

**TO COMPARE THE EFFICACY OF ULTRASOUND THERAPY WITH EXERCISES VERSUS LASER THERAPY WITH EXERCISES IN THE TREATMENT OF SUBACROMIAL IMPINGEMENT SYNDROME**Somashekhhar<sup>1</sup>, R. Raja<sup>2</sup>, Kanchan Kanti Brahma<sup>3</sup>, Ranganath H. D<sup>4</sup>, Yatish R<sup>5</sup>, Vivek Jha<sup>6</sup>**HOW TO CITE THIS ARTICLE:**

Somashekhhar, R. Raja, Kanchan Kanti Brahma, Ranganath H. D, Yatish R, Vivek Jha. "To Compare the Efficacy of Ultrasound Therapy with exercises Versus Laser Therapy with exercises in the Treatment of Subacromial Impingement Syndrome". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 41, September 04; Page: 10315-10324, DOI: 10.14260/jemds/2014/3339

**ABSTRACT: OBJECTIVES:** To compare and measure the effectiveness of Ultrasound therapy with exercises versus Laser therapy with exercises on affected shoulder in reducing pain which can be measured by Visual Analogue Scale in case of SAIS. To compare and measure the effectiveness of Ultrasound therapy with exercises versus Laser therapy with exercises in evaluating the active range of motion using Universal Goniometer. **BACKGROUND:** Sub acromial impingement syndrome (SAIS) is a painful condition resulting from the entrapment of anatomical structures between the antero inferior corner of the acromion and the greater tuberosity of the humerus. Van der Windt et al.,(1995) and Vecchio et al.,(1995) have postulated that Sub acromial impingement syndrome (SAIS) of the shoulder is the most common disorder of the shoulder, accounting for 44-65% of all complaints of shoulder pain. Shoulder Impingement syndrome is usually treated conservatively, but sometimes it is treated with arthroscopic surgery or open surgery. Conservative treatment includes rest, cessation of painful activity, ultrasound therapy, laser therapy and physiotherapy focused at maintaining range of movement and avoids shoulder stiffness. NSAID"s and ice packs may be used for pain relief. Therapeutic injections of corticosteroid and local anaesthetic may be used for persistent impingement syndrome. In this study the researcher would like to compare and see the effectiveness of ultrasound with exercises and laser therapy with exercises on SAIS. **METHODS:** For this study 60 patients with acute SAIS of both the sex were taken. Patients were randomly divided into group A and group B. Group A were treated with US therapy for 5 minutes along with shoulder exercises and Group B were treated with LLLT of Ga-As for 5-6 minutes along with shoulder exercises to maintain ROM within available pain free range. Both the groups were treated 5 times per week for 2 weeks. Patients were evaluated with VAS and ROM on every 3rd day from Day 1st to 15th day. **OUTCOME MEASURES:** Pain was measured by VAS and ROM of shoulder abduction was measured by Universal Goniometer. The values are compared to see which group has better improvement. The values are statistically analyzed to determine their effect in reducing pain and improving ROM. **RESULTS:** Both groups showed clinically and statistically significant improvement in VAS and ROM, with p value <0.001\*\*, after 1st to 15th days of physiotherapy intervention. At the end of 15 days of treatment, both the groups were substantially improved over baseline measurement, but Group "B" showed significant improvement compared to Group "A" at 95% confidence interval. **CONCLUSION:** This experimental study shows that LLLT along with exercise is effective in the treatment of SAIS.

**KEYWORDS:** SAIS, US, LLLT, Ex"s, ROM, VAS.

**INTRODUCTION:** Sub acromial impingement syndrome (SAIS) of the shoulder is the most common disorder of the shoulder, accounting for 44-65% of all complaints of shoulder pain.<sup>1</sup>

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Sub acromial impingement is a chronic inflammatory process produced as one of the Rotator Cuff Muscle and the sub deltoid Bursa are “pinched” against the Coracoacromial ligament and, or the Anterior Acromion when the arm is raised above the head. The supraspinatus portion of the rotator cuff is the most common area of impingement. This syndrome is commonly seen in individuals who use their arm repetitively in a position above the shoulder height. This condition also occurs in the Golfer, Tennis player and Swimmer.<sup>2</sup>

Stages have been described by Neer in 1983<sup>3,4,5,6</sup> in which he stated three stages.

**Stage-I:** Impingement is characterized by edema and hemorrhage of the bursa and cuff and is typically found in patients who are less than twenty-five years old.

**Stage-II:** Impingement represents irreversible changes, such as fibrosis and tendinitis of the rotator cuff, and is typically found in patients who are twenty-five to forty years old.

**Stage-III:** Impingement is marked by more chronic changes, such as partial or complete tears of the rotator cuff, and is usually seen in patients who are more than forty years old.

Later impingement was divided into outlet and non-outlet lesions. Outlet impingement occurs when the coracoacromial arch encroaches on the supraspinatus outlet. Non-outlet impingement occur secondary to thickening or hypertrophy of the bursa or the rotator cuff tendons.<sup>7</sup>

Many conditions can mimic impingement. They are- Rotator cuff tear, Biceps tendon rupture, Acute calcific tendinitis, Adhesive capsulitis, Acromioclavicular arthritis, Glenohumeral arthritis, Septic arthritis, Rheumatoid arthritis, Gout, Lyme disease, Lupus erythematosus, Spondyloarthropathy, Avascular necrosis, Cervical radiculopathy, Tumor, Thoracic outlet syndrome.<sup>4,5</sup>

Shoulder Impingement syndrome is usually treated conservatively, but sometimes it is treated with arthroscopic surgery or open surgery.<sup>4,5,7</sup>

Conservative treatment<sup>8</sup> includes rest, cessation of painful activity, ultrasound therapy,<sup>7,9,10</sup> laser therapy<sup>3,10,11</sup> and physiotherapy focused at maintaining range of movement [34] and avoid shoulder stiffness. NSAID“s and ice packs may be used for pain relief.<sup>4,2,5,12,10</sup>

Therapeutic injections of corticosteroid<sup>10,12,13</sup> and local anesthetic may be used for persistent impingement syndrome.<sup>3,5,14,15</sup> In this study the researcher would like to compare and see the effectiveness of ultrasound with exercises and laser therapy with exercises.

### OBJECTIVE OF THE STUDY:

1. To compare and measure the effectiveness of Ultrasound therapy with exercises versus Laser therapy with exercises on affected shoulder in reducing pain which can be measured by Visual Analogue Scale in case of SAIS.
2. To compare and measure the effectiveness of Ultrasound therapy with exercises versus Laser therapy with exercises in evaluating the active range of motion using Universal Goniometer.

**HYPOTHESIS:** Alternative Hypothesis: It may be seen that ultrasound therapy with exercises versus low intensity laser therapy with exercises may be effective in treating Subacromial impingement syndrome.

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Null Hypothesis: It may be seen that ultrasound therapy with exercises versus low intensity laser therapy with exercises may not be effective in treating Subacromial impingement syndrome.

### **METHODOLOGY:**

**Research Design:** It is a Comparative Experimental Study.

**Population:** Patients with Acute Sub- Acromial Impingement Syndrome.

**Sample Size:** 60 (30 in each Group) patients with Acute Sub- Acromial Impingement Syndrome, residing in Bangalore.

**Sampling Method:** Random Sampling Method

**Sampling Technique:** Samples are selected through simple random sampling by using chit method.

**Source of Data:** SAIS patients referred to in and out-patient department of Kempegowda Institute of Physiotherapy from Kempegowda institute of Medical Science and Research centre, those who fulfill the inclusion and exclusion criteria.

**Inclusion Criteria:** Subjects with unilateral Subacromial impingement syndrome diagnosed by orthopaedician and referred to physiotherapy OPD:

- Men and women 18-30 years of age.
- Shoulder pain due to Subacromial impingement syndrome
- Pain at rest, aggravating at overhead activity or on lying on the affected shoulder.
- Documented X-ray, ultrasound (US), or magnetic resonance imaging (MRI) evidence of rotator cuff injury involving edema and tendinitis.
- Patients who show positive Neer impingement sign, Hawkins-Kennedy test, Painful arc syndrome, Yocum manoeuvre.

### **Exclusion Criteria:**

- Documented US and/or MRI evidence of fibrosis or complete tearing of the cuff and clinical inability to lift the arm (drop arm sign).
- Radiological findings: Malignancy, avascular necrosis, glenoid developmental defects, acromial bone, severe degenerative signs affecting inter-articular space and fractures.
- Limited range of motion with capsular pattern.
- Recent history of trauma (contusion, fall, or sudden jarring).
- Ischemic cardiopathy in sub-acute case.
- History of more than five infiltrations and/or shoulder surgery.
- History of rehabilitation treatment for the same reason in the last 12 months.
- Concomitant cervical radiculopathy.
- Cognitive deficit, psychiatric alterations or behavioural disorders that might compromise the patient's collaboration.
- Unsuitable for electrotherapy: pregnancy, pacemaker, epilepsy, osteosynthesis.
- Known or suspected polyarthritis, rheumatoid arthritis or diagnosed of fibromyalgia.
- Dislocation of the Glenohumeral or the clavicular joints on the affected side.

**METHODS:** After informed consent and explanation of the protocol, the patients were included in the study. Pre-intervention assessment of pain was done using visual analogue scale (VAS) and range of

movements was assessed using universal goniometer. The patients then were randomly allocated to one of the intervention groups by chit method, each containing 30 patients.

**Group A:** received ultrasound therapy:

- a) Intensity: 0.5- 0.8 W/cm<sup>2</sup>
- b) Mode: Pulsed Mode
- c) Coupling media: Ultrasonic gel
- d) Transducer Size: 1 cm<sup>2</sup>
- e) Frequency: 3 MHz
- f) Technique: Direct contact in small concentric circles
- g) Treatment time: 3-4 mins.

**Group B:** received laser therapy:

- a) Wavelength: 850 nm
- b) Power output: 100 mV
- c) Dosage: 5 J/cm<sup>2</sup>
- d) Beam area: 0.07 cm<sup>2</sup>
- e) Duration: 5-6 mins

**Both Group A and Group B received shoulder exercises:**

- a) Codman's pendular exercise.
- b) Shoulder external rotation, internal rotation and abduction using Theraband.
  - Thera-Band Shoulder External Rotation at 0° (starting at 45°)
  - Thera-Band Shoulder Abduction to 45
  - Thera-Band Shoulder Internal Rotation at 0 (starting at 45)

VAS, ROM was assessed on the day before the treatment and at every 3 days interval. Both US therapy and LLLT is applied once a day, 5 days a week for 2 weeks

**Frequency:** 10 treatment sessions in 2 weeks.

**Duration of the Study:** 12 months

**STATISTICAL METHODS:** Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean  $\pm$  SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance.

The following assumptions on data is made, Assumptions: 1. Dependent variables should be normally distributed, 2. Samples drawn from the population should be random, Cases of the samples should be independent Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups Inter group analysis) on metric parameters.

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Leven1s test for homogeneity of variance has been performed to assess the homogeneity of variance. And Student t test (two tailed, dependent) has been used to find the significance of study parameters on continuous scale with in each group. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups. One proportion Z test has been performed under the binomial assumption of 0.50 for frequency distribution of variables studied

### RESULTS:

**Age distribution:** samples are age matched with  $p=0.202$

Age in years	Group A		Group B	
	N	(%)	N	(%)
24-26	5	(16.7%)	7	(23.3%)
27-30	25	(83.3%)	23	(76.7%)
Total	30	(100%)	30	(100%)
Mean $\pm$ SD	28.13 $\pm$ 1.41		27.60 $\pm$ 1.77	

Table 1

Group A= ultrasound with exercise. Group B= laser with exercise

**Gender distribution:** samples are gender matched with  $p=0.605$

Gender	Group A		Group B	
	N	(%)	N	(%)
Male	15	(50%)	17	(56.7%)
Female	15	(50%)	13	(43.3%)
Total	30	(100%)	30	(100%)

Table 2

Group A = ultrasound with exercise. Group B = laser with exercise

**Side involved:** are statistically similar in two groups with  $p=0.795$

Side	Group A		Group B	
	N	(%)	N	(%)
Left	14	(46.7%)	13	(43.3%)
Right	16	(53.3%)	17	(56.7%)
Total	50	(100%)	30	(100%)

Table 3

Group A= ultrasound with exercise. Group B = laser with exercise

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### Comparative evaluation of VAS score in the two groups

VAS	Group A (n=30)	Group B (n=30)	p value
1 <sup>st</sup> day	8.30±1.14	8.67±0.84	0.164
3 <sup>rd</sup> day	7.50±1.04	7.43±0.77	0.779
6 <sup>th</sup> day	6.93±1.01	6.63±0.61	0.171
9 <sup>th</sup> day	6.43±0.89	5.53±0.78	<0.001**
12 <sup>th</sup> day	5.60±0.89	4.87±0.68	0.001**
15 <sup>th</sup> day	5.17±1.02	4.23±0.69	<0.001**

Table 4

Group A= ultrasound with exercise. Group B= laser with exercise

### Comparative evaluation of VAS score in the two groups (left side involvement)

VAS : left side	Group A (n=14)	Group B (n=13)	p value
1 <sup>st</sup> day	8.21±0.89	8.69±0.75	0.146
3 <sup>rd</sup> day	7.57±1.09	7.46±0.66	0.756
6 <sup>th</sup> day	6.86±1.03	6.62±0.65	0.476
9 <sup>th</sup> day	6.50±0.94	5.69±0.63	0.015*
12 <sup>th</sup> day	5.43±1.02	4.92±0.64	0.138
15 <sup>th</sup> day	4.93±1.07	4.15±0.55	0.028*

Table 5

Group A-ultrasound with exercise. Group B-laser with exercise

### Comparative evaluation of VAS score in the two groups (right side involvement)

VAS : right side	Group A (n=16)	Group B (N=17)	p value
1 <sup>st</sup> day	8.37±1.36	8.64±0.93	0.505
3 <sup>rd</sup> day	7.44±1.03	7.41±0.87	0.939
6 <sup>th</sup> day	7.00±1.03	6.65±0.61	0.237
9 <sup>th</sup> day	6.37±0.88	5.41±0.87	0.004**
12 <sup>th</sup> day	5.75±0.77	4.82±0.73	0.001**
15 <sup>th</sup> day	5.37±0.96	4.29±0.77	0.001**

Table 6

Group A-ultrasound with exercise. group B- laser with exercise

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### Comparative Evaluation of SHOULDER ABDUCTION ROM score in two groups studied

Shoulder abduction range of motion	Group A (n=30)	Group B (n=30)	P value
1 <sup>st</sup> day	35.37±6.31	32.70±3.72	0.051
3 <sup>rd</sup> day	37.60±3.72	36.50±3.42	0.360
6 <sup>th</sup> day	39.30±5.16	38.77±2.82	0.621
9 <sup>th</sup> day	40.67±4.70	42.30±3.64	0.134
12 <sup>th</sup> day	42.77±4.62	46.70±4.09	0.001**
15 <sup>th</sup> day	44.60±4.88	51.63±3.96	<0.001**

Table 7

Group A–ultrasound with exercise .group B- laser with exercise

### Comparative Evaluation of SHOULDER ABDUCTION ROM score in two groups studied: left side involvement:

Abduction ROM	Group A (n=14)	Group B (n=13)	p value
1 <sup>st</sup> day	35.00±5.65	33.15±3.36	0.317
3 <sup>rd</sup> day	37.07±5.19	37.00±2.23	0.964
6 <sup>th</sup> day	39.21±4.41	38.84±1.82	0.782
9 <sup>th</sup> day	40.86±4.21	42.23±2.65	0.324
12 <sup>th</sup> day	43.00±4.28	46.84±3.16	0.014*
15 <sup>th</sup> day	45.07±4.97	51.46±2.78	<0.001**

Table 8

Group A–ultrasound with exercise. Group B- laser with exercise

### Comparative Evaluation of SHOULDER ABDUCTION ROM score in two groups studied: Right side Involvement:

Abduction (ROM)	Group A (n=16)	Group B (n=17)	p value
1 <sup>st</sup> day	35.68±7.00	32.35±4.03	0.101
3 <sup>rd</sup> day	38.06±5.98	36.11±4.14	0.283
6 <sup>th</sup> day	39.37±5.88	38.70±3.45	0.691
9 <sup>th</sup> day	40.50±5.22	42.35±4.18	0.269
12 <sup>th</sup> day	42.56±5.03	46.59±4.78	0.025*
15 <sup>th</sup> day	44.19±4.94	51.76±4.75	<0.001**

Table 9



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**DISCUSSION:** Impingement syndrome is a common shoulder disorder in which supraspinatus tendon impinges on the under surface of the acromion as the arm is raised overhead. Patients in the current investigation were diagnosed with impingement syndrome according to their history, physical examination, MRI and Ultrasonography.

This study was undertaken to determine the effects of UST with exercises versus LLLT with exercises in the treatment of SAIS for reducing pain with the help of VAS and increasing ROM with the help Universal goniometer.

According to statistical analysis, in Group A 15 males (50%) and 15 females (50%) were participated and in Group B 17 males (56.7%) and 13 females (43.3%) were participated. In both the groups the patient's age lies between 18-30 years.

Analysis of pain through VAS and ROM through Universal goniometer within Group A and Group B respectively. The comparison of Age, Sex, VAS, ROM and Side of the samples were shown on Tables: 1, 2, 3, 4, 5, 6, 7 & 8 concludes that there were statistically significant reduction of pain and increased ROM in Group B compared to Group A.

Derya CELIK et al. (2009) after their study on "The value of intermittent ultrasound treatment in subacromial impingement syndrome" suggested that intermittent ultrasound added to conservative treatment of SAIS do not provide an additional benefit to the patients. In SAIS, several methods of conservative treatment have been described.

Only ROM and capsule-strengthening exercises have been included in the method of standard therapy. Many systematic reviews and randomized clinical trials have suggested that LLLT could be an effective physical therapy intervention for decreasing pain and functional loss or disability for patients with SAIS. In this study, the researcher found that LLLT with exercises on SAIS showed significant improvement in improving ROM of shoulder abduction on 1st, 3rd, 6th, 9th, 12th & 15th day respectively, the SD of Group A on 1st Day  $35.37 \pm 6.31$  & on 15th Day  $44.60 \pm 4.88$ . The SD of Group B was 1st Day  $32.70 \pm 3.72$  & on 15th Day  $51.63 \pm 3.96$  respectively, with p value for Group A and B on 1st Day  $p=0.051$  & on 15th Day  $p<0.001^{**}$ .

The present study suggests that the Group B patients (LLLT with Exercises) showed significant improvement in improving ROM. For decreasing pain through VAS on 1st, 3rd, 6th, 9th, 12th & 15th day respectively the SD of Group A on 1st Day  $8.30 \pm 1.14$  & on 15th Day  $5.17 \pm 1.02$  and Group B on 1st Day  $8.67 \pm 0.84$  & on 15th Day  $4.23 \pm 0.69$  respectively, with p value for Group A and B on 1st Day  $p=0.146$  & on 15th Day  $p=0.028^*$ , which shows that the Group B patients (LLLT with Exercises) showed significant improvement in decreasing pain on SAIS.

Craig A. Cummins et al. (2009) in their prospective study of Impingement syndrome stated that the temporal outcomes of no operative treatment found to be effective with the help of UST and LLLT with exercise. In this study the patients with impingement syndrome treated with UST with Exercises showed significantly less improvement than LLLT with Exercises group. Generally 79% of patients treated with UST and LLLT did not require surgery after 2 years of follow-up.

In the present study, we compared the results obtained after 10 treatment sessions over a period of 2 consecutive weeks with UST with exercises and LLLT with exercises in subjects diagnosed with Neer stage I or II SAIS. The subjects treated with LLLT with exercises showed greater reduction in pain through VAS and more increase in ROM through Universal goniometer respectively compared to subjects being treated with UST with Exercises.



**LIMITATIONS:**

- In this study the researcher have used the small sample size .
- Prolonged follow-up was not possible due to drop outs of the sample.
- The study was done only between 18 to 30 years and not on other age groups.
- Study is limited only to NEER stage I & II of SAIS not on III & IV.
- Duration of the study is only 2 weeks.
- Study is mostly dependent on modalities and exercises.

**RECOMMENDATIONS FOR FURTHER STUDIES:**

- Further studies can be done using large sample size.
- In further studies, study can be done including older age groups.
- Further studies can include Stage III & IV SAIS.
- In future, duration of the study can be more than 2 weeks.
- Further studies can be done including other physiotherapy treatment modalities and exercises.

**CONCLUSION:**

- Analysis of ROM through Universal goniometer within Group A and Group B showed significant increase of ROM in Group B (LLLT with exercises) compared to Group A (UST with exercises).
- Analysis of pain through VAS within Group A and Group B showed significant decrease of pain in Group B (LLLT with exercises) compared to Group A (UST with exercises)

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Date of Submission: 16/08/2014.  
Date of Peer Review: 17/08/2014.  
Date of Acceptance: 30/08/2014.  
Date of Publishing: 03/09/2014.