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ORIGINAL ARTICLE

COMPARATIVE EFFECTS OF LASER THERAPY OVER MANUAL MOBILIZATION ALONG WITH CONVENTIONAL THERAPY ON FUNCTION IN FROZEN SHOULDER

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ABSTRACT

Background of the Study: Frozen Shoulder is also known as the Adhesive Capsulitis is a condition characterized by the stiffness and pain in the Shoulder joint. As a Physiotherapist we deal with these patients to improve their range of motion (Abduction and External Rotation) and reduce the stiffness and pain. Objective of the study is to find the comparative effects between the Laser Therapy and Manual Mobilization with Conventional Therapy on function in Frozen Shoulder. Methodology: This is an experimental study of comparative type. Total 30 subjects were selected for this study based on selection criteria. Each group was allocated with 15 samples, divided by random sampling method. Study was carried out at Physiotherapy department, A.C.S Medical College and Hospital, Chennai for duration of 4 weeks. Subjects with the age group between 40-60 years with stiffness and decreased ROM in the shoulder joint were selected for this study. Group A received laser and conventional therapy. Group B received manual mobilization and conventional therapy. VAS, SPADI and Goniometer were used as an outcome measurement tools. Study duration was 4 weeks and the intervention duration was 20 minutes per day for 3 days in a week. Result: Group A with laser therapy found more effective than Group B manual therapy with mean difference of 49.67 and 13.40 respectively on abduction ROM and shoulder function. Pain reduced more in Group B than Group A with mean difference of 3.533 and 3.200 respectively. Conclusion: The study concluded that Laser therapy and conventional therapy are effective in the improvement of pain and but manual therapy is more effective on improvement of shoulder range of motion.

Keywords: Frozen Shoulder; Adhesive Capsulitis; Laser Therapy; Manual Mobilization; Goniometer; VAS; SPADI.

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INTRODUCTION

The glenohumeral joint is the placed between the circular top of the humerus and the glenoid fossa of the scapula. Being a synovial joint, both articular surfaces are covered with hyaline ligament. The cross over humeral tendon expands on a level plane between the tubercles of the humerus. The coraco-humeral tendon stretches out between the coracoid process of the scapula to the tubercles of the humerus¹.

The superior, middle and inferior glenohumeral ligaments support the joint from the anteroinferior side. The superior glenohumeral ligament stretches out from the supra-glenoid tubercle of scapula to the proximal part of the lesser tubercle of humerus. The middle glenohumeral ligaments joins along the front glenoid edge of the scapula, only second rate compared to the unrivaled GH tendon. It reaches out to the lesser tubercle of humerus.

The glenohumeral joint is innervated by the subscapular nerve (C5-C6), a part of the back line of brachial plexus: suprascapular nerve supplies the back and prevalent perspectives, axillary nerve innervates the anteroinferior part of the case, horizontal pectoral nerve supplies the anterosuperior part and the rotator container Blood supply to the shoulder joint comes from the front and back circumflex humeral, circumflex scapular and suprascapular corridors: The glenohumeral joint has more Range of Movement (ROM) than some other body joint. Being a ball-and-attachment joint, it permits developments in three levels of opportunity Flexion (180°) - expansion (90°), Abduction (180°) - adduction (30°), Internal rotation (90°) -External rotation (90°)²⁻⁴.

Frozen shoulder (FS), otherwise called cement capsulitis, is an extremely normal excruciating shoulder problem. It has been accounted for that around 2% to 5% overall public experience this condition, and it is additionally one of the most serious difficult problems in the musculo skeletal framework. Patient who experience this condition frequently experience the ill effects of low quality of life due to the limitation of the both dynamic and uninvolved scope of their shoulder portability. Cement capsulitis is a typical, excruciating state of the shoulder that is related with loss of scope of movement in the glenohumeral joint. It results from compression of the glenohumeral joint container and adherence to the humeral head. Albeit cement capsulitis is in many cases self-restricted, it can endure for a really long time and might very well never completely resolve⁵⁻⁸.

Cement capsulitis is one of many circumstances that present with torment and moderate limit of dynamic and uninvolved shoulder movement. Both characteristic and extraneous pathology of the shoulder can cause solidness and torment, and treatment ought to address the particular anatomic reason. Patients who present with a difficult firm shoulder are regularly determined to have "frozen shoulder." Adhesive capsulitis is a particular pathologic element where ongoing irritation of the case subsynovial layer produces scapsular thickening, fibrosis, and adherence of the container to itself and to the anatomic neck of the humerus. The contracted, follower container causes torment, particularly when it is extended out of nowhere, and produces a mechanical restriction to movement. Frozen shoulder is a typical reason for shoulder pain and stiffness. It is typically self-limiting yet frequently has a delayed course of progress in few years⁹⁻¹².

Frozen shoulder frequently advances in three phases: the freezing (Pain), frozen (adhesive) and defrosting stage. In the freezing stage, which goes on around 2-9 months, there is a steady beginning of diffuse, extreme shoulder torment that commonly deteriorates at night.

The aggravation will start to die down during the frozen stage with a trademark moderate loss of glenohumeral flexion, abduction, internal rotation and external rotation. This stage can keep going for 4 a year. During the defrosting stage, the patient encounters a continuous return of scope of movement that requires around 5-26 months to finish. Capsulitis is in many cases self-restricting, ordinarily settling in 1-3 years, it can endure, introducing side effects that are usually gentle; pain is the most well-known complaint.

METHODOLOGY

The study design is an experimental study and the type of study is Comparative pre – post type. Study duration is 6 months by Laser with conventional therapy and manual mobilization with conventional therapy. Study setting was held in A.C.S Medical College and Hospital /OPD Physiotherapy. Study sample size consists of 30 subjects and divided 15 in Group A and Group B–15. Sampling method used in this study was purposive Random Sampling.

Inclusion criteria: 30 Subjects (Male and Female) between the age group of 40-60 years will be purposely selected in the A.C.S Medical College and Hospital.

Exclusion criteria: Trauma, Recent Surgery. Cardio Pulmonary disease

Measurement tools: Measurement tools used

in this study was VAS, Goniometer and SPADI.

Outcome measures: Pain, ROM (Abduction and external rotation), Function.

Materials used: Goniometer, VAS chart, SPADI scale, Swiss ball, Thera band

Procedure: Patients with Frozen Shoulder be checked to find out their range of motion in the Shoulder joint using Goniometer. Laser Therapy intensities are tabulated and conventional therapy is given. Mobilization along with Conventional Therapy is given. Range of Motion (Abduction and External Rotation) will be assessed using Goniometer. Both these data's are analysed.

Their demographic data such as name, age, gender, occupation were collected. The treatment will be explained clearly to the patient and will be assessed for any contraindication before starting. The treatment is given for 20 minutes for 3 days in a week. Both the Groups will be evaluated before and after 4 weeks of the treatment and assess the improvement of Range of motion through Goniometer, Pain through VAS and Function through SPADI.

Goniometer: Goniometer is an instrument that actions the accessible scope of movement at a joint. The term goniometry is gotten from two Greek words, gonia, signifying "angle" and metron, signifying "measurement". The joint angle and study of estimating the joint range in each plane of the joint are called goniometry. In the event that a patient or client is experiencing diminished scope of movement in a specific joint, the specialist can utilize a goniometer to survey what the scope of movement is at the underlying evaluation, and afterward ensure the mediation is working by involving the goniometer in resulting meetings.

Goniometer has various sorts; the most utilized is the general standard goniometer, which is either made with plastic or metal instrument. It comprises of a fixed arm, a portable arm, and a support. The scope of movement of each joint ought to be estimated in isolation to keep away from trick movement (concurrent development of another joint) and muscle deficiency which might modify the perusing. Both dynamic and uninvolved scope of movement ought to be estimated and recorded separately.

Laser treatment: Cold laser treatment, Also known as Low Level Laser Therapy (LLLT) low-power laser or delicate laser, is a painless treatment intended to help the body in its recuperating cycle. The cool laser treatment is an ideal answer for frozen shoulder as its essential objective is to decrease firmness and irritation in the joint.

The laser is applied straight forward to the Frozen shoulder and light is discharged by the device. For the most part there are 2 strategies utilized, frequencies between 600-700 nanometres (nm) for shallow tissue and trigger focuses and frequencies of 780-950 nm for more profound entrance.

Laser treatment fixes the tissue and gives help from pain and inflammation. It is a painless, non-harmful, no distress, no iscomfort and no secondary effects when performed appropriately by a professional. It very well may be utilized in mix with different treatments and treatment plans.



Fig.1 Laser therapy

Manual mobilization: Manual mobilization maintains the joint's full range of motion. Manual mobilization strengthens the muscles that support the joint. Strong muscles help the joint absorb shock.



Fig.2 Manual Mobilization

Posterior Glenohumeral mobilization:

Patient Position:

Supine: Specialist Position: Force Hand on Proximal Humerus Mobilization: A posteriorly guided force is guided opposite to the humerus.

Scapulothoracic Mobiliztion: Scapulothoracic mobilization is performed when there is dysfunction of the scapulothoracic explanation (for example limitation of upturn or parallel float). Activations that are normally utilized incorporate average/horizontal skims, prevalent/sub-par coasts, up and descending turn, and askew examples.

Patient postition-normally, the patient is lying side-lying with the elaborate side up and the arm laying on the advisor's arm. The advisor remains before the patient, confronting them. Hand contacts for these floats are the substandard point of the scapula and the acromion. Heading and extent of power are reliant upon the strategy being used and how much movement that is wanted.

Coventional Therapy

Traditional treatment is the activities further develop the patients Range of Motion. There are various kinds of ordinary treatment, In this study Finger walk, outward stretch, pendulum developments and armpit stretch is given.

Finger walk: Face a wall 3/4 of a manageable distance away. Make a real connection with the wall at midriff level with the fingertips of the impacted arm. With your elbow somewhat bowed, gradually walk your finger up the wall, insect like, until you've raised your arm to the furthest extent that you easily can. Your fingers ought to accomplish the work, not your shoulder muscles. Gradually lower the arm (with the assistance of the great arm, if fundamental) and rehash. Play out this exercise 10 to 20 times each day.

Outward Rotation: Hold an elastic activity band between your hands with your elbows at a 90degree point near your sides. Turn the lower part of the impacted arm outward a few inches and hold for five seconds. Rehash 10 to multiple times, one time each day.

Armpit stretch: Utilizing your great arm, lift the impacted arm onto a rack about bosom high. Delicately twist your knees, opening up the armpit. Develop your knee twist somewhat, delicately extending the armpit, and afterward fix. With every knee twist, stretch somewhat further, however doesn't drive it. Do this 10 to multiple times every day.

Pendulum Movements: Do this exercise first. Loosen up your shoulders. Stand and hang over somewhat, permitting the impacted arm to hang down. Swing the arm in a little circleabout a foot in measurement. Perform 10 transformations toward every path, one time per day. As your side effects improve, increment the measurement of your swing, however never compel it. At the point when you're prepared for more, increment the stretch by holding a light weight (three to five pounds) in the swinging arm.



Fig.3. Conventional therapy (Pendulum movements)



Fig 4.Conventional therapy (Pendulum movements)

After the completion of 6 months post data both the groups were collected. These post data were compared with their respective pre test data. From the pre test data it was found A subjects that group show better improvement in pain and range of motion. Later the mean value of both the groups post tests were compared in order to find whether the group had gained the effect from the exercises or not. From the results got, it was found that Group A had shown a significant improvement than Group B.

SPADI scale: The Shoulder Pain and Disability Index (SPADI) is a self-controlled poll that comprises of two aspects, one for torment and the other for practical exercises. The aggravation aspect comprises of five inquiries with respect to the seriousness of a singular's aggravation. Practical exercises are evaluated with eight inquiries intended to gauge the level of trouble an individual has with different exercises of everyday living that require furthest point use. The SPADI requires 5 to 10 minutes for a patient to finish and is the main solid and substantial district explicit measure for the shoulder.

Visual Analog Scale (VAS): A Visual Analog Scale (VAS) is an estimation instrument that attempts to gauge a trademark or disposition that is accepted to go across a continuum of values and can only with significant effort be straight forwardly estimated. It is much of the time utilized in epidemiologic and clinical examination to gauge the force or recurrence of different side effects. For instance, how much agony that a patient feels goes across a continuum from none to an outrageous measure of agony? According to the patient's point of view, this range seems consistent ± their aggravation doesn't take discrete leaps, as a classification of none, gentle, moderate and extreme would recommend. It was to catch this thought of a fundamental continuum that the VAS was formulated.

Subject recruitment: This study was done at A.C.S Medical College and Hospital, Chennai. The patients of age group between 40 - 60 years were recruited. And subjects were excluded according to the exclusion criteria.

Baseline data:Assessment sheet which includes name, age, gender, occupation, along with subject's medical history were collected. The patients were then allocated into two Groups (Group A and Group B). Group A will be given Laser therapy with conventional therapy. Group B will be given Manual mobilization with conventional therapy.

Intervention: A written informed consent was taken from all the subjects. History regarding the general health status was taken. Height and Weight were measured. Patients were selected based on the inclusion and exclusion criteria. A

clear explanation about the treatment is given to the patients.

Data Analysis: The collected data were tabulated and analyzed using both descriptive and inferential statistics. All the parameters

were assessed using Prism Pad software version 8. Paired t-test was adopted to find the statistical difference within the groups & Independent t-test (Student t-Test) was adopted to find statistical difference between the groups.

Table 1: Paired t Test for Shoulder abduction, VAS, and SPADI within the Group A

The above table 1 shows significant difference in abduction VAS, and SPADI within the Group A P<0.0001

Group A: Effects of laser therapy along with conventional therapy on function in frozen shoulder

Group A	Number of Pairs	Mean Difference	SD SEM	95% Cl	df	t	P value	Sig. different (P < 0.05)
Shoulder Abduction	15	49.67	6.673 1.723	45.97 to 53.36	14	28.83	<0.0001	****
VAS	15	3.200	0.676 0.174	3.574 to 2.826	14	18.33	<0.0001	***
SPADI	15	13.40	6.334 1.635	16.91 to 9.893	14	8.194	<0.0001	****



Paired T test Within Group A

Graph 1 Graphical representation of difference in abduction VAS, and SPADI within the Group A

Group B	Number of Pairs	Mean Difference	SD SEM	95% Cl	Df	t	P value	Sig. different (P < 0.05)
Shoulder Abduction	15	48.00	8.409 2.171	43.34 to 52.66	14	22.11	<0.0001	***
VAS	15	3.533	0.639 0.165	3.888 to 3.179	14	21.38	<0.0001	***
SPADI	15	13.07	3.575 0.923	15.05 to 11.09	14	14.16	<0.0001	****

Table 2: Paired t Test for Shoulder abduction, VAS, and SPADI within the Group B

Group B: Effects of manual mobilization along with conventional therapy on function in frozen shoulder



Paired t test data

Paired T test Within Group B

Graph 2 : Graphical representation of pre-post test abduction VAS, and SPADI within the Group B

Variables	Test	Group A Mean	Group B Mean	Df	t Value	P value	Sig. different (P < 0.05)
Shoulder Abduction	Pre Test	107.0	108.7	28	0.404	0.6888	No
	Post Test	156.7	156.7	28	0.000	0.9999	No
VAS	Pre Test	7.200	7.400	28	0.483	0.6328	No
	Post Test	4.000	3.867	28	0.487	0.6300	No
SPADI	Pre Test	70.07	67.07	28	1.092	0.2840	No
	Post Test	56.67	54.00	28	0.848	0.4035	No

Comparative study between Group A and Group B on Shoulder Abduction, VAS and SPADI

Table 3: comparative unpaired t Test for shoulder abduction, VAS, and SPADI between the Group A andB

The above table 3 shows NO significant difference in shoulder abduction, VAS, and SPADI between the Groups A and B.



UNPAIRED T' TEST

Comparative test between Group A and B

Graph-3: Graphical representation of shoulder abduction, VAS, and SPADI between the Group A and B.

RESULTS

Total 30 participants of patients with frozen shoulder were included in the study base on specific selection criteria.

In Group A abduction ROM, shoulder pain and shoulder function has increased with mean difference of 49.67, 3.200, 13.40, by laser therapy along with conventional therapy with P value >0.0001, among patients with frozen shoulder.

In Group B abduction ROM, shoulder pain and shoulder function has increased with mean difference of 48.00, 3.533, 13.07, respectively by laser therapy along with conventional therapy with P value >0.0001, among patients with frozen shoulder.

Comparative study between Group A and Group B showed No significant difference in effectiveness on abduction ROM, shoulder pain, shoulder function with P value 0.999, 0.630, 0.404 respectively among the patients with migraine.

Group A with laser therapy found more effective than Group B manual therapy with mean difference of 49.67 and 13.40 respectively on abduction ROM and shoulder function. Pain reduced more in Group B than Group A with mean difference of 3.533 and 3.200 respectively.

DISCUSSION

The table 1 reveals the Mean, Standard Deviation (S.D), t-test, degree of freedom (df) and p-value between (Group A) & (Group B) in pretest and posttest weeks. This table shows that there is no significant difference in pre test values between Group A & Group B (*P>0.05). This table shows that statistically highly significant difference in post test values between Group A & Group B (***-P≤0.001).

The table 2 reveals the Mean, Standard Deviation (S.D), t-test, degree of freedom (df) and p-value between (Group A) & (Group B) in pretest and posttest weeks. Table shows that there is no significant difference in pre test values between Group A & Group B (*P>0.05). This table shows that statistically significant difference in posttest values between Group A & Group B (***-P≤0.001).

This study examined the VAS, Goniometer and SPADI in detecting pain, ROM and function changes following Laser therapy and manual mobilization along with conventional therapy. Following a 6 months of Laser therapy that focused on Range of motion, Pain and function showed significant improvement in VAS, Goniometer and SPADI.

On comparing the mean values of Group A & Group B on Visual Analog Scale Score, Goniometer and SPADI, it shows a significant decrease in the post test mean values but (Group A– Laser and conventional therapy) which has the lower mean value is more effective than (Group B – Manual mobilization with conventional therapy) at $P \le 0.001$. Hence the Null Hypothesis is rejected.

The improvements in ROM and function seen in the patients can be attributed to the effect of the Laser therapy prescribed in this study. The prescribed six months of laser therapy might have enhanced patient's strength and ROM. In this study, strengthening shoulder and elbow muscles was part of the treatment protocol.

Two low level lasers in order to generate interference inside the irradiated tissue

showed to be a safe therapy. Both interferential and conventional laser therapy reduced shoulder pain and disability LLLT is a viable option in the conservative treatment of shoulder pain arising from adhesive capsulitis of the shoulder in the elderly, with a positive clinical result of more than 90% and with clinical efficacy both in the short-term and the medium-term. Benefit of low-laser therapy in frozen shoulder, the benefit of low-laser therapy as an adjunct treatment to exercise in the management of frozen shoulder is very effective. In management of frozen shoulder, laser therapy provided significant pain relief at 3 and 8 weeks. Laser therapy is a noninvasive adjuvant treatment that can reduce pain in frozen shoulders¹²⁻¹⁵.

In the recent years, frozen shoulder is estimated to be 2 to 5 percent of the general population. Frozen shoulder was found to affect 8.2 percent of men and 10.1 percent of women of working age. Main intend of the study is to evaluate the laser therapy that was designed to specifically target and improve blood circulation, reduce swelling and stiffness of the joint. This study examined the VAS, SPADI and Goniometer in detecting pain, function and ROM changes following a Laser mobilization therapy and manual with conventional therapy ¹⁶⁻¹⁸.

Following an 8 weeks of Laser therapy that focused on ROM, Pain and stiffness showed significant improvement in VAS, SPADI and Goniometer. The improvements in ROM seen in the group A patients can be attributed to the effect of the laser with conventional therapy prescribed in this study. The prescribed six sessions weekly dosage of exercise might have enhanced subject's pain, ROM and function .In this study, reducing pain and improving patient's ROM was part of the treatment protocol. Improving abduction and external rotation ROM is essential for shoulder function and it is evident when practicing on SPADI. In this study, the laser and conventional therapy shows more difference while comparing with manual mobilization and conventional therapy.

The calculated data were tabulated and analyzed. The mean value of group A, pretest and post test mean have ρ value<0.001. Thus both the mean are significantly differently and the null hypothesis is rejected. The mean value of group B, pretest and post test mean have ρ value<0.001. Thus both the mean are significantly differently and the null hypothesis is rejected.

Outcome measures were collected from both prior to the training (pretest score) and after the 6 weeks of training (post test score). From the post test data, it was found that there was an improvement in Group A as there is an increase in ROM. Following the six weeks of the laser and conventional therapy significantly improved in this study sample. This study illustrates how relatively Frozen shoulder patients can benefit by performing the laser and conventional therapy which shows improvement in ROM (abduction and external rotation).

Strengthening shoulder musculature is essential to upper extremity function. In this study, the laser therapy is more effective and patients were able to perform shoulder abduction and external rotation at an average ROM.

Following the six months of laser therapy significantly improved in this study sample. This study illustrates how relatively frozen shoulder patients can benefit from performing Laser therapy that challenges muscle strength and ROM in shoulder joint.

Ethical clearance: There was no risk of conducting this study. Ethical clearance was obtained from the ethical Institutional Review Board of Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Chennai with reference No. A34/PHYSIO/IRB/2020-2021 approval letter dated 09/03/2021.

Conflicts of Interest: There is no conflict of interest to conduct this study.

Fund for the study: This is self-funded study.

CONCLUSION

The result of this study reveals that there is a significant difference in the post and pre values on VAS, Goniometer and SPADI in both the groups. The study concluded that the Laser therapy with conventional therapy were more effective in the improvement of Frozen shoulder.

In Group A abduction ROM, shoulder pain and shoulder function has increased with mean difference of 49.67, 3.200, 13.40, by laser therapy along with conventional therapy with P value >0.0001, among patients with frozen shoulder.

In Group B abduction ROM, shoulder pain and shoulder function has increased with mean difference of 48.00, 3.533, 13.07, respectively by laser therapy along with conventional therapy with P value >0.0001, among patients with frozen shoulder.

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