Section: Orthopaedics

Original Research Article

INCIDENCE OF HEMIPLEGIC SHOULDER PAIN ALLIED WITH ULTRASONIC MANIFESTATIONS IN POST-STROKE PATIENTS

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ABSTRACT

Background: Hemiplegic shoulder pain represents the most prevalent complication following a stroke. This typically occurs during the crucial phase of stroke recovery and impedes the rehabilitation of upper extremity motor function. Nonetheless, there is a limited amount of research regarding the risk factors, progression, and outcomes of shoulder pain following a stroke. The study aims to find the prevalence of hemiplegic shoulder pain in the middle-aged to elderly population by using ultrasonography. **Materials and Methods:** Patients with hemiplegic shoulder pain in the rehabilitation unit were identified and monitored. The essential clinical information, including age, gender, history, and stroke location, was documented. The shoulder ultrasonography data were gathered. **Result:** A total of 260 individuals who fall under the inclusion criteria were considered for the study. The patients were grouped according to the intensity of pain as acute, subacute, and chronic stages. The prevalence rate was 60%. Shoulder ultrasonography displayed the most common shoulder lesion as biceps effusion in 68 individuals, while a supraspinatus tear and tendinopathy were noted in 48 subjects. A subscapularis tear was observed in 46 individuals. SA-SD bursitis was identified in 34 subjects, while subluxation was noted in 15 subjects; no significant findings were recorded in 49 subjects. **Conclusion:** Hemiplegic shoulder pain is commonly observed and may persist for an extended duration. There are several risk factors at play. Additionally, hemiplegic shoulder pain influences the readmission rate of patients. Consequently, it is essential to give greater consideration to this issue in our clinical practice. The implementation of diverse methods to alleviate shoulder pain will facilitate the recovery of upper limb motor function and reduce the duration of in-hospital rehabilitation.

INTRODUCTION

Post-stroke shoulder pain (PSSP), also referred to as hemiplegic shoulder pain, is a common condition after stroke. The commencement of PSSP can transpire in the initial 2 weeks post stroke and ensue within 2-3 months.[1] A measured onset of shoulder pain is reported in patients at test or certain postures. The clinical examination displays the signs of shoulder subluxation and rotator cuff impingement. The disposing factors comprise inappropriate positioning and traction force on the shoulder joint during transfers, flaccid paresis, spasticity, poor motor purpose, and minimised range of motion.[2]

The incidence of shoulder pain is 2.5%, with a prevalence of 67%. The risk factors include pathologies in the rotator cuff and glenohumeral joint.[3] In stroke patients, the most significant predictors of PSSP are age, gender, increased tone sensory impairment, left-sided hemiparesis, haemorrhagic stroke, and severity of stroke.[4] The major causes of PSSP can be divided into 3 categories: 1. Decreased motor control and tone variations; 2. Soft tissue lesions, and 3. Altered peripheral and central nervous activity.[5,6]

Various treatments, from traditional times to recent years, include Kinesio taping,[7] electrical stimulation,[8] shock wave therapy,[9] and robot-assisted therapy.[10]

In patients with stroke, moderate to severe pain is predominant. Pain lasting for more days can delay the recovery of limb function, which leads to sleep disorders, anxiety, and depression, followed by decreased life quality. Hence, tracking the HSP can have positive clinical significance by reducing the incidence.[11]

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In the present study, we aimed to observe the incidence of HSP by ultrasonography in patients with or without stroke pain.

MATERIALS AND METHODS

This was a quasi-experimental study conducted in the department of Orthopaedics, Swatantra Institute of Physiotherapy and Rehabilitation, GSL General Hospital, Rajahmundry. The duration of the study was 3 years. Patients hospitalised in the ward with stroke were screened by following the inclusion criteria. The criteria included patients with haemorrhagic stroke confirmed by MRI with first incidence of stroke, pain in the affected shoulder diagnosed and referred by Orthopaedician, and patients who have motor ability to participate in exercise intervention were considered.

Patients who had a history of surgery in the affected shoulder before the onset of stroke and having severe subluxation, skin problems, wounds or infection in the affected shoulder and having a history of allergy to Kinesio taping, poor cognition, major cardiopulmonary affecting physical examination and stroke relapse during intervention were excluded.

Procedure: This study includes an 8-week protocol. Both male and female participants who were having unilateral strokes and pain in the affected shoulder were recruited from a tertiary care hospital in Rajahmundry. After meeting the inclusion criteria, subjects were divided into 4 groups based on the onset of shoulder pain after stroke into 3 experimental groups, i.e., acute (< 6 weeks), sub-acute (6-12 weeks), chronic (>12 weeks), and a control group.

At first, a basic physiotherapy assessment involving the patient demographic data, patient history, and duration of pain onset was taken. Later, pre-test measures were taken by using the Ultrasonography rating scale, VAS, Universal goniometer, SPADI, and FMA-UE.

All subjects in the experimental groups underwent a 60-minute treatment protocol 2 days per week for 8 weeks. Subjects in the control group underwent conventional physiotherapy, which consists of TENS, Passive joint mobility, and strengthening exercises. Post-test measures were taken after 8 weeks of intervention.

Sonography procedure

A radiologist with a minimum of five years of experience in conducting sonography done the procedure with a Philips Health Care AFFINITI 70 G ultrasound system with a linear L 18-5 transducer that worked at 5-18 MHz and a 38.9 mm ultra-fine pitch. The system was designed with five optimized settings and variable frequency adjustments based on focal length. The bicep tendon, rotator cuffs, subacromial-subdeltoid bursa, acromioclavicular joint and posterior glenohumeral joint were looked at with an ultrasound. The biceps tendon is evaluated in both coronal and transverse sections as well as in long and short axis planes.

RESULTS

A total of 260 samples were considered for the study and grouped as per the pain intervention as acute, subacute, chronic and controls. There was a total of 143 males and 117 females with a percent of 55% to 45%.

The mean age of the acute group patients was 69.91 years; the subacute group was 61.74; the chronic group was 63.32 years. A total of 72 patients were fallen under the acute group, 63 in the sub-acute group and 60 in the chronic group. The male and female distribution in these groups is as follows.

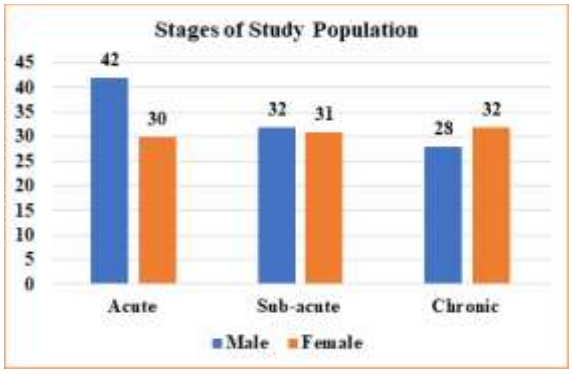

Figure 1: Stages of study population with male and female population

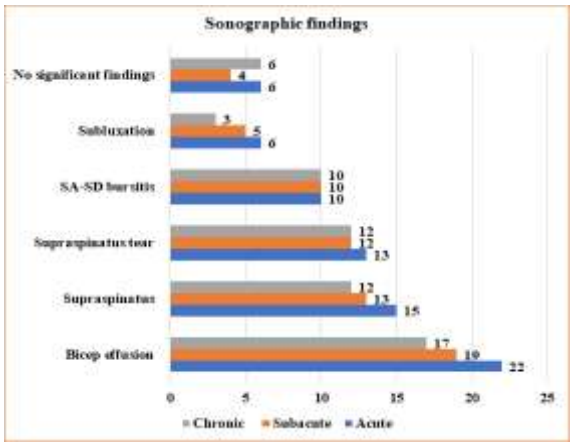

Figure 2: Sonographic findings

Table 1: Sonography findings

Sonographic findings	Acute	Subacute	Chronic	Control	Total
Biceps (effusion, tenosynovitis, tendinitis)	22	19	17	10	68
Supraspinatus (tear, tendinopathy)	15	13	12	08	48
Subscapularis tear	13	12	12	09	46
SA-SD bursitis	10	10	10	04	34
Subluxation	6	5	3	01	15

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No significant Findings	6	4	6	33	49
Total	72	63	60	65	260

In sonographic findings, biceps effusion was seen in 68 individuals; Supraspinatus tear and tendinopathy were observed in 48 subjects; Subscapularis tear was noted in 46 individuals; SA-SD bursitis was seen in 34 subjects, and subluxation was presented in 15 subjects; no significant findings were observed in 49 subjects.

DISCUSSION

In this study, we tried to observe the incidence of post-stroke hemiplegic shoulder pain in the middle-aged and elderly population and find out the sonographic examinations in different groups. We found that 60% of the stroke patients admitted to the hospital suffered from HSP. We noted that HSP last for a long time once it is developed.

Based on pain onset duration, this study divided subjects into acute, subacute, and chronic groups. Acute pain occurs 1-6 weeks after stroke, subacute is 6-12 weeks, and chronic is over 12 weeks, according to Reiling et al. Previous investigations reveal unique structural alterations with HSP advancement; hence, these stages are used to identify structural diseases. Our findings match this research. Hemiplegic shoulder pain (HSP) is a frequent stroke disability. HSP is linked to upper extremity dysfunction, shoulder subluxation, shoulder muscle tone, reflex sympathetic dystrophy, and rotator cuff injury.

The standard imaging techniques for assessing HSP include arthrography and magnetic resonance imaging of the shoulder. Shoulder sonography serves as an effective and cost-efficient imaging modality for evaluating soft tissue injuries in hemiplegic stroke patients.[12]

In this study, we focused on developing an ultrasonographic-guided protocol for assessing shoulder abnormalities in post-stroke patients. E. Naredo et al. conducted a comparison between physical examination and ultrasonography in a study involving 31 HSP patients, concluding that ultrasound offers more accurate insights into the structures affected. Ozcakar et al. highlighted the significance of ultrasonography extending beyond musculoskeletal injuries. Due to its reliability and accuracy, ultrasound was selected as the diagnostic tool for this study.

Lee et al. employed ultrasonography to conduct a comprehensive evaluation of the rotator cuff, the long head of the biceps tendon and its sheath, the rotator cuff interval, the subacromial subdeltoid (SASD) bursa, the acromioclavicular (AC) joint, and the posterior glenohumeral joint in all study participants. The presence of fluid accumulation in the SASD bursa, with a thickness greater than 2 mm and hyperaemia observed through power Doppler imaging, supports the diagnosis of bursitis. In Falsetti's study, the incidence of SASD bursal effusion was recorded at 26.6% among patients with brain damage. In patients demonstrating increasing spasticity, notable sonographic abnormalities, including a rotator cuff tear or bursitis, were expected to be visible on sonography. [13] The pathology of the supraspinatus tendon served as an independent predictor for the onset of HSP and demonstrated a correlation with HSP during the subacute and chronic phases within the initial six months post-stroke. The findings were aligned with our study results, indicating the presence of supraspinatus tear and supraspinatus tendinopathy in subjects experiencing acute, subacute, and chronic pain, with averages of 15, 13, and 12 study participants, respectively. [14,15]. The occurrence of tendinosis of the supraspinatus tendon post-stroke is reported at 42.2% in Falsetti's study, while our findings indicate a rate of 18%, as illustrated in [Table 1].

The presence of effusion in the long head of the bicep's tendon sheath was commonly observed during ultrasound examinations following an acute stroke. Bicipital tenosynovitis was diagnosed following the observation of a thickened hypoechoic area demonstrating increased power Doppler flow around the bicep's tendon. Ultrasonography serves as an effective method for evaluating changes in the hemiplegic shoulder. An anechoic region greater than 2 mm surrounding the long head of the bicep's tendon was evaluated in both transverse and longitudinal views, indicating effusion within the bicep's tendon sheath.[16] Collinger et al. conducted an examination of the ultrasonography changes in the appearance of the biceps and supraspinatus tendons during a rigorous wheelchair propulsion activity.[17] The respondents exhibited a stronger inclination towards a darker, diffuse appearance of the tendon, which was associated with extended wheelchair use or shortly after propulsion. Engagement in physical activity. The current study's sonography findings indicated bicep effusion/tenosynovitis and tendinitis in 26% of subjects across acute, sub-acute, and chronic categories.

Nerve issues and muscle fatigue are associated with subluxation of the affected shoulder in individuals who have experienced a stroke. Kumar et al. assessed the intra-rater reliability of the acromion-greater tuberosity (AGT) distance across different arm postures. Research indicates that glenohumeral subluxation (GHS) in stroke patients can be assessed with accuracy and reliability through ultrasonographic measurements of AGT distance.[18] Pop T also found that 25.3% of patients experienced shoulder subluxation on the paretic side, while none were observed on the healthy side.[19] Shoulder subluxation in lateral distances is a predictor of supraspinatus tendonitis. A quantitative method for evaluating the stiffness and laxity of the glenohumeral joint is ultrasonography.[20]

In this study, ultrasonography revealed shoulder subluxation in 15 subjects, accounting for 6% of the

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population. The additional observations in the shoulder, as indicated in the sonography findings, include a subscapularis tear at 17% and SA-SD bursitis at 13%. Typically, a rotator cuff tear is associated with biceps tendon effusion and subacromial-subdeltoid bursitis. E. Naredo suggests that the observed findings may be attributed to the exposure of the biceps tendon and SA-SD bursa to mechanical forces resulting from cuff impingement due to their anterior positioning relative to the impingement site. Furthermore, these structures establish direct communication with the glenohumeral joint following the tear. In HSP, these alterations may result from excessive exposure to mechanical forces due to a reduction in muscular support.

CONCLUSION

Our research indicates that hemiplegic shoulder pain occurs frequently and may persist for an extended duration. In females, large-scale strokes, elevated muscle tone, subluxation, and restricted shoulder movement could be significant risk factors for hemiplegic shoulder pain. The utilization of shoulder joint ultrasound holds significant value in diagnosing HSP. Furthermore, HSP contributes to a certain degree to the increase in patient readmission rates. Effective pain relief can enhance the recovery of upper limb motor function and reduce the duration of in-hospital rehabilitation.

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