

# Effects of Therapeutic Ultrasound and Manual Physiotherapy in Shoulder Impingement Syndrome in Volleyball Players

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## ABSTRACT

**Objective:** To look into the effectiveness of ultrasound therapy in addition to physical therapy and exercises on relief of pain, increase in the range of movements and improvement in muscle power in patients of Shoulder Impingement Syndrome (SIS).

**Patients and Methods:** A total of 30 patients, aged 18-30 years, of SIS were randomly selected amongst volley ball players. They were divided by convenient sampling into two groups of 15 patients each: therapeutic ultrasound manual physiotherapy & exercise treatment (TUMPET) Group and manual physiotherapy exercise treatment (MPET) Group; the latter served as the control group. Both group were tested twice once before the start of treatment and once after completion of treatment.

**Results:** The measurement of shoulder Rang of Movement and muscle power show significant results in both control and treatment groups at the end of 14th week's treatment period. In control group (Group MPET) the range of motion degree scale has improved from  $135.53 \pm 10.88$  to  $136.67 \pm 9.94$  P-value 0.000 and muscle strength grades has improved from  $3.33 \pm 0.49$  to  $4.00 \pm 0.000$ . In the interventional group (Group TUMPET) the range of motion degree scale has improved from  $134.00 \pm 6.80$  to  $164.33 \pm 8.42$  P-value 0.000 and muscle strength grades has improved from  $3.47 \pm 0.52$  to  $5.60 \pm 0.50$  P-value 0.000.

**Conclusion:** Those individuals who received ultrasound treatment along with manual and exercises therapy showed significant improvement at fourteen weeks' treatment.

**Keywords:** Manual therapy, Shoulder exercises, Shoulder impingement syndrome, Therapeutic ultrasound

### Author's Contribution

<sup>1</sup> Conception, Synthesis and Planning of the research, Active participation in data collection. <sup>2</sup> Active participations in active methodology, Interpretation, analysis and discussion. <sup>3</sup> Data management. <sup>4</sup> Analysis and discussion. <sup>5</sup> Data management

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## Introduction

Various studies have been conducted focusing on the clinical problem of Shoulder Impingement Syndrome (SIS), especially making an attempt to identify the causes

of this problem and the damage it causes to a sport man. Kibler argued that sportsmen, normally throwing athletes and swimmers, who experience the unpleasant effects of

impingement disorder, are shown to have tear of the scapulothoracic muscles.<sup>1</sup> The dynamic impact of the scapular muscles weakening is best shown when the serratus anterior muscle is involved.<sup>2</sup> The failure of stretching the scapula offers ascent to scapula winging via raising the upper limb.<sup>3</sup> Weak muscles of scapula modify the scapulohumeral muscles and spot tension on gleno-humeral, which brings about auxiliary muscles outward the impingement.

In the tendon of supraspinatus and sub acromial bursa, the painful condition is sub acromial impingement syndrome (SIS) in the arch of coracoacromial and humeral head; this is a common cause of pain.<sup>4</sup> The pain is felt severely and is caused by micro trauma, misuse or repetitive movements of the overhead position of the arm which is leading to deltoid and biceps area. It is presumed that the stiffness of coracoacromial ligament, the long head of biceps lesion, rotator cuff tear, partial or full thickness and sub acromial bursitis and abnormal biomechanical movements of scapula are the main causes of sub acromial impingement disorder.<sup>5</sup> The literature shows the effectiveness of different physical therapy movements and manual therapy procedures on the management outcome.<sup>6</sup> Effectiveness of the use of ultrasound therapy for the management of SIS is still inconclusive. Several researches show that ultrasound for SIS do not provide an extra advantage<sup>7</sup>; others show the usefulness of ultrasound in SIS.<sup>8</sup>

Sub acromial impingement might be treated by means of traditional treatment.<sup>9</sup> For range of motion and muscular power to restore the mobility and stability of shoulder perform specific supervised exercises. Therapeutic ultrasound is more common in physical therapy treatment and other electrotherapy treatments like TENS and stimulator are also used.

Mulligan's theory on manual therapy is that damage of joint or loss in function result in a chronic misaligns inside the joint and the procedures are used to straighten joint or re-establishing its alignment for decrease in pain, improve utility and improve dynamic range of movement in shoulder abduction.<sup>10</sup> The rationale of this study was to evaluate, firstly, the impact of ultrasound treatment for impingement disorder in athletes and coaches. We are interested to increase muscle strength of shoulder joint by different shoulder exercises.

## Patients and Methods

A randomized control trial was done. A total of 30 male volley ball players with SIS were enrolled in the study from different universities of Lahore. They were allocated into two groups of 15 individuals each by non-probability convenience sampling; these groups were named as therapeutic ultrasound manual physiotherapy & shoulder exercise treatment (TUMPET) Group and manual physiotherapy shoulder exercise treatment (MPET) Group. Both group were tested twice once before the start of treatment and once after completion of treatment. The participants were separated into two assemblies via convenience sampling. The duration of the study was 14 weeks.

The following two procedures were used for evaluation of the patients:

Abduction range of motion which was measured by the degree of range of motion and assessed by a goniometer. It consists of 4 degrees of shoulder abduction range of motion i.e., 40 – 60 degree, 61 – 100 degree, 101 – 150 degree and 151 – 180 degrees.<sup>12</sup> Muscle power which was measured by grading system of muscle power and assessed by using the 3 kg weight.<sup>12</sup> It consists of 6 grades and has response as (Grade 0: refers to non-contractile and non-sensory in palm of the person.

Grade 1: The individual presently feels a contraction lacking the capability of hands to move.

Grade 2: The patient devoid of burdens raises hands by means of half of the range. Grade 3: The person only with no weights can raise hands with full range.

Grade 4: person can lift weight up to three kg to partial range, 90 degrees.

Grade 5: The person can lift three kg with full range). Demographic data included the following information: ages of the participants and difficulties in overhead activities.

All participants completed the study and were included in the analysis. 15 individuals from MPET group completed the study that expected manual therapy and executed the exercises of shoulders. Whereas 15 individuals of TUMPET group as well completed the study that acknowledged ultrasound therapy, exercises of shoulders and manual therapy. The protocol for both the MPET and

TUMPET groups involved the application of manual physical therapy and shoulder exercises for a total of 14 treatment sessions of 30 minutes, over a period of 14 consecutive weeks. At the beginning of the treatment, all participants were given a brief explanation of anatomy and biomechanics of the shoulder complex and a short description of the etiology and pathology of SIS.

The treatments aimed to prevent further damage and consisted of manual therapy techniques such as joint mobilization techniques and transverse friction massage and shoulder pendulum exercises. The treatments aimed at restoring the functional level by increasing ROM, muscle strength and flexibility and consisted of ROM exercises with rope and pulley, L bar exercises, self-capsular stretching exercises, joint mobilization techniques and strengthening exercises with weights, therapeutic bands, springs and push-ups. The standard exercise protocol and manual therapy were given in order to restore muscular deficits in strength, mobility, and coordination of the rotator cuff and the shoulder girdle muscles to unload the subacromial space during active movements. And the participants were expected to return to their functional level without recurrence at the end of the treatment. Participants in the TUMPET group received continuous ultrasound for 5 minutes with a device that was operated at a frequency of 1.5 MHz, and an intensity of 1 W/cm<sup>2</sup>, the treating physical therapist, using the technique of slow circular movements, applied the transducer head over the superior and anterior periarticular regions of the participant's glenohumeral joint and on the shoulder trigger points. The treatment was

continued from the first treatment session over the 15<sup>th</sup> treatment session period.

All Data was entered and analyzed carried out with SPSS statistical software (version 21). Distributions of frequency and also standard deviations and means were utilized for expressive reasons. Paired sample T-test to assess the difference of Mean values,  $\pm$  Std. deviation and P value or not in 1st week range of motion and power of muscle and 14th-week range of motion and power of muscle within each group. Independent sample T-test to assess dissimilarity of Mean values,  $\pm$  Std. deviation and P value for significant or not in 1st-week range of motion and power of muscle and 14th-week range of motion and power of muscle in between groups. The P value was considered statically significant 0.05.

## Results

The mean range of ages and sports experience was calculated by mean values. The average age of both groups (MEPT and TUMPET) was  $24.57 \pm 2.54$  and sports experience was  $3.58 \pm 1.73$  (Table 1). Paired sample t-test was applied for change in (Group MPET & TUMPET), 1st week range of motion and muscle power and 14th week ROM and muscle power (Table 2) compare the mean significant values in between the groups, independent sample t-test was used that indicated highly significant difference in ROM and muscle power in impingement syndrome. It was hypothesized that ultrasound, manual therapy and physical therapy exercises are more effective in shoulder impingement syndrome in volleyball players.

**Table 1: Comparison of range of motion and muscle power within groups (Group MPET and TUMPET)**

Groups	Variables	Time Period		p-value
		1 <sup>st</sup> week (mean $\pm$ SD)	14 <sup>th</sup> week (mean $\pm$ SD)	
MPET	Range of motion (degrees)	130.53 $\pm$ 10.88	136.67 $\pm$ 9.94	.000
	Muscle Power (grades)	3.33 $\pm$ 0.49	4 $\pm$ 0.01	
TUMPET	Range of motion (degrees)	134 $\pm$ 6.80	164.33 $\pm$ 8.42	.000
	Muscle Power (grades)	3.43 $\pm$ 0.52	5.60 $\pm$ 0.51	.000

**Table 2: Comparison of range of motion and muscle power in between groups (n=30)**

Variables	Groups		p-value
	MPET (mean $\pm$ SD)	TUMPET (mean $\pm$ SD)	
1st week range of motion (degrees)	130.53 $\pm$ 10.88	134 $\pm$ 6.80	0.30
14th week range of motion (degrees)	136.67 $\pm$ 9.94	164 $\pm$ 8.70	0.000
1st week muscle power (grades)	3.33 $\pm$ 0.49	3.43 $\pm$ 0.52	0.47
14th week muscle power (grades)	4 $\pm$ 0.01	5.60 $\pm$ 0.51	0.000

## Discussion

In this study, 'the range of movements (ROM) and muscle power' in shoulder impingement syndrome were looked into before and after subjecting the affected joint to ultrasound therapy, manual therapy and physical exercises in an attempt to reduce the signs and symptoms and to increase the ROM and muscle power of the shoulder joint.

Previously, a randomized control study has been published from Turkey; it emphasized on the effectiveness of ultrasound versus physical therapy treatments and other measures in the management of shoulder problems.<sup>13</sup> The study was conducted on 40 patients who had been recognized with the help of ultrasonography or MRI to have a periarticular tender ailment of the shoulder and had been randomly selected. Of these patients, one group obtained proper ultrasound (n=20, mean time and standard deviation=8.7±8.8 months and the range was 1 – 36) and the other group received fake ultrasound (n=20, imply time=8.1±10.8 months, and range=1-42). Both groups were treated in 5 days a week with real or fake ultrasound for 10 minutes, superficial heat for 10 mins, electrical stimulation for 15 minutes, and exercise program for 15 to 30 minutes for 3 weeks. The groups showed a reduction of pain, improved ROM, shoulder incapacity annexure ratings, and fitness assessment rankings with treatment, but the changes were not statistically significant between the groups. After findings finally they determined that the results cautioned that proper ultrasound as compared with fake ultrasound deliver in addition gain whilst implemented to different physical therapy treatment within the control of shoulder problems.

Different studies have determined that manual and exercise therapy appear to have a role in shoulder impingement.<sup>14</sup> It is observed that a 4-week program along with motor management and strengthening exercises reduced shoulder pain and improved feature of individuals with shoulder impingement syndrome. The efficacy of ultrasound, laser, and exercises of shoulder impingement syndrome have been emphasized.<sup>4</sup>

In another study, a management plan of manual and exercise therapy was looked into for the efficacy of placebo treatment which was implemented through

physical therapists to the patients with persistent rotator cuff syndrome. Patients were selected randomly and blinded, placebo controlled trial was conducted. A program of manual therapy and domestic workout was no longer advised; further, instantaneous treatment for pain and functional ability was found to have benefits as compared with a practical placebo treatment that was given by therapists' in elderly patients with chronic rotator cuff syndrome.<sup>15</sup> Some authors investigated and concluded that ultrasound is a diagnostic tool with high precision, safe and affordable, dynamic, and conservative treatment after two months resulted in improved treatment outcome.<sup>12</sup>

In the present study, the individuals who were subjected to manual and physical exercises therapy of shoulder as well as those who were subjected to ultrasound treatment in addition to manual and exercises therapy had significant improvement after fourteen weeks treatment. However, in the latter group, there was the statistically highly significant difference in the degree of range of motion of shoulder joints. There was also observed a significant difference in term of muscle strength grades in impingement syndrome.

## Conclusion

It is concluded that ultrasound therapy has benefit as compared to physical exercises of shoulder in treatment of shoulder impingement syndrome to reduce pain, increase ROM and muscle power.

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