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Original Research Article

Effect of Maitland's Oscillatory Technique on Acute Hemiplegic Shoulder Pain

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ABSTRACT

Study Objective: Effect of Maitland's Oscillatory Technique on Acute Hemiplegic Shoulder Pain
Design: Randomized clinical trial
Method and Measurements: 30 patients 20 male and 10 female patients from outpatient rehabilitation clinic in Prince Sultan military medical city [Age group 50-60 yrs. Who were diagnosed with hemiplegia were included in the study randomly assigned to either group A (Experimental group11 males and 4 females) receiving Maitland's oscillatory technique grade 1 & 2 plus traditional physiotherapy treatment and group B (Control 9 males and 6 females) receiving traditional physiotherapy treatment only. The rehabilitation program took 12 weeks, 3 sessions per week to be completed. Outcome measures were modified visual analogue scale (VAS) is to measure the severity of pain, and motor assessment scale (MAS) measure the functional improvement of affected shoulder.
Results: there was a significant difference between pretest and posttest in first group; p value=0.003 for both variables (VAS & MAS). In second group there was a significant difference between the variables; p value for VAS= 0.007, and p value for MAS= 0.041.
Conclusion: this study showed that Maitland's oscillatory technique was beneficial in treatment of acute hemiplegic shoulder pain

Key Words: Maitland's oscillatory technique, Hemiplegic Shoulder, Ultrasound, Hot Pack

INTRODUCTION

Stroke is defined by the World Health Organization (WHO) as a " rapidly developing syndrome with clinical signs of focal or global disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than vascular origin" [1]

A stroke, also known as a cerebrovascular accident (CVA), it is the rapid loss of brain function(s) due to disturbance in the blood supply to the brain. This can be due to ischemia (lack of blood flow) caused by blockage (thrombosis, arterial, embolism), or a hemorrhage (leakage of blood). [2] As a result, the affected area of the brain cannot function, which might result in an inability to move one or more limbs on one side of the body, inability to understand or formulate speech, or an inability to see one side of the visual field. [3] The recovery of a

patient with hemiplegia represents a great challenge, not only due to the complexity of the lost functions, but also the high incidence of shoulder pain, resulting in a negative impact during the rehabilitation process. [4]

More than 700,000 people suffer strokes each year in the United States, according to the National Institute of Neurological Disorders and Stroke. Rehabilitation exercises help stroke patients relearn patterns of motion helping them to stand, walk, climb stairs and increase range of motion. These exercises can begin 24 to 48 hours after the stroke. Patients are encouraged to practice passive range of motion exercises while lying in bed as the first step in rehabilitation. [5]

In order to understand the pathologic processes and changes that occur in the hemiplegic shoulder, the factors that contribute to normal shoulder position need to be understood. Cailliet has proposed that normal anatomic position involves a well-approximated glenohumeral joint, proper glenoid fossa angle (forward and upward), and proper scapular alignment with the vertebral column. [6]

Shoulder pain is a common complication after a cerebrovascular accident. From 16% to 72% of stroke patients develop hemiplegic shoulder pain. [7] It may occur in up to 80% of stroke patients who have little or no voluntary movement of the affected upper limb. [8] Hemiplegic shoulder pain has been shown to affect stroke outcome in a negative way. [9] It interferes with recovery after a stroke: it can cause considerable distress and reduced activity and can markedly hinder rehabilitation. [10] Usually by 3 months post stroke, approximately 37% of the individuals continues to have decreased upper extremities (UE) function. Recovery of UE function lags behind that of the lower extremities because of the more complex motor skill required of the UE in daily life tasks. That means many individuals who have a stroke are at risk for lower quality of life.

Roy et al demonstrated that the presence of hemiplegic shoulder pain is strongly associated with prolonged hospital stay and poor recovery of arm function in the first 12 weeks after stroke. [8] Poduri reports that hemiplegic shoulder pain can begin as early as 2 weeks post stroke but typically occurs within 2-3 months poststroke. [11] The cause of hemiplegic shoulder pain is the subject of considerable controversy. The following processes have all been postulated as causes of a painful hemiplegic shoulder such as glenohumeral subluxation, spasticity of shoulder muscles, impingement, soft tissue trauma, rotator cuff tears, glenohumeral capsulitis, bicipital tendinitis, and shoulder hand syndrome. [12]

The oscillations may have an inhibitory effect on perception of painful stimuli by repetitively stimulating mechanoreceptors that block nociceptive pathways at the spinal cord or brain stem levels. [13]

Maitland's mobilization mainly consists of rhythmic oscillatory movements which stimulate the type 1 and 2 dynamic mechanoreceptors and by this way can inhibit the nociceptive receptors. [14]

MATERIALS AND METHODS

Methods of Sampling: 30 patients 20 male and 10 female patients from outpatient rehabilitation clinic in Prince Sultan military medical city [Age group 50-60 yrs. Who were diagnosed with hemiplegia were included in the study randomly assigned to either group A (Experimental group11 males and 4 females) receiving Maitland's oscillatory technique grade 1 & 2 plus traditional physiotherapy treatment and group B (Control 9 males and 6 females) receiving traditional physiotherapy

treatment only. The rehabilitation program took 12 weeks, 3 sessions per week to be completed. Outcome measures were modified visual analogue scale (VAS) is to measure the severity of pain, and motor assessment scale (MAS) measure the functional improvement of affected shoulder.

This study had approval from the Research and Ethics Committee of PSMMC and signed informed consent taken from participants. Inclusion criteria is had shoulder pain during last 6 months post stroke, diagnosis as painful hemiplegic shoulder, Patient did not had any medication or cortisone for shoulder during their participation in the study, no history of any surgical procedure on the affected shoulder not complaining of bone disease (Osteoporosis, TB, Ricket), no history of shoulder dislocation or fracture, not complaining of uncontrolled diabetic mellitus, no history of cerebral palsy or cancer, no history of cervical problems, no history of heart failure or unstable angina, able to follow commands.

Method of Randomization: Randomized clinical trial

Equipments & Measuring Tools:

VAS Scale, MAS Scale (Motor assessment scale), Hot Pack, Ultra Sound Machine, Examination table, evaluated –Sticks, Pillow.

Movement scoring sheet

Table (1) showed the Motor assessment scale

	0	1	2	3	4	5	6

- **Visual analogue scale (VAS)** Shoulder pain was evaluated by using visual analogue scale which is a 10 cm horizontal line, 0 represented no pain while 10 represented extremely intense pain. VAS was given to all participants then asked them to placed a vertical mark along the line where the feel pain. [15]

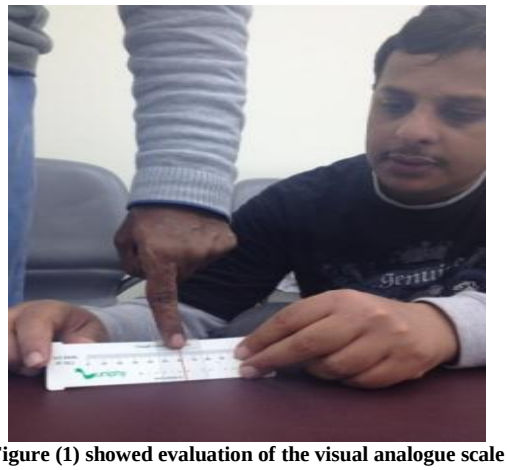

Figure (1) showed evaluation of the visual analogue scale

- **Motor assessment scale** The Motor Assessment Scale is a performance-based scale that was developed as a means of assessing everyday motor function in patients with stroke. [16]

Group allocation:

- **Both groups received physiotherapy program in the form of:**
- **Hot packs:** Patient (side lying) turning on (sound side) to make affected shoulder prominent, duration 30 minutes Patient will be asked frequently about the heating status.
- **Self-assistant exercise:** Patient thought how to use normal extremity to move the involved extremity through ranges of motion. Initially perform passive and active-assistive shoulder ROM in the supine position to maintain stability of the scapula on the thorax. [17]

Limiting factors in exercises

- Pain
- Loosed packed position
- Facial expressions

Flexion & Extension (Martin 2011) perform shoulder flexion and extension PROM exercises by using 2to3-foot long, flat-ended rod or dowel. With affected-side arm dangling freely at therapist side, grip one end of dowel using unaffected-side hand. Place the other end of the dowel in the palm of affected-side hand. This is the starting position. Using unaffected-side hand, arm and shoulder, slowly and smoothly lift your affected-side arm in front of your body until you've reached your shoulder flexion end range of motion, keeping your affected-side arm as straight as possible and taking care not to use any arm or shoulder muscles on your affected-side to assist your movement. Slowly return to your starting position. Perform 25 repetitions of exercise, three times per week.

Figure (2) showed the Flexion – Extension Self-assistant exercise

Abduction and Adduction Shoulder abduction is accomplished by moving arm away from the side of the body; Shoulder adduction involves moving arm toward or across the front of body. Shoulder abduction and adduction PROM exercises also use a rod or wooden dowel to passively guide the affected-side arm. Using the unaffected-side hand, arm and shoulder, slowly and smoothly lift affected-side arm away from the side of body until reached to shoulder abduction end range, keeping affected-side arm straight and taking care not to use any arm or shoulder muscles on affected side to assist movement. Slowly return to starting position. [17] Perform 25 repetitions of this exercise, three times per week.

Figure (3) showed the Abduction Adduction Self-assistant exercise

External & Internal Rotation The dowel or rod also can be used for shoulder PROM exercises. Bend the affected side elbow to 90 degrees and tuck the elbow against the side of your body, where it will remain for the duration of exercise. Affected-side hand should be in line with nave.

Perform the shoulder external rotation PROM exercise by gripping one end of the dowel with your unaffected-side hand. Grasp the other end of dowel with affected-side hand. This is starting position. Using unaffected-side hand, arm and shoulder, slowly and smoothly rotate the affected-side arm away from the body until reached shoulder external rotation end range of motion, taking care not to use any arm or shoulder muscles on affected-side to assist movement. Perform the shoulder internal rotation PROM exercise by using the unaffected-side hand to pull other hand back toward navel and the starting position. Perform 25 repetitions each of your shoulder internal and external rotation PROM exercises, three times per week.

Figure (4) showed External – Internal Self-assistant exercise

Ultrasound treatment procedure and technique

They were positioned side lying with additional pillow support comfortably and assessed thoroughly. Time and intensity was kept at '0' before switching on power. Patients were also instructed to report any excess heat or pain. Gel is applied to skin and surface of transducer. US head is moved in overlapping circles, rate of transducer movement is 3-4cmsq. Dose of US was 1w/cm^2 with frequency of 3MHz in continuous mode; Treatment lasted 5-10 minutes over the effected radiated region. [6]

Figure (5) showed the application of ultrasound therapy

Proprioceptive and balance training:

Patient is in standing position, Therapist stand closed to the patient for supporting and guidance. Patient stand with wide base then with narrow base gradually. Therapist tries to shift the weight between either foot. Give rest when the patient feels tired. Duration 5 minutes and frequency is 3-5 times.

Application procedures:

Figure (6) showed Proprioceptive and balance training

The experimental group received oscillatory technique in the form of following:

Oscillatory Technique- Grades **I** and **II** are used to help decrease pain within a joint. **In the present study, the following grades will be used:**

- **Grade I**- Small amplitude rhythmic oscillating movement at the beginning of range of movement
- **Grade II**- Large amplitude rhythmic oscillating movement within midrange of movement

Figure (7) showed Flexion –Extension oscillatory technique

Passive oscillatory movement are performed by moving one articular surface in relation to its counterpart two or three

oscillation per second of small or large amplitude, and applied anywhere in a range of movement. [18]

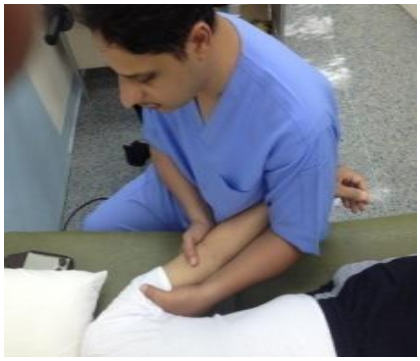

Figure (8) showed Abduction - Adduction oscillatory technique

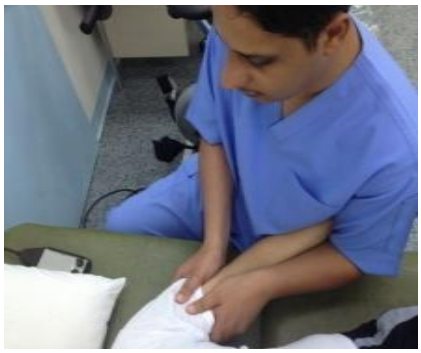

Figure (9) showed internal-external oscillatory technique

Joint Positions

Resting position (supine):

Maximum joint play - position in which joint capsule and ligaments are most relaxed

Speed, Rhythm, & Duration of Movements

- Joint mobilization sessions usually involve:

  2-3 glides per second for 30 seconds for each glide and every glide was given for 5 sets
- Apply smooth, regular oscillations
- Vary speed of oscillations for different effects

Patient Response

- May cause soreness
- Perform joint mobilizations on alternate days to allow soreness to decrease & tissue healing to occur
- Patient should perform ROM techniques
- Patient's joint & ROM should be reassessed after 4 weeks.
- Pain is always the guide

Statistical analysis

SPSS Statistics program used to calculate the following values: mean Standard Deviation (SD) and P value. Paired-Samples T Test procedure used to compares the means of two variables (pre and post) for a single group and The Independent-Samples T Test procedure used to compares means for two groups

RESULTS

The purpose of this study was to compare the effectiveness of receiving (Maitland's oscillatory technique grade 1 and 2 plus traditional physiotherapy treatment) with that receiving (traditional physiotherapy treatment only) in subjects suffering from shoulder pain during last 6 months post stroke who do not take any medication or cortisone during their participation in the study.

Table (2) Characteristics of experimental and control Subjects

Data	Experiment group (n=15)		Control group (n=15)		P value
Sex	N	%	N	%	
Male	11	73.3	9	60	
Female	4	26.7	6	40	
Age	57.07 ± 2.49		58.13 ± 1.55		0.170 (P>0.05)

Table (2) shows the characteristics of the study group, which can be summarized in the sex and age, the experimental group about 11 males and 4 females, males

accounted for 73% and females 26%, while the control group was 9 male and 6 female patients, male accounted for 60% and females 40%, on the other hand the average age of the experimental group was (57.07) years with a standard deviation of (2.49 years), while the average age of the control group was (58.13 years) with a standard deviation of (1.55 years) and no significant difference between the two groups regarding age (P>0.05) .

Results of experimental group (receiving Maitland's oscillatory technique grade 1 & 2 plus traditional physiotherapy treatment).

Table (3) comparison of the mean values of VAS and MAS for the experimental group (pre and post) treatment

N		Mean± SD	P value
15	Pre-test scores of VAS	5.20 ± 1.699	0.003
15	Post-test scores of VAS	4.60 ± 1.50	
15	Pre-test scores of MAS	2.67 ± 2.469	0.003
15	Post-test scores of MAS	3.40 ±2.06	

Table (3) displays the results of the experiment group in (pre and post) stages regarding (VAS and MAS). A significant difference was observed for both variables (P = 0.003). For VAS the pretest mean coded score was 5.20 and for post-test the score was 4.60 a reduction of 11.5 %. For MAS the pretest mean coded score was 2.67 and for post-test the score was 3.40 a reduction of 27.3%. The post-test mean scores were lower for VAS and higher for MAS.

So, there is a significant difference between pre-test and post-test scores which indicating improvement as regard to VAS and MAS.

Results of control group (receiving traditional physiotherapy treatment only).

Table (4) showed the comparison of the mean values of VAS and MAS for the control group (pre and post) treatment

N		Mean± SD	P value
15	Pre-test scores of VAS	6.33 ± 1.543	0.007
15	Post-test scores of VAS	5.67 ± 1.175	
15	Pre-test scores of MAS	1.67 ± 1.877	0.041
15	Post-test scores of MAS	1.93 ± 1.830	

Table (4) showed the results of the control group in (pre and post) stages regarding (VAS and MAS), which compared the mean test scores before (pre-test) and after (post-test) in the subjects received traditional physiotherapy treatment only. For VAS the pretest mean coded score was 6.33 and for post-test the score was 5.67 a reduction of 10.4%. For MAS the pretest mean coded score was 1.67 and for post-test the score was 1.93 a reduction of 15.5 %.

Table (4) showed that the P values comparison between the groups regarding (VAS) (P= 0.007) and (MAS) (P= 0.041). The significant value is less than 0.05, so we can conclude that there was a significant difference between pre-test and post-test scores which indicating improvement for VAS and MAS.

Comparison between groups according to pretest

Table (5) comparison between groups according to pretest

	N	Pre- Exp.	Pre- Cont.	P value
		Mean± SD	Mean± SD	
Visual Analogue Scale (VAS)	15	5.20 ±1.69	6.33±1.54	0.066
Motor Assessment Scale (MAS)	15	2.67± 2.47	1.67±1.88	0.222

Table (6) comparison between groups according to posttest

	N	Post- Exp.	Post- Cont.	P value
		Mean± SD	Mean± SD	
Visual Analogue Scale (VAS)	15	4.60±1.50	5.67 ±1.75	0.009
Motor Assessment Scale (MAS)	15	3.40± 2.06	1.93±1.83	0.049

Tables (5) revealed that there was no significant difference between pretest phases regarding (VAS and MAS) in the two groups (experimental and control groups) (P>0.05)

Control groups

Tables (6) showed a highly significant difference between the two groups (experiment and control in the post phase) regarding (VAS) (P= 0.009) and the difference trend was in favor of posttest in the experimental group which mean a significant less pain.

Also the table showed a significant difference between the two groups (experiment and control in the post phase) regarding (MAS) (P= 0.049) and the difference trend was in favor of posttest in the experimental group.

DISCUSSION

The present study was designed to know the efficacy of Maitland oscillatory technique adjunct with traditional physiotherapy program in the treatment of acute hemiplegic shoulder pain by comparing with traditional physiotherapy program alone.

While analyzing the outcome measures of this study, it was observed that both the groups showed a significant improvement over time in favor of experimental group regarding VAS and MAS. Statistical analysis of data in the experimental group showed a significant difference for both variables (P value = 0.003). For VAS the pretest mean and standard deviation score was 5.20±1.699 and for post-test the score was 4.60±1.50 a reduction of 11.5 %. For MAS the pretest mean and standard deviation score was 2.67±2.47 and for post-test the score was 3.40±2.06 a reduction of 27.3%.

In control group, the VAS pretest mean and standard deviation score was 6.33±1.54 and for post-test the score was 5.67±1.17 a reduction of 10.4% with p value = 0.007. For MAS the pretest mean and standard deviation score was 1.67±1.8 and for post-test the score was 1.93±1.83 a reduction of 15.5 % with P value= 0.041.

Joint Mobilization Is a type of passive movement performed by the therapist at a speed slow enough that the patient can stop the movement. The technique may be applied with Oscillatory motion to decrease Pain and (or) increase mobility due to neurophysiologic effects on the stimulation of peripheral mechanoreceptors and the inhibition of nociceptors. [19,20]

Johnson et al., 2007 found that there was a significant effect of anterior versus posterior glide joint mobilization on external rotation range of motion in patients with shoulder pain [21]

Teys et al., 2008 reported that the effects of the mobilization technique on range of movement and pressure pain threshold in pain-limited shoulders was Significant and clinically meaningful improvements in ROM and pain occurred immediately after post treatment. The results indicate that this specific manual therapy treatment has an immediate positive effect on both ROM and pain in subjects with painful limitation of shoulder movement. [22]

Camarions 2009 found that the manual therapy appears to increase either active or passive mobility of the shoulder. A trend was found favoring manual therapy for decreasing pain, while increases in function and quality of life are still questionable. [23]

Bergman et al 2010, found that manual therapy with usual care decreases shoulder and neck pain and increases shoulder and neck mobility. At 6 weeks: no difference between groups. At 12 weeks: significant improvement with manual therapy group for shoulder and neck pain. At 26 weeks: manual therapy favored for shoulder pain and mobility and neck mobility [24]

Yiasemides et al., 2011 demonstrated that the addition of passive mobilization of shoulder region joints to exercise and advice is not more effective than exercise and advice alone in decreasing pain and painful

ROM and improving function. So, there is no significant difference in any of the outcome measurements between the two groups at short-, medium-, or longer-term follow-up. [25]

Kumar A et al., 2012 confirmed that the addition of the Maitland mobilization technique with the combination of exercises have proved their efficacy in relieving pain and improving R.O.M. and shoulder function and hence should form a part of the treatment plan. [26]

CONCLUSION

The combined effect of traditional physiotherapy program plus Maitland's oscillatory technique grade one and two was more effective in reducing pain of acute hemiplegic shoulder than using of traditional physiotherapy program only.

Recommendations

1. Maitland's oscillatory technique is consider one of the effective physiotherapy techniques for relieve pain.
2. Further studies needed for searching about oscillatory technique grade one and two in different joint.

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