Original Research Article

Effect of Therapeutic Shoulder Sling And Proximal Control Exercises on Shoulder Subluxation in Stroke Survivors

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Abstract

Background: Shoulder subluxation is the common problem as it causes shoulder pain and hinders activity . In flaccid stage, propreoceptive impairment, lack of tone and muscle paralysis reduce the support and normal stirring action of rotator cuff muscles particularly supraspinatus. **Methods: Ethical** clearance was obtained from Institutional Ethical Comittee, KIMSDU, Karad. An Experimental study was conducted with 50 subjects .Which were divided into two groups using consecutive sampling with random allocation with computer generated table. Group A was given conventional treatment for reducing shoulder subluxation in stroke survivors Group B was treated with the Therapeutic shoulder sling and proximal control exercises .The outcome measures were AP lat X-ray, VAS, Functional outcome measurement By Motor assessment scale :Upper arm function. **Results:** Within the group comparison for the X-ray was done with the pair t test which was very significant for group A with P value of 0.0301 and Extremely significant for group B with P value ≤0.0001 . within the group comparison for visual analogue scale for both the groups is extremely significant with the p value of ≤0.0001 .within the group comparison for motor assessment scale for both the groups is extremely significant with the p value of ≤0.0001 **Conclusions:** Therapeutic shoulder sling with proximal control exercises shows significant reduction of subluxation in shoulder x-ray as well as it reduces the pain and improves ADL activity.

Keywords*: Shoulder subluxation, therapeutic shoulder sling, Proximal control exercises, VAS, MAS*

Introduction

Stroke is an acute onset of neurological dysfunction due to abnormality in the cerebral circulation with resultant sign and symptom that correspond to involvement of focal areas of brain Motor deficits are characterized by paralysis **(hemiplegia)** or weakness **(hemiparesis)**, typically on the side of the body opposite the side of the lesion. The term hemiplegia is often used generically to refer to the wide variety of motor problems that result from stroke. The location and extent of brain injury, the amount of collateral blood flow, and early acute care management determine the severity of neurological deficits in an individual patient. Impairments may resolve spontaneously as brain swelling subsides (reversible ischemic neurological deficit Stroke is a global health care problem that is common, serious and disabling2. In most countries stroke is the second or third most common cause of death and one of the main causes of acquired disability[3] The estimated prevalence rate of stroke range, 84-262/100,000 in rural and 334-424/100,000 in urban areas. The incidence rate is 119-145/100,000 based on the recent population based studies. There is also a wide variation in case fatality rates with the highest being 42% in Kolkata[2] In the absence of any cure for the initial pathology, rehabilitation is the most universally adopted treatment strategy to improve quality of life in patients with stroke.[4] Rehabilitation, as described by Stucki et al[5] can be defined as 'the health strategy that aims to enable people with health conditions experiencing or likely to experience disability to achieve and maintain optimal functioning in interaction with the environment'.[5] The

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main aim of organised stroke rehabilitation is to achieve a level of functional independence that enables patients to return home and reintegrate into community life that lives up to their own expectations and desires as much as possible.[4] Physiotherapy is perceived as one of the key disciplines in providing Organised stroke care.[10]Early intervention after stroke improves the prognosis [19]

Normal shoulder biomechanics Shoulder joint is ball and socket type of synovial joint with 3 degree of freedom. it is most mobile joint of human body .as it is mobility is more stability is compromised. Particularly if the abduction of complex is considers the main force couple acting is the supraspinatus and posterior fibbers of deltoid muscle.

Pathomechanics in stroke responsible for subluxation The normal stirring action of the force couple of supraspinatus and posterior fibres of deltoid is affected due to flaccid stage of the muscles .so while abduction and flexion movement due to gravitational pull to the head of humerus subluxates caudally[9].

Shoulder subluxation in stroke

Shoulder subluxation is the common problem as it causes shoulder pain and hinders activity .the reported incidence is 17% to 18% . in flaccid stage, propreoceptive impairment ,lack of tone and muscle paralysis reduce the support and normal stirring action of rotator cuff muscles particularly supraspinatus . the normal orientation of glenoid fossa is upward, outward and forward .so that it keeps the superior capsule taut and stabilizes the humerus mechanically. in the absence of support from the muscles any abduction or forward flexion of humerus or scapular depression and downward rotation reduces the stabilization and causes the humerus to subluxation. [8]

Management of shoulder subluxation in stroke

Education: Caregivers/Health Professionals/ Relatives need to be informed on the importance of proper handling of the arm. Stroke patients who have their arm unsupported and/or handled inappropriately by caregivers (pulling on the arm) are at a higher risk for traction neuropathy and injury. Hence, it is essential that caregivers of stroke survivors are adequately trained in handling the hemiplegic arm especially when shoulder subluxation is present.[13] **Positioning**: Lap trays, Pillows and foam support help to keep the arm and shoulder supported in the correct position. Good positioning will help reduce strain on your ligaments and prevent frozen shoulder from occurring.

Orthotic devices: The use of shoulder supports is common early after stroke to decrease glenohumeral subluxation and support the shoulder joint[17]. Examples of shoulder supports are the Henderson shoulder ring, Bobath roll, Harris hemi-sling, Rolyan humeral cuff sling, Cavalier shoulder support, arm trough or lapboard and shoulder strapping. A study conducted by Nadler et al found reducing vertical subluxation with a shoulder orthoses may reduce hemiplegic shoulder pain. Orthosis with proximal and distal attachments are more effective. In addition, care must be take in its usage to avoid contractures.

Exercises: In the early phase of rehabilitation passive range of motion exercises has been shown to be effective in preventing shoulder subluxation among stroke patients. Range-of-motion exercises for the shoulder joint include flexion-extension, abduction-adduction and external-internal rotation. It is important to know that if the exercises are improperly carried out, it can cause injury to the shoulder and increase the stroke patient's risk for shoulder subluxation. Also, weight bearing exercises on the affected upper extremity proved to be beneficial .these exercises are included as proximal control exercises .

Electrical stimulation conventional trans cutaneous electrical nerve stimulation(TENS)[16]is given to relieve pain.

Traditionally ,slings have been applied to prevent or reduce shoulder subluxation after stroke but most of them have drawback of holding the limb in poor position that is likely to cause soft tissue contractures and also affect in terms of pain .conventionally the shoulder subluxation in stroke survivors is treated considering radiological changes in joint anatomy but the pain caused due to pull to joint capsule and surrounded soft tissue is untouched area. to consider this both the shoulder sling is modified with the inclusion of electrical modality of pain relieving that is TENS this newly invented therapeutic shoulder sling gives the treatment in corrected position of shoulder joint .by means of orthosis working on three point pressure system of forces.

Materials and Method

The study protocol was started after obtaining ethical clearance from ethical committee of Krishna Institute of

medical sciences deemed to be University, Karad The subjects were selected according to the inclusion and exclusion criteria. Informed consent was taken from the patient or patients caretaker. the purpose of the study was explained to the participants and their care takers Randomization is done and the subjects was divided in two groups

- **Group A** conventional management for shoulder subluxation in stroke

- **Group B** Therapeutic shoulder sling[1] with proximal control exercises

Patient was assessed for the neurological symptoms and the pre treatment shoulder x-ray for assessing the position of humeral head in glenoid fossa was taken. pre treatment VAS also was taken Patients were also assessed for functional scale by Motor assessment scale Intervention was given for 3 weeks .5days per week for both the groups.

Statistical Analysis

Post treatment assessment were taken Data was statistically analyzed by using software (INSTAT 3).Within the group comparison was done with pair t test and between the group was done by unpaired t test .

Results

In the study out of 50 participants from group A 10 were left hemiplegics and 15 were right hemiplegics .in group B 8 were left hemiplegics and remaining 17 were right hemiplegics

In the study group A was having 15 male and 10 female .group B was having 16 male and 9 female participants. In total sample of 50 31 were male and 19 female patients.

Mean age of group B was 45 years and for group A 46 years

TABLE NO 1. INTERGROUP ANALYSIS FOR VAS

	Group A	**Group B**
Mean ±SD	5.84±1.375	4.72±1.720
Two tailed P Value	<0.001	<0.001
t value	5.527	5.126
Significance	Extremely significant	Extremely significant

TABLE NO.2 INTERGROUP ANALYSIS FOR X-RAY

	Group A	**Group B**
Mean ±SD	1.0952±0.4364	0.2528±0.2617
Two tailed P value	0.0301	<0.0001
t value	10.314	10.094
Significance	very Significant	Extremely significant

Table No.3 Inter Group Analysis For Mas

	Group A	Group B
Mean ±SD	3.04±0.9345	3.72±0.9798
Two tailed P Value	<0.001	<0.001
t value	5.421	6.220
significance	Extremely significant	Extremely significant

Discussion

Shoulder subluxation is most likely to occur in the first 3 weeks after stroke, while the limb is still flaccid and, in particular, the supraspinatus muscle is inactive. For individuals with hemiplegia inferior shoulder subluxation develops as a result of a prolonged downward pull of gravity on the arm against hypotonic muscles, resulting in overstretch of both the glenohumeral capsule and the hypotonic supraspinatus and deltoid muscle. [19]

Along with the subluxation the over stretch of soft tissue causes pain and relative decreased hand activities in daily living .

Present study was done in patients with brunnstrom recovery stage 2 which were having shoulder subluxation secondary to stroke. Total 50 patients were included in the study fulfilling inclusion and exclusion criteria. Group A with 25 patients received conventional treatment for the subluxation and group B received therapeutic shoulder sling and proximal control exercises .

In the available research done by K Walsh Management of shoulder pain[14]in patients with stroke stated that Foam supports or shoulder strapping may be used to prevent shoulder pain.[6] treatment should include high intensity transcutaneous electrical nerve stimulation.

M .leandri, C.I Parodi in their study comparison of TENS treatments in hemiplegic shoulder pain concluded that high intensity TENS valuable for treating hemiplegic shoulder pain, whereas traditional low intensity TENS seems to be of no use in such case[15]. Evidences shows that shoulder subluxation can be reduced by the application of external devices such as orthosis. There is insufficient evidence to conclude whether slings and prevent subluxation, decrease pain, increase function or adversely increase contracture in the shoulder after stroke. . The first systematic studies of the painful shoulder after a stroke or traumatic brain injury were conducted back in the 1970s. Krempen et al. Emphasise that there are many causes of a painful shoulder in neurological diseases. In the cases where the painful shoulder occurred in conjunction with a subluxation, effective pain relief was achieved using a conventional neck.]. Radiologic evidence of the reduction of subluxation was found when this shoulder sling was used. The authors also report a reduction of pain. However, no information was provided on the effect on the development or reduction of SHS. Zorowitz et al. also studied the effect of different orthoses ("single-strap hemisling", "Bobath roll", "Rolyan humeral cuff sling", "Cavalier support") for a shoulder subluxation [23]. For the study, 20 stroke patients were provided with 4 different orthoses and the change in horizontal, vertical, and absolute asymmetry compared with the unaffected side was determined by radiologic analysis. Ultimately, an improvement of subluxation was found for all orthoses, although different orthoses had the best result for different patients. The authors concluded that fitting with an orthosis for shoulder subluxation must be customised for the individual patient. This study did not investigate other effects of the orthosis such as relieving pain or reducing SHS .[7]

In flaccid paralysis, subluxation due to the absence of muscular stability was identified as the cause of pain. In addition to cautious use of the affected arm and systematic interdisciplinary care, continuous support of the arm was considered to be essential. Functional electrical stimulation (FES) to activate muscles could also be important. It was not specified how continuous support of the arm should be implemented in practice[12]. However, continuous support the arm must be ensured not only when sitting, but also when the patient is

mobilised when standing, walking, or during therapy. Consequently, merely positioning on a therapy table or immobilising the arm in a neck slings neither sufficient nor useful.

Ada et al. come to a similar conclusion. In a review, four studies were identified that investigated the effect of an orthosis on preventing subluxation, repositioning the humeral head, reducing pain, and improving the motor function of the shoulder after a stroke[18] .In summary, no clear evidence was found for the use of a shoulder sling Dajprathamet al. reach the same conclusion. They also found no significant reduction of shoulder subluxation when using two different neck slings .

There is insufficient evidence to conclude whether slings and prevent subluxation, decrease pain, increase function or adversely increase contracture in the shoulder after stroke. [11]

Present study shows the significant effect of using therapeutic shoulder sling [1] in treating the subluxation of shoulder after stroke. In the experimental group Pain is relieved in the corrected position of shoulder by applying the therapeutic shoulder sling. Proximal muscle control exercises also shown significant changes in the post treatment radiological measurements of experimental group supports the Available Observational studies suggesting that orthoses reduce vertical subluxation whilst in-situ conventional group also showed the changes after treatment as in reduction of pain and improvement in the functional scale measured for motor assessment of upper part of arm. The use of therapeutic shoulder sling have benefited patients because it gives the simultaneous effect of pain relief in the corrected position by application of orthosis .

Conclusion

Therapeutic shoulder sling with proximal control exercises shows significant reduction of subluxation in shoulder x-ray as well as it reduces the pain and improves ADL activity

Ethical Clearance- Taken from Institutional Ethical committee of KIMSDU, Karad

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