

Therapeutic Effects of Moist Hot Packs with Laser and Ultrasound in Rotator Cuff Injury

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Abstract— Background- Shoulder pain is the third most common pain after back & knee pain, about 1% of the population report to the physician regarding the pain and disability of shoulder due to Rotator cuff injury, Rotator cuff injury limits the functional activity of the shoulder joint .Activity of daily living is compromised (ADL), cause pain and disability of the shoulder joint.

Purpose- To know the therapeutic effects of moist hot packs with Laser therapy and Ultrasound therapy in Rotator cuff injury grade 1 & 2 of the shoulder joint.

Methodology- 30 male subjects randomly selected for the study with 15 subjects in each group i.e. ultrasound therapy group A and Laser therapy group B. whereas both the treated for 5 day a week for 4 weeks. The data of the subjects were taken on the base line day, 21 days and on the 30 days.

Result- The result shows that the significant improvement of VAS (pain) ,ROM Flexion ,Abduction, Internal & External Rotation SPADI Pain & SPADI Disability improves in Laser therapy group than the Ultrasound therapy group , the P value of the laser therapy group is $P > 0.001^*$.

Conclusion- The study concludes that the therapeutic effects of moist hot pack with Laser therapy and Ultrasound produce better effects. But Laser therapy with moist hot packs produce much better effects in Rotator cuff injury with grade 1 & 2 than the Ultrasound therapy.

Index Terms— Ultrasound, Laser, moist hot packs, Goniometer, ROM, SPADI Pain, SPADI Disability.

I. INTRODUCTION

Shoulder pain is the third most common site of pain after back and knee joint pain. There is compromised shoulder movement due to pain, weakness stiffness causes disability and affects activity of daily living (ADL), self-reported prevalence of shoulder pain is about 16 % to 26 %,generally 1 % of population consult to the physician for regarding pain Rotator cuff injury is one of the most common cause of the shoulder pain, Rotator cuff injury is usually have a history of trauma most of time , sometimes it is very difficult to diagnose or differentiate between rotator cuff tear and Rotator tendinopathy weakness and compromised movement is seen in case of injury to rotator cuff muscles¹,lots of studies suggested that there is no substantial correlation exist between symptom or loss of function and partial or full tear of the rotator cuff or supraspinatus muscles tear ,the tear rotator cuff leads to very difficult to even rotate 20⁰and this finding

are seen in the Radio-diagnosis i.e. imagine MRI². Rotator cuff tear is the most common cause of injury of the shoulder joint³.Rotator cuff is group of four muscles Supraspinatus, Infraspinatus, Subscapularis and Teres minor. Rotator cuff muscles is stabilizer of the shoulder joint .Rotator cuff injury is very common injury of upper extremities it is very common among the young adult and older age person. The average thickness of the rotator cuff tendon is 10 to 12 mm³. Partial-thickness tears occur within the tendon and do not communicate with the sub acromial bursa (SB) or the glenohumeral joint (GHJ). The tear are of 3 subtypes: 1) a bursal side tear (BT) which is confined to the bursal surface of the tendon; 2) an intratendinous tear (IT) which is found within the tendon; and 3) a joint-side tear (JT) which is present on the side of the tendon adjacent to the joint⁴ . Those who are involved in sports activity are more prone to get injured during sports activity⁵. Rotator cuff injured person will complaining of pain, tenderness, unable to lift his/her hand and unable to perform normal activity from particular affected injured shoulder. Older age person above 50 years are also more prone to develop rotator cuff injury^{6,7} Young age person with sports activity are also prone to develop Rotator cuff injury⁵, it occurs during the sports activity in which there is involvement of upper extremities there will be pain, weakness⁸, tenderness, restriction of shoulder movement which affects quality of life, it is also very common in old age. Some times its non-traumatic may be due to weakness of muscles and internal bony changes (OA) and sometimes its traumatic factors, this factors are genetic predisposition, extrinsic impingement and Biomechanical imbalance from the structure the rotator cuff and intrinsic degeneration within the muscles and tendon itself and finally co-morbidities. Rotator cuff injury may be due to over repeated activity of the shoulder movements in which the tendon gets injured by avulsion, tear. Geriatric personalities are commonly affected, above age of 50 are more affected. Women's are more prone to develop rotator cuff injury than male in general but it can happen to both gender i.e. male and female. Rotator cuff injury leads pain, swelling, tenderness, spasm in the shoulder joint, weakness of the muscles, ligament and tendon of the rotator cuff leads to disability in upper arm. The performance of the upper extremities is hampered, the range of motion (ROM) of the shoulder i.e. movement flexion, abduction, internal rotation, external rotation of the shoulder is compromised. Rotator cuff is made up of four group of muscles of shoulder joint i.e. supraspinatus, infraspinatus, subscapularis and teres minor,

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these four group of muscles combine to form rotator cuff .Rotator cuff is dynamic stabilizer of gleno-humeral joint. Stability of shoulder joint depends upon the efficient optimal action extrinsic and intrinsic muscle⁹. Rupture of rotator cuff was 1st described by J.G Smith in the London medical Gazeet.E.ACodman¹⁰ [1934] 1st describe the classification of rotator cuff tear pathology in the year 1934.C.S Neer¹¹ 1983 has categorized the Rotator cuff in three stages. Describe the types of tear Edema and hemorrhage as grade 1 may be due to overuse and overhead activity in sports. This is observed in younger age group of below 25 years. Grade 2 Stages found in age above 25 years to 40 years due to overhead activity, due to repeated over head activity and there is mechanical inflammation the bursa becomes thickened and Fibrotic ,this occurs in throwing is found in above 40 years of age

II. METHODOLOGY

A Study Design

The study design is randomized-controlled trial with three months prospective follow up. The subjects will be randomized equally in two groups by lottery method. For this, 30 folded papers of same shape and size will be marked either A for Ultrasound group or B for LASER Group were kept in a box and mixed thoroughly before and after withdrawing a paper from the box. Marking on the paper drawn by the subjects allocate their mode of treatment. The demographic characteristics Age, Weight, sex, Height and Body mass index (BMI) of the two groups is assessed at baseline. Outcome variables such as pain, SPADI disability index, ROM flexion, abduction. Internal rotation and external rotation. The data is observed on the base line date i.e. 0 day, after 3weeks on 21th day, after 4th weeks on 30th day.

Total 30 Subjects with Rotator cuff injury were taken for the study ,it was refered from the orthopaedician from (OPD) out patient department of Goodwill Hospital and research centre noida u.p.india , The study was approved by the Monad University Hapur U.P, India For the P.hD curriculumcourse.Before participation the propective individual were explaine about the nature of the study.subjects were also explained that upon participation in the study can be allocated to any treatment group as per the randomized allocation.volunters will complay with the protocol of the study nature ,were evaluted according to the inclusionand exclusion criteria of the study for checking their suitability for this study.only male subjects were taken for the trial ,subjects were divided into two group ie group A and Group B

B.Inclusion Criteria

Subjects diagnosed with Rotator cuff injury grade 1 & 2 . Only male subjects with 20 to 55 age group, with painfull shoulder with atleast 3 wks to 1 one month, with limited range of motion abduction, flexion,internal rotation and

external rotation, with unilateral or bilateral shoulder joint diagnosed by clinician and Radiological examination

C.Exclusion Criteria

Subjects with non diabetics –Type 1 Diabetics mellitus .Subjects with recent injury to neck and Head,recent surgery to shoulder.Subjects to paresthesia and loss of sensation, calcification of of tendon of the shoulder joint, CVA,Brachial plexius injury,parkinson syndrome,cervical spine injury, rotator injury secondary to para thyroidism.

D. Procedure

The design of the study is randomized – controlled trial with three months prospective follow up.The subjects were randomly allocated equally in to any one of the two intervention groups by lottery method. For this, 30 folded papers chits of same shape, color and size were marked either with symbol “A” for the Ultrasound group or symbol “B” for LASER Group were kept in a box and mixed thoroughly before and after withdrawing a paper chit from the box. Each participant of the study was asked to withdraw any one slip of own choice from the box. After the slip was withdrawn, the symbol marked on this slip indicated which treatment group he/she has to be allotted. After receiving the written consent form from the participants, the demographic variables including age, weight, gender, sex, height and Body mass index (BMI) of the two groups were recorded at baseline. Baseline scores of the dependent variables of the study were recorded including VAS, SPADI pain , SPADI disability and shoulder ROM (range of motion) for flexion, abduction, internal and external rotation. All variables were recorded by same blinded tester at baseline (0 day), after 21 days, and after 30 days of interventions. All interventions were done by same physiotherapist supervising the test and intervention procedures. Test and retest of the two groups was conducted in the same place and environment and at same time of the day. After group allocations, respective subjects for either group were given interventions as per the protocol of their concerned group. Treatment interventions were done by same physiotherapist for the 5 days in week for 4weeks (hence total 20 sessions). The duration of each individual treatment session was about 45 to 50 minutes per session. Subjects we required not to take any other treatment or change their exercise schedule. They were requested to report any discomfort or issues if experienced by them during the study tenure.

E. Variables

Dependent Variables of the study were: VAS, SPADI pain, SPADI disability and range of motion (flexion, abduction, internal rotation and external rotation) scores. The independent variables of the study included ultrasound treatment and LASER treatment. Shoulder ROM: - range of motion for the shoulder joint was measured using full circle goniometer adopting the standard methodology as described in many previous published literatures.

F. LASER treatment group;

Following are the parameters of the LASER therapy used in the LASER intervention group: (Lasermid 2200 Italy made) Infra-red diode LASER; wavelength 905nm; maximum power 25 watt; peak power value 25 watt; pulse frequency 5000Hz; total energy density 1.5Joule/cm²; scanning method; treatment duration 10 minutes per session. Patient was positioned in the supine lying posture on high couch; with body parts well supported in the position of maximum comfort. The affected shoulder was exposed and marks were made on skin on the anterior aspect of the greater tubercle of humerus bone shoulder at the maximum tender point. Therapist stood on the affected side of affected shoulder. The remaining part of the patient's body was covered except the part to be treated. For the LASER treatment both therapist as well as patient wore the protective goggles. Therapist manually scanned the treatment probe over the targeted area in rhythmic manner to cause uniform exposure of the LASER beam to the target area of shoulder.

G. ULTRASOUND treatment group

Chatonoga Intellect U.S.A Made is used for ultrasound treatment the coupling medium was applied over the target marked area and then ultrasound transducer head was moved in uniform circular motion to cover the entire area and to make the uniform exposure over the region. The purpose of the coupling medium is to exclude air from the region between the patient and the transducer so that ultrasound can get to the area to be treated. Group A patients administered with ultrasound dose with Frequency 1 MHz \pm 5%; duty cycle 10%,20%,50% continuous; ultrasound head size 5cm; peak power 20 Watts at 1MHz; intensity amplitude used 0 to 2.5W/cm² in continuous mode and 0.3 W/cm² in continuous mode; treatment time 8 Minutes per session for 5 day week for 4 weeks total 20 session.

I. Intervention of subjects with ultrasound therapy group A

Subjects were lying on the couch on supine position with shoulder in proper comfortable position supported by pillow under the neck and side of the hand. Irradiation of **Ultrasonic** therapy (Chattanooga intellect U.S.A) with 1MHz Continuous over supraspinatus muscles and tendon anteriorly and posteriorly over tender spot for 7 to 8 minutes in continuous modes, The ultrasound head is moved in circumductory way over the skin of shoulder supraspinatus muscles. Application of Gel is used to avoid and air between the skin and ultrasound head, which created cavitation in bone if gel is not used followed by **hot** moist packs for 10 to 15 minutes. The shoulder joint is wrapped by towel to avoid the loss of heat, which increase and improves the blood supply to the shoulder joint, and helps in decreasing the soreness of the muscles and helps in repairing the tear by increasing the level of calcium, lipid, and removing the P substance which is causing the pain¹² followed by gentle active exercise shoulder, 10-15 repetition of T pulley exercise, 10 repetition of shoulder wheel exercise, 10-15 Repetition of Dumble exercise with 2.5 pound of weight in standing position in

abduction and flexion direction and in against the gravitational force to increase the strength of the Rotator cuff muscles which is lost after injury, followed by finger ladder which is fixed in wall horizontally again to improve the function and the range of the motion (ROM) of the rotator cuff muscles of the shoulder joint. Initially light gentle resistant exercised is performed in which the therapist used to hold the hand of the subject in full abduction position and in comfortable position lying on the bed on supine position with pain free range, the therapist will gently slightly apply resistance and the subject will be asked to draw the shoulder in adduction position this resistant force will produce resultant resistant to the muscles and will increase the strength of the rotator cuff muscle, this exercise will improve the ROM of the shoulder joint, will improve the **ADL** (activity of daily living). All this intervention will be applied by the researcher to subject. During this period of treatment no any other treatment will be given to the subjects

J. Intervention Subjects with laser group B

Subjects were lying on the couch in the supine position with pillow under the neck and shoulder in adduction position with the arm kept in the side by the body with comfortable position. Irradiation of **laser** over 4 points with 2 minute over each point on the tender point of the shoulder joint. Total irradiation time is 8 minutes over the shoulder spot followed by **Hot** moist packs over the shoulder for 10 to 15 minutes & is wrapped by towel to avoid moist heat. This moist heat increases and improves the blood supply and decrease the soreness and pain and tenderness over the injured rotator cuff muscles. Same protocol of exercise is used which is used in U.S therapy group.

K Ethical clearance

The methodology of the study was approved by the research committee of the monard university HAPUR U.P. INDIA. The purpose of the study was to know the therapeutic effects of Ultrasound therapy and Laser therapy in the Rotator cuff injury grade 1 & 2. The confidentiality of the subject identity is protected related to data.

III. DATA ANALYSIS

The study design of this research is randomized –controlled trial with post intervention of the follow up up to three months. The subjects of the study was equally & randomly divided into two group namely "Ultrasound Therapy Group A" and "Laser Therapy Group as B". Using paper chit method. Each of the both group consists of 15 subjects in each group. total 30 subjects. The demographic characteristic, AGE, WEIGHT, HEIGHT, BMI, and Onset of symptom of the disease. Both group were assessed at the base line day for comparing the base line homogeneity comparison using independent T-Test. Outcome of variables of the study such as VAS (Pain), ROM (Flexion, Abduction, Int. Rotation, Ext. Rotation) and SPADI Pain

,SPADI Disability score at the base day 0 day, 21st day and on 90th day were recorded.

A Priori alpha level of alpha significance is chosen as 0.05 is used to for all analyses. Data obtained was summerised using descriptive statistics of mean and standard deviation .All the statistical analysis was performed using SPSS 14. for descriptive statistics.

Scores of the dependent variables VAS ,(Pain),ROM of shoulder joint for Flexion ,Abduction,Int.Rotation,

Ext.Rotation, SPADI Pain,SPADI Disability were compared for the three instant in each group at base line (0 day) ,21 days and 30 days using repeated measures ANOVA and the comparison is evaluted. These comparison were performed to evaluate the differences in the performance of the variables for between the group and as well as within the group comparisons.

IV. RESULT

Table 1. Base line comparisson of the demographic variables of the subjects who participated in the study.

Table 1

Demographic Variables	Ultrasound group A (N= 15)	LASER Group B (N= 15)	Mean difference	Level of significance (P value)
AGE (years)	41.40± 8.61	39.66 ± 6.94	-1.734	.274
Weight (kg)	64.26 ± 2.76	62..60 ± 1..91	-1.66	.653
Height (cm)	165.40 ± 2.41	165.06 ± 1.70	-0.34	.332
BMI	23.48 ± .825	22.98 ± .60	-0.5	.050
On set of symptom (weeks)	3.26 ± .45	3.40 ± .50	0.14	.228

Table 1 shows that shows that there was no significant difference between the baseline scores of demographic data.

Table 2 Base line (0 day) comparisons of the subjects participated in the study variables VAS, ROM (Flexion, Abduction, Internal Rotation, External Rotation SPADI Pain, and SPADI Disability)

Table 2

Variables	Ultrasound Therapy group A N=15	Laser Therapy Group B N=15	Mean difference	Level of significance P value
VAS 0 day	7.60±.50	7.40±.73	-0.2	0.176
ROM Flexion 0 day	52.40± 7.82	56.20 ± 6.17	3.8	0.075
ROM Abduction 0 day	51.66 ± 8.56	54.26 ± 5.00	2.6	0.159
ROM Int.Rotation 0 day	28.40 ± 2.32	29.33 ± 2.12	0.93	0.130
ROM External rotation 0 day	29.20 ± 2.26	30.06 ± 2.01	0.86	0.159
SPADI Pain 0 DAY	37.20 ± 1.22	37.20 ± 1.74	0	0.169
SPADI Disability 0 day	59.00 ± 3.07	57.26 ± 3.19	-1.74	0.070

Base line data in table 2 shows that both the groups were homogenous at baseline and there was very little possibility that the any improvement/deterioration in the scores with time could be due to group characteristics.

TABLE 3 ANOVA Comparison among the variables score with time of ultrasound group A and Laser therapy group B ,of various parameters such as VAS, ROM (Flexion, Abduction ,Internal Rotation, External .Rotation), SPADI Pain , SPADI Disability ,0 day to 21 day,21 ay to 30 day .and 0 day to 30 day

Table 3 ANOVA Comparison within the group of ultrasound therapy and Laser therapy group.

		0 day	21 day	30 day	Level of Difference P Value
Pain severity (VAS)	Ultrasound group	7.6 ± 0.50	6 ± 0.65	4.4 ± 0.73	0.001*
	Laser group	7.4 ± 0.73	4.93 ± 0.70	3.06 ± 0.70	0.001*
ROM Shoulder Flexion	Ultrasound group	52.4 ± 7.82	68.26 ± 8.06	83.8 ± 6.04	0.001*
	Laser group	56.2 ± 6.17	75.13 ± 5.34	93.26 ± 3.30	0.001*
ROM Shoulder Abduction	Ultrasound group	51.66 ± 8.56	69.2 ± 6.30	84.6 ± 3.94	0.001*
	Laser Group	54.26 ± 5.00	74.66 ± 4.63	94.33 ± 3.15	0.001*
ROM INTERNAL ROTATION	Ultrasound group	28.4 ± 2.32	37.66 ± 1.29	49.46 ± 1.92	0.001*
	Laser Group	29.33 ± 2.12	39.4 ± 1.59	55.46 ± 4.67	0.001*
ROM EXTERNAL ROTATION	Ultrasound group	29.2 ± 2.62	38.53 ± 1.76	51.4 ± 2.69	0.001*
	Laser Group	30.06 ± 2.01	49.46 ± 2.87	61.8 ± 2.80	0.001*
SPADI PAIN	Ultrasound Group	37.73 ± 1.22	28.66 ± 1.29	18.8 ± 1.65	0.001*
	Laser Group	37.2 ± 1.74	26.33 ± 2.22	14 ± 2.23	0.001*
SPADI DISABILITY	Ultrasound Group	59 ± 3.07	44.33 ± 2.41	28.33 ± 1.54	0.001
	Laser Group	57.26 ± 3.19	38.53 ± 5.19	19.73 ± 3.89	0.001*

Table 4 shows that the variable score of the Laser group shows more improvement significantly than ultrasound Therapy group, while making the days wise comparison it was found that in 0 day to 21 day comparison of the variable of both group have significantly improvement .But Laser group improved significantly more than the ultrasound group,

For 21 day to 30 day comparison, there was not much improvement as compared to 0 day to 30 day in ROM Flexion,Abduction, InternalRotation, External Rotation and the SPADI Pain and SPADI Disability score.

While exploring the 0 day to 30 day comparison, it is observed that all the variable improved significantly in the Ultrasound therapy group as well as in the Laser Therapy group. The improvement observed was much higher in the

Laser Therapy group as compared to the improvement in the Ultrasound Therapy group .VAS 0.95 times higher in Laser therapy group than ultrasound therapy group , ROM Flexion 1.18 times higher in Laser therapy group than the Ultrasound therapy group ,ROM Abduction 1.22 higher in Laser therapy group than ultrasound therapy group ,ROM Internal Rotation 1.24 times higher in Laser therapy group than ultrasound therapy group ,ROM Ext. Rotation 1.42 times higher in Laser therapy group than ultrasound therapy group, SPADI Pain score 1.23 times is less in the Laser therapy group than Ultrasound therapy group ,SPADI Disability score decreases by 1.22 times in disability score in Laser therapy group when compared with the Ultrasound therapy group .

Group mean differences mean differences of variables of both the group of U.S Therapy and laser therapy Table 4.

Table 4 ANOVA Mean difference value of different variables VAS, ROM Flex, Ext, SPADI Pain & SPADI Disability respectively of on different stages of treatment comparing from 0 day to 21 day, 21 days to 30 days and from 0 day to 30 days of Ultrasound therapy group A and Laser Therapy group B respectively.

Table 4 ANOVA Mean difference variable of Ultrasound and Laser therapy with 0 day to 21 days, 21days to 30days and 0 day to 30 days

		U.S Group A	P value	Laser Group B	P Value
Vas (pain severity)	0 day to 21 day	1.6	0.001*	2.67	0.001*
	21 day to 30 day	1.6	0.001*	1.86	0.001*
	0 day to 30 day	3.2	0.001*	3.06	0.001*
ROM Flex	0 day to 21day	15.86	0.001*	18.93	0.001*
	21 day to 30 day	15.54	0.001*	18.13	0.001*
	0 day to 30 day	31.4	0.001*	37.06	0.001*
ROM .Abd	0 day to 21 day	17.59	0.001*	20.04	0.001*
	21 day to 30 day	15.4	0.001*	19.67	0.001*
	0 day to 30 day	32.6	0.001*	40.07	0.001*
ROM Int.rotn	0 day to 21 day	9.26	0.001*	10.07	0.001*
	21 day to 30 day	11.8	0.001*	16.06	0.001* ¹²
	0 day to 30 day	21.06	0.001*	26.13	0.001*
ROM Ext.rotn	0 day to 21 day	9,33	0.001*	19.4	0.001*
	21 day to 30 day	12.78	0.001*	12.34	0.001*
	0 day to 30 day	22.2	0.001	31.74	0.001*
SPADI	0day to21day	9.07	0.001*	10.87	0.001*

Pain					
	21day to 30 day	9.86	0.001*	12.33	0.001*
	0 day to 30day	18.8	0.001*	18	0.001*
	21 day to30day 30 day	15	0.001*	18.8	0.001*
	0 day to 30 day	30.67	0.001*	37.53	0.001*

V. DISCUSSION

The purpose of study was to know the effectiveness of the moist Hot packs, Ultrasound and Laser in rotator cuff injury and which one is better in treatment of rotator cuff injury Grade1& 2 with severity of pain and loss of functional activity i.e. flexion, abduction, Internal Rotation and External Rotation. It was found that ultrasound is also effective tool to treat the Rotator cuff injury patients but laser is more effective and produce better effect in rotator cuff injury grade 1&2. A study by Gregory Garra¹³ et,al 2010stated that hot packs are easily available and inexpensive may alleviate the pain of muscle strain through a number of physiologic mechanisms, that hot packs helps in decreasing pain and tenderness in adding to the management of pain improves the muscles activity

Similar another study by Nicholas A. Cosgray¹⁴ et.al 2004 using pneumotherm and moist hot packs over tight Hamstring it helps in reducing tightness of hamstring and increases flexibility of the hamstring muscles and decreases soreness of the hamstring muscles when compared with pre and post treatment . Both the group has significant result but pneumotherm has better effect than moist packs but moist packs is used for only 8 minutes only on hamstring so the result has not improved when comparing with pneumotherm which has more penetration more than 5cm heat of about 49⁰ C while moist hot have 40 ⁰C this may be the difference which doesn't brings the result in the moist hot pack and the duration of the moist pack is less.

Another study by Gerard A.Malanga¹⁵ et.al 2015 said that physiological action of heat therapy reduces and relieves pain and increase blood flow and metabolis and increases elasticity of the connective tissue ,increases tissue temperature,vasodialation and promotes tissue healing by increasing the supply of nutrient and oxygen to the site of injury.

According to Brain V Reed¹⁶ ultrasound is effective in knee MCL stretching. Brain V Reed recruited 25 female for his study in MCL Ligament stretching study & found that Ultrasound is clinically improve the stiffness of MCL.Another study by Robert H.Bickford¹⁷ that primary action of ultrasonic energy in the tissues is liberation of heat which induces a local arteriolar relaxation. The rise of temperature in skeletal muscle is of short duration because of

resultant hypermia it self serves to remove heat rapidly. Ultrasound increase the blood supply in the tissue where is treated in forearm by vasodialation of arteriolar it helps in tissue healing.Similarly another study by K G Baker¹⁸ et.al said that Ultraonic therapy produces Biophysical effect when it is applied on human body it produces thermal and non thermal effects on body it thermal effects increases the metabolic activity blood supply to the tissue and produce analgesic effects on nerve and increases the collagen extensibility activity .The term cavittion is 1st time used by Sir John Thornycroft in the early 20th century and was defined as a formation and life bubbles in the liquid the term cavitation is used to define Bubbles phenomenon, the tiny gas bubble in tissue is due to ultrasonic vibration. Ultrasound produces increase in protein synthesis ,mast cell degranulation ,growth factor production ,increases uptake of calcium and fibroblast activity Dayson suggested these activity brings tissue repair after irridation of Ultrasound therapy. Similarly a research byB.Reed¹⁹ et.al belief was that ultrasound increases the collagen tissue extensibility it is surprisingly found in 1997 on human knee joint extesibity with clinically therapeutic Ultrasound dose of 1.5W/CM² at 1MHz for 8 min slightly increases the extensibility of the lateral & medial collateral ligament ,but ligament extensibility wss not much significant. Reed and Ashikaga thought that the extensibility is due to increase of blood supply ,it is concluded that Biophyscial effects of Ultrasound is beneficial to the subjects.Another study by Mohammad Bayat ,Naser Rizavi²⁰ et al ultrasound is one of the modalily widely used for the therapeutic purpose on human body by the physiotherapist as physical medicine for pain management & to increase blood flow & movability.

Fieldhouse said that ultrasound treatment after episitomy, scar ,pain decreases and strongly tissue repairs, untreated scars tissue becomes harder ,stiff and difficulty in movement, impairment of the social behaviour ,distorted selfesteem and ADL is affected ,loss of Quality of life. Another study by Osvander Lechi²¹[2000] on the partial or complete tear of the Rotator cuff tear using ultrasound therapy to the trigger points,continuous ultrasound with frequency of 1.0 Mhz and dose of 1.5 w/cm² for 5 minutes to the subacromial region (model AVATAR US 873 - KLD Biossistemas Equip. Elet. Ltda.), and stretching exercises external rotation in shoulder plan and horizontal abduction at 30 degrees of flexion, strenghtning exercises with isometrics, elastic bands and

dumbbell weights for shoulder external and internal rotators, muscles of the scapular waist (trapezius and anterior serratus) and deltoid.

Similar another study by Gerold R.E. Benbichler²² et.al. on the calcified tendinitis on the supraspinatus and infraspinatus muscle which cause pain and disability to the shoulder joint movement by using Ultrasound therapy. Ultrasound therapy with dosemetry of 0.89 MHz and an intensity of 2.5 W/cm² for 15 minutes per session to the area over the calcified area. The first 15 of the 24 treatments were given daily (five times per week) for three weeks, and the remaining 9 were given three times a week for three weeks. The pulsed mode was 1:4, the transducer was 5 cm² (Sonodyn, Siemens), and an aquasonic gel was used as the couplant to avoid cavitation. At the end those who receive ultrasound therapy has got better result than who received sham ultrasound therapy. At the end of the study after 9 months, clinical improvement was significantly more common in the ultrasound-treatment group than in the sham-treatment group (29 [91 percent] vs. 15 [52 percent], P=0.002 by twotailed Fisher's exact test). The pain, disability and quality of life improved in those subjects who receive ultrasound therapy. Another researcher Gam AN²³ et.al unable to detect significant difference in pain reduction between ultrasound and sham ultrasound when applied in combination with massage and exercise.

Apostolos stregioulas²⁴ et.al.[2008] has treated frozen shoulder with low level laser with 810 Nm Ga-Al-AS laser with continuous output of 60mW on 8 point on frozen shoulder for 30 seconds at each point and dose of 1.8J per point and total dose of 14.4 J. Duration of therapy is for 8 wks and total session was 12 for active Laser group and placebo group with 31 subjects in active laser group and 32 subjects in placebo group has found decrease in VAS score pain and SPADI pain and Disability score after 4 wks of treatments in laser group at night pain in comparison to placebo group in case of frozen shoulder. The p value for active laser group was p< 0.005 and after 8 wks the p<0.01 and spadi disability the P value after 4 wks was the P <0.005 and p value after 8 wks the P<0.01 in comparison to placebo laser group. There is significant overall improvement in laser group it has been shown in the above study. Another study by Ikuko Ohkuni²⁵ et.al[2011] has used low level laser in sacroiliac joints pain on 9 subjects with 4 male and 5 female for pain and tenderness for 5 wks with the dosemetry of 830 nm diode laser for 30 second on bilateral tender spots over the sacroiliac joint, there is significant decrease in the pain and tenderness there is improvement in VAS and increase mobility of the sacroiliac joint when compared from base line.

Bela Hegedus²⁶ et.al[2009] in a study on knee osteo arthritis selected 35 subjects with OA knee but only 27 subjects in which 22 women and 5 men full fill the criteria for trial. 18 subjects were treated with active Laser and 9 subjects were treated with placebo laser with a dosemetry of wavelength of

830 nm and 6 joule/cm² with power density 50mW/0.05mm² per point total 4 points at knee joint total dose of laser was 48J/cm² twice a wk for 4 wks total. The VAS and range of motion of knee flexion before the treatment observation was taken at the base line day and after the end of treatment it was observed that the marked improvement in active laser group than compared to the laser group in VAS and increase in range of motion (ROM) of knee again it shows that that Low level Laser is very effective in treatment of the OA knee. Similar another study by Aimee L. Thornton²⁷ et.al [2013] that adding low-level laser therapy with exercise programme helps in reducing pain and increases function in adults with shoulder pain

Similar another study strongly by Yashiro Musha²⁸, et.al [2009] that low-level laser Therapy is effective in for pain relief and improve range of motion of shoulder peri-arthritis and serum prostaglandin E₂ (PGE₂) level decreases and VAS score for pain decreases.

VI. CONCLUSION

Current study concludes that adding moist hot packs with laser Therapy and ultrasound therapy helps in reducing the pain, improves functional activity of the shoulder joints. Both ultrasound therapy and Laser therapy is helpful is important modalities for the treatment of Rotator cuff injuries and helpful in improving the ROM of the shoulder joint Flexion, Abduction, Internal rotation and External Rotation and reduction of SPADI pain and disability score among the subjects with grade 1 & 2 Rotator cuff injury. Laser therapy produces much better effects than the ultrasound therapy for the management of grade 1 & 2 rotator cuff injury.

Limitation of the study; The sample size is small, Further study is required with larger sample size with increase study time.

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