



The Intervention Role of G D Maitland as Compared to Low Level Laser Therapy in Adhesive Capsulitis Male Patients

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ABSTRACT

Introduction: Adhesive capsulitis is characterized by commonly gradual loss of both active and passive range of motion (ROM) in all planes of the glenohumeral joint. Patients with Adhesive capsulitis is generally believed to be a self-limiting condition lasting 2-3 years, and 40% of patients have persistent symptoms and stiffness beyond 3 years. Objective: Study to show that effects of G D Maitland and laser therapy in patients of age group 40- 60 years male subjects. Methods: This study is randomized controlled, total 20 subjects with equal distribution of 10 in each group. All the subjects were treated for 0 days, 30 days and 90 days. Assessment of pain by Visual Analogue Scale (VAS) and ROM (Flexion and abduction) can be increased with common supervised exercises were taken in starting of the study and evaluation documentation after 0 days, 30 days and 90 days for both the groups. The total duration of study Six weeks. Goniometric assessment of active and passive ranges of shoulder movements was assessed. Data of 20 subjects (male) prospectively enrolled subjects were used for analysis. Functional activity shoulder is measured by using VAS Score for pain assessment and range of motion measured by goniometer both pre and post treatment. Results: Statistical analysis of the data done that within groups showed significant improvement for all the parameters, where between group comparison revealed higher improvement in group A compared to group B. Conclusion: This study concludes that G D Maitland technique is more effective in addition to combination of exercise have proved better decreasing pain and improving ROM and shoulder function as a protocol for treatment approach.

Keyword: Adhesive capsulitis, Laser Therapy, Maitland, ROM, VAS.

1. INTRODUCTION

Adhesive capsulitis, of the shoulder, is a disorder frequently encountered by key health professionals. The annual incidences of adhesive capsulitis are 3% to 5% in the general population and up to 20% in people with diabetics [1]. Warner established that the spherical humeral head had an articular surface area of approximately 21-22cm², and that of glenoid fossa was approximately 2.5 times greater than that of the glenoid fossa while a mere 22% of that area was engaged by the fossa[2].

Codman (1934) explains that stiffness and pain in the shoulder occur without exogenous influence and he separated this condition 'frozen shoulder' an expression which generally accepts and used with humero scapular periarthritis in a limited concept [3]. Physiotherapy management aims to relieve pain, promotes healing, reduce muscle spasm, increase joint ROM and strengthen weakened muscles and ultimately to prevent and treat functional impairment[4]. Vermeulen and colleagues examined the effectiveness of high grade mobilization techniques (movements into the stiffness zone) and low grade mobilization technique (movements in the pain free zone) in 100 patients of adhesive capsulitis. The study proves physical therapy is valuable inspite of intensity due to increased movement and range of motion and decreased the stiffness of the shoulder [1].

Lasers are commonly used in treatment of wound healing, musculoskeletal diseases, and injuries, and for pain relief (Alster & Zaulyanov-Scanlon,2007;Baxter,Bleakley&Barnsley, 2006; Hoggan, Cameron Maddern, 2009; Lomke, 2009; Naspro et al.,2009;Santana-Blank, Rodraeguez-Santana & Santana Rodraeguez,2005; Wu & Wong, 2008) [5]. Hill et al (2011) concluded that SPADI has a bidimensional factor structure representing pain and disability, with adequate internal consistency and construct validity for use in population studies of shoulder symptoms [6]. The objective of this paper is to establish the clinical result of the efficacy of LLLT in the management of early phase of symptomatic adhesive capsulitis of the shoulder in elderly. Also side by side effects of LGMT and HGMT in the improvement of pain, ROM and decreasing limitation of shoulder mobility in adhesive capsulitis.

2. METHODOLOGY

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

2.1 Inclusion Criteria

Subjects with a 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 a sagittal plane compared with opposite side.

2.2Exclusion 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).

2.3Groups

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

2.4 Procedure

The subjects were randomly allocated equally to 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 the gender of the two groups were recorded at baseline. Baseline scores of dependent variables of the study were recorded including pain score on VAS pain index score of the shoulder joint. 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

2.5 Variables

Dependent variable was VAS, range of motion (Flexion, Abduction) score, respectively.

2.6 Group A (G.D Maitland)

10 patients with 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 & III 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 repetitions) and T-Pulley (50 repetitions) exercises twice a day for three months. The reading was taken at 0 days, 1 month, 3 months (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. Also, exercise includes 15-20 repetition of wall crawling exercise in the abduction and flexion direction of the shoulder joint.

2.7 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 the position of ease and shoulder joint is equally relaxed. Marks are made on the skin on four different aspects of the shoulder from anterior, lateral and posterior at the tender point on the arc of shoulder joint suffering from adhesive capsulitis.

The therapist should stand on the head area of the couch to place the 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 the beam is directly incident on the marked point at four different locations on the shoulder joint. Exercise Program for Group B included Codman Pendulum 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 an interval of 0 days, 1 month and 3 months and evaluation is done on VAS and ROM measurement of shoulder joint affected by adhesive capsulitis.

2.8 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 into 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 both groups consisted of twenty participants. The demographic characteristics Age, Weight, Sex, Height, and the onset of disease of both groups were assessed at baseline for making baseline comparison using unrelated t-test. Outcome variables of the study such as VAS (pain), were collected by the same physiotherapist for the test procedure at the base line 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) shoulder joint 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 within group comparisons.

3.1 RESULTS

Table 1. Base line comparison of the demographic variables of the subjects who participated in the study Demographic value at the base line day. Demographic valuation of the age of ultrasound group A, The mean age of G D Maitland group is 46.10± 3.47, the mean age of laser group B is 48.70±3.05. The mean weight of G D

Maitland group A is 63.60 ± 4.74 , the mean weight of the laser group B is 61.40 ± 3.74 . The Mean height of the Maitland group A is 165.60 ± 4.08 , The Mean height of the Laser group A is 165.20 ± 2.57 .

The Mean BMI of Maitland group is 23.32 ± 1.68 Standard Deviation and the mean BMI of the LASER Group B is 22.50 ± 1.46 standard Deviation. The mean onset of disease of Maitland group is 8.50 ± 2.79 and the Mean onset of disease of LASER Group B is 9.40 ± 2.83 . The mean difference of the age is 2.6, Weight 2.2, Height 0.4, BMI 0.82 and on set of symptom is 0.9 respectively.

Using t test for two independent mean value SPSS 16 .The significant level of age group is $P > .0463$ which is not-significant ,the p Value for weight is $P > 0.132$ which is Non-significant ,The P value Height is $P > .398$ is non-significant ,The P value for BMI is $P > .130$ is also not-significant, The P Value for onset of disease is $P > .242$ is also not-significant at baseline Demographic data .

TABLE 1: Demographic Value of Variables f Age, Weight, Height, BMI, and Onset of Disease

| DEMOGRAPHIC VALUE | G.D MAITLAND GROUP N=10 | LASER THERAPY GROUP N=10 | Mean Difference | LEVELOF SIGNIFICANT(P VALUE) |
|---------------------------|-------------------------|--------------------------|-----------------|------------------------------|
| Age(Years) | 46.10 ± 3.47 | 48.70 ± 3.05 | 2.6 | 0.0463 |
| Weight (Kgs) | 63.60 ± 4.74 | 61.40 ± 3.74 | 2.2 | 0.1323 |
| Height (Cms) | 165.60 ± 4.08 | 165.20 ± 2.573 | 0.4 | 0.398 |
| BMI | 23.329 ± 1.68 | 22.50 ± 1.46 | 0.82 | 0.130 |
| Onset of Disease (Months) | 8.50 ± 2.79 | 9.40 ± 2.83 | 0.9 | 0.242 |

Base line comparisons of the variables VAS, ROM flexion abduction Subject participated at the base day 0 day as seen in table 2,

TABLE 2: Variables at the Baseline Day VAS, Flexion, and Abduction

| BASELINE VALUE | G D MAITLAND | LASER THERAPY | Mean Difference | P VALUE |
|-----------------|-------------------|-------------------|-----------------|---------|
| VAS 0 DAY | $7.20 \pm .788$ | $6.90 \pm .73$ | 0.3 | 0.195 |
| FLEXION 0 DAY | 41.00 ± 8.09 | 42.00 ± 7.52 | 1 | 0.389 |
| ABDUCTION 0 DAY | 42.50 ± 25.19 | 41.50 ± 14.53 | 1 | 0.457 |

The mean difference at the base line for the VAS is 0.3, ROM Flexion is 1, and ROM Abduction is 1 respectively. The P value for the Vas at base day 0 day is $P > 0.195$, for ROM Flexion is $p > 0.389$, for ROM Abduction is $P > 0.457$ respectively. All the variables p value is non-significant at the base line day.

Table 3 ANOVA Comparison among the variable score with time shows that the performance of the Maitland group and Laser Therapy group shows that there is an improvement in both the group for all variable the scores.

Table 3: One way Anova Comparison within the Group among the Variables Score with Time

| Variables | 0 DAY | 30 DAY | 90 DAY | Level of Significance (p-value) |
|----------------------------|-------------|--------------|-------------|---------------------------------|
| VAS Maitland | 7.2±.788 | 5.5±.707 | 2.5±.527 | 0.0001* |
| VAS LASER Therapy | 6.9±.737 | 5.5±1.50 | 2.7±6.74 | 0.0001* |
| ROM Flexion G.D.MAITLAND | 41±8.096 | 72±10.852 | 99.7±6.89 | 0.0001* |
| ROM Flexion LASER GROUP | 42±7.527 | 65±7.817 | 86.5±9.44 | 0.0001* |
| ROM Abduction G.D MAITLAND | 42.5±25.193 | 115.5±22.242 | 140.5±16.40 | 0.0001* |
| ROM Abduction LASER GROUP | 41.5±14.539 | 89±11.005 | 127.5±16.02 | 0.0001* |

The table 3.3 ANOVA comparison within the group shows there is a significant improvement in both G D Maitland and Laser therapy group while comparing from 0 days to 30 days and from 90 days to 30 days and 0 days, The VAS, ROM improved significantly in both the group. G D Maitland mobilization produces much better improvement than the Laser therapy group.

There is significant improvement in both the group i.e. G D Maitland and Laser therapy group, but when comparing with each other from base day to 90 day. The Maitland mobilization group with exercise has edge over the Laser therapy group and there is higher improvement in VAS, ROM in Maitland group than Laser therapy group.

4. 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 six 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 ranges of motion of shoulder joint. According to the various research published article. Some authors do believed it to be a self-limiting conditions and spontaneous resolution may take two to three years for symptoms to resolve. Some patients may never fully regain full motion Neviasser et al, 2010[7]. Even with the spontaneous reduction in pain the associated disability and range restrictions rarely get recovered spontaneously. Various intervention such as oral medication, corticosteroids injections, manipulation and surgery are used. It has been discussed that the primary treatment for adhesive capsulitis should be physical therapy and anti-inflammatory

Measures Brue et al 2007[8]. 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 Keley et al,2009[9]. Maitland’s mobilization technique involves the application of passive and accessory oscillatory movements to spinal and vertebral joints to treat pain and stiffness Gautam et al 2014 [10]. H.BShiv Kumar [11] et.al 2014 pendulum exercise (Codman exercise) used pendulum exercise and helps in improving the coordination of the shoulder at the glenohumeral joint. Another study on low level

laser therapy for shoulder tendinopathy shows it decreases pain and initiate more better improvement both alone and in combination of physiotherapy treatments Haslerund S et al 2015[12].

Another research on mobilization shows end range mobilization and mobilization with movement was found to be significantly equally effective than compared to control group for pain, ROM and SPADI Dhruvika Makwana et al 2015[13]. Khan et al reported greater improvement in pain and ROM in patients receiving distension with steroid injection and physical therapy, such as therapeutic exercises, than participants receiving physical therapy alone, they reported significant difference in pain, AROM and shoulder function scores between the IMSID and SID group[14]. Another research on Laser therapy where it is proved to be effective tool in repair of wound and energy density appear to be the only treatment parameter with predictable dose dependent treatment effects Lynda D Woodruff et al; 2004[15]. Similar study suggest that effects of early and long term low level laser therapy (LLLT) on Oxidative stress and inflammatory biomarkers after acute traumatic muscle injury where LLLT at 3 J/cm² dose given 2 h after the trauma prevent the trauma induced pro inflammatory state characterized by IL-6 and IL-10. Thus, LLLT helps in vascular remodeling and fiber- proliferation markers by irradiation, it induces bio stimulatory effects that accelerates resolve inflammatory response and Oxidant state elicited by the muscle trauma Paulo Cesar Lock Silveira; 2016 [16]. Another study shows that LLLT with Nano current Bio-Stimulation showed a significant improvement in pain, range of motion and function in patients with adhesive capsulitis after 3 weeks of treatment than exercise Alone Dipen Patelet al 2017[17]. Similarly another study by Hoon Chung, Tianhong Dia et .al[18] said that irradiation of laser on the human body produces Biomodulation in cells and low level laser acts on the mitochondria to increase ATP (Adenosine Tri Phosphate) production and LLLT may cause photodissociation of NO from cytochrome c oxidase (CCO), cellular respiration is downregulated by the production of NO by mitochondrial NO synthesis, LLLT promotes metabolism of oxygen LLLT also increase the reactive oxygen species (ROS), in turn ROS activate transcription factor which leads to the up gradation of the of various stimulation and protective genes. These genes are most likely to cellular proliferation, migration, and production of cyto-oxygenase and growth factor. LLLT produces vasodilation by triggering the relaxation of smooth muscles associated with endothelium which is highly relevant to the treatment of joint inflammation the vasodilation increases the availability of the oxygen to the treated cell and also allow for greater trafficking of the immune cells into the tissue. These two effects contribute to accelerate the healing NO is a potent vasodilator. LLLT may produce photodissociation of NO not only from CCO, but from intracellular stores such as nitrosylated form of both and myoglobin, leading to vasodilation. Another study by G.D Baxter et.al[19] 1994 said the laser therapy is help full in wound healing , reducing edema and swelling in various etiology however Baxter et.al (1991) demonstrated that low level laser with intensity 9.6 j/cm² with out put power 830 Nm for 30s, over palm at four equidistance points were treated with laser, at two point proximal and two point distal flexor Retinaculum at wrist and four point approximately at equal distance on the Fore arm reduces the pain, and there is rise of temperature by 0.5⁰ C after 2 minutes of irradiation of laser to the median nerve at the elbow and wrist joint , there is increase in median nerve latency. This clearly indicates that low-level laser therapy is helpful in increasing the conductivity of nerve when compared from the base line day pre treatment to post treatment of laser treatment. As in our study laser with exercise helps in improving the ROM flexion and abduction followed by decreases in pain severity and disability.

5. CONCLUSION

The current study conclude that G D Maitland and supervised exercises and laser therapy with exercise produces improvement in adhesive capsulitis with grade 1 and 2 but Maitland mobilization high and low grade with exercise produce much better effects in adhesive capsulitis. Maitland mobilization is effective mode of treatment for Adhesive capsulitis.

Ethical Clearance: The protocol is approved by the Ethical committee of the Monad University, Hapur, and U.P for Ph.D. Curriculum Course.

6. ACKNOWLEDGEMENT



The author acknowledges the vice chancellor of Monad University for the approval of study and Dr. Javed research head committee and Dr. Suhail Ahmed deputy registrar of the Monad university for their valuable

suggestion and guidance. The author also acknowledges the subjects for their kind support and cooperation for the research work.

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