

TO STUDY THE EFFECTIVENESS OF G.D MAITLAND MOBILIZATION VERSUS LASER THERAPY IN ADHESIVE CAPSULITIS

Zaki Anwer ¹, Suraj Kumar ^{*2}.

¹ Reseach Scholar, Monad University, Hapur, UP, India.

^{*2} Associate Professor and HOD, Department of Physiotherapy, UPUMS, Saifai, UP, India.

ABSTRACT

Background: Adhesive Capsulitis (also known as frozen shoulder) is a disorder with greatly restricted motion and chronic pain. Although many treatment have shown significant benefit but role of physical therapy in initial stage found to be effective. The authors present a prospective randomized study to show the effectiveness of G.D.Maitland mobilization versus Laser Therapy in Adhesive Capsulitis.

Methodology: 20 subjects suffering from frozen shoulder were randomized into two treatment groups. Group A subjects were given hot pack and Maitland mobilization with exercises and Group B with Laser therapy and supervised exercises. Patients were assessed using VAS, SPADI and ROM (flexion, extension, abduction external rotation and internal rotation) scores.

Result: It shows that the variable scores for all the variables improved significantly in both the groups namely Maitland therapy group as well as LASER therapy group. But it was found that in "0 day versus 30 days", "30 vs 90 days" as well as the "0 day versus 90 days" the improvement was much higher in the Maitland therapy group.

Conclusion: Thus conclude that the LASER and Maitland's mobilization was effective at reducing pain intensity and restoring shoulder function for people with adhesive capsulitis. The improvement of the functional scores and associated disability performance was much higher in the Maitland mobilization group while compared to the LASER treatment group.

KEY WORDS: Adhesive Capsulitis, LASER Therapy, Maitland.

Address for correspondence: Dr.Suraj Kumar, Associate Professor and HOD, Department of Physiotherapy, UPUMS, Saifai, UP, India. Mobile: 7055006705, **E-Mail:** surajdr2001@yahoo.com

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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 e" 25% in at least two directions most notably shoulder abduction and external rotation [1].

Adhesive capsulitis, commonly referred to as frozen shoulder with synovitis and capsular contracture of shoulder joint and can be classified as either primary or secondary Frozen

shoulder is considered primary if the onset is idiopathic while secondary results from a known cause or surgical event⁽⁷⁾. 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) [2].

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 [3].

Current approaches in management of adhesive capsulitis in conservative medical management where it is a self-limiting condition, it can take up to two to three years for symptoms to resolve and some patients may never fully regain full motion. Therefore, it is mandatory for patients to undergo treatment for pain, loss of motion, and limited function rather than take the waiting option approach. Various interventions have been researched that address treatment of the synovitis and inflammation and modify the capsular contractions such as oral medications, corticosteroid injections, distension, manipulation, and surgery. Even though many of these treatments have shown significant benefits over no intervention at all, definitive management regimens remain unclear. It has been discussed that the primary treatment for adhesive capsulitis should be based on physical therapy and anti-inflammatory measures [3].

Although, corticosteroid injections have shown to have success rates ranging from 44-80 % [3] with rapid pain relief and improved functions occurring mainly in the first weeks of treatment. Thus injections will be suggested to patients with pain as their predominant complaint in the early stage of adhesive capsulitis [4,5].

Manipulation under anaesthesia involves a controlled and forced, end range positioning of the humerus relative to the glenoid in physiologic planes of motion (flexion, abduction, rotation) in patients with an anaesthetic block to the brachial plexus [2]. Contraindication to manipulation under anaesthesia do exist and include: history of fracture or dislocation, moderate bone loss, or an inability to follow through with post procedure or an inability to follow through with post procedure care [6,7]. Although manipulation under anaesthesia has been shown to be effective in improving function and motion in patients with adhesive capsulitis, it is necessary to have randomized controlled trials comparing this treatment to competing treatments before widespread use is advocated [6,7]. Modalities, such as hot packs, can be applied before or during treatment. Moist heat used in

conjunction with stretching can help to improve muscle extensibility and range of motion by reducing muscle viscosity and its relaxed⁽²⁾. Bat et al, patients improved with combined therapy which involved hot and cold packs applied before and after shoulder exercises were performed⁽⁵⁾. And a study by Jewell et al, claimed that ultrasound, massage, iontophoresis reduced the odds of improved outcomes of patients with adhesive capsulitis [7].

Mobilizations may include the breakup of adhesions, realignment of collagen, or increased fibre glide when specific movements stress certain parts of the capsular tissue. High grade mobilization techniques (HGMT) have been shown as an important technique for improving range of motion in patients with adhesive capsulitis for at least three months.

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 and IV according to the subject's tolerance with the intention of 'managing the stiffness'. Patients 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 low grade mobilization technique (LGMT) were given Maitland Grades I or II without the perception of pain.

Statistically significant greater change scores were found in the HGMT group for passive abduction (at the time of three and twelve months), and for active and passive external rotation (at twelve months) when compared with low grade mobilization techniques. While concluding HGMT appear to be more effective for increasing joint mobility and reducing disability. HGMT beneficial during later stages of adhesive capsulitis, while LGMT would provide stages [8].

Low energy laser therapy (LLLT) has recently been popularized in the treatment of various rheumatologic, neurologic and musculoskeletal disorders such as osteoarthritis, rheumatoid arthritis, fibromyalgia, carpal tunnel syndrome,

rotator cuff tendinitis and chronic back pain syndromes[9]. LLLT is believed to modulate neuronal activity in the tissue and have a pain relieving effect; however, the indication for LLLT in painful musculoskeletal system disorders is known for discussion and establish its reliability [10].

The objective of this study is to establish the clinical result of efficacy of LLLT in the management of early phase of symptomatic adhesive capsulitis of the shoulder in elderly. Also effects of mobilization of (LGMT) and HGMT in improvement of pain, ROM and reducing limitation of shoulder mobility in adhesive capsulitis.

METHODOLOGY

This study is randomized controlled in nature where aim of this systemic study is to assess the effects of Maitland and LLLT (Low Level LASER Therapy) in subjects of adhesive capsulitis.

Participants: 20 subjects were included 10 in each group. The study was conducted at Goodwill Hospital and Research Centre, Noida, UP in department of physiotherapy and subjects were referred by orthopaedic surgeon.

Inclusion criteria: Subjects with diagnosed case of grade I & II adhesive capsulitis unilaterally with age group of 40-60 years of painful condition of at least 3 months with 50% restriction in passive shoulder flexion, extension, abduction and external rotation, in sagittal plane compared with opposite side.

Exclusion Criteria: Subject had previous manipulation under anesthesia of the affected shoulder or injection with corticosteroids in the affected shoulder in the preceding 4 weeks, history of fracture, neurological deficits affecting shoulder dysfunction in normal daily activities, pain or disorders of the cervical spine, elbow, wrist or hand or any skin lesions/bruises around the shoulder and 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).

Groups: Group A subjects were given hot pack and Maitland mobilization with exercises and Group B with Laser therapy and supervised exercises at department.

Procedure: The subjects were randomly allocated equally in each group on the basis of inclusion and exclusion criteria and written consent was taken from the participants. The demographic variables including age, weight, height, sex and gender of the two groups were recorded at baseline.

Baseline scores of dependent variables of the study were recorded including pain score on VAS, SPADI (shoulder pain and disability index) disability and pain index score, shoulder ROM (range of motion) for flexion, extension, abduction and external rotation.

Material/tools/instruments used were couch, cushion, bed sheet, pillow, Chair, Laser therapy modality with protective goggle, Wall crawler, Shoulder wheel, T-Pulley, moist heat therapy modality with packs, towel to wrap the body when moist heat is used over shoulder, Goniometer.

Group –A (G.D Maitland): 12 patients of 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) along with wall crawling (20 repetition) and T-Pulley (50 repetition) exercises twice a day for three months. The reading were taken at 0 day, 1 month, 3 month (0, 30 days, 90 days).

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

Group B (Laser Therapy): Laser with infrared beam (LASERMED 2200 make in Italy) is used with following parameters:- wavelength- 905 nm (single probe), maximum power- 25 watt, peak power value- 25 watt, Pulse Frequency- 5000 Hz, total energy density- 1.50 J/cm², duration 3 min/ session on each point and 3 session per week in total of 6 weeks (18 treatment Sessions).

Patients were 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 aspect 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 therapist and the patient wore protective goggles 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.

Exercise Program for Group B included Codman Pendular Exercise 10-15 repetition twice daily and Shoulder Wheel Exercise 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 repetition twice daily.

Reading recorded at interval of 0 day, 1 month and 3 month and evaluation done on VAS, SPADI and ROM measurement of shoulder joint affected from adhesive capsulitis.

Data analysis: The design of this study is randomized – controlled trial with the post-intervention follow up to three months. The subjects of this study were equally and randomly allocated in to either of the two groups namely “high grade mobilization techniques or low level laser therapy group” or the conventional exercises group using lottery method. Each of the both groups consisted of thirty participants. The demographic characteristics Age, Weight, sex, Height and duration of symptoms of the both groups were assessed at baseline for making baseline comparison using unrelated t-test. Outcome variables of the study such as VAS (pain), SPADI disability index, SPADI pain score, goniometry ROM of shoulder joint for abduction and external rotation were collected by same physiotherapist for the test procedure at baseline as well as on day 30 and 90.

Baseline demographic data were compared using unrelated t-test across both treatment groups to assess the adequacy of the randomization and to make baseline comparison. An *a priori* alpha level of 0.05 was used for all analyses. Data obtained was summarized using descriptive statistics of mean and standard deviation. All statistical analyses were performed

using SPSS 16.0.

Scores of the dependent variables VAS (pain), SPADI disability index, ROM of shoulder joint for flexion, extension, abduction, external rotation and internal rotation were compared for the three instances in each group at baseline, after 30 days and after 90 days using repeated measures ANOVA and the comparisons were evaluated using Tukey’s post-hoc analysis. These comparisons were performed to evaluate the differences in the performance of the variables for between-group as well as with-in group’s comparisons.

Baseline comparison

Participants profile: Twenty four males suffering from adhesive capsulitis participated in this study. Initially about 34 patients participated in the study and during the course of the study about 10 patients dropped from the study due to time schedule and other reasons. Only those twenty four participants who completed the study protocol were considered for the data analysis.

The baseline comparison of the participants characteristics using unpaired t-test revealed (table 1) that there was no statistically difference among the subjects of both group in terms of the age (p=1.02); weight (p =0.75); height (p=0.68) and duration of symptoms (p=0.46).

Table 1: Demographic variables of the study for comparison at baseline.

Demographic variables	high grade mobilization techniques	LASER group (n=12)	Level of significance (P value)
Age (years)	46.67 ± 3.42	48.75±2.90	1.02
Weight (kg)	63.17±4.42	62.58±4.38	0.749
Height (cm)	164.83±4.13	165.42±2.47	0.679
Duration of symptoms (weeks)	8.17±2.66	9±2.76	0.459

Table 2: ANOVA results showing of the variable performance with time.

		0 day	30 day	90 day	Level of difference P value
Pain severity (VAS)	Maitland mobilization group	7.08±0.79	5.42±0.79	2.50±0.52	0
	LASER group	6.83±0.72	5.58±1.44	30.95	0
ROM shoulder abduction	Maitland mobilization group	40.08±23.49	109±21.08	135.75±18.55	0
	LASER group	40.25±13.69	90.75±10.78	128.17±14.66	0
ROM shoulder external rotation	Maitland mobilization group	18.25±7.77	32.42±6.43	62±15.07	0
	LASER group	24.17±7.56	54.58±10.38	81.33±4.14	0
SPADI pain	Maitland mobilization group	31±1.70	23.33±2.18	12.08±1.24	0
	LASER group	34.25±1.86	24.58±1.62	15.17±1.46	0
SPADI disability score	Maitland mobilization group	55.67±3.72	39.33±3.52	19.75±1.81	0
	LASER group	53.92±2.57	41±2.41	25.88±2.42	0

Table 3: Representing the mean percentage change in the variable scores of the variables.

		Maitland therapy group mean difference	P value	LASER therapy group mean difference	P value
Pain severity (VAS)	0 versus 30 days	31.4	0.000**	40.9	0.000**
	30-90 day	41.6	0.000**	30.7	0.000**
	0 versus 90 days	60.9	0.000**	60	0.000**
ROM shoulder flexion	0 versus 30 days	48.6	0.000**	33.6	0.000**
	30-90 day	47.3	0.000**	51.6	0.000**
	0 versus 90 days	117.5	0.000**	90.7	0.000**
ROM shoulder extension	0 versus 30 days	53	0.000**	46.2	0.000**
	30-90 day	35.8	0.000**	27.9	0.000**
	0 versus 90 days	108.7	0.000**	86.4	0.000**
ROM shoulder abduction	0 versus 30 days	229.5	0.000**	58.3	0.000**
	30-90 day	37.6	0.000**	29.6	0.000**
	0 versus 90 days	67.7	0.000**	58.8	0.000**
ROM shoulder ER	0 versus 30 days	43.8	0.000**	45.7	0.000**
	30-90 day	29	0.000**	37.3	0.000**
	0 versus 90 days	208.8	0.000**	50.8	0.000**
ROM shoulder IR	0 versus 30 days	43.3	0.000**	63.2	0.000**
	30-90 day	34.5	0.000**	41.3	0.000**
	0 versus 90 days	91.5	0.000**	130.3	0.000**
SPADI pain score	0 versus 30 days	35.6	0.000**	34.6	0.000**
	30-90 day	78.8	0.000**	59.4	0.000**
	0 versus 90 days	142.7	0.000**	150.3	0.000**
SPADI disability score	0 versus 30 days	24	0.000**	24.3	0.000**
	30-90 day	42.1	0.000**	37.2	0.000**
	0 versus 90 days	202.6	0.000**	189.1	0.000**

The findings of this study demonstrated that Maitland's mobilization as well as LASER both successfully reduced the shoulder pain and associated disability; also both treatments caused significant improvement in shoulder function for people with adhesive capsulitis but the patient who received the Maitland mobilization responded more to treatment.

Table 3 representing the mean percentage change in the variable scores of the variables; shows that the variable scores for all the variables improved significantly in both the groups namely Maitland therapy group as well as LASER therapy group. In both the groups it was found that in "0 day versus 30 days", "30 vs 90 days" as well as the "0 day versus 90 days" the improvement was much higher in the Maitland therapy group.

DISCUSSION

The observed improvements in pain and shoulder functions were comparable to similar previous studies.

In this study the minimum duration of symptoms related to the pain and disability were of 4 weeks, therefore it is assumed that during this time period the capsule must have developed some adhesions which could be responsible for the restriction in the ranges of motion of shoulder joint.

In Maitland mobilization group there was significant improvement in all ranges of motion as compared to LASER treatment only. For external and internal rotation values at 30 days the LASER treatment shows better improvement while compared to the day 0. This increase in range of motion is to be linked to the stretching of the joint capsule and surrounding soft tissue during shoulder Maitland mobilization. The mechanical force used during mobilization may include the stretching of adhesions, realignment of collagen or increase fiber gliding when specific mobilization movement stress the specific parts of the capsule. The previous study report the circulatory effects by increasing the blood flow in the vessels supply in nerve fibers

and synovial fluid flow surrounding avascular cartilage. This further would be helpful to overcome the state of possible ischemia which could have been responsible for causing the intra-neural edema along with fibrosis [11,12].

Reduction in the pain and disability score is similar to the findings of study done by Stergioulas (2008) [13].

The improvement in the joint place between articular surfaces does have a role in helping to keep scapula in correct position during dynamic movement of shoulder; the reduction in the surrounding fascia contraction which had occurred during chronic soft tissue impairment, the correction in the joint biomechanics. All these factors do play a role in providing a gentle sensory stimulation of the mechanoreceptors and via spinal inhibitory system this activates the descending inhibitory pain suppression system for closing the pain perception and hence results in the reduced perception of the pain associated with the movement [14].

In case of adhesive capsulitis the movement of scapula occurs with respect to humerus but in such case the scapula remains comparatively fixed hence the joint play occur in unnatural pattern which leads to increase in the pain. In such conditions the muscles are not able to exert the force on the joint capsule which leads to the development of hypo-mobility of the joint capsule and eventually loss of the movement at the joint [15].

The patho-anatomy of adhesive capsulitis includes thickening of the synovial portion of the capsule and adhesions with in the subacromial bursa resulting from bicipital tenosynovitis. Fibroblast proliferation consist enlyalteres both the rotator cuff interval 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 [16]. 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 [17] and decreased extensibility of musculo-tendinous [18] unit in patients with adhesive capsulitis. Joint mobilization also activates mechanoreceptors with in joint

capsule & inhibit the noceptive fibers, the area thus reducing pain-spasm cycle [19].

The LASER therapy is more effective than the placebo treatment in reducing the pain and disability scores at the end of treatment period as well as at follow ups in the patients with frozen shoulder [13]. The subjects treated with laser therapy show a greater reduction in pain and more improvement in articular movement, functionality and muscle strength of the affected shoulder than the subjects treated with ultrasound therapy [20].

Stimulation of mechanoreceptors within the joint capsules of the facet inhibits the nociceptive fibers in the area, thereby disrupting the pain-spasm cycle. LASER therapy quickly reduces inflammation and painful symptoms [21]. Joint mobilization is one of the methods which enhance the frequency of discharge from mechanoreceptors for reducing the intensity of many types of pain [22].

Mobilizations may include the breakup of adhesions, realignment of collagen, or increased fibre glide when specific movements stress certain parts of the capsular tissue. Mobilization techniques (HGMT) have been shown as a important technique for improving range of motion in patients with adhesive capsulitis for at least three months [8].

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 and IV according to the subjects tolerance with the intention of 'managing the stiffness'. Patients 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 low grade mobilization technique (LGMT) were given Maitland Grades I or II without the perception of pain [8].

Limitations:

The limitations of the present study include a small population sample size. Better statistical data can be obtained by including more subjects

in the study. Biochemical markers and metabolic markers could have been included in the study to establish the possible mechanism behind reduced pain in both the groups.

CONCLUSION

In conclusion, the LASER or Maitland's mobilization was effective at reducing pain intensity and restoring shoulder function for people with adhesive capsulitis. The improvement of the functional scores and associated disability performance was much higher in the Maitland mobilization group while compared to the LASER treatment group. The pain performance in the LASER therapy group was marginally higher in the LASER therapy group. The improvement after 10 sessions of either LASER or Maitland's mobilization was significant. Maitland mobilization is better to improve shoulder ROM while LASER is more better to reduce the pain quickly.

ABBREVIATIONS

LASER- Light Amplification by Stimulated Emission of Radiations

LLTT – Low level laser Therapy

LGMT – Low grade mobilization technique

ROM- Range of motion

SPADI- Score pain and disability Index

VAS- Visual Analogue Scale.

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Conflicts of interest: None

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