

Comparative Study Between Ultrasound Therapy with Combination of Elastic Band and Conventional Therapy for Anterior Shoulder Instability

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Abstract- Background: Shoulder joint has the greatest range of motion so shoulder instability occurs between 10-30% total populations. **Objective:** The purpose of the study is to investigate the effect of ultrasound therapy along with elastic band over conventional therapy in subjects with anterior shoulder instability. **Study Design:** Randomized clinical trials. **Method:** The study is randomized controlled study, the total subjects were ten for each group. The assessment of pain and ROM were taken before starting the treatment of both the groups. The patient were randomly assigned for both the group, assessment were taken on 0 day and 21 day of pain by VAS, ROM by goniometer. **Result:** The scores of variables VAS and ROM were improved significantly better in the subjects treated with ultrasound therapy and elastic bands. **Conclusion:** The study concludes that the elastic band exercise in combination with ultrasound therapy is more beneficial than the manual conventional therapy in shoulder instability condition.

Index Terms: shoulder instability, elastic band, ultrasonic, ROM, VAS.

I. INTRODUCTION

The shoulder instability refers to the inability to maintain the humeral head¹. The glenohumeral joint is a multiaxial, ball and socket, synovial joint that depends primary on the muscles and ligaments² rather than bones for its support, stability, and integrity³. The primary ligaments of the glenohumeral joint the superior, middle, and inferior glenohumeral ligaments⁴ play an important role in stabilizing the shoulder. The primary ligament of the glenohumeral joint the superior, middle, and inferior glenohumeral ligaments plays an important role in stabilizing the shoulder. It is a pathological condition, rather than a normal physiologic variant such as loose joint. Physiotherapy has been found effective⁵ in reducing pain and disability in patients with shoulder instability⁶. The success rate of an average is about 35.5% that require aggressive rehabilitation programme until the goal is achieved⁷.

In this study ultrasound is used in soft tissue injuries⁸ and there are rational theories for its use, sound evidence for its effectiveness in such conditions, the dose of therapeutic ultrasound is determined by many factors, the thermal effect decreases the tissue stiffness⁹ of trigger point, in therapeutic application of ultrasound, non-ionizing radiation is delivered to the desired tissue in mechanical wave form, several researcher have indicated the beneficial results of low frequency ultrasound, in this

frequency, high intensities lead to cell death, whereas at low intensities useful effect has emerged¹⁰.

Elastic resistance devices such as elastic band are being increasingly used for muscular conditioning for shoulder instability, these devices allow for a larger range of motion with both concentric and eccentric muscle contraction¹¹. Elastic band resistance has been proven to increase strength, mobility and function as well as reduce joint pain. Elastic band rehabilitate injuries improve the function ability of shoulder¹². The W.Z. Burkhead found has found good results in shoulder instability¹³.

The aim of this study is to assess the effectiveness of ultrasound therapy when added to elastic band exercise in the rehabilitation of patients with anterior shoulder instability. This study hypothesized that the ultrasound therapy is beneficial when combined with elastic band and exercise in the physiotherapy management of patients with anterior shoulder instability to reduce pain, increase range of motion and strength to reduce shoulder instability.

II. METHODOLOGY

A. Study design

Total 20 subjects were taken 10 in each group (Group A and Group B). This study is randomized controlled study, subject were selected by simple sampling method from the Ojjas Goodwill hospital outpatient department. The entire subjects diagnosed with anterior shoulder instability by Orthopedics doctor. All the patients were explained about the objective of the study along with duration and nature of the study. Informed consent were taken from subjects. The study was approved by the ethical committee for research.

B. Inclusion criteria

The subject included must be diagnosed with anterior shoulder instability, aged 18 to 55 year, and shoulder was painful in external rotation, internal rotation, abduction and flexion. One of the instability test should be positive from anterior drawer test¹⁴ or load and shift test. The patient should be available for three months; the patient should understand the language and instructions¹⁵.

C. Exclusion criteria

Patient with past history of shoulder surgery, diagnosed with rotator cuff, primary scapulothoracic dysfunction due to paresis, pain due to adhesive capsulitis and any involvement with sensory and muscular deficit were excluded.

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D. Procedure

The design of the study is randomized – controlled trial, subjects were randomly allocated equally in to any one of the two intervention groups by lottery method. For this, 20 folded papers chits of same shape, color and size were marked either with symbol “A” for the Ultrasound with elastic band exercise group or symbol “B” for Manual therapy and hot pack (conventional therapy) were kept in a box and mixed thoroughly before and after withdrawing a paper chit from the box. Each participant of the study was asked to withdraw any one slip of own choice from the box. After the slip was withdrawn, the symbol marked on this slip indicated which treatment group he/she has to be allotted.

After receiving the written consent form from the participants, the demographic variables including age, weight, gender, sex and height of the two groups were recorded at baseline. Baseline scores of the dependent variables of the study were recorded including pain score; SPADI (Shoulder pain and disability index) disability index score; SPADI pain index score¹⁶; shoulder ROM (range of motion) for flexion, abduction, internal and external rotation¹⁷.

All variables were recorded by same blinded tester at baseline (0 day) and after 21 days of interventions. All interventions were done by same physiotherapist supervising the test and intervention procedures. Test and retest of the two groups was conducted in the same place and environment and at same time of the day.

After group allocations, respective subjects for either group were given interventions as per the protocol of their concerned group. Treatment interventions were done by same physiotherapist for the 5 days in week for 3 weeks (hence total 15 sessions). The duration of each individual treatment session was about 40 minutes per session.

E. Variables

Dependent Variables of the study were perceived level of pain intensity, range of motion (flexion, abduction), SPADI pain score, SPADI disability scores. The independent variables of the study included ultrasound treatment and Elastic band treatment.

Pain:-Pain score was scored as the participants were asked to mark the currently experienced level of pain on a 10 cm horizontal line called as VAS¹⁸ (Visual analogue scale). Two extremes of this line were labelled as “0” indicating no pain at all; and the “10” indicating maximum intensity of pain as subjectively perceivable by the specific participant. The distance of the point marked by the participant from the “0” point indicates the level of pain as perceived.

SPADI:-Participants were also requested to complete the shoulder pain and disability index (SPADI) Questionnaire. Shoulder Pain and Disability Index (SPADI) is a tool to measure the self-reported current level of shoulder pain and disability in an outpatient setting for the patients suffering from shoulder problems. The SPADI contains 13 items that assess two domains; a 5-item subscale that measures pain and an 8-item subscale that measures disability. In both domains of

SPADI the each item is scored on a visual analogue scale (VAS).

F. Group A

Elastic band treatment - The elastic band exercises were performed by the therapist. The elastic band tension was adjusted according to each participant 12 repetition. The participants were then asked to perform three sets of 10 repetitions resembling a normal training load in the clinic.

Shoulder abduction, flexion and external rotation were performed with three second eccentric contraction phase. There was two second break between each repetition where there was no tension in the exercise.

To assist the participants in maintaining the correct time under tension during exercises, the patient was supervised by therapist to reach the required range of motion. Two minute break was held after each set of ten repetitions. If the exercise were not performed correctly then therapist must stop the exercise and allow the participant to take rest, instruct the participant the correct technique. Data from exercise set not completed correctly were deleted, only the correct data were collected and stored¹⁹.

Ultrasound treatment - For ultrasound treatment the coupling medium was applied over the target marked area and then ultrasound transducer head was moved in uniform circular motion to cover the entire area and to make the uniform exposure over the region²⁰. The purpose of the coupling medium is to exclude air from the region between the patient and the transducer so that ultrasound can get to the area to be treated.

Dosimeter : Frequency 1MHz, Duty Cycle – continuous, Pulse Frequency 100 Hz, Pulse duration 1msec, Output power 1MHz, 5cm² crystal – 0-10 watts 1 MHz, effective radiation area 5cm² and maximum treatment time 10 minutes.

G. Group B

Hot pack:Hot pack application is used for patient with inflammation and are applied to reduce edema. It is given for 15 minutes covering the affected area in supine lying position²¹.

Manual Exercises:patient should be assessed for pain and disability before initiating manual exercise select the mobilization grade⁶. Pendulum Exercises²², Wall Crawl and range of motion exercises 10-15 repetitions for 5 days in a week for 3 weeks.

H. Ethical clearance

The methodology of the study was approved by the research committee of the Monad University, Hapur, Uttar Pradesh, India. The purpose and details of the study were explained to the study subjects and assurance was given regarding confidentiality of the participant’s identity related data.

Data Analysis

Statistical analysis was done by using SPSS version 14 and unpaired t- test was used to find comparison between groups.

III. RESULT

A. Demographic data

A total of 20 participants volunteered for this study (Group A: 10 and Group B: 10). The mean age in the Group A and Group B were 27.80 ± 7.613 and 28.20 ± 7.829 respectively which shows it is non-significant ($p > 0.05$).

Table 1. Mean and standard deviation of Age of Group A and Group B

	Mean	SD
Group A	27.80	7.613
Group B	28.20	7.829

B. Between the group comparisons

The mean value for range of motion of flexion, abduction and pain respectively, of participants in the Group A & B measured at 0 day came out to be 128.00 ± 20.796 & 119.00 ± 22.706 for Flexion ROM, 118.00 ± 21.499 & 107.00 ± 21.609 for Abduction ROM and 5.80 ± 1.549 & 6.00 ± 1.414 for Pain respectively.

Between the groups comparison of values of Flexion & Abduction ROM and Pain was done using unpaired t-test, with level of significance, p set at 0.05. The comparison of Flexion & Abduction ROM and VAS readings between Group A and B, was found to be statistically non-significant ($p > 0.0001$) which states the reliability of data at baseline.

Table 2. Mean and standard deviation of Flexion & Abduction Range of Motion and Pain of Group A & B at day 0

	Group A	Group B	p value
Flexion	128.00 ± 20.796	119.00 ± 22.706	0.170
Abduction	118.00 ± 21.499	107.00 ± 21.609	0.100
Pain	5.80 ± 1.549	6.00 ± 1.414	0.168

The mean value for range of motion of flexion & abduction and pain respectively, of participants in the Group A & B measured at 21 day came out to be 155.00 ± 15.811 & 131.00 ± 21.318 for Flexion ROM,

153.50 ± 18.864 & 111.00 ± 19.692 for Abduction ROM and 2.50 ± 1.780 & 4.90 ± 1.595 for Pain respectively.

Between the groups comparison of values of Flexion & Abduction ROM and Pain was done using unpaired t-test, with level of significance, p set at 0.05. The comparison of Flexion & Abduction ROM and VAS readings between Group A and B, was found to be statistically significant (0.0001) which states the improvement.

Table 3. Mean and standard deviation of Flexion & Abduction Range of Motion and Pain of Group A & B at day 21

	Group A	Group B	p value
Flexion	155.00 ± 15.811	131.00 ± 21.318	0.001
Abduction	153.50 ± 18.864	111.00 ± 19.692	0.000
Pain	2.50 ± 1.780	4.90 ± 1.595	0.005

IV. DISCUSSION

The finding of this study demonstrated that ultrasound therapy in combination with elastic band reduced the shoulder pain as well as increases the range of motion. Although both the groups have improved after treatment but the subjects treated with ultrasound therapy along with elastic band have shown greater significant improvement compared to conventional therapy (hot pack and manual exercises).

Ultrasound is use for its thermal effects in order to relieve pain and muscle spasm to increase tissue extensibility which may be of use in combination with stretching exercises to achieve optimal tissue length. Lengthening with thermal dose of ultrasound has been demonstrated in the ligament of normal knees and in scar tissues¹⁰.

In the previous study concluded that in patients with symptomatic calcific tendinitis of the shoulder, ultrasound treatment helps resolve calcifications and shows improvement²³.

The result of the study done by¹⁹ showed that resistance exercises with dumbbells and elastic tubing showed increasing EMG amplitude and perceived loading with increasing resistance. Thus they concluded comparably high levels of muscle activation were obtained during resistance exercises with dumbbells and elastic tubing, indicating that therapists can choose either type in clinical practice.

In ultrasound therapy with elastic band exercise group there was significant improvement as compared to manual therapy with hot pack group. Thus, elastic band in combination with ultrasound therapy found as effective treatment for anterior shoulder instability with significant reduction in pain and increase in range of motion.

Since the numbers of subjects are small and treatment given for short duration, so in future researches can be done to prove its efficacy more reliable on large number of sample and with long duration of treatment to see better results.

V. CONCLUSION

The findings of this study demonstrated that ultrasound therapy with elastic band as well as hot pack with manual therapy both successfully reduced the shoulder pain and associated disability; also both the treatments caused significant improvement in shoulder function for subjects with anterior shoulder disability but the patients who received the ultrasound therapy with elastic band exercises responded more to treatment.

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