

TO COMPARE THE EFFECTIVENESS OF THERAPEUTIC KINESIO TAPING AND EXERCISES AND ULTRASOUND WITH THERAPEUTIC KINESIO TAPING AND EXERCISES AND LOW INTENSITY LASER IN TREATING PATIENTS WITH SUBACROMIAL IMPINGEMENT SYNDROME

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ABSTRACT: BACKGROUND AND OBJECTIVES: Subacromial impingement syndrome (SIAS) is a painful condition resulting from the entrapment of anatomical structures between the anteroinferior corner of the acromion and the greater tuberosity of the humerus. Subacromial impingement syndrome (SAIS) of the shoulder is the most common disorder of the shoulder, accounting for 44-65% of all complaints of shoulder. SAIS is usually treated conservatively, but sometimes it is treated with arthroscopic surgery or open surgery. Conservatively treatment includes rest, cessation of painful activity, ultrasound therapy, laser and physiotherapy focused at maintaining range of movement and avoids shoulder stiffness. NSAIDs's and ice packs may be used for pain relief. Therapeutic injections of corticosteroid and local anesthetic may be used for persistent impingement syndrome. Hence this study aimed to compare and see the effectiveness of ultrasound, kinesio taping and exercises with low level laser, kinesio taping and exercises. **STUDY DESIGN:** Comparative study design **SETTING:** Outpatient Department of Orthopedics, Kempegowda Institute of Medical Science Hospital and Research Center, Bangalore. Outpatient Department of Physiotherapy, Kempegowda institute of Physiotherapy, Bangalore. **OUTCOME MEASURES:** Visual analog scale (VAS) for pain, Shoulder ROM, Shoulder pain and disability index (SPADI). **METHOD:** For this study 60 patients with chronic SAIS of both the sex were randomly divided into group A and group B. Group A were treated with Ultra sound therapy for 5 minutes along with shoulder exercise and kinesio taping 5 times per week. Group B were treated with LLLT for 3 minutes along with exercises and kinesio taping 3 times per week. Both the groups were treated for 3 weeks. Patients were evaluated with VAS, ROM and SPADI score on 1st day, 1st week, 2nd week and 3rd week. **RESULT:** Both groups showed clinically and statistically significant improvement in VAS, SPADI and ROM, with p value <0. 001**, after Initial Day to 3rd week of physiotherapy intervention. At the end of 3rd week of treatment, both groups were substantially improved over baseline measurement, but Group 'B' showed significant improvement compared Group 'A' at 95% confidence interval.

KEYWORDS: Low level laser, Sub acromial impingement syndrome, Visual analog scale, Shoulder pain and disability index, Ultrasound therapy.

INTRODUCTION: Shoulder pain is the second most common pathology following low back pain.^[1] Sub acromial impingement syndrome is one of the leading causes of shoulder pain and impairment.^[2,3] Van der windt et., (1995) have postulated that Subacromial impingement syndrome (SAIS) of the shoulder is the most common disorder of the shoulder, accounting for 44-65% of all complaints of the shoulder pain. ^[2]

Sub acromial impingement syndrome occurs following the entrapment of the Supraspinatus, Infraspinatus, Teres minor muscle and biceps tendon, soft tissues and sub acromial bursa between the coracoacromial arch and humeral head^[4] and causes swelling, inflammation and pain in the shoulder. Structural and functional factors narrowing the sub acromial space may lead to Sub acromial impingement syndrome. Most cases with Sub acromial impingement syndrome are in patients under 60 years of age who are exposed to recurrent trauma through consistent use of their arms above the shoulder level.^[4]

Various treatments for the management of Sub acromial impingement including physical therapy methods, surgical approaches, subacromial corticosteroid injection and Non-steroidal anti-inflammatory drugs have been attempted in addition to strengthening and stretching exercises.^[1,5-16] However, there is still a lack of scientific evidence on the effectiveness of these treatment methods.^[11] Physiotherapy for shoulder pain may consist of exercise,^[6, 8] manipulative treatments,^[9, 10] several electrotherapy techniques,^[11,12] and taping.^[13,14]

In this research Ultrasound therapy is used for one group of patients. The ultrasound means mechanical waves of a frequency higher than 20,000 Hz.^[15] Ultrasound has been used in the treatment of shoulder pain for decades. It consists of electrical energy that is converted to acoustic energy through mechanical deformation of a piezoelectric crystal located within the transducer. In ultrasound we have two different frequencies. The selection of frequency is determined by the target tissue; 1 MHz frequency is used for deep tissues and 3 MHz frequency for superficial tissues. It is applied in either pulsed or continuous mode. Intensity or dosage for acute condition - 0.5 W/cm² and for chronic condition- 0.8-1.0 W/cm² (intensity must not exceed 2.0 W/cm² in continuous mode and 3.0 W/cm² in pulsed mode).^[15, 16] Duration of application for acute- 3 minutes and for chronic- 5 minutes. Frequency of treatment is 5 times a week for acute and 3 times a week for chronic.^[15]

For other group I would like to use Low Intensity Laser therapy. The word LASER is an acronym for Light Amplification by the Stimulated Emission of Radiation. Laser has characteristics like Monochromaticity, Coherence and Collimation.^[17] Classes of laser range from 1 to 5. Low intensity lasers known as Class 1 to 3B have less than 500 mW power, 50 mW/cm² power density and 40 J/cm² energy density and are referred to as low level lasers and are used as adjunct therapy in rehabilitation. High intensity laser, known as Class 4 and 5 lasers.^[18]

For both groups Therapeutic Kinesio Taping and Hughston's Exercises are common. Kinesiology tape is a 100% cotton, hypoallergenic, latex free, non-restrictive elastic adhesive tape designed to have the same amount of stretch as human skin and provides a multitude of uses as a protective and rehabilitative taping technique. Applied over muscles, the main benefits are to; reduce pain and inflammation, improve circulation, relax and support over-used/tired/injured muscles, provide structural support to joints and muscle movement, assist healing and provide support to the injury site whilst allowing full range of movement. This Kinesio taping methods can be useful for preventative or rehabilitative purpose.^[19]

Hughston's Exercises are designed to achieve scapular stabilization and distal mobility. These exercises are useful to strengthen the rotator cuff muscles of the shoulder with the patient in a prone position.^[20]

MATERIALS AND METHODS: Source of data: Outpatient Department of Orthopedics, Kempegowda Institute of Medical Science Hospital and Research Center, Bangalore.

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Outpatient Department of Physiotherapy, Kempegowda institute of Physiotherapy, Bangalore.

Measuring Scales: VAS scale-To measure the pre and post treatment Pain.

Shoulder pain and disability Index: To assess the functional outcome of the shoulder.

Universal Goniometer: To measure the shoulder joint range of motion.

Inclusion Criteria:

- Subjects with unilateral Sub acromial impingement syndrome diagnosed by Orthopaedician and referred to Physiotherapy OPD.
- Men and Women over 18-60yrs of age.
- Pain at rest and/or with free movement and/or with movement against resistance with a score on the visual analogue scale of (1-8)/10
- Patients who show positive Hawkins-Kennedy test & Neer impingement sign.

Exclusion Criteria:

- Documented US and/or MRI evidence of fibrosis or complete tearing of Rotator cuff and clinical inability to lift the arm (Drop arm sign).
- Patient with post fracture in and around shoulder joint.
- Stroke patients.
- Patients with Cervical Radiculopathy.
- Radiological findings: Malignancy, avascular necrosis, glenoid developmental defects, acromial bone, severe degenerative signs affecting inter-articular space and fracture.
- Age group below 18 years and above 60 years.
- Patients with any other musculo-skeletal or neurological disorders in the shoulder.
- Patients with shoulder deformities.
- Unsuitable for electrotherapy: Pregnancy, Pacemaker, Epilepsy and implants.
- Known or suspected Polyarthritits, Rheumatoid arthritis or diagnosed of Fibromyalgia.
- Cognitive deficit, psychiatric alterations or behavioral disorders that might compromise the patient's collaboration.

METHODOLOGY: Sixty subjects fulfilling the inclusion and exclusion criteria diagnosed with subacromial impingement syndrome are considered for the study. The study population consisted of individuals between 18 to 60 years of age. After explaining the subjects about the treatment, written consent is taken. Pre assessment will be taken prior to the commencement of treatment with self-report outcome measure of VAS, Shoulder pain and disability index and range of motion with goniometry. After evaluation sixty subjects are divided into two groups i. e, Group-A and Group-B. Each group consists of 30 subjects each.

TREATMENT:

GROUP A: 30 subjects will be treated with Ultrasound therapy, Therapeutic Kinesio taping and exercises.

Calibration of the Instrument: Ultrasound:

- a. Frequency : 1 MHz
- b. Intensity : $1\text{W}/\text{cm}^2$
- c. Mode : Pulsed.
- d. Coupling media: Ultrasonic gel.
- e. Transducer size : 1 cm^2
- f. Technique : Direct contact in small concentric circles.
- g. Treatment time: 5 minutes, 5 times a week for 3 weeks.

Group-A subjects will be treated using ultrasound therapy (1MHz) for 5 minutes with the intensity of $1\text{W}/\text{cm}^2$, and in pulsed mode with 1. 5g of a standard coupling media for the treatment and kinesiotope (KT) is applied to Supraspinatus and Deltoid muscles and ask the patient to do exercises

Application of Ultrasound therapy: Subject will be positioned in back rest chair with arm adducted and internal rotated and ultra sound along with the coupling medium over the transducer is given on the antero- lateral aspect of involved shoulder by the therapist. The applicator makes small concentric circular movements. The Transducer head is applied to the treatment area at right angle to ensure maximum absorption.

**Fig. 1**

Group-B will receive Low Intensity Laser, Therapeutic Kinesio taping and exercises.

Calibration of the instrumentation: low level laser

- a. Wavelength : 820nm.
- b. Mean Power : 40mW.
- c. Intensity : $30\text{J}/\text{cm}^2$
- d. Duration : 3minute.
- e. No. of sessions : 3 sessions/week, 3 weeks, Total "9" sessions.

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Group B is treated with Low intensity laser for 3 minutes and kinesiotope(KT) is applied to Supraspinatus and Deltoid muscles and ask the patients to do Hughstons exercises.

Application of Laser therapy: Before the start of the treatment the patient is instructed about the harmful effects of LASER beam and a precautionary measure is taken by wearing protective Goggles by the patient and the therapist. This prevents eye from getting exposed to the LASER beam. Patient is made to sit on the chair with proper back support. The LASER should applied such that the beam strikes the patient skin so as to make right angle for the deep penetration.



Fig. 2

Both Group A and Group B will receive Therapeutic Kinesio Taping and exercises for the affected shoulder area.

Application of Kinesiotape: 1st strip: Y-strip representative of the supraspinatus muscle which will be applied from origin to insertion (Paper off tension). Subject in a position combining cervical side bending to the contralateral side and the arm reaching behind the back.

2ndstrip: It will be applied with the 1st tail to the anterior deltoid while the arm was externally rotated and horizontal abducted. The tail for the posterior deltoid will be applied with arm horizontally adducted and internally rotated.

3rd strip: Depending on shoulder counter tape is applied from the region of coracoid process around to the posterior deltoid with mechanical correction.

**Fig. 3****Hugustons Exercise Resume: Total exercises: 6****1st Exercise:**

- The arm is abducted to 90 degrees with the elbow extended and the thumb facing toward the head.
- The therapist initially supports the arm distally with one hand and palpates the scapular adductors with the other hand.
- The patient is asked to raise the arm by adducting the scapula with the assistance of the therapist.
- The movement has three phases: concentric lifting, stabilization for 2 seconds, and eccentric lowering.

2nd Exercise:

- The arm is moved to eye level in approximately 120 degrees of abduction with the thumb pointing toward the head. This movement engages the supraspinatus muscle.

3rd Exercise:

- The arm is returned to 90 degrees of abduction with the thumb pointing toward the ceiling. This exercise emphasizes the action of the external rotators -the infraspinatus and teres minor.

4th Exercise:

- The arm is returned to the 120-degree abducted position (eye level), with the thumb pointing toward the ceiling. This exercise emphasizes all of the rotator cuff muscles.

5th Exercise:

- The arm is placed next to the side of the body with the thumb pointing out. The arm is lifted into extension. This exercise emphasizes the action of the teres minor.

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6th Exercise:

- The patient moves over toward the opposite side of the table, with the arm resting on the table, the forearm off the table, and the elbow flexed to 90 degrees with the thumb pointed toward the patient's side. The humerus is rotated externally until the hand is level with the table, it is stabilized, and then it is lowered. The glenohumeral joint must be in a neutral position, and the motion must be isolated to the glenohumeral joint. This action produces contraction of the infraspinatus and teres minor.
Repetitions: Start with 5 reps and increased to 15 reps (As tolerated)
- Exercises are once a day, for 5 days a week under supervision of Physiotherapist and lasted two weeks.
- Week days once a day, weekend twice a day.



Fig. 4



Fig. 5

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Fig. 6



Fig. 7



Fig. 8



Fig. 9

RESULTS AND DISCUSSION: Impingement syndrome is a common shoulder disorder in which supraspinatus tendon impinges on the undersurface 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.

This study was undertaken to determine the effects of UST (Ultrasound therapy), exercises and kinesio taping versus LLLT (Low Level Laser Therapy), exercises and kinesio taping in the treatment of SAIS for reducing pain, to increase the ROM and to improve functional ability.

According to statistical analysis, in Group a 18 male (60%) and 12 female (40%) were participated and in Group B 16 male (53.3%) and 14 female (46.7%) were participated. In both the groups the patient's age lies between 18-60 years.

Analysis of pain through VAS, functional ability by SPADI and ROM by goniometer within Group A and Group B respectively. The comparison of Age, Sex, VAS, SPADI and ROM of samples were shown on Tables and concludes that there is statistically significant reduction of pain, improvement in functional ability and improvement in ROM in Group B compared to Group A.

Many systematic reviews and randomized clinical trials have suggested that LLLT could be an effective physical therapy intervention for decreasing pain, for improve functional ability and to increase ROM in patients with SAIS. In this research I found that LLLT, exercises and kinesio taping on SAIS showed significant improvement in VAS score on Initial day, 1st week, 2nd week and 3rd week respectively the SD of Group A on Initial Day 7.13 ± 0.68 & on 3rd week 4.50 ± 0.90 and SD of Group B on Initial day 7.36 ± 0.61 & on 3rd week 3.63 ± 0.85 respectively, with 'p' value for Group A and B on Initial Day $p=0.169$ and on 3rd week $p<0.05$ which shows that Group B patients (LLL, exercises & kinesio taping) showed significant improvement in decreasing pain.

For improving functional ability assessed by SPADI on Initial day, 1st week, 2nd week and 3rd week respectively the SD of Group A on Initial day 70.37 ± 5.94 & on 3rd week 63.97 ± 6.12 and SD of Group B on Initial day 74.97 ± 5.67 & on 3rd week 67.16 ± 5.57 respectively, with the 'p' value for Group A and Group B on Initial Day $p=0.003$ and 3rd week $p=0.038$ which shows that Group B patients showed significant improvement in improving functional ability.

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For improvement in increasing ROM of shoulder flexion on Initial day, 1st week, 2nd week and 3rd week respectively the SD of Group A on Initial day 139 ± 6.04 & on 3rd week 144 ± 6.07 and SD of Group B on Initial day 128 ± 10.88 and on 3rd week 140.27 ± 11.01 respectively, with the 'p' value for Group A and Group B on Initial day $p=0$ and 3rd week $p = 0.077$ which shows that Group B patients showed significant improvement in improving ROM of Flexion.

For improvement in increasing ROM of shoulder abduction on Initial day, 1st week, 2nd week and 3rd week respectively the SD of Group A on Initial day 70.87 ± 5.04 & on 3rd week 75 ± 5.01 and SD of Group B on Initial day 73.93 ± 8.71 and on 3rd week 84.80 ± 8.08 respectively, with the 'p' value for Group A and Group B on Initial day $p=0.101$ and 3rd week $p=0$ which shows that Group B patients showed significant improvement in improving ROM of Abduction.

For improvement in increasing ROM of shoulder External rotation on Initial day, 1st week, 2nd week and 3rd week respectively the SD of Group A on Initial day 39.73 ± 5.47 & on 3rd week 44.90 ± 5.48 and SD of Group B on Initial day 51.76 ± 6.95 and on 3rd week 63.70 ± 7.17 respectively, with the 'p' value for Group A and Group B on Initial day $p=0$ and 3rd week $p=0$ which shows that Group B patients showed significant improvement in improving ROM of External Rotation.

CONCLUSION: This study can be concluded by stating that both Ultrasound, Kinesio taping, Exercises and Laser, kinesio taping, exercises got beneficial effect in reducing pain intensity, reducing the disability and improving shoulder ROM in chronic subacromial impingement syndrome of shoulder.

Both the treatments showed significance in reducing the pain levels, reducing the disability and improving ROM from initial day to 3rd week of the treatment. But only subjects in group B showed marked improvement in measurements taken in the follow up 1st week, 2nd week and 3rd week. Group A subjects showed slight improvement from initial day to 3rd week till the treatment was given to them but showed mild reduction in pain, disability and improvement in ROM after the 3 weeks treatment.

When both the treatment regimens were taken into consideration for significance Laser therapy, kinesio taping and exercises showed superior hand over Ultrasound therapy, kinesio taping and exercises.

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