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Comparative Study of Rotator Cuff Tendinitis Management Ultrasoundwith Exercises and Exercises Alone

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Abstract:
Study Objective*: Comparative study of rotator cuff tendinitis management by Ultrasound with Exercises and Exercises alone*
Design: *Pre &post test control group design.*
Method and Measurements*: 40 patients [Male=20, Female=20] from Outpatient department, who werediagnosed with rotator cuff tendinitis pain, were randomly assigned to either group A receiving US and Exercise combined and group B receiving Exercise alone. Treatment was given for 5 times in a week for the period of 3 weeks. Before treatment and after 3 weeks of treatment pain was assessed on VAS and MPQ.*
Results: *Subjects in-group A that received US and exercise showed greaterImprovement in pain compared with the exercise group on 3rd week compared with pre treatment. (p0.050)*
Conclusion: *The result of study suggests that both US and exercise improves the symptoms of rotator cuff tendinitis pain. Exercise alone improved the pain symptoms but was too small to reach satisfactory outcome for patients. Based on these results US and Exercise should be the treatment of rotator cuff tendinitis pain rather than Exercise alone.*
Keywords: *Continuous Ultrasound, Exercise, Rotator cuff,*

I. Introduction

Rotator cuff disease is the most common cause of shoulder pain, particularly among the middle-aged and elderly. It is the most commonly diagnosed cause of shoulder dysfunction being the causative factor in 74% of cases of shoulder pain. With increasing age, the tendons that form the rotator cuff undergo progressive degenerative changes which can lead to partial or full-thickness tearing of the tendons, resulting in pain, weakness and dysfunction in the rotator cuff and scapular muscles, tightness in the soft tissues, and postural abnormalities[1].

Rotator cuff disease can possibly be treated successfully with conservative management, but this depends upon the gender of the patient and tear size as well as the degree of atrophy[2].

Conservative management aims to control pain, improve patients' range of motion (ROM), and enhance the scapulothoracic rhythm and function. Conservative management also includes patient education and the use of analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), and injections, functional rehabilitation, and manual therapy along with physiotherapy modalities such as therapeutic ultrasound (US), which is used to promote healing and regeneration in inflamed tissue, reduce pain and muscle spasms, and improve ROM[2,3,4]. Some studies have found that the use of US does not significantly improve shoulder problems[3,5].

The aim of this study was to evaluate the effects of therapeutic US on pain along with exercise, functional status, in patients with shoulder pain due to rotator cuff tendinitis.

II. Materials And Methods

Subjects:40 patients[M=20, F=20] from Outpatient department, who werediagnosed with rotator cuff tendinitis, were randomly assigned to either group A receiving US and Exercise combined and group B receiving Exercise alone. Treatment was given for 5 times in a week for the period of 3 week. Before treatment and after 3 weeks of treatment pain was assessed on VAS and MPQ[6].

Design: Study utilized pre &post test control group design.

Equipments& Measuring Tools:
Examination table, US machine, Towel, VAS, Pillow, weight

Inclusion Criteria:[7,8]
1- Presence of unilateral shoulder pain and limited active movement for at least four weeks priorto the study.
2- Normal passive shoulder movement,
3- Diagnosis of rotator cuff disease by magnetic resonance imaging (MRI),
4- No physiotherapy for the shoulder in the four weeks prior to the study.

In addition potential study subjects needed to have at least two of the following positive impingement signs: positive results in the Speed, Neer, or Hawkins tests or the drop arm, lift-off, or supraspinatus isolation tests; a resistant, painful shoulder during internal and external rotation (IR and ER); or pain during the abduction of the shoulder with a painful arch.

Exclusion Criteria:[1]
1-History of acute trauma, surgery or a fracture to or in the proximity of the shoulders,
2-ROM limitation in the upper extremities,
3- Neurological deficit in the upper extremities,
4- Underlying inflammatory rheumatic disease, or signs of cervical pathologies that might beassociated with shoulder pain.

Ultra Sound treatment procedure and technique:

Ultrasound was applied at a continuous wave frequency of 1MHz and at an intensity of 1.5 W/cm2. The transducer head had an area of 4.7 cm2 and an effective radiating area of 4.1 cm2. While sitting on a table, the patients placed an arm on their lap with their hand in a supinated position. Using slow circular movements, the physiotherapist applied the transducer head over the glenohumeral joint, covering an area of approximately 10 cm2 for a five-minute period[1].

Fig 1- Ultrasound technique

Placebo Ultrasound:

Patients in placebo group received same duration of Ultrasound with the apparatus switched on (so that patients see lights flashing on machine) but without any current output. In this way, patients were blinded for Ultrasound treatment[9].

Exercise therapy:

Exercise for the shoulder girdle included the active and passive range of motion (ROM) exercises, stretching, Codmann exercises, and isometric and isotonic exercises. The exercises were applied to all of the subjects by the same physical therapist. The duration of exercise was a minimum of 15 minutes and a maximum of 30 minutes. At the start of the therapy, or when a subject had severe pain, passive restricted ROM exercises and gentle stretching were used. At a later phase or when pain lessened, exercise shifted toward active ROM exercises, and gradually isometric and dynamic resistance exercises were added, resulting in a longer duration of intervention[6].

Pendulum exercise, isometric exercises on the shoulder, chin tuck, back extension, shrug exercise were done in this phase too. All of these exercises were done 30 times daily. Stretching exercises for posterior capsule, anterior capsule, the inferior capsule, and trapezius muscle were done per day. Each time 5 repetitions were done for 15 seconds. Strength training for periscapular muscles was added to the previous exercises. Wall push up, wall push up with medicine ball, push up, push up plus were conducted as 3 sets 10 repetitions daily beside other exercises. Cuff strength training severity was increased gradually as 3 sets 15 repetitions and abduction was done in higher angles. Exercises on medicine ball were done as push up, quadruped exercise, diagonal exercise. At the beginning of each treatment sport session, At the end of each treatment session, ice was applied on the shoulder for 20 min[10].

Fig 2- ROM exercise

Fig 3- Pendulum exercise with 1 kg weight

Pain was assessed by VAS and MPQ before starting treatment and on 3rd week of post treatment session.

In VAS Patients were asked to describe their pain status on a 10cms line where left end represents no pain and right end represents maximum pain.MPQ consists of a set of pain descriptor list, and are read to a patient with the explicit instruction that he chooses only those words which described his feelings and sensations at that moment.

PRI is based on the rank values of words. In this scoring system, the word in each subclass implying the least pain is given a value of 1, the next word is given a value of 2, etc. The rank values of words chosen by a patient are summed to obtain a score separately for the sensory (subclass 1-10), affective (subclasses 11-15), evaluative (subclass 18) and miscellaneous (subclasses 17-20) words, in addition to provide a total score (subclasses 1-20).The PPI is recorded as a number and is associated with the following words 1-mild, 2-discomforting, 3-distrcession, 4- horrible, and 5-excruciating.

DataAnalysis: All Data was analyzed using statistical test-pair t test. Mean and SD for pre R_x and after 3rd week Rx pain values were calculated for each group. Significance was accepted at 0.05 level of probability.

III. Result

In this study 40 patients participated with a mean age of 46.35±14.22 in group A (M, n=10; F, n=10) and 43.55±15.33 in Group B (M, n=10; F, n=10) ranging from 25 to 65 years (Table 1). Sex was matched in both the groups.

	Group A (N=20)Mean±SD	Group B (N=20)Mean±SD
Age (Yrs)	46.35±14.22	43.55±15.33

Table1: Mean and SD of age between group A and B.

Mean reduction in PRI, PPI &VAS of group A & B with p & t values:

Mean reduction in PRI (Table 2,)

Both groups had significant difference in pre R_x to 3rd week values as t and p values for group A and B were t=12.55, p=0.003 and t=10.75,p=0.018 respectively (table 2).

Groups	Pre R_X	3rd week	Pre R_x to 3rd week		
			Mean±SD	Paired t value	P value
Group A (N=20)Mean±SD	21.21±4.15	2.15±1.35	15.61±4.14	12.55	0.003
Group B (N=20)Mean±SD	17.22±4.39	7.55±3.31	7.71±2.42	10.75	0.018

Table 2: Mean reduction in PRI values between group A and B. Mean and standard

deviation at pre treatment, 3rd week and pre treatment to 3rd week with t and p values.

Mean reduction in PPI (Table 3,)

Both groups had significant difference in pre R_x to 3rd week values as t and p values for group A and B were t=10.58, p=0.010 and t=10.39,p=0.025 respectively (table 3).

Groups	Pre R_X	3rd week	Pre R_x to 3rd week		
			Mean±SD	Paired t value	P value
Group A (N=20)Mean±SD	4.35±0.60	0.58±0.41	2.54±0.73	10.58	0.010
Group B (N=20)Mean±SD	4.14±0.62	1.45±0.63	1.89±0.67	10.39	0.025

Table3: Mean reduction in PPI values between group A and B. Mean and standard deviation at pre treatment, 3rd week and pre treatment to 3rd week with t and p values.

Mean reduction in VAS (Table 4,)

Both groups had significant difference in pre R_x to 3rd week values as t and p values for group A and B were t=16.76, p=0.006 and t=10.66,p=0.015 respectively (table 4).

Groups	Pre R_X	3rd week	Pre R_x to 3rd week		
			Mean±SD	Paired t value	p value
Group A (N=20)Mean±SD	6.53±1.20	0.40±0.35	5.55±1.38	16.76	0.006
Group B (N=20)Mean±SD	5.61±1.40	2.73±1.13	2.87±0.85	10.66	0.015

Table 4: Mean reduction in VAS values between group A and B. Mean and standard deviation at pre treatment, 3rd week and pre treatment to 3rd week with t and p values.

Thus, it can be concluded from above results that both interventions (US and Exercise) were effective in Pain reduction as reflected by VAS and MPQ .But, Patients (group A) that received US and Exercise showed greaterimprovement in pain compared with Exercise (group B)on 3rd week compared with pre treatment .

IV. Discussion

Several factors, such as poor posture, weakness and dysfunction of the rotator cuff and scapular muscles, decreased ROM in the shoulder complex, degeneration and inflammation of tendons and bursae, acromial dysmorphology, capsular tightness, and glenohumeral instability, are commonly believed to contribute to rotator cuff disease[3,6,10,11]. Rehabilitation of this disease aims to control pain, improve ROM, and provide scapulothoracic rhythm and function[12,13].

Evaluating the efficacy of physiotherapy programs for rotator cuff disease, joint mobility and stretching, relaxation, and exercise programs are deemed to be beneficial for strengthening the rotator cuff muscles[14].

Therapeutic US is commonly used for the conservative treatment of rotator cuff disease and is generally prescribed in conjunction with other interventions. When applied with appropriate intensity and frequency, it increases the temperature in soft tissues with a high protein density. The physiological effects of US are increased blood flow, vascular permeability, and local metabolism and enhanced fibrous tissue extensibility and muscle relaxation[1].

US is commonly prescribed in addition to other interventions such as electrical stimulation and exercise. US were applied in addition to the use of superficial heat because of the often-used hypothesis that US further affects healing in people with soft tissue diseases[6].

There is positive impact of conservative treatment in total tear of rotator cuff. According to the reports of the previous studies[15,16].

There is evidence in favor of positive impact of exercise in treatment of total tear of rotator cuff tendons. In most of the studies it has been emphasized that further studies are required for supporting the results[17].These all study findings support the results of the present study.

V. Conclusion

Based on the literature and the results of our study, we conclude that there is insufficient evidence to merit wide use of 1-MHz US in combination with Exercise in the management of pain full shoulder conditions (RCT). In our opinion, with the guidance of randomized controlled trials, it is time to use interventions that favor minimal use of time and maximum economy. Although further studies are needed on the effectiveness of physical therapy interventions in the management of painful conditions such as shoulder disorders, it is apparent that adding US to a well-planned intervention regimen has no benefit.

VI. Interest of Conflict Reference

Some limitations of this study when no follow up was done by patient and variable patient mass. To reach significant conclusion further prospective study with comparable patient variables like ROM, Muscle force, disability & muscle strength. Further research is clearly indicated to establish if there is effectiveness of exercise alone in the treatment of rotator cuff tendinitis. There was an improvement of shoulder pain, but it was too small to reach a satisfactory outcome for patient, most of whom required further physiotherapy to reduce their symptoms. This is a dire necessity in the field since a number of physiotherapy approaches are in vogue. So, further research can be done with a large sample using the same protocol to study which modality is more effective in treatment of shoulder pain due to rotator cuff tendinitis.

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