EFFECT OF ECCENTRIC VERSUS CONCENTRIC EXERCISE IN ROTATOR CUFF TENDINITIS

A Thesis

Submitted

In Partial Fulfillment of the Requirements

for the Degree of

MASTER OF PHYSIOTHERAPY

In

Neurology

Submitted by

Swati Sharma

Under the Supervision of

Prof. (Dr.) Abdur Raheem Khan

Department of Physiotherapy

Faculty of Medical Sciences

INTEGRAL UNIVERSITY, LUCKNOW, INDIA

May 2022

CERTIFICATE (SUPERVISOR)

This is to certify that Miss. SWATI SHARMA (Enroll. No.-2000100097) has carried out the research work presented in the thesis titled **"Effect of ECCENTRIC VERSUS CONCENTRIC EXERCISE IN ROTATOR CUFF TENDINITIS"** Submitted for partial fulfillment for the award of the Degree of Master of Physiotherapy in NEUROLOGY from Integral Institutes of Allied Health Sciences and Research, Lucknow under my supervision.

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Prof . (Dr) Abdur Raheem Khan

Head

Department of Physiotherapy,

Integral Institute of Allied Health Science and Research,

Integral University, Lucknow

Date:

CERTIFICATE (CO – SUPERVISOR)

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Dr. Neeraj Maurya
Associate Professor
Date :

Place :

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I hereby recommend that the project prepared under my supervision by Tazeen Bano entitled **"EFFECT OF ECCENTRIC VERSUS CONCENTRIC EXERCISE IN ROTATOR CUFF TENDINITIS"** is an original work done by him and be accepted in partial fulfillment for the degree of Master of Physiotherapy.

Prof.(Dr.)Abdur Raheem Khan

M.P.T.(ORTHOPEDICS)

Integral University

Lucknow

DECLARATION

I hereby declare that the thesis titled **"EFFECT OF ECCENTRIC VERSUS CONCENTRIC EXERCISE IN ROTATOR CUFF TENDINITIS"** is an authentic record of the research work carried out by me under the supervision of Prof. (Dr.) Abdur Raheem Khan, Department of Physiotherapy, for the period from 2020 to 2022 at Integral University, Lucknow. No part of this thesis has been presented elsewhere for any other degree or diploma earlier.

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Last but not least I am grateful to my parents, sister, and brother for their constant encouragement, help, and emotional support.

SWATI SHARMA

DEDICATION

This is dedicated to my parents; who encouraged me with education and armed my entire family, with the values necessary to succeed in life. Also, my teacher's who supported me in every obstacle.

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LIST OF ABBREVATION

SPADI :- Shoulder Pain And Disability Index

ROM :- Range of Motion

SITS :- SUPRASPINATUS , INFRASPINATUS , TERES MINOR , SUBSCAPULARIS

CHAPTER-1

INTRODUCTION

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, some what 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 rehabilitation programme and have been comparatively analyzed for their efficacy in strengthening rotator cuff muscles to try and prevent further possible reccurence[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 ishigher in women than in men[8]. The risk factors for AC have been reported to includechronic 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. Guler-Uysal et al. conducted a comparison on twodifferent modes that included the Cyriax method and physical therapy, and reported thatthe Cyriax method provided faster and better effectiveness than the physical therapy inshoulder pain and the ROM [14]. The thesis, therefore attempts to study the relative efficacy of Eccentric exercises and Concentric exercises for strengthening cuff muscles in rotator cuff tendonitis[15].
The thesis comprises of rotator cuff anatomy cuff anatomy and biomechanics, eccentric role of rotator cuff, specific eccentric and concentric exercise protocols.

Musculotendinous cuff of the shoulder (Rotator cuff)

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 humerous. 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].

The cuff gives strength to the capsule of the shoulder joint all around except inferiorly[19].

1. SUPRASPINATUS

Origin- Medial 2/3 of the supraspinus fossa of the scapula.

Insertion-upper impression of the greater tubercle of the humerus.

Nerve supply-Suprascapular nerve (C5,6).

Actions- (i) The supraspinatus initiates abduction of the arm and carries it upto 15 degrees.

(ii) Along with other short scapular muscles it steadies the head of the humerus during movements of the arm, so that latter does not slip out of the glenoid cavity.

2. INFRASPINATUS

Origin- Medial 2/3 of the infraspinous fossa of the scapula.

Insertion- Middle impression on the greater tubercle of the humerus.

Nerve supply- Suprascapular nerve(C5,6).

Actions- (i) Lateral rotator of arm.

3. TERES MINOR

Origin- Upper 2/3 of the dorsal surface of the lateral border of the scapula.

Insertion- Lowest impression on the greater tubercle of the humerus.

Nerve supply- Axillary nerve (C5, 6)

Action- Same as infraspinatus.

4. SUBSCAPULARIS

Origin- Medial 2/3 of the subscapular fossa.

Insertion- Lesser tubercle of the humerus.

Nerve supply-Upper and lower Subscapular nerves.

Action- Medial rotator and adductor of arm.

The central role the rotator cuff has in shoulder function almost precludes its involvement in most painful disorders of this joint. Rotator cuff tendonitis (RCT) refers to micro-tearing or inflammation of one or more of the four rotator cuff tendons of the shoulder (Supraspinatus, Infraspinatus, Teres minor, and Subscapularis, or SITS) [20]. Commonly referred to as impingement syndrome, RCT can be primacy bursitis, implegent from mechanical abutment, or secondary from glenohumeral instability. RCT is common in those who are 25 to 40 years, when tendonitis and fibrosis are found to be most frequent and chronic. After 40 years, there is full-thickness rotator cuff tearing, requiring operative repair. This age -related characterization of RCT is accelerated in athletes involved in sports with repetitive overhead motions, who not only increase the forces on the cuff tendons, but also the repetitions of aggravating motions[21].

Patients usually present with pain of indisdious 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 [22]. 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 [23]. 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 question

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

Need of study

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

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.

HYPOTHESIS

ALTERNATIVE 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.

OPERATIONAL DEFINIATION

Rotator Cuff Tendonitis

It is the inflammation of the tendons of rotator cuff muscles. (Rotator cuff muscles are Supraspinatus, Infraspinatus, Teres minor and Subscapularis).

Eccentric Exercise

It is a type of dynamic muscle loading where tension in the muscle develops and physical lengthening of muscle occurs as an external force is applied to the muscle.

Concentric Exercise

It is a type of dynamic muscle loading where tendon in the muscle develops and physical shortening of muscle occurs as an external force is applied to the muscle.

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.

ROM The active ROM in the shoulder joint was measured for internal rotation and abduction and the external rotation was measured using a plastic Baseline goniometer in a supine position with the knees flexed. The goniometer axis was placed over the center of the humeral head at the greater tuberosity. The fixed arm was placed along the side of the participant, which was aligned with the greater trochanter and was parallel to the floor. The moving arm was placed along the lateral aspect of the humeral shaft and aligned with the lateral epicondyle. For measuring the ROM of shoulder abduction, the goniometer axis was placed over the humeral head center at the greater tuberosity. The fixed arm was parallel to the sternum and the participant was instructed to move the arm in the direction of abduction. The ROM for the shoulder ER was measured at 90_ elbow flexion and 90_ shoulder abduction in the supine position. The goniometer axis was placed over the center of the olecranon process and styloid process of the ulna**.**

REVIEW OF LITERATURE

Juan G. Dominguez-Romero et al (2012) All exercise programs were effective in RC tendinopathy,improving pain and shoulder function. No solid results were obtained when the interventions werecompared due to their heterogeneity. Patients perception assessment tools were the most widelyused. Amount of load applied should be considered.

Won-Moon Kim et al (2015) The study participantswere in the freezing stage and they had severe pain and a limited ROM in the shoulderjoint. Therefore, the application of this result for patients in other stages is not suitable.Subsequent studies comparing patients in the frozen stage and those in the thawing stage are warranted. further investigations are necessary to identify the obvious mechanisms of the effects of eccentric training programs on the improvement of the shoulder function and muscle strength for patients with AC.

Christiana Blume, et al (2012) Both eccentric and concentric PRE programs resulted in improved function, AROM, and strength in patients with SAIS. However, no difference was found between the two exercise modes, suggesting that therapists may use exercises that utilize either exercise mode in their treatment of SAIS. These findings agree with the findings of the other authors who used resistance exercise in the treatment of SAIS that resulted in improved function and improved strength. Posthoc analysis also revealed that all of the outcomemeasures

demonstrated significant improvement from baseline to week five with the greatest change in scapular elevation AROM and function (DASH scores) occurring in that time frame. The mean improvement in the DASH scores exceeded the minimal clinically important difference (MCID) of 10 points by the week five assessment with only an additional three points improvement at week eight. From week five to week eight, all participants continued to make significant improvements in all outcome measures except scapular elevation AROM. The findings of this study suggest that significant ROM and functional improvements occurred primarily in the first five weeks of

PRE treatment approaching normal limits in that time frame. Strength gains improved in that same five week time frame but continued to improve even after ROM and functional scores were no longer improving significantly. However, without a true control group,

one cannot be certain if these improvements were due to our intervention or simply due to the normal course of the condition over time.

Corbin Hedt et al (2015) Eccentric exercises consist of a muscular contraction wherein the contractile unit (muscle and tendon) lengthen under external load. There are unique molecular and neural characteristics which distinguish eccentric activities from isometric and concentric contractions. These characteristics can positively affect the morphology of the target muscle as well as neuromuscular control – both of which are primary goals in rehabilitation and injury prevention. Eccentric exercises have shown promising outcomes in the rehabilitation of many different conditions in both the upper and lower extremities. A majority of research has indicated that tendon-related injuries respond especially well to eccentrics, likely due to histological changes about the muscle-tendon interface.Furthermore, the shoulder complex has been a topic

of more recent research as eccentric exercises seem to provide greater strength and pain improvements versus general exercise protocols in the short and long-term. However, information on eccentric exercise selection based on targeted structures is scarce. Different variations in upper extremity positioning (hand, elbow, forearm) have also not been studied with these activities.

Eva Vallés-Carrascosa et al (2014) There are electromyographic studies that evidence changes in range of motion and muscular synchrony deficits in patients with SS, which would justify an exercise protocol in its therapeutic approach decreased muscle activity of the middle and lower portion of the serratus anterior and rotator cuff, delayed activation of the middle and lower trapezius, and excess activation of the upper trapezius and middle deltoid; and in many cases, the shortening of the pectoralis minor. Several studies report that conservative treatment is generally recommended as a first option for SS, physical exercise being the most used. This
helps to improve the clinical symptoms of most patients, and there are no statistically significant differences between the effectiveness of conservative and surgical treatments (the latter involving a greater risk and cost) in the long term. Exercise is intended to improve the pain, strength, and neuromuscular control and to restore the articular pain-free ROM; even in certain cases of complete rotator cuff tear (although the tear is not solved without surgery), shoulder function could be restored.

Holmgren et al. (2015) argue that the combination of exercises to strengthen the rotator cuff and scapular stabilization optimizes rehabilitation and minimizes the risk of injury and is recommended over placebo treatment and no treatment. As for the type of exercise, in the last

decade, eccentric exercise (EE) is being studied as an effective treatment option in achilles and patellar tendinopathies.

Rita Kinsella et al (2015) in the management of patients with SPS and given our increasing understanding of intrinsic rotator cuff pathology rather than extrinsic bony compression associated with this condition, it is pertinent to ascertain whether greater clinical gains can be achieved with rotator cuff rehabilitation that utilises a specific type of muscle contraction. This is of particular clinical importance if the analgesic effect demonstrated in other tendons of the body following isometric contractions can be replicated in SPS, where patients are frequently severely impaired by the pain and loss of function they experience, whatever stage along the continuum of tendon pathology they may be. Findings from a small pilot study suggest that low-load isometric exercises for rotator cuff tendinopathy may positively influence pain and tendon thickness but little has been established in the literature regarding rotator cuff tendon responses to varying isometric loads. Hence, the dosage in this present study will be semi-tailored, as per clinical practice, according to pain, severity and irritability. The primary aim of this study is to establish the feasibility of running a full-scale randomised controlled trial (RCT) that compares the effects of isometric, isotonic concentric and isotonic eccentric rotator cuff contractions
when used as part of a structured semi-individualised exercise-based physiotherapy rehabilitation program in patients diagnosed with SPS.

METHODOLOGY

METHODS

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).

l. 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 Integral hospital in Lucknow.

INCLUSION AND EXCLUSION CRITERIA

INCLUSION CRITERIA

l. 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 anterio lateral shoulder region.

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

   Empty Can Test.(Supra spinatous 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 defecit 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^{o} shoulder abduction, 30^{o} 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 Suprasspinatous tendon (Rotator Cuff tear)

Test procedure

Patient sitting or standing. Examiner passively abducts patients shoulder to 90^{o}. 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

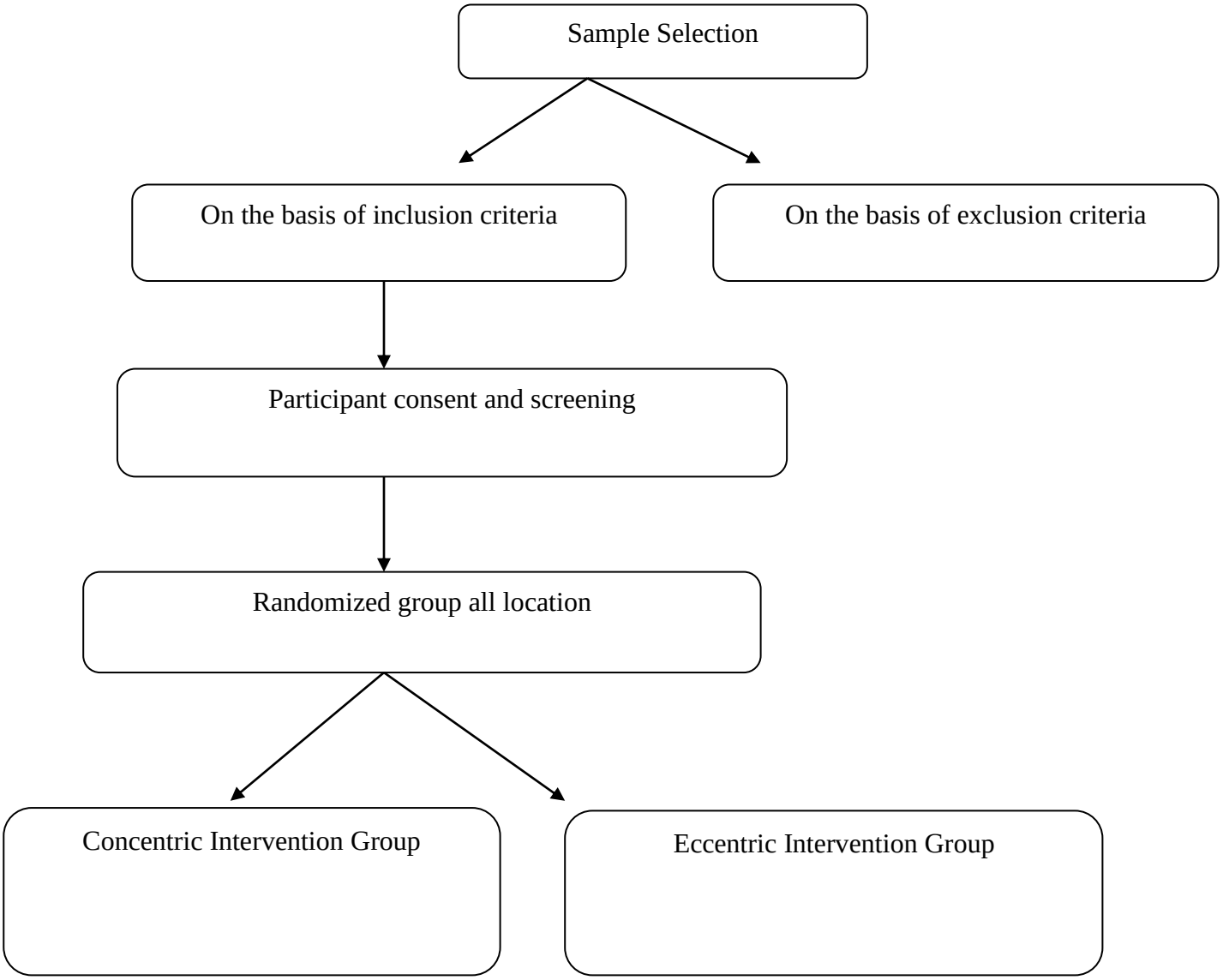
When lying on the involved side?	0	1	2	3	4	5	6	7	8	9	10
Reaching for something on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
Touching the back of your neck?	0	1	2	3	4	5	6	7	8	9	10
Pushing with the involved arm?	0	1	2	3	4	5	6	7	8	9	10

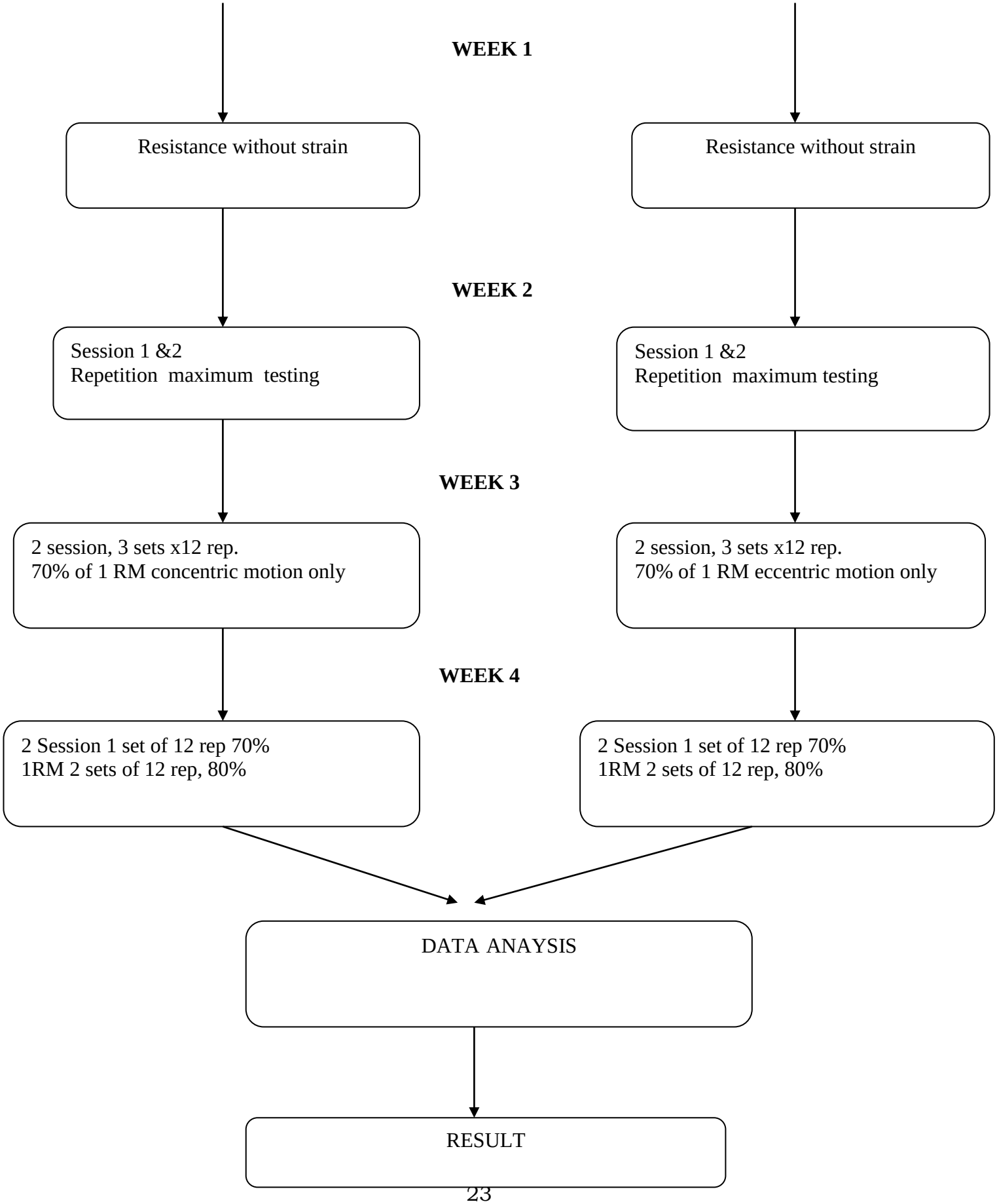
Disability scale

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.

Washing your back?	0	1	2	3	4	5	6	7	8	9	10
Putting on an undershirt or jumper?	0	1	2	3	4	5	6	7	8	9	10
Putting on a shirt that buttons down the front?	0	1	2	3	4	5	6	7	8	9	10
Putting on your pants?	0	1	2	3	4	5	6	7	8	9	10
Placing an object on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
Carrying a heavy object of 10 pounds (4.5 kilograms)	0	1	2	3	4	5	6	7	8	9	10
Removing something from your back pocket?	0	1	2	3	4	5	6	7	8	9	10

PROTOCOL


Sample Selection
On the basis of inclusion criteria
On the basis of exclusion criteria
Participant consent and screening
Randomized group all location
Concentric Intervention Group
Eccentric Intervention Group


WEEK 1
Resistance without strain
Resistance without strain
WEEK 2
Session 1 &2
Repetition maximum testing
Session 1 &2
Repetition maximum testing
WEEK 3
2 session, 3 sets x12 rep.
70% of 1 RM concentric motion only
2 session, 3 sets x12 rep.
70% of 1 RM eccentric motion only
WEEK 4
2 Session 1 set of 12 rep 70%
1RM 2 sets of 12 rep, 80%
2 Session 1 set of 12 rep 70%
1RM 2 sets of 12 rep, 80%
DATA ANAYSIS
RESULT

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 3^{rd}-4^{th}.

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 repeitions, 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 3^{rd} - 4^{th}.

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 thera band in hand of affected side and the arm is brought into medial rotation up to maximal range against resistance of theraband 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 sorness.

Figure 1 Interferential Therapy

Figure 2 Ultrasonic Therapy

.

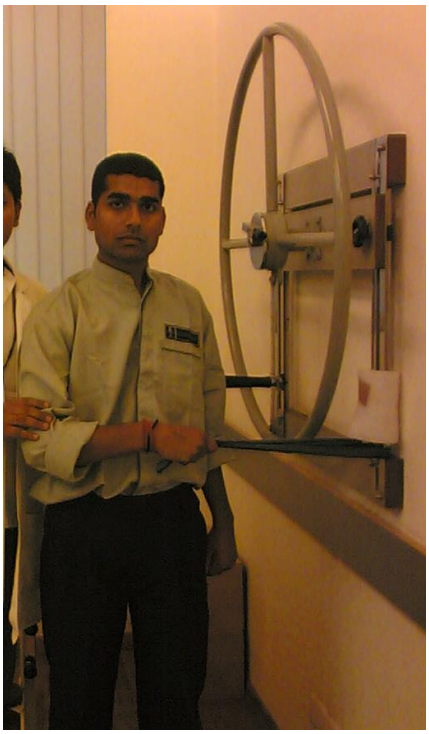


Figure 3 patient perfoming Theraband Exercises for external rotators (Infraspinatus and Teres Minor)

Figure 4 Patient perfoming effective stretch for Rotator Cuff

Figure 5 Patient Performing rotator strengthening exercise with dumbbells.

Figure 6 Patient Performing Rotator cuff Theraband strengthening exercises.

Figure 7 Therapist performing a external rotation of shoulder joint

Figure 8 Therapist performing a internal rotation of shoulder joint

Figure 9 Therapist performing a flexion of shoulder joint

Figure 10 Therapist performing a abduction of shoulder joint

DATA ANALYSIS

DATA ANALYSIS

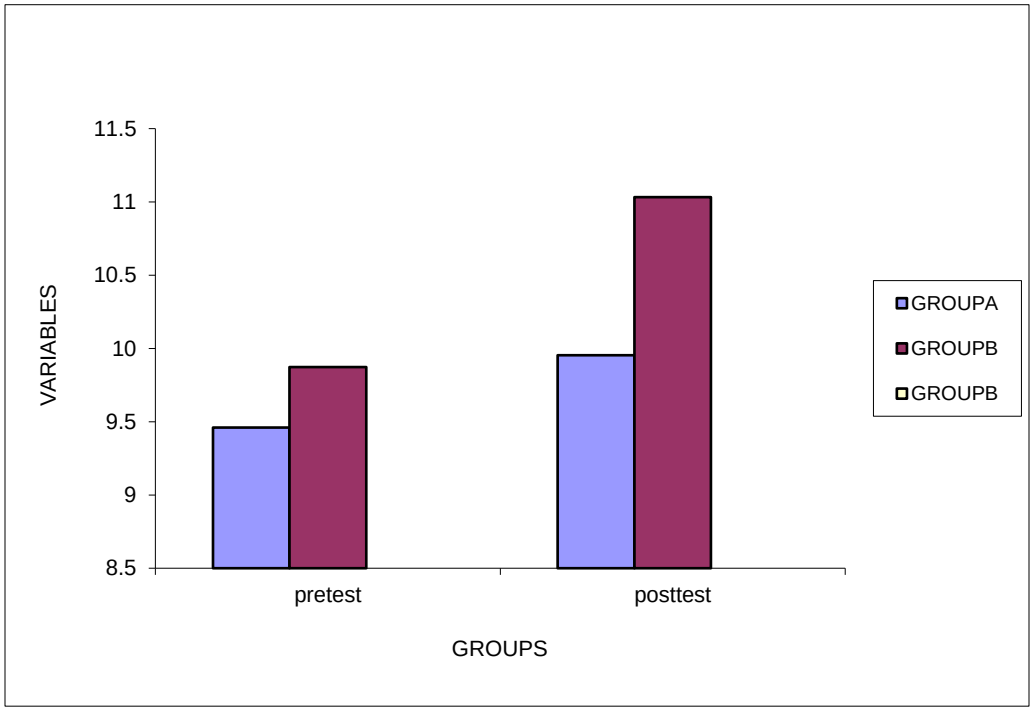
All the statistical data were analyzed by a professional Statesian. Descriptive statistics work carried out using MS excels 2010 Data Tool Pack, excel analysis tool pack 2019. The dependent variables were summarized by mean, standard deviation (SD), and the independent variables summarized by the percentage and mean value. T – Test: Two – Sample Assuming Equal Variances were performed to determine the significant 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

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. The study result showed that there is the statistically significant difference in the SPADI Test Pre- Concentric And Eccentric Exercise . 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 statistic difference with p value of Concentric exercise ($p<.0006$) and p value of Eccentric is ($p<.0009$).

	Pretest	Posttest
GROUPA	9.46	9.953
GROUPB	9.873	11.033

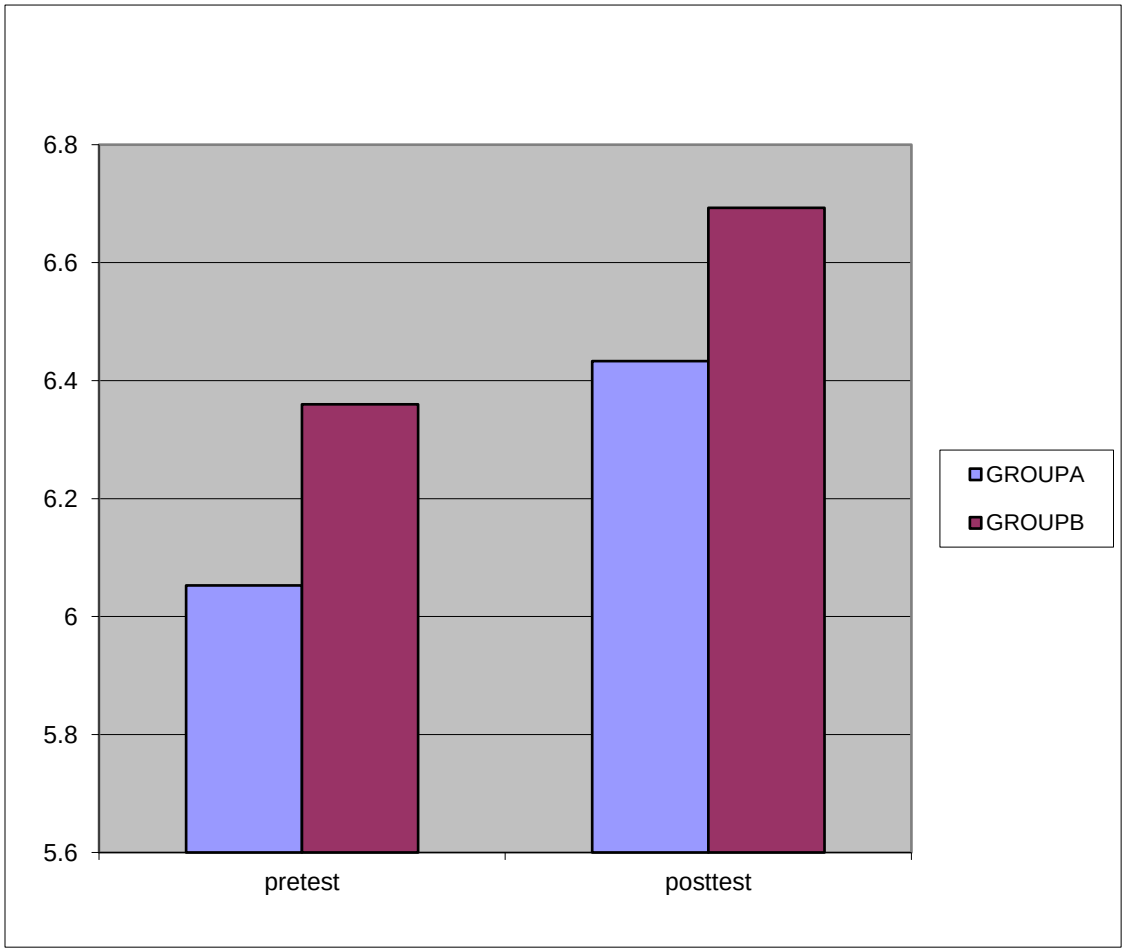
Table -1: illustrate the comparison of SPADI pretest and post test concentric and eccentric



Graph 1: Shows comparison of SPADI concentric and eccentric in between groups for pretest and post test of group A and B

GROUPA	6.053	6.433
GROUPB	6.36	6.693

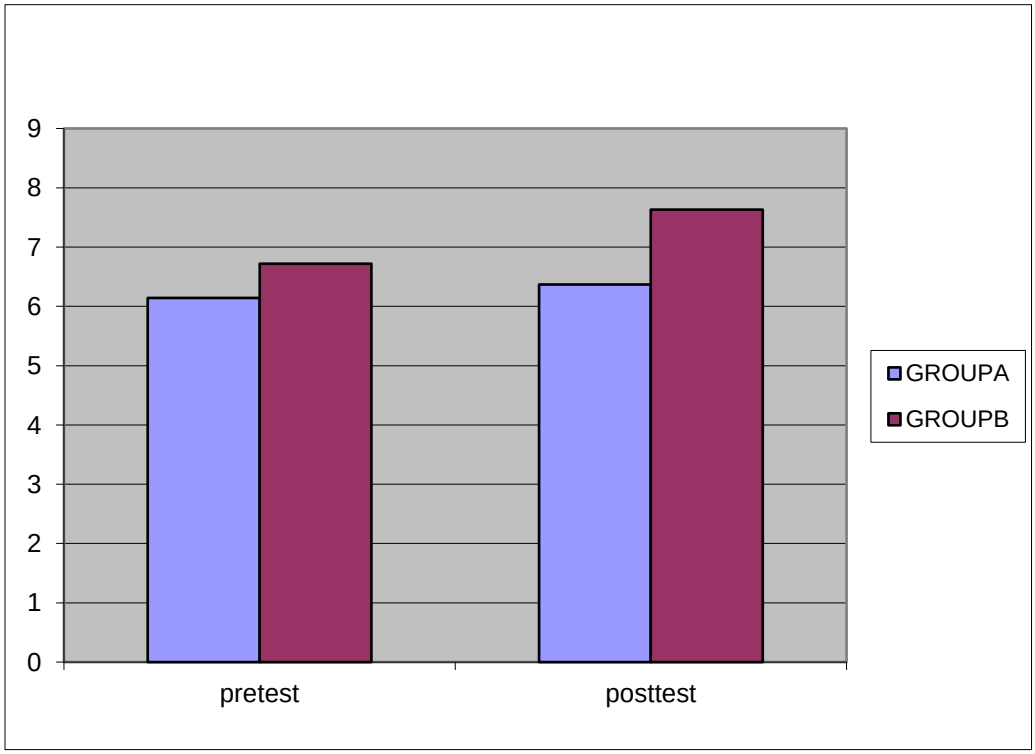
Table 2: Illustrate the comparison of ROM pretest and protest for Concentric in group A and B.



Graph 2: Shows comparison of ROM concentric in between groups for pretest and post test of group A and B

	Pretest	Posttest
GROUPA	6.14	6.367
GROUPB	6.72	7.633

Table 3 : Illustrate the comparison of ROM pre test and posttest for Eccentric in group A and B



Graph .3: Shows comparison of ROM eccentric in between groups for pretest and post test of group A and B

DISCUSSION

DISCUSSION

The sample population of 30 persons who were suffering from rotator cuff tendinitis were divided into 2 groups viz. Group A and group B. Each group contained 15 persons. The underlying idea behind giving two types of exercises was to find relative efficacy of each of the exercise administered. In addition, the eccentric exercises in the Achilles and patellar tendon studies were performed daily into the painful ROM and using body weight resistance on a single limb. the eccentric exercises in the Achilles and patellar tendon studies were performed

daily into the painful ROM and using body weight resistance on a single limb[24]. One wrist extensor study used isokinetic exercises and another released a twisted rubber bar The resistance load and volume of exercise in the current study was the same for both groups in terms of percentage of predicted 1RM used and number of sets and repetitions performed. Submaximal eccentric resistance (70-80% of predicted concentric 1RM) was used to lessen the possibility of pain or injury during exercise in the participants[25]. As a result, the concentric group may have been challenged at a dif-intensity than the eccentric group, as 70% of the concentric 1RM could have been easier to lower than to lift. Eccentric exercise in the training of healthy adults often involves supramaximal resistance in order to elicit muscle strength and mass

gains.23 Many studies of eccentric exercise effects in other tendinopathies have used resistance that placed participants above the pain threshold[26].

This approach is thought to have a greater effect on tendon properties and healing. However, the use of exercise beyond the pain threshold and use of suprafindingsThe results of this study demonstrated a significant main effect of time on all four outcome measures, indicating that all participants (both groups) made significant improvements after eight weeks for all

of the outcome measures[27]. The findings of this study suggest that significant ROM and functional improvements occurred primarily in the first five weeks of PRE treatment approaching normal limits in that time frame. Strength gains improved in that same five week time frame but continued to improve even after ROM and functional scores were no longer improvingsignificantly. However, without a true control group, one cannot be certain if these improvements were due to our intervention or simply due to the normal course of the condition over time. The use of a submaximal exercise testing protocolmappears to be a safe method for selecting and progressing resistance for shoulder rehabilitation exercises.

Muscle strength also improved significantly in both groups; in terms of what is expected, both performed progressive resistance training, despite the weight load was relatively low. Besides, significant differences were observed between the groups in favor of the eccentric training group. These structural changes are consistent with decreased symptoms and improvement in mobility and strength, in that tendons with partial rupture exhibit healing data, with these changes observed in both groups. Strengthening programs with progressive load have demonstrated to improve tendon structural characteristics, and exercise remain as the core treatment for tendinopathies[28]. But it is important to identify the correct load, progression ways and right types of contraction, as well as pain caused by load. There is still not enough strong evidence for making a recommendation about the advantages of eccentric over concentric exercises in tendinopathies, in recent years it has been a controversy over this, because of the mixed or non-conclusive results reported. It is in part derived from the huge variation of programs, patients' characteristics, sites of the tendinopathies, and that many articles do not report the complete programs to be reproducible[29].

This study provides information on the importance of a load strengthening program on the structural changes and tendon healing in painful phases and brings quality evidence in favor of the use of eccentric training for rotator cuff partial tears[30]. Specifically in rotator cuff tendinopathies there is still a knowledge gap about the best program related to structural changes with several exercise types or tendon response to the load, there are still deficits that need to be addressed to improve clinical outcomes.

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.

LIMITATIONS OF THE STUDY

1. More number of patients should have been taken
2. More follow ups should have been done.
3. As sample size of this study was very small a larger sample size could be more predictive for laying down of treatment protocol for rotator cuff tendonitis subjects

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APPENDIX

TEST

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

When lying on the involved side?	0	1	2	3	4	5	6	7	8	9	10
Reaching for something on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
Touching the back of your neck?	0	1	2	3	4	5	6	7	8	9	10
Pushing with the involved arm?	0	1	2	3	4	5	6	7	8	9	10

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.

Washing your back?	0	1	2	3	4	5	6	7	8	9	10
Putting on an undershirt or jumper?	0	1	2	3	4	5	6	7	8	9	10
Putting on a shirt that buttons down the front?	0	1	2	3	4	5	6	7	8	9	10
Putting on your pants?	0	1	2	3	4	5	6	7	8	9	10
Placing an object on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
Carrying a heavy object of 10 pounds (4.5 kilograms)	0	1	2	3	4	5	6	7	8	9	10
Removing something from your back pocket?	0	1	2	3	4	5	6	7	8	9	10

DATA COLLECTION FORM

DATA COLLECTION FORM

GROUP CASE DIAGNOSIS

NAME AGE SEX

(A) RANGE OF MOTION AT START OF STUDY(AFFECTED SHOULDER)

1 ACTIVE ROM: Flexion

Extension

Abduction

Adduction

Medial Rotation

Lateral Rotation

2.PASSIVE ROM: Flexion Abduction

Extension Adduction

MASTER CHART

GROUP A **CONCENTRIC**

					PRE – TEST		ROM			POST – TEST		ROM		
S.NO	**AGE**	**SEX**	**HEIGHT**	**WEIGHT**	**PAIN**	**DISABILITY**	**INT**	**EXT**	**ABD**	**PAIN**	**DISABILITY**	**INT**	**EXT**	**ABD**
1	37	F	5.4	56	7	6	60	61	75	4	3	75	70	85
2	35	M	5.6	68	6	8	62	63	72	5	4	78	73	86
3	34	F	5.4	62	8	7	51	61	75	4	5	65	70	85
4	28	F	5	52	6	5	52	59	78	3	4	66	69	88
5	37	F	5.2	50	9	7	59	52	71	4	5	69	62	90
6	26	M	5.4	56	7	6	60	62	81	5	3	79	72	82
7	37	M	5.6	52	5	8	50	67	85	2	4	61	76	81
8	34	F	5.2	68	8	7	52	69	70	4	5	75	78	82
9	25	M	5.4	54	6	8	50	65	86	3	4	69	75	81
10	32	F	5.6	56	9	9	58	63	85	6	3	70	73	84
11	30	M	5.2	48	8	9	57	68	75	4	2	65	78	80
12	32	F	5	52	7	7	56	67	73	5	3	66	77	81
13	25	M	5.1	49	6	8	55	68	82	3	4	71	72	82
14	29	M	5.3	50	8	8	54	62	82	4	4	75	75	85
15	31	F	5.2	58	8	9	50	61	82	4	5	71	70	90

GROUP B **ECCENTRIC**

					PRE – TEST		ROM			POST – TEST		ROM		
S.NO	**AGE**	**SEX**	**HEIGHT**	**WEIGHT**	**PAIN**	**DISABILITY**	**INT**	**EXT**	**ABD**	**PAIN**	**DISABILITY**	**INT**	**EXT**	**ABD**
1	35	F	5.4	56	6	8	60	62	74	3	4	65	72	82
2	26	M	5	48	8	6	65	63	72	4	3	70	74	82
3	32	M	5.5	62	8	8	50	60	75	4	4	60	70	85
4	37	M	5.6	61	7	8	52	59	71	3	4	60	68	81
5	38	F	5.7	63	8	8	57	54	78	4	4	64	68	88
6	36	F	5.9	60	7	8	60	62	80	4	4	70	72	90
7	34	M	5.2	62	7	7	50	67	85	4	7	62	79	92
8	30	M	5.1	55	7	9	56	69	72	4	5	61	79	82
9	28	M	5	50	6	6	50	65	86	3	3	73	76	90
10	26	F	5.2	51	6	5	68	63	86	3	1	72	73	90
11	28	M	5.2	50	6	7	57	67	73	2	3	63	77	86
12	27	F	5.1	55	5	6	55	68	82	4	3	65	78	94
13	33	M	5.3	62	7	7	56	62	87	4	4	66	72	98
14	35	M	5.1	60	7	9	50	60	80	4	5	70	70	92
15	31	M	5.2	60	7	7	54	67	84	4	4	69	75	94

DATA ANAYSIS AND OUTPUT SHEET

	Pre test	Post test
GROUP A	9.46	9.953
GROUP B	9.873	11.033

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

GROUP A	6.053	6.433
GROUP B	6.36	6.693

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

	Pre test	Post test
GROUPA	6.14	6.367
GROUPB	6.72	7.633

Table 3: Illustrate the comparison of pre test and posttest for Eccentric in group A and B

DECLARATION

I _____ voluntarily agree to participate in this study. I have been informed to my satisfaction level about the procedure , risk , and benefits of the study . I reserve my right to withdraw at any point of time and I understand participation is voluntarily and refused to participate will have no penalty or loss of benefits to which ever I am entitled understood that no compensation is being offered or is available on my participation and I have contact address of Miss SWATI SHARMA if I required any further clarification**.**

CONSENT FORM

CONSENT FORM

To find out the effect of Eccentric Versus Concentric Exercise In Rotator Cuff Tendinitis

Invitation of participate

You are invited to participate in this study , which is being done as a partial fulfillment of Master Program in Physiotherapy in Integral University.

Introduction of the study

The research is being undertaken to find out the effect of o Eccentric Versus Concentric Exercise In Rotator Cuff Tendinitisin Lucknow Uttar Pradesh.

Benefits of participation in the study

The data would be helpful in identifying Effect Of Eccentric Versus Concentric Exercise In Rotator Cuff Tendinitis

Risk of participation

There is no risk factor in the study.

Right to withdrawal

You have the right to withdraw from the research at any point of time as desirable.

Confidentiality

All the information about the study would be kept confidential and limited to me and research guide Dr. Abdur Raheem Khan and will not be shared with any person who may or may not be the part of this study you are further informed that the data may be used in photographs , for presentation and publication purpose without revealing identify.

PUBLICATION FORM

ABSTRACT

Purpose : To find out the effect of Eccentric Versus Concentric Exercise In Rotator Cuff Tendinitis

Material & Methods: 30 subjects were taken from the IIMSR ,Lucknow. All subject go through the inclusion and exclusion criteria. Included participated were evaluated on the SPADI Test.

Result: The study result showed that there is the statistically significant difference in the Pre-Right and Left Concentric And Eccentric Exercise . 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.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 statistic difference with p value of Concentric exercise ($p<.0006$) and p value of Eccentric is ($p<.0009$).

Conclusion: The were significantly high for eccentric exercise of in terms of concentric exercise.

Key Word: SPADI , ROM , SITS.

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, some what 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 rehabilitation programme and have been comparatively analyzed for their efficacy in strengthening rotator cuff muscles to try and prevent further possible reccurence[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 ishigher in women than in men[8]. The risk factors for AC have been reported to includechronic 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. Guler-Uysal et al. conducted a comparison on twodifferent modes that included the Cyriax method and physical therapy, and reported thatthe Cyriax method provided faster and better effectiveness than the physical therapy inshoulder pain and the ROM [14]. The thesis, therefore attempts to study the relative efficacy of Eccentric exercises and Concentric exercises for strengthening cuff muscles in rotator cuff tendonitis[15].

The thesis comprises of rotator cuff anatomy cuff anatomy and biomechanics, eccentric role of rotator cuff, specific eccentric and concentric exercise protocols.

Musculotendinous cuff of the shoulder (Rotator cuff)

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 humerous. 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].

The cuff gives strength to the capsule of the shoulder joint all around except inferiorly[19].

1. SUPRASPINATUS

Origin- Medial 2/3 of the supraspinus fossa of the scapula.

Insertion-upper impression of the greater tubercle of the humerus.

Nerve supply-Suprascapular nerve (C5,6).

Actions- (i) The supraspinatus initiates abduction of the arm and carries it upto 15 degrees.

(ii) Along with other short scapular muscles it steadies the head of the humerus during movements of the arm, so that latter does not slip out of the glenoid cavity.

2. INFRASPINATUS

Origin- Medial 2/3 of the infraspinous fossa of the scapula.

Insertion- Middle impression on the greater tubercle of the humerus.

Nerve supply- Suprascapular nerve(C5,6).

Actions- (i) Lateral rotator of arm.

3. TERES MINOR

Origin- Upper 2/3 of the dorsal surface of the lateral border of the scapula.

Insertion- Lowest impression on the greater tubercle of the humerus.

Nerve supply- Axillary nerve (C5, 6)

Action- Same as infraspinatus.

4. SUBSCAPULARIS

Origin- Medial 2/3 of the subscapular fossa.

Insertion- Lesser tubercle of the humerus.

Nerve supply-Upper and lower Subscapular nerves.

Action- Medial rotator and adductor of arm.

The central role the rotator cuff has in shoulder function almost precludes its involvement in most painful disorders of this joint. Rotator cuff tendonitis (RCT) refers to micro-tearing or inflammation of one or more of the four rotator cuff tendons of the shoulder (Supraspinatus, Infraspinatus, Teres minor, and Subscapularis, or SITS) [20]. Commonly referred to as impingement syndrome, RCT can be primacy bursitis, implegent from mechanical abutment, or secondary from glenohumeral instability. RCT is common in those who are 25 to 40 years, when tendonitis and fibrosis are found to be most frequent and chronic. After 40 years, there is full-thickness rotator cuff tearing, requiring operative repair. This age -related characterization of RCT is accelerated in athletes involved in sports with repetitive overhead motions, who not only increase the forces on the cuff tendons, but also the repetitions of aggravating motions[21].

Patients usually present with pain of indisdious 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 [22]. 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 [23]. 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 question

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

Need of study

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

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.

HYPOTHESIS

ALTERNATIVE 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

METHODS

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).

l. 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

l. 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 anterio lateral shoulder region.

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

Empty Can Test.(Supra spinatous 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 defecit 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^{o} shoulder abduction, 30^{o} 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 Suprasspinatous tendon (Rotator Cuff tear)

Test procedure

Patient sitting or standing. Examiner passively abducts patients shoulder to 90º. 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 repeitions, 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 3^{rd} - 4^{th}.

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 thera band in hand of affected side and the arm is brought into medial rotation up to maximal range against resistance of theraband 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 sorness.

DATA ANALYSIS

All the statistical data were analyzed by a professional Statesian. Descriptive statistics work carried out using MS excels 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 significant 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

	Pretest	Posttest
GROUPA	9.46	9.953
GROUPB	9.873	11.033

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

GROUPA	6.053	6.433
GROUPB	6.36	6.693

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

	Pretest	Posttest
GROUPA	6.14	6.367
GROUPB	6.72	7.633

Table 3 : Illustrate the comparison of pre test and posttest for Eccentric in group A and B

DISCUSSION

The sample population of 30 persons who were suffering from rotator cuff tendinitis were divided into 2 groups viz. Group A and group B. Each group contained 15 persons.

Each person in group A was given Concentric muscle strengthening exercises, and members in group B were given Eccentric muscle strengthening exercises for total period of 30 days .The underlying idea behind giving two types of exercises was to find relative efficacy of each of the exercise administered. In addition, the eccentric exercises in the Achilles and patellar tendon studies were performed daily into the painful ROM and using body weight resistance on a single limb. the eccentric exercises in the Achilles and patellar tendon studies were performed daily into the painful ROM and using body weight resistance on a single limb[24]. One wrist extensor study used isokinetic exercises and another released a twisted rubber barThe resistance load and volume of exercise in the current study was the same for both groups in terms of percentage of predicted 1RM used and number of sets and repetitions performed. Submaximal eccentric resistance (70-80% of predicted concentric 1RM) was used to lessen the possibility of pain or injury during exercise in the participants[25]. As a result, the concentric group may have been challenged at a dif-intensity than the

eccentric group, as 70% of the concentric 1RM could have been easier to lower than to lift. Eccentric exercise in the training of healthy adults often involves supramaximal resistance in order to elicit muscle strength and mass

gains.23 Many studies of eccentric exercise effects in other tendinopathies have used resistance that placed participants above the pain threshold[26].

This approach is thought to have a greater effect on tendon properties and healing. However, the use of exercise beyond the pain threshold and use of suprafindingsThe results of this study demonstrated a significant main effect of time on all four outcome measures, indicating that all participants (both groups) made significant improvements after eight weeks for all

of the outcome measures[27]. The findings of this study suggest that significant ROM and functional improvements occurred primarily in the first five weeks of PRE treatment approaching normal limits in that time frame. Strength gains improved in that same five week time frame but continued to improve even after ROM and functional scores were no longer improvingsignificantly. However, without a true control group, one cannot be certain if these improvements were due to our intervention or simply due to the normal course of the condition over time. The use of a submaximal exercise testing protocolmappears to be a safe method for selecting and progressing resistance for shoulder rehabilitation exercises.

Muscle strength also improved significantly in both groups; in terms of what is expected, both performed progressive resistance training, despite the weight load was relatively low. Besides, significant differences were observed between the groups in favor of the eccentric training group.

These structural changes are consistent with decreased symptoms and improvement in mobility and strength, in that tendons with partial rupture exhibit healing data, with these changes

observed in both groups. Strengthening programs with progressive load have demonstrated

to improve tendon structural characteristics, and exercise remain as the core treatment for tendinopathies[28]. But it is important to identify the correct load, progression ways and right types of contraction, as well as pain caused by load. There is still not enough strong evidence for making a recommendation about the advantages of eccentric over concentric exercises in tendinopathies, in recent years it has been a controversy over this, because of the mixed or non-conclusive results reported. It is in part derived from the huge variation of programs, patients' characteristics, sites of the tendinopathies,

and that many articles do not report the complete programs to be reproducible[29].

This study provides information on the importance of a load strengthening program on the structural changes and tendon healing in painful phases and brings quality evidence in favor of the use of eccentric training for rotator cuff partial tears[30]. Specifically in rotator cuff tendinopathies there is still a knowledge gap about the best program related to structural changes with several exercise types or tendon response to the load, there are still deficits that need to be addressed to improve clinical outcomes.

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.

LIMITATIONS OF THE STUDY

4. More number of patients should have been taken
5. More follow ups should have been done.
6. As sample size of this study was very small a larger sample size could be more predictive for laying down of treatment protocol for rotator cuff tendonitis subjects

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