VOLUME-6 | ISSUE-3 | MARCH - 2017 • ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46

EFFECTIVENESS OF COMBINED ULTRASOUND THERAPY AND DEEP FRICTION MASSAGE VERSUS ULTRASOUND THERAPY ALONE IN MANAGEMENT OF SUPRASPINATUS TENDONITIS

Physiotherapy

KEYWORDS: Supraspinatus Tendonitis; Ultrasound Therapy; Deep Friction Massage.

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ABSTRACT

Background: Supraspinatus tendonitis is found to be one of the most common causes for the Shoulder pain. Deep friction massage (DFM) can be applied to treat musculoskeletal pain, inflammation and adhesions. Even though, US is used to stimulate tissue healing and repair, US therapy alone is less effective in treating soft tissue disorders. So the objective of the present study is to compare the combined therapy of US and DFM versus US therapy alone in the management of supraspinatus tendonitis. **Materials and Methods:** Seventeen male patients diagnosed with supraspinatus tendonitis were randomly distributed into two different groups. Group (A) treated by therapeutic US and DFM and group (B) treated by therapeutic US alone. The outcome tools used to evaluate the effect were the Visual Analogue Scale (VAS) and active abduction range of motion (AROM- ABD) in shoulder joint. **Results:** The results shows that, at the end of the treatment, the VAS as well as shoulder abduction ROM showed significant changes in the group A than in the group B. **Conclusion:** The combination of US treatment and DFM were significantly more effective than the US alone in management of supraspinatus tendonitis.

INTRODUCTION:

The shoulder pain ranked the third most common musculoskeletal disorder behind spine and knee, according to the American Orthopaedicians. Prevalence of shoulder pain with the age 65 years and older is 34% [1]. Shoulder pain is one of the most common musculoskeletal complaints handled by physical therapists in clinical practice which is having a prevalence of as high as 20% in the general population. Rotator cuff injury is found to be one of the most common causes of shoulder pain. Among the whole of rotator cuff injury, the most common muscle gets involved is the supraspinatus. Other common causes of shoulder pain formed within the joint comprises of frozen shoulder, calcific tendonitis, shoulder dislocation, instability, labral tears and degeneration as osteoarthritis. Shoulder pain can also initiate from nearby areas such as the neck or shoulder girdle muscles as well [2]. The rotator cuff muscle's function is to rotate the arm and to stabilize the humeral head. Rotator cuff injuries include a spectrum of disorders affecting the muscles, tendons and bursa around the glenohumeral joint. Injuries to these includes tendinitis, tendinosis, impingement and tears[3].

Supraspinatus tendinitis can be manifested as an acute or chronic painful disorder of the shoulder. Acute stage usually takes place in younger patients after overuse or abuse of shoulder joint. Chronic stage tends to occur in older patients mainly of due to aging. Supraspinatus tendonitis pain is felt mainly in the deltoid region which is constant and severe in nature[4]. Most cases with such syndrome are treated by Analgesics, NSAID, Steroid injections and common physiotherapy modalities such as Laser, TENS, Interferential currents, cryotherapy, Ultrasound (US), Massage and exercises [5]. Tendinotis treatment comprises of medical, surgical or rehabilitation methods. The rehabilitation approaches commonly use soft tissue mobilization and massage. Deep friction massage (DFM) can be applied to relieve pain, inflammation and adhesions in musculoskeletal disorders[6,7]. It is carried out by applying pressure in a slow circular manner with the fingers or ball of the thumb deeply and transversely to the definite tissue unlike the superficial massage. These intense movements over a very small area make it operative. Mechanical action of DFM can stimulates the mast cells in connective tissues producing histamine, which will cause blood vessels dilation, resulting in hyperaemia and increasing in blood flow to the specific area. The release of histamine also can help to diminish the pain [8, 9]. DFM is often the method used to minimize abnormal fibrous adhesion formation and mobilize scar tissue in sub-acute and chronic inflammations. It also boosts normal healing by cutting cross bridges and stopping abnormal scarring [10]. The stimulus of this massage type can penetrate into deep muscles, tendons and ligaments. It is one of the dignified techniques of treatment in managing tendinitis, which is found to be effective by improving blood flow, mobilizing the scars, improving ROM and by stimulating the mechanoreceptors [11].

Ultrasound (US) therapy is widely used in many soft tissue lesions and especially in sports injuries. It is a device using sound waves generating heat inside a body area. US produce several effects further than just the possible heating. It has been revealed to diminish pain, muscle spasm, increase circulation, increase mobility of soft tissues and breakdown of scar tissues. Therapeutic US has a frequency range of 1.0 - 3.0 MHz, where US at a frequency of 1MHz is absorbed chiefly by deeper tissues and a frequency of 3MHz is applied for more superficial lesions [12, 13]. Therapeutic US have been found to be effective by one or more mechanisms like; early resolve of inflammation, speeding up of fibrinolysis, stimulation of macrophage derived fibroblast, denser collagen fiber and improved tissue tensile strength [14, 15]. By this way, the US promotes and accelerates tissue healing and repair [16, 17]. Even tough, both US therapy and DFM is found to be effective in isolation, in the treatment of soft tissue disorders, the present study is conducted to find out whether combined Therapy of US and DFM would be a better method of treatment rather than US Therapy alone in the management of supraspinatus tendonitis.

MATERIALS AND METHODS:

Seventeen males patients aged from 50 to 70 years old diagnosed with supraspinatus tendonitis were selected from physiotherapy outpatient Clinic. They were randomly divided into either of the two different groups; Group (A) treated by therapeutic ultrasound and deep friction massage and group (B) treated with therapeutic ultrasound alone. All the patients were selected according to the following inclusion criteria; subjects diagnosed with supraspinatus tendonitis for more than 1-3 months, patients aged between 50 to 70 years, suffering of severe pain during activities in the affected shoulder joint and the specific tests like drop arm test, Neer's impingement sign, Hawkins impingement sign and Painful arc were of positive as a confirmatory clinical tests. The following were the exclusion criteria; acute inflammation, diabetes mellitus, sensory motor deficit, fractures around shoulder complex and cervical spondylosis.

The US therapy was administered with the equipment Intellect Mobile Combo (Model 2778) manufactured by Chattanooga, Mexico. Before the start of the treatment the patient was positioned comfortably and assessed thoroughly about his or her condition. The patient has been advised of the benefits and risks of the procedure and as well as the sensation they should expect during procedure. Patient was instructed that the appropriate sensation and any excess heat or pain should be reported.

A transmission gel is applied as a coupling media to the skin and to surface of the transducer head. The ultrasound head is moved in

overlapping circles, rate of transducer movement is slow, maximum 3-4 cm sq and dose of ultrasound was 1W/cm^2 with a frequency of 1 MHz in continuous mode. Since 1MHz has a deeper penetration effect, this frequency was selected. The US was administered over the supraspinatus tendon at its insertion on the greater tubercle of the humerus in a slow circular movement fashion. The shoulder of the patient was positioned in extension and medial rotation, so that supraspinatus tendon is exposed properly.

Dosimetry for Ultrasound Therapy:
Machine: Intellect Mobile Combo (Model 2778) manufactured by Chattanooga, Mexico.
Frequency: 1 MHZ
Mode: Continuous mode
Intensity: 1 W/cm^2
Duration: 6 Minutes
Treatment protocol: 3 times weekly for 6 weeks [18].

The Deep friction massage was applied by making patients to sit comfortably on a chair. With the fingers directly onto the supraspinatus tendon, the fingers were moved over the surface of the tendon with a considerable degree of pressure, and fingers moved in a circular direction. The shoulder of the patient was positioned in extension and medial rotation. And the deep friction massage treatment was given for 6 minutes.

The outcome tools used for evaluating the effect of both the groups of treatments were; the Active Range of Motion of Shoulder Abduction (AROM-ABD) to know the objective method to know the improvement and Visual Analogue Scale (VAS) to check the intensity of pain. The AROM-ABD was measured by making the patient positioned comfortably in a sitting position and assessed thoroughly about his condition. Shoulder was positioned in 0° flexion and extension with externally rotated and stabilized against thorax, following which the patient was asked to abduct his shoulder. Goniometer's axis was kept at the greater tuberosity of humeral head, while stationary arm is parallel to sternum and movable arm is aligned with midline of humerus. The VAS was assessed by asking the patient to indicate the subjective intensity of pain on the line where the pain is in relation to the two extremes from 0 to 10 cms scale, where 0 means no pain at all and 10 mean the worst unbearable pain [19].

Treatment for both groups continued for six successive weeks with three sessions per week and the outcome measures were assessed before starting the treatment and at the end of six weeks of treatment.

STATISTICAL ANALYSIS AND RESULTS:
The data were statistically analyzed by using the statistical package SPSS for Windows (version 21.0; SPSS Inc, Chicago, IL). The level of statistical significance have been set at p <0.05. To compare differences for the outcome tools of AROM- ABD and VAS within each group (A and B) before and after six weeks of treatment, the paired-sample t-test was used to obtain statistical comparison between values and for the intergroup comparison the unpaired t test was used. Results are presented as means ± standard deviation (SD). Comparison between mean values of all variables in both A and B groups before application of treatment revealed non-significant differences (p>0.05). Seventeen patients who diagnosed with supraspinatus tendonitis data were analyzed where, their ages range from 50 to 70 and the mean age was 62 (±5.27) years.

As shown in Table: 1 and Figure: 1, AROM-ABD in the affected side was significantly increased in the group A than the group B, where the pretreatment mean value of the shoulder abduction ROM in the group (A) patients was 158.50 (±13.426) and became 176.50 (±4.248) post treatment, which means there is significant difference between the values of shoulder abduction ROM pre and post treatment (p<0.002). In the group (B) patients, the pretreatment mean value of shoulder abduction ROM was 160.00 (±13.498) and became 171.00 (±9.188) post treatment, which means there is significant difference between the values pre and post treatment (p< 0.001).

As shown in Table: 1 and Figure: 2, the pretreatment mean value of the pain intensity in the group (A) patients was 6.50 (±1.080) and became 1.80 (±0.789) post treatment, which means there is significant difference between the values pre and post treatment (p<0.001). In the group (B) patients, the pretreatment mean value of the present pain intensity was 6.60 (±1.174) and became 2.40 (±0.641) post treatment, which means there is significant difference between the values of pain intensity pre and post treatment (p< 0.002).

The inter-group comparison was done for the AROM-ABD using the unpaired t-test, and the difference in the mean improvements of the groups was 7.0 degrees (p<0.05), a significant result in the group A showed greater improvement (Table 2). However, for the inter-group comparison of VAS showed the difference in the mean improvements of the groups was 0.5 (p<0.05), a significant result in the group A showed greater improvement (Table 3).

Table 1: Mean score of AROM-ABD and VAS in A & B Groups.

Group	Mean AROM-ABD		Mean VAS	
	Pre	Post	Pre	Post
A	158.50 (±13.426)	176.50 (±4.248)	6.50 (±1.080)	1.80 (±0.789)
B	160.00 (±13.498)	171.00 (±9.188)	6.60 (±1.174)	2.40 (±0.641)

Table 2: Comparison for AROM-ABD between the A& B Groups.

Group	N	Mean Difference	SD
A	9	18	9.18*
B	8	11	4.31

* p <0.05

Table 3: Comparison for VAS between the A& B Groups.

Group	N	Mean Difference	SD
A	9	4.7	0.29*
B	8	4.2	0.53

* p <0.05

Figure 1: Pre and post treatment comparison of affected AROM-ABD in both groups (A and B).

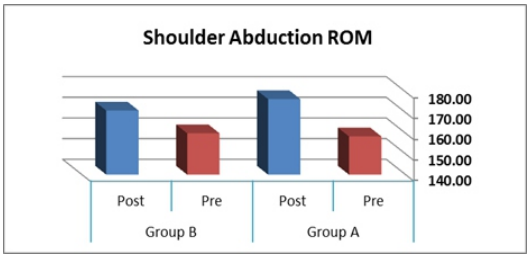
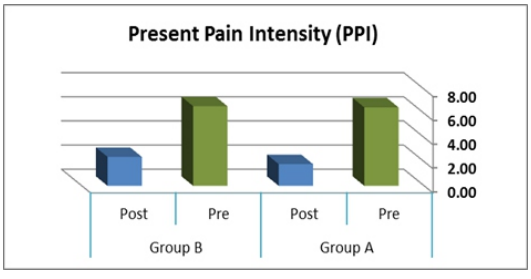


Figure 2: Pre and post treatment comparison of VAS in both groups (A and B).



DISCUSSION:
Supraspinatus tendonitis is one of the conditions that can be treated by a wide variety of physiotherapy methods and in the current study an effort was made to study the efficacy a combination of deep friction massage with ultrasound versus ultrasound therapy alone in

VOLUME-6 | ISSUE-3 | MARCH - 2017 • ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46

the management of supraspinatus tendonitis. The results of the study found that ultrasound treatment with deep friction massage was significantly more effective in the management of supraspinatus tendonitis than the ultrasound alone. In treatment of supraspinatus tendinitis the ultrasound and deep friction massage was found to reduce pain and disability significantly than the ultrasound alone.

In this study all patients were asked to modify their activities to reduce impact on the tendon as it may influence in early stages of treatment for tendonitis. However, exercises are not included in any of the groups for the reason that, micro tears present in tendonitis may be prevented from healing. The initial goal of any shoulder treatment program includes the reduction of pain and inflammation by protection of the extremity from stress but not complete function. No significant advantage was found in treatment of shoulder conditions with ice or ultrasound treatment but both were beneficial in decreasing the pain [20].

The biophysical effects of ultrasound revealed that, there was insufficient evidence to provide a scientific effect for the clinical use of ultrasound. During the session, 1MHz was used because it produces biophysical effects in the deeper tissues with ultrasound and is capable of reaching the supraspinatus tendon.

Deep friction massage is very effective in treating supraspinatus tendonitis with its effect of increasing local blood flow to enhance the rate of healing. DFM is one of the numerous treatment techniques advised for the management of pain in patients having tendonitis. Dr. James Cyriax in 1930s, a famous orthopedic surgeon in England, first explained about it [21, 22]. DFM increase mechanical load to the tendinopathic tissue and minimize molecular cross-linking during the healing course, which offers a sensible demonstration for observed reactions. In addition, the mobilization of metabolic waste products out of target tissue and improving of blood flow via massage can cause diminishing in muscle spasms that lead to reducing pain [23]. Massage allows pressure to be applied to greater depth in tendons and it is been advocated in the treatment of muscle strains, tendonitis and ligament strains [24]. They also help in increasing the blood supply to the area applied and deep structures are usually given. When applied helps in increasing local temperature of the part and breaking adhesions and scar tissue. Have tissue feeling and increase macrophage activity and increase the adhesion of leucocytes to the damaged endothelial cells thus helping in reducing the inflammation and associated muscle spasm [20].

In this study to understand the efficacy of treatment methods, pain was taken as one of the parameter. Extensive data about the pain was collected for all the 17 patients. Data for pain was collected in the form of Visual Analogue Scale (VAS) score, and AROM-ABD was also taken. To assess the intensity of pain, the most common tool used in physical therapy session is the Visual Analogue Scale (VAS), which is a reliable and valid measure [25]. It is commonly consist of the patient is asked the level of pain intensity he presently feels and it is sensitive to pharmacological and non-pharmacological procedures, which alters the experience of pain. There are also limitations and disadvantages of VAS. It has difficulty with administration in a patient who has perceptual motor problems, patients who cannot comprehend the instructions and impractical scoring method in a clinical setting where immediate measurement of patient's response may not be possible.

In the previous two studies, the combination of DTFM with other physiotherapy modalities did not show appropriate benefit over the control of pain, or functional status for patients with lateral knee tendinitis or for patients with lateral elbow tendinitis. However, these outcomes are limited by the small sample size, so there is a need for future trials using adequate sample sizes and specific methods before conclusions about the specific effect of DTFM on tendonitis can be drawn.

CONCLUSION:

The combination of US treatment and DFM were significantly more effective than the US alone in management of supraspinatus tendonitis.

ACKNOWLEDGMENT

I acknowledge all the subjects who participated in this study.
Financial Support: Self
Conflict of Interest: Nil

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