



**A STUDY TO COMPARE THE EFFECTS OF LASER THERAPY VERSUS MAITLAND MOBILIZATION TECHNIQUES IN REDUCING PAIN AND IMPROVING SHOULDER RANGE OF MOTION IN SUBJECTS WITH ADHESIVE CAPSULITIS**

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**ABSTRACT**

**Background & Objective:** The objective of the study is to compare the effects of Laser therapy versus Maitland mobilization technique in reducing pain and improving shoulder range of motion in subjects with adhesive capsulitis. **Methods:** 30 subjects who fulfilled inclusion and exclusion criteria were selected through simple random sampling method and divided into two groups of 15 each. Both the groups underwent a pre test measurement of pain intensity and range of motion. Subjects in Group A were treated with Laser therapy and subjects in Group B were treated with Maitland mobilization for 6 weeks and after 6 weeks the outcome was measured (a) pain by using visual analogue scale and (b) range of motion by using Goniometer. **Results:** Both the groups showed improvements after 6 weeks of intervention. But Group A with Laser therapy showed a higher statistical significance with a value ( $p < 0.0001$ ) while compared to Group B who were given Maitland mobilization. **Conclusion:** In conclusion, the results of this study shows that there was significant improvement in pain and ROM in subjects with adhesive capsulitis who are treated with Laser therapy (Group A) compared with subjects treated with Maitland mobilization (Group B). Hence Group A is more effective in reducing pain and improving ROM than compared to Group B. However, subjects in both Group A and Group B showed reduction in pain and improving range of motion after 6 weeks of intervention but significant reduction in pain and range of motion was seen in Group A when compared to Group B in patients with adhesive capsulitis.

**KEYWORDS:** Adhesive capsulitis, Laser therapy, Maitland mobilization.

**INTRODUCTION**

Adhesive capsulitis is a specific condition of self-limiting of unknown aetiology characterized by painful and limited active and passive gleno-humeral range of motion of 25% in at least two directions most notably shoulder abduction and external rotation.<sup>[1]</sup>

Three subcategories of secondary frozen shoulder include systemic (diabetes mellitus) and other metabolic condition, extrinsic (cardiopulmonary disease, cervical disc, CVA, humerus fractures, Parkinson's disease) and intrinsic factors (rotator cuff pathologies, biceps tendonitis, calcific tendonitis, AC joint arthritis).<sup>[2]</sup>

Adhesive capsulitis is often more prevalent in women, individuals 40-65 year old, and in the diabetic population, with an occurrence rate of approximately 2-5% in the general population and 10-20% of the diabetic population.<sup>[3]</sup>

The term adhesive capsulitis, periarthritis of shoulder are used at times with a meaning synonymous with frozen shoulder. Adhesive capsulitis is characterized by

insidious and progressive onset of pain and loss of active and passive mobility of the glenohumeral joint with adversely affects the entire upper extremity. Frozen shoulder syndrome was first described by Duplay in 1872. In 1934, Codman used the term frozen shoulder to describe this condition. In 1945, Nevasier concluded that frozen shoulder was not periarthritis, but thickening and contraction of the capsule which becomes adherent to the humeral head that he termed as 'Adhesive Capsulitis'.<sup>[4,5]</sup>

**Functional limitations seen in frozen shoulder are<sup>[6]</sup>**

- Inability to reach overhead, behind head, out to the side and behind back thus having difficulty in dressing (such as putting on a jacket or coat or women fastening under garments behind their back), reaching hand into back pocket of pant (to retrieve wallet), self grooming (such as combing hair, brushing teeth, washing face) and bringing utensils to mouth.
- Difficulty in lifting weighted objects.
- Limited ability to sustain repetitive activities.

The intensity of the mobilization techniques with rhythmic oscillatory movements usually is categorized according to 5 grade classification of Maitland.<sup>[7]</sup>

In Maitland classification system, a concept of management in which accessory and physiologic passive movements of the joint are applied at various grades of intensity depending on subject's pain and joint stiffness. A vital component of the Maitland approach is that the treatment is based on constant assessment and reassessment with subsequent individual modification of treatment techniques.<sup>[8]</sup>

In a study by Vermeulen et al, patients were given inferior, posterior and anterior glides as well as a distraction to the humeral head. These techniques were performed at greater elevation and abduction angles if glenohumeral joint ROM increased during treatment. Patient who received HGMT the mobilization of Maitland grades III and IV according to the subject's tolerance with the intension of 'managing the stiffness'. Patient were allowed to report a dull ache as long as it did not alter the execution of the mobilizations as persist for more than four hours after treatment. However, patient who received LGMT were given Maitland grades I or II without the perception of pain.<sup>[9]</sup>

Low level laser therapy has recently emerged as a distinct therapeutic modality in a control of both acute and chronic pain. Lower level laser therapy is a type of phototherapy and invasive technique, include light source (wavelength 632-1064) treatment that generates light of a single wavelength.<sup>[10]</sup>

The main mechanism of the therapy is considered to be bio stimulation with the light energy enhancing the level homeostasis. Low energy laser is use in acute, chronic pain and in the inflammation by irradiation of very weak(1-10mins) but special wavelength (30-904nm).<sup>[11,12,13]</sup>

## METHODOLOGY

**STUDY DESIGN:** Experimental study

**STUDY DURATION:** 6 weeks.

**SAMPLE SIZE:** 30 subjects.

**STUDY SETTING:** The study was conducted at physiotherapy outpatient department Sims College of Physiotherapy, Guntur.

**SAMPLE DESIGN:** Simple random sampling

## SAMPLING CRITERIA

### Inclusion criteria

1. Age group between 40-60 years
2. Shoulder pain more than 3 months with 50% restriction in passive shoulder flexion, extension, abduction and external rotation
3. Shoulder ROM restricted
4. Subjects with diagnosed case of grade I & II adhesive capsulitis unilaterally
5. Both the genders are included

6. Subjects who are willing to participate in the study

### Exclusion criteria

1. Subject who had previous manipulation under anaesthesia of the affected shoulder or injection with corticosteroids in the affected shoulder in the preceding 4 weeks.
2. Subjects with history of fracture
3. Subjects with neurological deficits affecting shoulder dysfunction in normal daily activities.
4. Subjects with pain or disorders of the cervical spine, elbow, wrist or hand or any skin lesions/bruises around the shoulder.
5. Any other conditions involving the shoulder. (e.g. Rheumatoid arthritis, Osteoarthritis, damage of the glenohumeral cartilage, Hill sachs lesion osteoporosis or malignancies in the shoulder region).

## MATERIALS

- Couch
- Cushion
- Bedsheet
- Pillow
- Chair
- Protective goggle
- Wall crawler
- Shoulder wheel
- T- pulley
- Moist heat therapy packs
- Towel
- Goniometer
- Patient assessment chart
- Data analysis chart
- Patient consent form

## VARIABLES

### Independent variables

- Laser therapy
- Maitland mobilization

### Dependent variables

- Pain
- Range of motion

## MEASUREMENT TOOLS

1. Visual Analogue Scale
2. Goniometer

## STATISTICAL TOOLS

Unpaired 't' test

## PROCEDURE

Thirty samples selected from the population divided into two equal groups. The procedure was explained to subject. Both the group underwent a pre test measurement of pain intensity and Range of motion. Group A – Subjects were treated with Laser therapy. Group B – subjects were treated with Maitland mobilization.

Both groups are treated for 6 weeks and after 6 weeks the outcome was measured (a) pain by using visual analogue scale and (b) Range of motion will be measured by using Goniometer.

#### GROUP – A TREATMENT (LASER THERAPY)

Laser with infrared beam (LASERMED 2200 make in Italy) is used with following parameters:

- Wavelength : 905nm (single probe)
- Maximum power : 25 watt
- Peak power value : 25 watt
- Pulse frequency : 5000hz
- Total energy density : 1.50 J/cm
- Duration : 3 min/session on each point and 3 session per week in total of 6 weeks (18 treatment session).

Patient was positioned in supine lying on high end couch with position of ease and shoulder joint is equally relaxed. Marks are made on the skin on four different aspects of shoulder from anterior, lateral, and posterior at the tender point on arc of shoulder joint suffering from adhesive capsulitis.

Therapist should stand on the head area of the couch to place probe on the shoulder joint affected. Both the therapist and the patient wore protective goggle for eye safety. Contact method is used with appropriate frequency and position of beam is directly incident on the marked point at four different locations on shoulder joint.

#### CONVENTIONAL THERAPY

**Codman pendular exercise** started with 10-15 repetition. Patient was asked to bend forward, flexing the trunk to right angle. The knees were slightly flexed to avoid low back discomfort, the body was supported by placing the other arm upon table or chair. The arm was then moved forward and backward, side to side and circumductory manner with arm moving 10 times advice to perform twice daily.

**Shoulder wheel exercise** has advice to perform clockwise and anticlockwise rotations 10,20,50 repetitions gradually performed thrice a week for 6 weeks.

**Home exercise program** included stretching and strengthening exercises that are all active range of motion and isometrics 10-20 repetitions twice daily.

#### GROUP – B TREATMENT (G.D MAITLAND)

Adhesive capsulitis (grade I & II) were taken on basis of inclusion criteria and exclusion criteria. These patients were given hot pack for 10-20 minutes and G D Maitland mobilization grade I & II which included posterior glide, anterior glide and caudal glide thrice a week with 15-20 repetition per session for 6 weeks (18 treatment sessions).

#### GLENOHUMERAL CAUDAL GLIDE

Patient will be in supine lying position, the therapist will hold the affected arm in 90 degrees of abduction and will push the head of the humerus in inferior direction for the caudal glide.

Passive oscillatory movements were performed at the rate of 2-3 glides per second for 30 seconds each glide and every glide was given for 5 sets. This technique was applied 3 days a week for 6 weeks.

#### GLENOHUMERAL ANTERIOR GLIDE

Patient will be in supine lying position, therapist will hold the head of the humerus on the affected side firmly, and will apply an upward pressure on the head of the humerus posteriorly.

Passive oscillatory movements were performed at the rate of 2-3 glides per second for 30 seconds for each glide and every glide was given for 5 sets. The technique was applied 3 days a week for 6 weeks.

#### GLENOHUMERAL POSTERIOR GLIDE

Patient will be in prone lying position, the therapist will hold the head of the humerus on the affected side firmly and apply an upward pressure on the head of the humerus from the anterior from the anterior side of humerus.

Passive oscillatory movements were performed at the rate of 2-3 glides per second for 30 seconds for each glide and every glide was given for 5 sets. The technique was applied 3 days a week for 6 weeks.

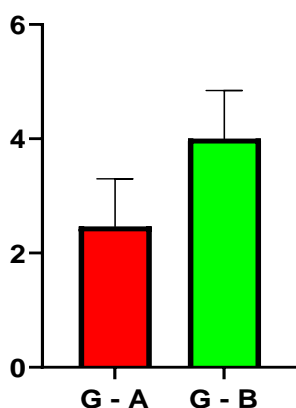
#### CONVENTIONAL THERAPY

**Wall crawler** patient was advised to perform this exercise at clinic as well as at home 20 repetitions twice a day for three months.

**T – pulley** patient was advised to perform this exercise when comes for treatment session and home setting by selecting a rope to be hanged from the hook at home and sitting below the U sling to lift arm up and down 50 repetitions twice a day for three months.

**Home exercise program** Home based stretching and strengthening exercises are also advised including all active range of motion and isometrics 10-20 repetition twice daily.

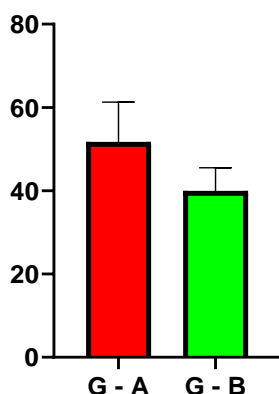
**STATISTICAL ANALYSIS:** Statistical analysis was performed using Ms excel. The demographic data like standard deviation and mean percentage were calculated and presented.

**POST VAS Group A Vs Group B****GRAPH- 1 COMPARISON OF POST VAS BETWEEN GROUP – A & GROUP – B.****DESCRIPTION**

The difference between post values measured by VAS using the two tailed P value is ( $<0.0001$ ), considered extremely significant.

**Table 1.**

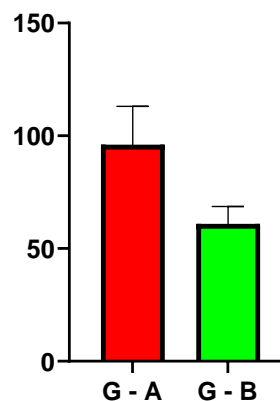
Vas	Mean	Sd	P-value	T- value
Pre-value	2.46	0.83	$<0.0001$	5.001
Post-value	4	0.84		

**POST EXTERNAL ROTATION Group A Vs Group B****GRAPH-2 COMPARISON OF POST EXTERNAL ROTATION ROM BETWEEN GROUP – A & GROUP – B.****DESCRIPTION**

The difference between post values of external rotation ROM measured by GONIOMETER using the two tailed P value is ( $0.0003$ ), considered extremely significant.

**Table 2.**

Goniometer	Mean	Sd	P-value	T-value
Pre-Value	51.73	9.52	0.003	4.145
Post-Value	39.93	5.56		

**POST ABDUCTION Group A Vs Group B****GRAPH-3 COMPARISON OF POST ABDUCTION ROM BETWEEN GROUP – A & GROUP – B****DESCRIPTION**

The difference between post values of abduction ROM measured by GONIOMETER using the two tailed P value is ( $<0.0001$ ), considered extremely significant.

**Table 3.**

Goniometer	Mean	Sd	P-value	T-value
Pre-Value	96	17.029	$<0.0001$	7.268
Post-Value	60.93	7.695		

**RESULT**

The above table and graph shows mean values within the groups from pre test and post test were found to be statistically significant ( $p<0.0001$ ).

**DISCUSSION**

This study was carried out to compare the effects of Laser therapy versus Maitland mobilization technique in reducing pain and improving shoulder ROM in subjects with adhesive capsulitis.

In this study a total sample of 30 subjects were recruited, all the patients included were in accordance with the inclusion criteria stated for the study. Subjects in Group A were treated with Laser therapy and subjects in Group B were treated with Maitland mobilization for 6 weeks and after 6 weeks the outcome was measured (a) pain by using visual analogue scale and (b) Range of motion will be measured using Goniometer.

The paired t – test was used to find out the statistical significance between pre and post values of VAS and ROM before and after treatment for Group A and Group B. Based on the results above it is seen that subjects in both Group A and Group B showed reduction in pain and improving Range of motion after 6 weeks of intervention but significant reduction in pain and Range of motion was seen in Group A when compared to Group B.

Stimulation of mechanoreceptors within the joint capsules of the facet inhibits the nociceptive fibres in the

area, thereby disrupting the pain-spasm cycle. Laser therapy quickly reduces inflammation and painful symptoms.<sup>[14]</sup>

The efficacy of low-level laser therapy in patients with supraspinatus tendonitis, she measured pain intensity, range of motion and strength of shoulder muscles. She reported a significant difference in range of motion, shoulder strength and pain in patients that received active laser treatment in comparison with a placebo group.<sup>[15]</sup>

A double blind study of the effectiveness of low level laser treatment of rotator cuff tendonitis. Investigated the efficacy of laser irradiation (Ga-Al-As, 830 nm, 30 mw CW) in 30 patients with rotator cuff tendonitis. Ten points around the shoulder were irradiated with 4.2 J per point. After 16 sessions, there was an increase in the range of motion and muscle strength, and decrease of pain intensity.<sup>[16]</sup>

In a study by Vermeulen et al, patients were given inferior, posterior and anterior glides as well as a distraction to the humeral head. These techniques were performed at greater elevation and abduction angles if glenohumeral joint range of motion increased during treatment. Patients who received HGMT the mobilization of Maitland grades III & IV according to the subjects tolerance with the intension of 'managing the stiffness'. Patient were allowed to report a dull ache as long as it did not alter the execution of the mobilizations as persist for more than four hours after treatment. However, patients who received LGMT were given Maitland grades I & II without the perception of pain.<sup>[17]</sup>

The Patho – anatomy of adhesive capsulitis includes thickening of the synovial portion of the capsule and adhesions with in the subacromial bursa resulting from bicipetal tenosynovitis. Fibroblast proliferation consist both the rotator cuff and the coracohumeral ligament by depositing a type III collagen dense matrix and found surgical release of coracohumeral ligament immediately increases the external rotation range of motion in frozen shoulder patients.<sup>[18]</sup> This proliferation of fibroblast may be responsible for the loss of movement of shoulder structural changes in the periarticular tissues responsible for capsule – ligament restrictions<sup>[19]</sup> and decreased extensibility of musculo-tendinous<sup>20</sup> unit in patients with adhesive capsulitis. Joint mobilization also activates mechanoreceptors with in joint capsule & inhibit the nociceptive fibres, the area thus reducing pain-spasm cycle.<sup>[21]</sup>

The pain relief was assessed by using Visual Analogue Scale. The subjects showed significant pain relief in Group A when compared to Group B. It was also noted that Group A showed better pain relief than Group B.

The glenohumeral range of motion measured by using Goniometer. The subjects showed significant ROM in Group A when compared to Group B. It was also noted

that Group A showed better improvement in ROM than compared to Group B.

When Group A and Group B were compared. Group A showed better results than Group B. VAS and ROM scores across the baseline and post interventions showed a highly significant improvement statistically in their median values in Group A than compared to Group B.

## CONCLUSION

In conclusion, the results of this study shows that there was significant improvement in reducing pain and ROM in subjects with adhesive capsulitis who are treated with Laser therapy (Group A) compared with subjects treated with Maitland mobilization (Group B). Hence Group A is more effective in reducing pain and improving ROM than compared to Group B.

However, subjects in both Group A and Group B showed reduction in pain and improving range of motion after 6 weeks of intervention but significant reduction in pain and range of motion was seen in Group A when compared to Group B in patients with adhesive capsulitis. Based on statistical analysis we have concluded that laser therapy is better in the treatment of patients with adhesive capsulitis compared with Maitland mobilization. Hence the null hypothesis is rejected and alternative hypothesis is accepted.

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