ORIGINAL RESEARCH

Assessment of scapular behaviour in stroke patients

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Abstract

Background: Stroke is the number two cause of death world-wide and may soon become the leading cause of death worldwide. The occurrence of shoulder pain after stroke is quite common in hemiplegia with an estimated incidence between 16% and 84%.This so-called Post Stroke Shoulder Pain, or PSSP can impede rehabilitation and interfere with both function and quality of life. It may not only interfere with shoulder function, but also with balance, walking, transfers and performance of self-care activities. Alterations in shoulder kinematics could lead to shoulder instabilities which in turn could lead to shoulder pain.

Purpose: Assessment of scapular stability, assessment of type of scapular dyskinesia , and assessment of disability in stroke patients with scapular dyskinesia

Materials and Methods: Weighing scale, Dumbbells weighing three pounds and five pounds, Ruler to calculate scapular balance angle, Disability assessment scale, Goniometer.

Results: Scapular alterations were evident in patients with stroke

Conclusion: The scapular stability is affected as evaluated by scapular dyskinesia test and scapular balance angle. Various types of scapular dyskinesia were observed. It was observed that patients with disability have scapular dyskinesia

Keywords: Stroke, shoulder pain, scapular kinematic alteration, dyskinesia

Introduction

Stroke is a world-wide health problem; with incidence ranging from 0.2 to 2.5 per thousand per year according to WHO Collaborative Study in 12 countries. It accounts for 20% of neurological admissions. Till date, in India there have been only a few community based studies for either prevalence or incidence of stroke; with one reporting a prevalence rate of 334/100,000 and an incidence of 73/100,000 in 1990[1]. Hemiplegic shoulder pain (HSP) is one of the commonest complications, occurring in about 20-72% of such patients with average figures ranges from 43% to 64%.

Kalichman and Ratmansky[2] reported prevalence of HSP is approximately 22%-23% in the general population of stroke survivors and approximately 54%-55% among stroke patients in rehabilitation settings. Alterations in shoulder kinematics could lead to shoulder instabilities which in turn could lead to shoulder pain.

It has been shown that during glenohumeral elevation in patients with subacromial impingement syndrome, scapular winging is increased (decreased posterior tilt) and lateral rotation (also referred to as upward rotation i.e. angulus inferior of the scapula moves outwards and upwards) is decreased[3, 4]. Also, weak, dysfunctional or fatigued scapular musculature could lead to alterations in shoulder kinematics[5-7] as well as changes in thoracic and cervical spine posture[8].Stroke patients are susceptible to all the above mentioned disturbances and it seems likely that these disturbances could provide a basis for the development of Post Stroke Shoulder Pain.

Alteration in the normal state or dynamic position of the scapula during coupled scapulohumeral movements (Kibler 2013)[9] is called scapular dyskinesia. A generalised term used to describe the loss of scapular control and motion. Alterations in scapular position and motion occur in 68-100% of patients with shoulder injury.

Thus, the aim of the study is to evaluate scapular behaviour in post stroke patients.

Objectives: Assessment of scapular stability, assessment of type of scapular dyskinesia. and assessment of disability in patients with scapular dyskinesia

Materials and Methods

Materials: Weighing scale, Dumbbells weighing three pounds and five pounds, Ruler to calculate scapular balance angle, Disability assessment scale, Goniometer.

Research design: Cross sectional study

Sampling method: Convenience

Sample size: 50 stroke patients

Patient selection criteria:

Inclusion criteria: Hemiplegic patients since more than three months, Upper extremity Voluntary control of 3 or more than 3.

Exclusion criteria: Hemiplegic patients since less than three months, Upper extremity Voluntary control of less than three.

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Measurement of scapular balance angle (SBA): The subject stands on both bare feet and arms hanging on both the side of the pelvis and heels together. The inferior angle of the scapula was marked bilaterally and a line was drawn connecting these marks. Another vertical line between C7 and T10 spinous processes was drawn. The angles formed by the line joining both inferior angles of the scapula with the vertical line running through the spine were measured. The difference between these two angles corresponded to the scapular balance angle[10].

Measurement of scapular dyskinesia:

Scapular dyskinesis test (SDT): Testing began with arms at the side of the body, elbows straight, and shoulders in neutral rotation. The patient was given 3 pounds or 5 pounds dumbbell with respect to their weight (68kg and above were given 5 pounds dumbbell and 68kg and below were given 3 pounds dumbbell).The examiner stood behind the subjects with the subjects back facing towards the examiner. The patients were asked to do flexion of the shoulder five times starting with arms on the side of the body, elbow in extension and shoulder in neutral rotation each time. The patients were then asked to do abduction of the shoulder five times starting with arms on the side of the body, elbow in extension and shoulder in neutral rotation each time. The movement of the scapula was observed and accordingly noted [11].

Results

Table 1: Demographic profile

Demographic Profile	Mean	Standard Deviation
Age (years)	64.94	7.95
Body mass Index (kg/m^2)	25.95	3.13

Table2: Ischaemic and haemorrhagic stroke:

Type	No. Of patients
Ischaemic	40
Haemorrhagic	10

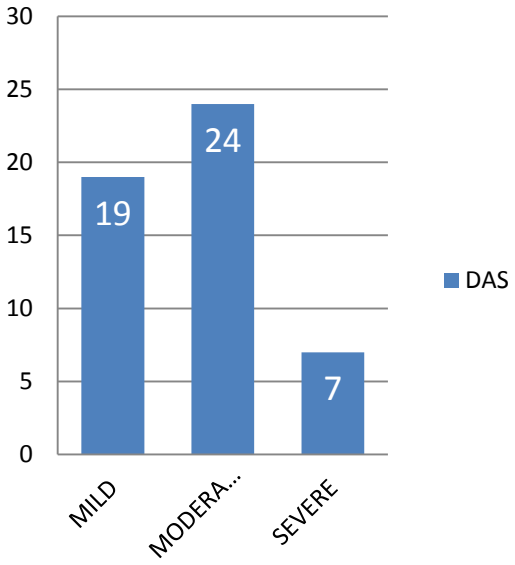
Table 3: Dominance and Hemiplegic side:

	Dominance	Hemiplegic side
Right	44	13
Left	6	37
Total	50	50

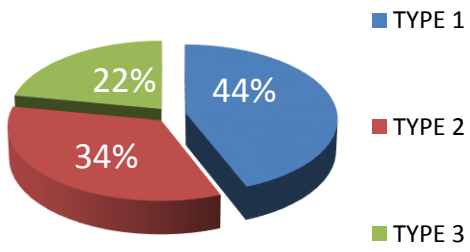
Table 4: Gender wise distribution

Male	78%
Female	22%

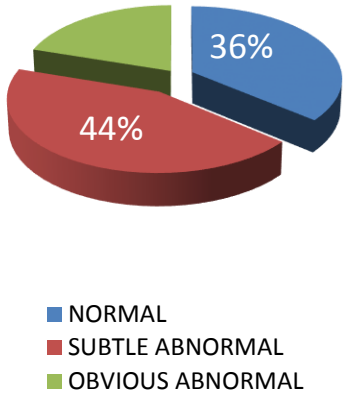
Graph 1: Disability Assessment Scale



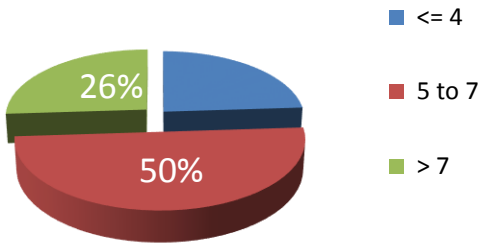
Graph 2: Types of Dyskinesia



Graph 3: Scapular Dyskinesis Test (SDT)



Graph 4: Scapular Balance Angle (SBA)



Discussion

Injury or paralysis of muscles around the shoulder complex may lead to Glenohumeral joint subluxation. Glenohumeral subluxation (GHS), a frequent complication for patients with a post stroke hemiplegia, is reported to be present in 17 to 81 percent of patients with hemiplegia following stroke, However, GHS's role in post stroke complications is still controversial. Although the impact of GHS on the development of shoulder pain (SP) and upper-limb functional recovery has not been completely explained, a number of authors consider GHS an important source of SP. Moreover, several recent reviews focused on SP describe GHS management as the main intervention to prevent SP[12]

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. Without normal tone, the rotator cuff can no longer maintain the integrity of the GHJ. These conditions contribute to a subluxing GHJ.[13,14] 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 &SP.

Kibler 2003[15] stated that muscle imbalance or weakness, scapular muscle fatigue may lead to altered glenohumeral proprioception, muscular inhibition, impaired coordination and timing of movements are the causes for scapular dyskinesia. 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.

Studies suggest that in patient with post stroke shoulder pain a particular kinematical shoulder pattern was established characterized by enhanced lateral rotation and diminished glenohumeral mobility.

DePalma et al.[16] notes 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[17]. Poor position, alignment, or stability of the scapula on the chest wall will significantly impact the available range of motion of the shoulder, may also cause pain, and will consequently impede functional use of the upper extremity.

Looking at the scapula from a neurological perspective may attribute any malalignment to, for example, increased tone or abnormal movement patterns. Landel and Fisher[18] also highlight that an orthopedic perspective can be extremely effective in determining the relative alignment of various body segments. They note the importance of the position of the head on the neck, neck on thorax, and

shoulder girdle on thorax and conclude that other possible reasons for malalignment could be lack of range, weakness, habit, and resting muscle tension. They state that therapists need to recognize that faulty alignment may predispose the patient to move abnormally. Only after scapular stabilization is achieved should treatment focus on distal upper extremity dysfunction.

Conclusion:

The scapular stability is affected as evaluated by scapular dyskinesis test and scapular balance angle. Various types of scapular dyskinesis were observed.It was observed that patients with disability have scapular dyskinesis

Clinical Implication:

The present study highlights the presence of scapular alterations in stroke patients.

Recommendations: Positioning, Slings, Strapping, Neuromuscular Approach: Electrical Stimulation, Facilitation of Movement[19]

Conflict of interest

We certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Source of funding

This research received no specific grant from any funding agency in the public, commercial, or not / for profit sectors.

Ethical clearance

We certify that this study involving human subjects is in accordance with Helsinky declaration of 1975 as revised in 2000 and it has been approved by the relevant ethical committee

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