

A Comparative study to Assess the effectiveness of Eccentric exercises Versus Concentric exercises in Rotator cuff tendonitis

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Abstract: This study was conducted to find out the effectiveness between Eccentric Exercises versus Concentric exercises. Aimed to find out the efficacy of concentric exercises in the rotator cuff tendonitis and eccentric exercises in rotator cuff tendonitis. Finally comparative analysis of concentric and eccentric exercises in rotator cuff tendonitis to suggest the most useful protocol for the treatment of rotator cuff tendonitis. The result shows Eccentric exercises are more effective than concentric exercises in rotator cuff tendonitis. The mean score for Pre – Concentric is 6.14 with the standard deviation of ± 6.367 .

The mean score for Pre – Eccentric is 6.72 with the standard deviation of 7.633. ROM The mean score for Group A is 6.053 with the standard deviation of ± 6.433 . The mean score for Group B is 6.36 with the standard deviation of ± 6.693 . A significant statistical difference with p value of Concentric exercise ($p < .0006$) and p value of Eccentric is ($p < .0009$).

Key Words: Eccentric Exercise, Concentric Exercise, Rotator cuff Tendonitis

INTRODUCTION

Rotator cuff tendonitis is a very common shoulder problem between the age group of 25-40 years. Conventionally concentric exercise have been used for strengthening in addition to other modalities such as ultrasonic therapy, interferential therapy etc. for relief of pain and inflammation^[1]. However, during research it has been found that most tendon injuries happen during the eccentric part of the activity, i.e. the activity which causes the muscles to lengthen against an external force during contraction^[2]. Hence eccentric protocol is supposed to be more beneficial than concentric exercises in strengthening

of rotator cuff muscles in such cases^[3]. The role of rotator cuff in the shoulder movements has long been, and still remains, somewhat controversial^[4]. The established roles are those of dynamic stability by contracting eccentrically and that of steering the humeral head. Eccentric training thus forms an essential component of rotator cuff rehabilitation^[5]. Eccentric and concentric training with the use of various devices has been pictorially represented which form an essential component of rotator cuff rehabilitation programme and have been comparatively analyzed for their efficacy in strengthening rotator cuff muscles to try and prevent further possible recurrence^[6]. Adhesive capsulitis (AC), also known as frozen shoulder, is characterized by shoulder pain, a decreased range of motion (ROM), and a decreased shoulder function^[7]. The prevalence has been reported to range from 2% to 5% in the general population, and it is higher in women than in men^[8]. The risk factors for AC have been reported to include chronic inflammation, endocrine and biochemical changes, diabetes mellitus, neurological factors, and long-term shoulder immobilization after surgery. Several factors including a decreased ROM, muscle weakness, and the thickening of the joint capsule and synovial membrane are used for AC diagnosis^[9]. In general, AC can be divided into three stages: freezing, frozen, and thawing^[10]. The freezing stage is characterized by an increase in pain at night and usually lasts for 2 to 9 months^[11]. The next stage is the frozen stage and is referred to as a stiffness phase that is accompanied by a loss of shoulder motion and a decrease in pain^[12]. In general, this stage lasts between 4 and 12 months, exercise therapy has been recommended as an intervention method for improving the shoulder ROM,

muscle strength, and shoulder function^[13]. The main types of exercise intervention are stretching, mobilization exercises, and strengthening exercises. This is a fibrous sheath formed by the four flattened tendons, which blend with the capsule of the shoulder joint and strengthen it^[16]. The muscles which form the cuff arise from the scapula and are inserted into the lesser and greater tubercles of the humerus. They are the subscapularis, the supraspinatus, the infraspinatus and the teres minor^[17]. Their tendons, while crossing the shoulder joint, become flattened and blend with each other on one hand, and with the capsule of the joint on the other hand, before reaching their points of insertion^[18]. Patients usually present with pain of insidious onset exacerbated with overhead activities. The pain is usually in the anterior deltoid, but it can be referred anywhere on the deltoid and down the mid-arm^[19]. The pain often felt at night and can awaken patients from sleep. Later, pain may occur when the arm is moved forward to shake hands. Usually, pain will be elicited by pushing things away, with little or no pain on pulling objects in. The available literature in rotator cuff rehabilitation programme focuses on concentric exercises mainly for rotator cuff muscles strengthening^[20]. Eccentric muscle strengthening is grossly neglected. An attempt was hence made to study the effect of eccentric muscle strengthening of rotator cuff muscles in rotator cuff rehabilitation programme and compare its efficacy with concentric muscle strengthening.

Statement of the Problem:

Eccentric exercises protocol efficacy has been poorly researched in rotator cuff tendonitis. Hence it attempt has been made to test its efficacy.

- Objectives:
- To study the efficacy of concentric exercises in the rotator cuff tendonitis.
- To study the efficacy of eccentric exercises in rotator cuff tendonitis.
- To do the comparative analysis of concentric and eccentric exercises in rotator cuff tendonitis.
- To suggest the most useful protocol for the treatment of rotator cuff tendonitis.

Need for the study:

Eccentric exercises is more effective than concentric exercises in strengthening in rotator cuff tendonitis.

The population prevalence of having at least one full-thickness tear was 22.2% (4.5% bilateral). For age groups 60–69, 70–79 and 80–89, these were 14.9%, 25.9% and 29%, respectively, and bilateral tears were 2.3%, 5.9% and 5.8%, respectively.

Rotator Cuff Tendinopathy is seen as the most common type of shoulder pain as it is seen in about 30% of the overall population. It is extremely common, affecting between 6.8% and 22.4% of the population over age 40.

HYPOTHESIS:

The study seeks to approach its objective with the hypothesis that a greater increase in muscle strength after eccentric exercises in rotator cuff tendonitis.

NULL HYPOTHESIS:

There will similar changes in strength with both eccentric and concentric exercises in rotator cuff tendonitis.

METHODOLOGY

SUBJECT NUMBER AND SOURCE

The study included 30 patients (18 males and 12 females) with rotator cuff tendonitis between age group of 25-38 years. Patients were randomly divided into two groups (every alternate patient coming to Physiotherapy O.P.D kept in first group).

1.First group and every even number subject selected to the concentric exercises for strengthening of rotator cuff.

2.Second group and every odd number subject selected to the eccentric exercises for strengthening of rotator cuff.

The study was carried out of IIMSR hospital in Lucknow.

INCLUSION AND EXCLUSION CRITERIA INCLUSION CRITERIA

1.Age 25-38 years.

2.Both male and female.

3.Both right and left side shoulder injuries included in the study.

4.Pain localized to the proximal anterior lateral shoulder region.

5.Positive for pain on at least one of the following three tests.

Empty Can Test.(Supra spinatus Test) , Drop Arm Test, Break Test

EXCLUSION CRITERIA

1. Those who had previous history of musculoskeletal injury on affected side.
2. Those that had cardiopulmonary diseases.
3. Those who had history of neuro muscular diseases.
4. Neurological deficit of the upper limb
5. Malignancy.
6. Those with any other associated recent fracture, dislocation or muscular strain/rupture of affected upper limb.

SAMPLING

Randomized sampling

Design of the study

Pre and post experimental design

Study Duration: 4weeks

VARIABLES

Dependent

Shoulder Pain And Disability Index (SPADI) ROM

Independent

Concentric Exercise Eccentric Exercise

INSTRUMENTS AND TOOLS USED

1. Interferential therapy.
2. Cryotherapy pack.
3. Ultrasonic Therapy.
4. High back wooden chair.
5. Treatment plinth.
6. Dumbbells (2 to 5 kegs).
7. Therabands (very low, low, medium & high resistance).

TEST

Empty can test (Supraspinatus test)

Detects

Tom supraspinatus muscle or tendon Supraspinatus tendonitis Neuropathy of Suprascapular nerve.

Test Procedure

Patient sitting or standing patient empty can test position 90° shoulder abduction, 30° horizontal abduction, and maximum internal rotation. Examiner resists patients attempt to abduct.

Positive Sign

Reproduction of patients witness compare with uninvolved side.

Drop-arm test

Detects

Specially Supra spinatous tendon (Rotator Cuff tear)

Test procedure

Patient sitting or standing. Examiner passively abducts patients shoulder to 90°. Patient is then instructed to maintain arm in that position. Examiner then presses inferiorly on patients arm.

Positive Sign

Arm drops suddenly to side because of fitness and/or pain.

Break Test

The therapist must decide whether to use 'make' or 'break' test to assess strength. The make test is performed by having the body segment impart a force to some external object (e.g. the therapist's hand in case the manual muscle test)

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. The SPADI takes 5 to 10 minutes for a patient to complete and is the only reliable and valid region- specific measure for the shoulder.

Scoring instructions

To answer the questions, patients place a mark on a 10cm visual analogue scale for each question. Verbal anchors for the pain dimension are 'no pain at all' and 'worst pain imaginable', and those for the functional activities are 'no difficulty' and 'so difficult it required help'. The scores from both dimensions are averaged to derive a total score.

Interpretation of scores

Total pain score: / 50 x 100 = %

(Note: If a person does not answer all questions divide by the total possible score, eg if 1 question missed divide by 40)

Total disability score: / 80 x 100 = %

(Note: If a person does not answer all questions divide by the total possible score, eg. if 1 question missed divide by 70)

Total Spadi score: / 130 x 100 = %

(Note: If a person does not answer all questions divide by the total possible score, eg. if 1 question missed divide by 120)

The means of the two subscales are averaged to produce a total score ranging from 0 (best) to 100 (worst).

Minimum Detectable Change (90% confidence) = 13 points

(Change less than this may be attributable to measurement error)

Shoulder Pain and Disability Index (SPADI) Pain scale

How severe is your pain?

Circle the number that best describes your pain where: 0 = no pain and 10 = the worst pain imaginable

Disability scale

How much difficulty do you have?

Circle the number that best describes your experience where: 0 = no difficulty and 10 = so difficult it requires help.

PROCEDURE

(STRENGTHENING PROGRAMME)

CONCENTRIC EXERCISES (GROUP A)

1. SUPRASPINATUS:

Starting position:

Patient sitting on chair, with 0 degrees abduction and elbow in full extension. The patient holds dumbbell in hand of affected side.

Exercise: Ask patient to do active abduction of shoulder with elbow extended against resistance of the dumbbell. This exercise is done in 3 sets of 10 repetitions, with 2 kg dumb-bells and gradually increased up to 5 kg from weeks 3rd-4th.

2. INFRASPINATUS AND TERES MINOR

Starting position: Patient laying prone on plinth with affected shoulder in 0 degrees flexion, 90 degrees abduction and in neutral rotation, elbow flexed 90 degree and forearm hanging over edge of plinth, dumb-bell held in hand on affected side.

Exercise: Ask patient to slowly do maximum possible external rotation against dumbbell resistance. This exercise is done in 3 sets of 10 repetitions, 3-4 times/week.

3. SUBSCAPULARIS:

Starting position: Patient lying prone on plinth with affected shoulder in 0 degrees flexion, 90 degrees abduction and in neutral rotation, elbow flexed 90 degree and forearm hanging over edge of plinth, dumbbell held in hand on affected side.

Exercise: Ask patient to slowly do maximum possible internal rotation of shoulder against dumbbell resistance. The exercise is done in 3 sets of 10 repetitions, 3-4 times/week.

Note: Cryotherapy/ice applied after each exercise session to relieve muscle soreness.

ECCENTRIC EXERCISES (GROUP B)

1. SUPRASPINATUS:

Starting position: Theraband attached to door handle, patient stands with unaffected shoulder towards the door handle and theraband held firmly in hand of affected side. Affected shoulder is held in 30 degrees flexion, 0 degrees abduction, and in slight medial rotation. Therapist assistant lifts shoulder against resistance of theraband to 90 degrees of abduction.

EXERCISE: Slowly allow the arm to return back to 0 degree of abduction (eccentric contraction of supraspinatus occurs to control the arm during the movement)

The exercise should be done 3-4 times / week in 3 sets of 10 repetitions.

Medium (green) and then high (black) for providing gradually increasing resistance from week 3rd - 4th.

2. INFRASPINATUS AND TERES MINOR

Starting position: Theraband attached to door handle, patient stands with unaffected shoulder towards the door handle. Affected shoulder flexed 0 degrees, abducted degrees and in neutral rotation, elbow flexed to 90 degrees.

External rotation against resistance of theaband by therapist/assistant.

Exercise: Slowly return the arm back to the neutral shoulder rotation (eccentric contraction of external rotators occurs to control the return movement).

The exercise is done 3-4 times/week in 3 sets of 10 repetitions.

3. SUBSCAPULARIS

STARTING POSITION: Thera band attached to door handle, patient standing with affected shoulder towards the door. Affected shoulder in 0 degrees flexion, 0 degrees abduction and in neutral rotation,

elbow flexed 90 degrees. Patient holds the band in hand of affected side and the arm is brought into medial rotation up to maximal range against resistance of the band by therapist/assistance.

EXERCISE: Slowly return the arm back to neutral position of shoulder (eccentric contraction of subscapularis occurs to control the movement back).

The exercise is done 3-4 times/week in 3 sets of 10 repetitions.

Note: Cryotherapy/ice applied after each exercise session to relieve muscle soreness.

DATA ANALYSIS

All the statistical data were analyzed by a professional Statistician. Descriptive statistics work carried out using MS Excel 2010 Data Tool Pack, Excel analysis tool pack 2019. The dependent variables were summarized by mean, standard deviation (SD), and the independent variables summarized by the percentage and mean value. T – Test: Two – Sample Assuming Equal Variances were performed to determine the significance of the variables in the groups. Where alpha value kept at 0.05 thus P – value below 0.05 is considered as statistically significant. P and T value were used in the study, and confidence level is 95.0% thus their data can be used with 95% of confidence for clinical purpose.

RESULT

Table -1: illustrate the comparison of pretest and post test concentric and eccentric

GROUP A	6.053	6.433
GROUP B	6.36	6.693

Table 2: Illustrate the comparison of pretest and posttest for Concentric in group A and B.

	Pretest	Posttest
GROUP A	6.14	6.367
GROUP B	6.72	7.633

CONCLUSION

Eccentric exercises are more effective than concentric exercises in rotator cuff tendonitis. This study provides evidence in favor of the use of strengthening as part of an initial rehabilitation program for partial rotator cuff tears, even during painful phases. Both types resulted effective in pain control, but eccentric exercise appears to be more effective in early recovery in

functionality, strength, and tendon healing. In the future, it could be performed a larger study with major sample size, with a heavier load and progression, and with a more rigorous follow-up, using an exercise diary, in order to ensure and have better control in the exercise performance and technique.

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