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COMBINED EFFECT OF EXERCISE THERAPY AND ELECTRO THERAPEUTIC MODALITY ON SHOULDER HAND SYNDROME IN STROKE PATIENTS

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ABSTRACT:

Objectives:*The objectives of the study are to evaluate the effect of hot moist pack with exercises, transcutaneous electrical nerve stimulation(TENS) with exercises and investigate the effect of hot damp pack with rehearses and transcutaneous electrical nerve prompting with rehearses on shoulder hand condition in stroke subjects.*

Methods: *Ethical clearance was obtained from the ethical committee, KIMSDU, Karad. Study was conducted at Physiotherapy Department of KIMSDU. Comparative study was done on total 40 subjects. they were equally divided into two groups using simple random sampling with lottery method(Group A, Group B) Group A was given hot moist pack with exercises and Group B was given transcutaneous electrical nerve stimulation with exercises.*

Result: *Statistical analysis was performed using paired t-test and unpaired t-test. In pre-intervention therewas no statistical significant difference seen according to p values for Voluntary control grade (VCG) 0.7436, Visual analogue scale (VAS) 0.6092, likewise, for Shoulder distress and failure record (SPADI) 0.8487 .On comparing the post-interventional values, the results between the two groups using unpaired t-test showed that there was extremely significant difference seen in p value for Voluntary control grade (VCG) 0.0002Visual analogue scale (VAS) 0.0001 likewise, for Shoulder distress and failure record (SPADI) 0.0001*

Conclusion: *The study concluded thatTranscutaneous electrical nerve stimulation (TENS) and exercises is significantly effective in reducing pain and improving voluntary control in subjects with shoulder hand syndrome.*

Keywords: *Exercise Therapy, Electro Therapeutic Modality, Shoulder Hand Syndrome, Stroke*

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I. INTRODUCTION

Stroke is a the sudden loss of neurological function caused by interruption of the bood stream to the cerebrum[1]. Clinically stroke causes impairments of motor, sensory, cognitive, perception, speech and language functions, neurological deficit, dysphagia, bladder and bowel dysfunction altered emotional status and changes in the level of consciousness . Stroke is an important cause of disability in India with the prevalence of 334 to 424/1,00,000 in urban and 84 to 262/1,00,000 in rural areas. The incidence rate is 119 to 145/1,00,000[2]. The recovery of a patient with stroke achieves hemiplegia that addresses an exceptional test, as there is multifaceted nature of the lost limits with high event of shoulder torment, realizing a negative impact during the rebuilding technique[3]. Stroke is classified into ischemic stroke and hemorrhagic stroke where the most common is ischemic stroke that results when clot blocks or impairs the blood flow, depriving of brain of essential oxygen and nutrients that causes irreversible damage and cell death due to necrosis[4]. Hemorrhagic stroke occurs when blood vessels rupture and results from intracerebral haemorrhage in subarachnoid space and causes due to atrioventricular malformation in the dural space, bleeding from tumor, vasculitis and takes place when weakened blood vessels bursts and bleeds into brain[5]

Complex regional pain syndrome of upper arm is known as shoulder hand syndrome[6]. It is caused by proximal trauma to the shoulder which can occur with stroke or as a result of autonomic nervous system changes[1]. Complex regional pain syndrome type 1 and type 2 are neuropathic pain disorders which occurs as an response that is exaggerated due to nerve damage that affects the extremities which are consequence of process such as strokeor a myocardial infarction.6Shoulder hand syndrome is characterised by a deep, burning pain, shoulder stiffness, changes in skin colour and temperature, limitation in movement and edema.7 Clinical factors of shoulder hand syndrome includes motor deficits, sensory deficits stiffness and spasticity where early stages includes pain which is limited to the shoulder and later stages consist of intense pain which involves the whole extremity[1]. Early stage 1 changes include discoloration in skin colour and alterations in temperature. Stage 2 is characterised by early dystrophic changes which includes muscle and skin atrophy, vasospasm. Stage 3 the atrophic phase includes vasomotor changes and pain which is rare[1]. Motor impairment in the arm persisting for long time can make patients functionally dependent on others and it additionally can lead to complication like shoulder pain and subluxation[7]. The glenohumeral subluxation is the major and customary snare which makes in the underlying scarcely any weeks following hemiplegia where without muscle work the draw of gravity cause the holder to expand which further prompts shoulder subluxation which hurts each and every supporting structure of the shoulder[8]. Hemiplegic shoulder pain can be divided into flaccid and spastic presentations, where flaccid stage include proprioceptive impairement, muscle paralysis and hypotonia reduces the action of rotator cuff muscles particularly supraspinatus and spastic stage includes abnormal muscle tone which leads to poor scapular position mainly retraction,depression and downward rotation, restricted movement and subluxation[1]

Hemiplegic shoulder pain affects the outcome of stroke in a negative way, it affects the recovery of stroke which reduce activity and can markedly hinder rehabilitation[9].

II. MATERIALS AND METHODOLOGY:

An experimental study was conducted in 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 (12 males, 8 females) received hot moist pack and exercises. Group B: 20 Subjects (11

males, 9 females) received transcutaneous electrical nerve stimulation and exercises.Informed consent form was taken from the patient and patient's caretaker. Subject was explained about the procedure of the study. An ordered Neurological assessment was taken before the assessment Inclusion criteria was as follows:(1)Subjects with All age groups,(2)Both gender male and female (3)Subjects with brunnstromstage 1 and above (4)Subjects with Middle cerebral artery involvements. Exclusion criteria was as follows (1) Other medical conditions related to upper limb (2)Vitalsunstable (3)subjects associated with psychological disorders.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). Application of Hot moist pack 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)
4. Shoulder shrugging exercises (5 repetitions)
3. Weight bearing exercises (10 repetitions with hold of 10 seconds)

Group B (Experimental group) received transcutaneous electrical nerve stimulation and exercises (5 days/6 weeks)Transcutaneous electrical nerve stimulation was applied on and posterior deltoid muscleand supraspinatusfor 20 minutes with the usage of rectangular balance electrical stream with repeat of 35-50 Hz and exercises performed same as get-together A.. After 6 weeks the post treatment re-assessment for shoulder function was taken with the help of outcome measures using, voluntary control scale, visual analogue scale and shoulder pain and disability index.

III. RESULTS:

Visual analogue scale (VAS) - intragroup comparison(within the group) 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-intercession was 7.86 ± 0.3885, which was lessened to 4.78 ±0.7208. The P value was found to be <0.0001 which was extremely significant.

Voluntary control grade (VCG) – intra group comparison(within the group) 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 extended to 3.55 ±0.9445. The P regard was viewed as <0.0001 which was extremely essential.

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.

Visual analogue scale (VAS) – intergroup comparison (between the group) using un-paired t-test.

On taking a gander at the pre-interventional values, the results between the two get-togethers using unpaired t-test revealed that there was no really basic balance seen with p value = 0.6092. While on taking a gander at the post-meeting regards, the results between the two social affairs using unpaired t-test revealed that there was incredibly basic qualification seen with p value = 0.0001

Table 4 shows the comparison of mean and standard deviation of VAS scores in Group A and Group B

Voluntary control grade (VCG)- intergroup comparison (between the group) using un-paired t-test.

On differentiating the pre-interventional values, the results between the two social affairs using unpaired t-test revealed that there was imperative qualification seen with p regard =0.7436. While on taking a gander at the post-meeting regards, the results between the two social events using unpaired t-test revealed that there was gigantic differentiation seen with p value = 0.0002.

Table 5 shows the comparison of mean and standard deviation of VCG in Group A and Group B.

Shoulder Pain And Disability Index (SPADI)- intergroup comparison (between the group) using un-paired t-test.

On contrasting the pre-interventional values, the outcomes between the two gatherings utilizing unpaired t-test uncovered that there no measurably was critical distinction seen with p value = 0.8487. While on contrasting the post-meeting esteems, the outcomes between the two gatherings utilizing unpaired t-test uncovered that there was very critical distinction seen with p value = 0.0001.

Table 6 shows the comparison of mean and standard deviation of SPADI in Group A and Group B

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

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

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

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

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

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

IV. DISCUSSION:

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

There is a need of some effective interventionfor reducing pain, spasticity and shoulder, subluxation and improving voluntary controlas patients live with this disabilities.There are 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.

There were relative assessments done by Hiroe Kobayashi et al in their examination of abatement in subluxation and improved muscle limit of the hemiplegic shoulder joint after supportive electrical induction with the outcome measure visual straightforward scale demonstrated half torment decrease in 17 perpetual hemiplegic patients and found genuinely tremendous diminishing in shoulder subluxation at week 6 in patients who get electrical prompting to deltoid and supraspinatus muscle when appeared differently in relation to patients who didn't get electrical stimulation[10]. The examination of Ekim An, Armagan O, Oner C on Efficiency of TENS treatment in hemiplegic shoulder torment: a phony treatment controlled assessment contemplated that TENS treatment alongside standard recuperation could be used as a nice elective treatment in patients[11].

Previous study done on shoulder pain and dysfunction in hemiplegia: Effects of functional electrical stimulation by alexchantraine et al: studied the effectiveness of functional electrical stimulation for shoulder in 120 patients who had hemiplegia followed by stroke and he reported that maximum improvement in pain, subluxation and motor recovery was observed at 6 months by functional electrical stimulation and there was improvement in result again after 12 months and remain constant upto 24 months[12]. 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 functionby applying transcutaneous electrical nerve stimulation on shoulderas it aims to generate normal movement or function, which mimic normal voluntary movements and consist of analgesic effect that helps to breakdown the vicious cycle of pain caused by the inhibitory effect of pain on extremity movements and restores functions served by those movements. It

stimulates supraspinatous and posterior deltoid muscle which are responsible to maintain the head of humerus in glenoid fossa so that it reduce pain, restore subluxation and improves voluntary control and helps in better recovery[14].

Improvement by exercises is due to “use-dependent plasticity” following brain lesion. It involvestrength of the neural networks as well as number of neurons in the exercise task which is directly related to its repetition of exercise practice.When the patients achieved shoulder control the task was made more complex by increasing the frequency and repetition of exercises[15].

Hot moist pack helps to dilate capillaries by 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[13].

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

Intergroup comparison (between groups) 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), SPADI of (0.8487) and significant difference of VCG (0.0196). 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) for VCG (0.0002) and for SPADI (0.0001)

This study shows that Transcutaneouselectrical nerve stimulation (TENS) with exercises is significantly effective in reducing pain and improving voluntary control as compared to hot moist pack and exercisein subjects with shoulder hand syndrome.

V. CONCLUSION:

This study concluded thatTranscutaneous electrical nerve stimulation (TENS) with exercises is significantly effective in reducing pain and improving voluntary control in subjects withshoulder hand syndrome

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