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Original Research Paper

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EFFECT OF ELECTRICAL STIMULATION, HOT MOIST PACK AND EXERCISES ON SHOULDER HAND SYNDROME IN STROKE PATIENTS

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ABSTRACT

Background : the purpose of the study is to evaluate the effect of hot moist pack with exercises, electrical stimulation with exercises, and compare the effect of hot moist pack with exercises and electrical stimulation with exercises on shoulder hand syndrome in stroke subjects.

Methods : A total of 40 patients were equally divided into two groups using simple random sampling with lottery method. Group A was given hot moist pack with exercises and Group B was given electrical stimulation with exercises.

Result : Pre and post treatment protocol was analysed using paired t test and Unpaired t test. Unpaired t test analysis showed that there was extremely significant difference seen in p value for Visual analogue scale 0.0001 for Voluntary control grade 0.0002 and for Shoulder pain and disability index 0.0001

Conclusion: Electrical stimulation and exercises is significantly effective in reducing pain and improving voluntary control in subjects with shoulder hand syndrome.

KEYWORDS : Stroke, Shoulder hand syndrome, Hot moist pack, Electrical stimulation.

Introduction

Stroke is a clinical syndrome characterised by rapidly developing clinical symptoms and signs of focal and at times global, loss of cerebral function with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than vascular origin[1]. Clinically stroke causes impairments of sensory, motor, cognitive perceptual and language functions, neurological dysfunction, dysphagia, bladder and bowel dysfunction altered emotional status and changes in the level of consciousness[2].

Stroke is an important cause of disability in India with the estimated adjusted prevalence of 84 to 262/1,00,000 in rural and 334 to 424/1,00,000 in urban areas. The incidence rate is 119 to 145/1,00,000[3].

Stroke is classified into ischemic and hemorrhagic stroke where the most common is ischemic stroke that results from a clot that blocks or impairs the blood flow, oxygen and nutrients to brain which causes irreversible damage and cell death due to necrosis[4]. Hemorrhagic stroke results from intracerebral hemorrhage in subarchnoid space and causes due to brain aneurysm or atrioventricular malformation in the dural space, bleeding from tumor, vasculitis, hemorrhagic stroke occurs when weakened blood vessels bursts and bleeds into brain[5].

Complex regional pain syndrome types 1 and 2 are neuropathic pain disorders which occurs as an exaggerated response to a traumatic lesion or nerve damage that generally affects the extremities which are consequence of process such as stroke, complex regional pain syndrome of upper arm is known as shoulder hand syndrome[6].

Shoulder hand syndrome is characterised by a deep, burning pain, changes in skin colour and temperature, limitation in movement and edema[7]. Clinical factors of shoulder hand syndrome includes motor deficits, sensory deficits and spasticity where early stages includes intermittent pain which is limited to the shoulder and later stages consist of intense pain which involves the whole extremity[2].

Early stage 1 vasomotor changes include discoloration and alterations in temperature. Stage 2 is characterised by early dystrophic changes which includes muscle and skin atrophy, hyperhidrosis. Stage 3 the atrophic phase includes pain and vasomotor changes[2].

Motor impairment in the arm persisting for long time can make patients functionally dependent on others and it additionally can lead to complication like glenohumeral subluxation and shoulder pain[8].

The glenohumeral subluxation is the major and frequent complication which develops in the first few weeks following hemiplegia where in absence of muscle function the pull of gravity cause the capsule to stretch which further leads to shoulder subluxation which damages all supporting structures of the shoulder[9].

Shoulder pain can be divided into flaccid and spastic presentations, where flaccid stage include proprioceptive impairement, lack of tone and muscle paralysis which reduce the action of rotator cuff muscles particularly supraspinatus and spastic stage includes poor scapular position mainly depression, retraction and downward rotation, subluxation and restricted movement[2].

Hemiplegic shoulder pain affects the outcome of stroke in a negative way, it affects the recovery of stroke which causes considerable distress and reduced activity and can markedly hinder rehabilitation[10].

Materials And Methodology

Ethical clearance was obtained from the ethical committee, KIMSDU, karad. A experimental study was conducted at Physiotherapy Department of Krishna institute of medical sciences. 40 subjects were equally divided into two groups using simple random sampling with lottery method. Group A: 20 subjects (15 males, 5 females) received hot moist pack and exercises. Group B: 20 Subjects (13 males, 7 females) received electrical stimulation and exercises. Informed consent form was taken from the patient and patient's caretaker. Subject was explained about the procedure of the study. A detailed Neurological assessment was taken. Inclusion criteria was as follows: (1) Subjects with All age groups, (2) Gender-male and female, (3) Subjects with brunnstrom stage 1 and above, (4) Subjects with Middle cerebral artery involvements. Exclusion criteria was as follows: (1) Other medical conditions related to upper limb, (2) unstable vitals, (3) subjects associated with psychological disorders, (4) subjects who are not willing to participate in the study. Pre treatment assessment was taken by outcome measures - Visual analogue scale, voluntary control grade, shoulder pain and disability index..

Group A (control group) received hot moist pack and exercises (5 days/6 weeks) Hot moist pack was applied on shoulder for 20 minutes and the exercises performed were-

1. Passive range of motion exercises of upper limb (10 to 15 repetitions)
2. Active assisted exercises of upper limb (10 to 15 repetitions)
3. Weight bearing exercises (10 repetitions with hold of 10 seconds)
4. Shoulder shrugging exercises (5 repetitions)

Group B (experimental group) received electrical stimulation and exercises (5 days/6 weeks) Electrical stimulation was applied on supraspinatus and posterior deltoid muscle for 20 minutes with the use of rectangular balanced electrical current with frequency of 35-50 Hz and exercises performed same as group A. After 6 weeks the post treatment re-assessment for shoulder function was taken with the help of outcome measures using visual analogue scale, voluntary control scale, shoulder pain and disability index

Statistical analysis

1. Visual analogue scale - intragroup comparison using paired t test.

Table 1 shows the comparison of mean and standard deviation of pre and post values of Group A and B. In Group A, the mean and standard deviation of VAS score on pre-intervention was 7.79 ± 0.4667, which was reduced to 6.58 ± 0.5347. The P value was found to be <0.0001 which was extremely significant. In Group B, the mean and standard deviation of VAS score on pre-intervention was 7.86 ± 0.3885, which was reduced to 4.78 ± 0.7208.The P value was found to be <0.0001 which was extremely significant.

Table 1 - pre and post comparison of VAS score within the group

Group	Pre training Mean ± SD	Post training Mean ± SD	P value	Inference
Group A	7.79 ± 0.4667	6.58 ± 0.5347	<0.0001	Extremely significant
Group B	7.86 ± 0.3885	4.78± 0.7208	<0.0001	Extremely significant

2. Voluntary control grade - intra group comparison using paired t test

Table 2 shows the comparison of mean and standard deviation of pre and post values of Group A and B. In Group A, the mean and standard deviation of VCG on pre-intervention was 1.35 ± 0.4894, which was increased to 2.45 ± 0.7592. The P value was found to be <0.0001 which was extremely significant. In Group B, the mean and standard deviation of VCG on pre-intervention was 1.3 ± 0.4702, which was increased to 3.55 ± 0.9445. The P value was found to be <0.0001 which was extremely significant.

Table 2 - pre and post comparison of VCG within the group

Group	Pre training Mean ± SD	Post training Mean ± SD	P value	Inference
Group A	1.35 ± 0.4894	2.45 ± 0.7592	<0.0001	Extremely significant
Group B	1.3 ± 0.4702	3.55 ± 0.9445	<0.0001	Extremely significant

3. Shoulder Pain And Disability Index - intra group comparison using paired t test

Table 3 shows the comparison of mean and standard deviation of pre and post values of Group A and B.In Group A, the mean and standard deviation of SPADI on pre-intervention was 79.0875 ± 2.892, which was reduced to 72.4885 ± 2.946. The P value was found to be <0.0001 which was extremely significant.In Group B, the mean and standard deviation of SPADI on pre-intervention was 79.2975 ± 3.941, which was reduced to 64.5345 ± 6.299.The P value was found to be <0.0001 which was extremely significant.

Table 3 - pre and post comparison of SPADI within the group

Group	Pre training Mean ± SD	Post training Mean ± SD	P value	Inference
Group A	79.0875 ± 2.892	72.4885 ± 2.946	<0.0001	Extremely significant
Group B	79.2975 ± 3.941	64.5345 ± 6.299	<0.0001	Extremely significant

4. Visual analogue scale – intergroup comparison using un-paired t-test.

Table 4 shows the comparison of mean and standard deviation of VAS scores in Group A and Group B. The pre-interventional values, the results between the two groups using unpaired t-test revealed that there was no statistically significant difference seen with p value = 0.6092. While on comparing the post- session values, the results between the two groups using unpaired t-test revealed that there was extremely significant difference seen with p value = 0.0001

Table 4 - pre and post comparison of VAS score between the group

Group	Group A Mean ± SD	Group B Mean ± SD	P value	Inference
Pre training	7.79 ± 0.4667	7.86 ± 0.3885	0.6092	Not Significant
Post training	6.58 ± 0.5347	4.78 ± 0.7208	0.0001	Extremely Significant

5. Voluntary control grade - intergroup comparison using un-paired t-test.

Table 5 shows the comparison of mean and standard deviation of VCG in Group A and Group B. The pre-interventional values, the results between the two groups using unpaired t-test revealed that there was significant difference seen with p value = 0.7436. While on comparing the post-session values, the results between the two groups using unpaired t-test revealed that there was extremely significant difference seen with p value = 0.0002.

Table 5- pre and post comparison of VCG between the group

Group	Group A Mean ± SD	Group B Mean ± SD	P value	Inference
Pre training	1.35 ± 0.4894	1.3 ± 0.4702	0.7436	Not Significant
Post training	2.45 ± 0.7592	3.55 ± 0.9445	0.0002	Extremely Significant

6. Shoulder Pain And Disability Index - intergroup comparison using un-paired t-test.

Table 6 shows the comparison of mean and standard deviation of SPADI in Group A and Group. The pre-interventional values, the results between the two groups using unpaired t-test revealed that there no statistically was significant difference seen with p value = 0.8487. While on comparing the post-session values, the results between the two groups using unpaired t-test revealed that there was extremely significant difference seen with p value = 0.0001.

Table 6- pre and post comparison of SPADI between the group

Group	Group A Mean ± SD	Group B Mean ± SD	P value	Inference
Pre training	79.0875 ± 2.892	79.2975 ± 3.941	0.8487	Not Significant
Post training	72.4885 ± 2.946	64.5345 ± 6.299	0.0001	Extremely Significant

Discussion

Shoulder hand syndrome is a major challenge in rehabilitation in stroke patients. It results in loss of mobility, pain which makes them functionally dependent on others and hampers their activities of

daily living.

As the patient lives with this disabilities there is a need of some effective intervention for reducing pain, spasticity and shoulder subluxation and improving voluntary control. Traditionally many interventions have been designed to improve upper limb functions in stroke patients but shoulder hand syndrome has remained a challenging condition in treating hemiplegic patients, so there is a need to concentrate on this particular condition Literature review suggests use of exercises therapies and electrical agencies for managing upper limb function in stroke patients.

Previous study done by Hiroe Kobayashi et al in their study named reduction in subluxation and improved muscle function of the hemiplegic shoulder joint after therapeutic electrical stimulation with the outcome measure visual analogue scale showed 50% pain decrease in 17 chronic hemiplegic patients and found statistically significant decrease in shoulder subluxation at week 6 in patients who receive electrical stimulation to supraspinatous and deltoid muscle as compared to patients who did not receive electrical stimulation.

This study was undertaken considering all the mentioned points, and the aim of this study was to find out the effect of electrical stimulation, hot moist pack and exercises on shoulder hand syndrome in stroke patients

There was significant post training improvement in shoulder function by applying electrical stimulation on shoulder as it consist of analgesic effect which helps to breakdown the vicious cycle of pain caused by the inhibitory effect of pain on extremity movements and it aims to generate normal movement or function, which mimic normal voluntary movements and therefore restores functions served by those movements and it stimulates supraspinatous and posterior deltoid muscle which are responsible to maintain the head of humerus in glenoid fossa so that it prevents or restore subluxation, reduce pain and improves voluntary control and helps in better recovery. Improvement by exercises is due to "use-dependent plasticity" following brain lesion which involves number of neurons and strength of the neural networks in the exercise task which is directly related to its repetition of exercise practice. As the patients achieved shoulder control the task was made more complex by increasing the repetition of exercises Hot moist pack helps to dilate capillaries and increasing blood flow in deep tissues and reducing pain but it does not show any significant effect on subluxation and improving voluntary control. This accounts to better improvement with electrical stimulation with exercises as compared to hot moist pack with exercise

Intragroup comparison was analysed statistically using paired t-test for VAS, VCG and SPADI. This shows that there is extremely significant difference of group A VAS ($p = <0.0001$), VCG ($p = <0.0001$) and SPADI($p = <0.0001$)

Intergroup comparison was analysed statistically using unpaired t-test. This shows that pre-intervention there was no statistically significant difference seen in p values for VAS (0.6092),VCG (0.7436) and SPADI (0.8487). While on comparing the post-interventional values, the results between the three groups revealed that there was extremely significant difference seen in p value for VAS (0.0001) , VCG (0.0002) and SPADI (0.0001)

This study shows that electrical stimulation with exercises is significantly effective in reducing pain and improving voluntary control as compared to hot moist pack and exercise in subjects with shoulder hand syndrome.

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