

A COMPARATIVE STUDY BETWEEN THE EFFICACIES OF ULTRASOUND THERAPY WITH CRYOKINETICS VERSUS ULTRASOUND THERAPY WITH SOFT TISSUE MASSAGE (DEEP FRICTION MASSAGE) IN ACUTE SUPRASPINATUS TENDINITISH. B. Shivakumar¹, Chanappa. T. S², Pradeep Kumar Reddy³, Jayashree Dey⁴**HOW TO CITE THIS ARTICLE:**

H. B. Shivakumar, Chanappa. T. S, Pradeep Kumar Reddy, Jayashree Dey. "A Comparative Study between the Efficacies of Ultrasound Therapy with Cryokinetics versus Ultrasound Therapy with Soft Tissue Massage (Deep Friction Massage) in Acute Supraspinatus Tendinitis". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 15, April 14; Page: 3898-3907, DOI: 10.14260/jemds/2014/2374

ABSTRACT: BACKGROUND: Supraspinatus tendinitis is the non-traumatic, inflammatory and degenerative changes of tendon. This condition is common in athletes involving repetitive overhead activities like bowling, swimming, and javelin throw etc. and even in persons involving these repetitive overhead activities at their work places. The pain and discomfort associated with this condition have a dramatic impact on physical mobility and function. This study was done to assess the effectiveness of ultrasound and cryokinetics versus ultrasound and soft tissue massage (deep friction massage) in patients suffering from acute supraspinatus tendinitis. **AIMS:** To compare the efficacy of ultrasound therapy with cryokinetics versus ultrasound therapy with soft tissue massage (deep friction massage) in acute supraspinatus tendinitis. **METHODS AND MATERIALS:** It is a comparative experimental study dividing in to two groups. 60 subjects aged between 30-60 years 30 in each group. Group A: (n=30):- Treated with ultrasound therapy and cryokinetics Group B: (n=30):- Treated with ultrasound therapy and soft tissue massage (deep friction massage). Analysis was based on VAS scores and Shoulder Pain and Disability Index (SPADI). Treatment was given for 6 days a week for 2 weeks. The following outcome measures were measured at baseline, day 7 and day 14 with 1 week follow up. VAS Score, and Shoulder pain and disability index (SPADI). The baseline measurements were compared to data at the end of 2nd week. **RESULTS:** The VAS, SPADI percentage across baseline, day 7 and day 14 follow up showed a significant improvement statistically in their mean scores within Group A and Group B (P<0.001). Statistically significant greater changes in score were found in ultrasound therapy and soft tissue massage (deep friction massage) in (Group B) for VAS, and SPADI as compared to ultrasound therapy and cryokinetics (Group A). **CONCLUSION:** The results indicate that ultrasound therapy with cryokinetics (Group A) and ultrasound therapy with soft tissue massage (deep friction massage) in (Group B) are significantly effective in improving VAS, ROM and SPADI. However ultrasound therapy with soft tissue massage (Group B) appears to be more effective in improving shoulder function and reducing VAS and disability as compared to ultrasound therapy with cryokinetics (Group A).

KEYWORDS: Acute supraspinatus tendinitis, ultrasound therapy, cryokinetics, soft tissue massage (deep friction massage), pain intensity, shoulder functional scale, visual analogue scale, shoulder pain and disability index.

INTRODUCTION: Tendinitis is the inflammation of the tendon and results from micro-tears that happen when the musculotendinous unit is acutely overloaded with a tensile force that is too heavy and/or too sudden. It is a degeneration of the tendon's collagen in response to chronic overuse; when

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overuse is continued without giving the tendon time to heal and rest, such as with repetitive strain injury, tendinitis results.¹ We can define supraspinatus tendinitis as the non-traumatic, inflammatory and or degenerative changes of tendon. This condition is common in athletes involving repetitive overhead activities like bowling, swimming, and javelin throw etc. And even in persons involving these repetitive overhead activities at their work places.²

This supraspinatus tendon tear are more common in older population, increasingly more common in the athletes whose sports involve repetitive overhead motions. The prevalence of supraspinatus tendon is among adults under 65 years of the age ranges from 7% to 27%, whereas this prevalence is between 13.2% and 26% among individuals over 65 years of the age. Patients younger than 40 years of age, history may include usually glenohumeral instability and acromioclavicular joint disease and patients older than 40 years of age, history may include glenohumeral impingement and glenohumeral joint degenerative disease. In a study it is found that both males and females are equally affected with supraspinatus tendinitis.³

Stages of Tendinitis:

Stage 1: Which has acute inflammation, edema, and hemorrhage within the supraspinatus tendon characteristic of early tendinitis. This stage is reversible with non- operative treatment.

Stage 2: Usually represents a progression of acute edema and hemorrhage to fibrosis and inflammation within the tendon. In this there is thinning and irregularity of the tendon.

Stage 3: Is typified by mechanical disruption of tendons and changes in the coracoacromial arch with osteophytosis along the anterior acromion. And there is the discontinuity of tendon. Their also may be effusion of the shoulder joint, with a complete supraspinatus tendon tear and atrophy may occur as the tear become chronic.⁴

Supraspinatus tendinitis can be caused by extrinsic and intrinsic factors. Extrinsic factors are divided into primary and secondary impingement. Increased subacromial loading, overhead activities, or trauma can cause primary impingement. Rotator cuff overload and muscle imbalance can cause secondary impingement. Supraspinatus tendonitis can also occur because of the decrease in the supraspinatus outlet space due to underlying instability of the glenohumeral joint.⁵

Diagnosis can be done first by painful arc sign. This is when a person experiences pain upon abduction of the arm between 60° and 120°. The next step would be to perform the empty can test. This is performed with the arm abducted to 90°, 30° of anterior circumduction, and internal rotation with thumb downward. The patient attempts to further abduct their arm while the examiner applies downward pressure. Weakness or pain is considered a positive sign. The validity of the empty can test has been studied and shown to have sensitivity of 62%, 41% and 88% for supraspinatus tendinitis, full thickness tear, and large to massive tears.⁶

Many physiotherapy treatments are in use for or in the treatment of Supraspinatus Tendinitis some of them are, Hot or cold pack application, Ultrasound therapy, Iontophoresis, Deep friction massage, Low level laser therapy, Short wave diathermy.⁷ The purpose of the treatment is to manage pain and resolve mechanical problems so that Function is improved. The goal of the conservative treatment is to alleviate pain and Improve function through the reduction of swelling.³

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Ultrasound: Refers to mechanical vibrations which are essentially the same as sound waves but of a higher frequency. Such waves are beyond the range of human hearing and therefore also called as ultrasonic. Thixotropic substances are gels that become fluid on vibration and thus make ideal couplants for ultrasound.⁸

Ultrasound induced heating is result of the absorption of ultrasonic energy biological tissues. This modality now typically has a base unit for generating an electrical signal and a handheld transducer. The handheld transducer is applied with coupling gel and moved in a circular motion over and injured or painful area of the anatomy to treat conditions such as bursitis of the shoulder and tendinitis. The objective is to warm tendons, muscle, and other tissues to improve blood flow and accelerate healing. The coupling medium can also include various compounds for enhancing the treatment.⁷

Cryokinetics: Is a systemic combination of cold application to numb the injured body part and graded progressive, active exercises. Cryokinetics referring to combination of cold and exercise. Ice used to anesthetize the injured part; this took 3 to 20 minutes and was ceased when patient reported numbness. Once numbed the body part was exercised with active movements, if any discomfort recurred the ice was reapplied.⁹

Cryotherapy is thought to decrease edema formation via induced vasoconstriction. Reduce secondary hypoxic damage by lowering the metabolic demand of the injured.⁹ Exercises increases blood flow to the injured area vital in healing. Exercise re- establishes neuromuscular function. With this technique exercise is possible much earlier than normal. Swelling is reduced dramatically through the combination of cooling and exercises. If the exercise during cryokinetics becomes so vigorous that further damage may result, the body responds with a pain sensation. Thus cryokinetics has a built in safety value.⁹

Soft Tissue Massage (Deep friction massage): Is a technique popularized by Dr. James Cyriax for pain and inflammation relief in musculoskeletal conditions. Deep friction massage is a technique that attempts to reduce abnormal fibrous adhesions and make scar tissue more mobile in acute, sub-acute and chronic inflammatory conditions by realigning the normal soft tissue fibers.¹⁰

This is carried out by fingertip or by the thumb. Recent study suggests the rise of fabricating material in administrating deep friction massage for better effect and to overcome the fatigue to therapist. Friction massage produces local vasodilatation and also mobilizes the structures in the area. It is an effective means for treating conditions like sprains, strains, tendinitis etc.

According to Cyriax, Deep Transverse Friction causes traumatic hyperemia which results in increased blood flow and decrease in pain. It also increases tissue perfusion and stimulates mechanoreceptors. When we talk about the effect of deep friction massage in tendinitis around shoulder, it stimulates circulation, which overcomes the congestion within the tendon, reduces/prevents adhesion formation.¹¹

AIMS AND OBJECTIVES:

1. To find out the effect of Therapeutic ultrasound along with cryokinetics in patients with acute supraspinatus tendinitis.

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2. To find out the effect of Therapeutic ultrasound along with soft tissue massage (deep friction massage) in patients with acute supraspinatus tendinitis.
3. To compare the effectiveness of Therapeutic ultrasound and cryokinetics over Therapeutic ultrasound and soft tissue massage (deep friction massage) in reducing pain and improving shoulder function in patients with acute supraspinatus tendinitis.

METHODOLOGY:

SOURCE OF DATA:

1. Out Patient Department of Orthopedics, Kempegowda Institute of Medical Science Hospital and Research Center, Bangalore
2. Out Patient Department of Physiotherapy, Kempegowda Institute of Physiotherapy, Bangalore.

METHODS OF COLLECTION OF DATA:

- Study Design: Comparative study design
- Sample size: 60 subjects
- Sample method: Random Sampling Method
- Study duration: 1 year

INCLUSION CRITERIA:

- Clinically diagnosed as acute supraspinatus tendinitis.
- Age group 30-60 years
- Patients of both sexes.
- Empty Can Test positive

EXCLUSION CRITERIA:

- Cold Urticaria
- Cold intolerance or hypersensitivity
- Deep open wounds in shoulder
- Peripheral Vascular Disease
- Skin areas of impaired somatosensory discrimination
- Ischemic Regions around shoulder
- Shoulder Fractures
- Cardiac pacemakers
- Cardiac Condition
- Shoulder dislocation
- Ligament injury in shoulder
- Subjects with clinical disorders such as infective condition of shoulder, tumor, metal implant.
- Adhesive Capsulitis

OUTCOME MEASURES: Pain was assessed on Visual Analog Scale (VAS), and Functional Disability of Shoulder with Shoulder Pain and Disability (SPADI). These outcome measures were assessed at baseline before treatment, day 7 and day 14 and at 2 weeks at the end of treatment session.

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1. Visual Analogue Scale (VAS): A horizontal line was drawn on a paper and participants were asked to mark a point on the line best defined the present pain level, where 0 is indicated no pain and 10 indicated severe pain.
2. Shoulder Pain and Disability Index (SPADI): The Shoulder Pain and Disability Index (SPADI) is a self-administered questionnaire that consists of two dimensions, one for pain and the other for functional activities. The pain dimension consists of five questions regarding the severity of an individual's pain. Functional activities are assessed with eight questions designed to measure the degree of difficulty an individual has with various activities of daily living that require upper extremity use.

PROCEDURE: Sixty subjects fulfilling the inclusion and exclusion criteria diagnosed with acute supraspinatus tendinitis are considered for the study. The study population consisted of individuals between 30 and 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 measures of VAS and shoulder pain and disability index.

After evaluation sixty subjects are divided into two group's i.e.

Group-A and Group-B. Each group consists of 30 subjects each.

INTERVENTION: Group-A will receive treatment using ultrasound therapy with cryokinetics. Group-B will receive treatment using ultrasound therapy with soft tissue massage (deep friction massage).



Fig. 1: Cryopack with towel



Fig. 2: Ultrasound Therapy with Gel

Ultrasound Therapy: Before the start of the treatment, the patients were instructed of the use and the harmful effects of ultrasound. The patient was also instructed about the time of application and the duration of treatment.

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The patient part to be treated was exposed and patient was made to sit on a chair with proper back support and with arm abducted and elbow flexed and resting on a pillow which was placed over table. Skin and transducer was coated with acoustic gel. The applicator is moved in small concentric circular movements.

The transducer head was applied to the therapy region at right angle to ensure maximum absorption. Pulsed Ultrasound with a ratio of 1:4 will be given over the anterolateral tip of the shoulder with an intensity of $1\text{w}/\text{cm}^2$ and 1 MHz frequency for 5 minutes with diameter of ultrasound head was 3cm^2 for a period of 2 weeks at the rate of 1 sitting per day and 6 times a week.



Fig. 3: Therapist giving Therapeutic Ultrasound

Cryokinetics: In this group, pre application precautions were given to all the patients. Patients were instructed not to consciously attempt to overcome the pain. The patients were explained about the types of the pain that they would be experience during the treatment. An insulating layer should be used between the cold pack and patient's skin. Placing a towel between the skin and the cold packs, as many recommended, insulates the skin against the cold, decreasing the effectiveness of cold pack. Some types of cold packs are too cold to be applied to the skin. This is too much too cold for the skin and often results in tissue damage.

The subject is in comfortable supine position. Cryo pack is applied around the involved shoulder covering superior to posterior, superior to anterior aspects. Treatment was given 20 minutes following which active exercises were given for 5-7 minutes. Again cryo pack was applied for 5 minutes then another set of active exercises were given. Exercises include active exercises flexion, extension and abduction of the involved shoulder for ten repetitions. 1 minute of rest session should be given and this treatment is given for 6 sessions per week.



Fig. 4: Application of Cryopack



Fig. 5: Active Flexion Exercise

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Fig. 6: Active Abduction Exercise

Soft Tissue Massage (Deep Friction Massage): Before the start of the treatment, the patients were instructed of the use of and harmful effects of soft tissue massage. The patients were also instructed about the time of application and duration of treatment. Patient receiving soft tissue massage (deep friction massage) were made to bend his/ her elbow to 90° and put the forearm behind his/ her back, then lean back in half lying position. Thus arm was fixed in adduction and medial rotation. Deep friction massage was given to supraspinatus tendon with the tip of index finger, which was reinforced by middle finger. It was given in transverse direction for 10- 12 minutes.



Fig. 7: Administration of soft tissue massage

DISCUSSION: A comparative evaluation study with 60 patients with acute supraspinatus tendinitis was undertaken. 60 patients were divided into two groups, group 1 and group 2. Each group consisting 30 patients. Group 1 received ultrasound therapy and cryokinetics and group 2 received ultrasound therapy and soft tissue massage (deep friction massage). This study was undertaken to study the effectiveness of ultrasound therapy and cryokinetics in comparison with ultrasound therapy and soft tissue massage.

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According to the study done by De Berardino T in which they concluded supraspinatus tendinitis was reported to be more common in people whose job requires repetitive overhead motion and athletes who complete in sports such as swimming, throwing sports, volleyball.

In this study ultrasound therapy and soft tissue massage showed beneficial results in the treatment of acute supraspinatus tendinitis. So group 2 has been shown improvement than group 1 which is proved statistically.

Between the patients interviewed, both males and females in both groups are almost equally affected with acute supraspinatus tendinitis. With 46.7% of males in group 1 and 53.3% in group 2. 53.3% of females in group 1 and 46.7% in group 2. In relation to age this study showing that the patients incidence with acute supraspinatus more in the age group of 30- 60 years. Percentage distribution with regards to age in group 1 is 20% at the age of 31-40 years, 50% at the age group of 41-50 years, 35% at the age of 51-60 years.

In group 2 it is 22% at the age group of 31-40 years, 48% at the age group of 41-50 years and 35% at the age group of 51-60 years. According to Andre Roy (2010), shoulder pathologies increases as age increases.

In this study ultrasound therapy and soft issue massage found to be better than ultrasound therapy and cryokinetics. In group 1 the VAS at day 1 assessment was 7.23 (SD:0.6), day 7 was 5.73 (SD:0.8) and VAS assessment in day 14 was 4.33 (SD:0.9). In group 2 VAS assessment at day 1 was 7.17 (SD:0.7), day 7 was 5.17 (SD:0.9) and was decreased to 3.13 (SD:0.8) at day14. The outcome based on % change was found to be more in group 2.

In group 1 the SPADI at day 1 assessment was 109.90 (SD: 7.14), day 7 was 100.97 (SD: 6.51) and SPADI assessment in day 14 was 96.53 (SD: 6.30). In group 2 SPADI assessment at day1 was 106.67 (SD: 5.81), day 7 was 75.37 (SD: 6.56) and was decreased to 55.75 (SD: 6.38) at day 14.

According to study, Therapeutic Ultrasound is effective in treating supraspinatus tendinitis, which supports the Results of Nauslund (2001) who found that ultrasound was effective in seven randomized controlled trial in the review of Medicine literature and few other studies.¹²

The effectiveness of ultrasound depends upon the intensity, frequency, and duration of treatment. The dose of Ultrasound used in this study was chosen from evidence available literature. Pulsed Ultrasound was used. It is preferred for soft tissue repair with the pulsed ratio 1:4 as per Dyson M. The high intensity can be potentially damaging so the dose of 1w/cm² was used.¹³

According to results of deep Friction massage technique, we can state that Soft Tissue Massage is highly effective in treating supraspinatus tendinitis. These findings support the study done by Guler UF et al (2004) and Gimblett PA et al (1999) who stated that Deep Friction Massage is an effective means of treating with soft tissue lesions.

But these results were contraindicating to the findings of Brosseau et al (2002) who stated that Soft Tissue Massage is not effective for controlling pain in tendinitis because it showed significant improvement in VAS score.

The technique used in this study had evidence from the literature. Position of patients arm behind the back was used in this study as it bend the supraspinatus tendon through the right angle passing from base of coracoids process directly forwards over the head of humerus. Massage was given with tip of index finger, as it is an effective method.

These results of the study also got strong evidences from the study done by Shamshi Sharick (2013) who has done a comparative study of effectiveness of ultrasound and massage alone in

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treatment of acute supraspinatus tendinitis. The result of the study suggests that ultrasound and deep friction massage improves pain symptoms of supraspinatus tendinitis. Deep friction massage alone improved the pain symptoms but was too small to reach.¹⁴

This study implies that both ultrasound therapy with cryokinetics and ultrasound therapy with soft tissue massage (deep friction massage) can be used for treating patient with Acute Supraspinatus Tendinitis.

CONCLUSION: In this study, Visual Analogue Scale and Shoulder Pain and Disability Index were used to measure the prognosis of the pain intensity and functional ability in treating acute supraspinatus tendinitis was determined.

Taking into consideration the parameters of pain using VAS and shoulder functional scale by SPADI, therapeutic ultrasound and cryokinetics was compared with therapeutic ultrasound with soft tissue massage (deep friction massage) in acute supraspinatus tendinitis.

The study concluded by taking mean scores that therapeutic ultrasound with cryokinetics and therapeutic ultrasound with soft tissue massage are efficient and useful in rehabilitation of patient with acute supraspinatus tendinitis. They improved the functional ability, relieve pain and considerably improve the physical performance of patients in their own aspects.

Hence therapeutic ultrasound and soft tissue massage (group 2) showed significant improvement than therapeutic ultrasound and cryokinetics (group 1) in reducing pain and enhancing functional performance in patient with acute supraspinatus tendinitis.

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AUTHORS:

1. H. B. Shivakumar
2. Chanappa T. S.
3. Pradeep Kumar Reddy
4. Jayashree Dey

PARTICULARS OF CONTRIBUTORS:

1. Professor, Department of Orthopaedics, KIMS, Bangalore.
2. Associate Professor, Department of Orthopaedics, KIMS, Bangalore.
3. Lecturer, Department of Physiotherapy, KIMS, Bangalore.
4. 2nd Year Post Graduate, Department of Physiotherapy, KIMS, Bangalore.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. H. B. Shivakumar,
Professor, Department of Orthopaedics,
KIMS, V. V. Puram,
Bangalore – 560004.
E-mail: hbsk67@gmail.com

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