;22:1024-1029.

18) Van Nes IJ, Nienhuis B, Latour H, Geurts AC. Posturographic assessment of sitting balance recovery in the subacute phase of stroke. Gait Posture. 2008;28:507-512.

19) Tanaka S, Hachisuka K, Ogata H. Muscle strength of trunk flexion-extension in post-stroke hemiplegic participants. Am J Phys Med Rehabil. 1998;77:288-290.

20) Karatas M, Cetin N, Bayramoglu M, Dilek A. Trunk muscle strength in relation to balance and functional disability in unihemispheric stroke participants. Am J Phys Med Rehabil. 2004;83:81-87

21) Hsieh CL, Sheu CF, Hsueh IP, Wang CH. Trunk control as an early predictor of comprehensive activities of daily living function in stroke participants. Stroke. 2002; 33:2626-2630.

22) Massion J. Postural control system. Curr Opin Neurobiol. 1994;4:877- 887.