

A Study to Compare the Effectiveness of Concentric and Eccentric Training Program for Patients with Lateral Epicondylitis

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Abstract

Background: Lateral epicondylitis is considered to be the most prevalent overuse injury which affects 1% to 3% of the total population among all age groups and genders. The tendon of extensor carpi radialis brevis gets affected and can be strengthened by resistance exercises. It also affects plumbers, carpenters ,housewives etc. The daily activities are interrupted which increases pain in lateral epicondylitis can be treated conservatively and surgically.

Purpose: To compare the effectiveness of concentric vs Eccentric training programs for lateral epicondylitis by reducing pain.

Materials and Methods: 68 subjects were selected from Active physio care physiotherapy clinic based on the inclusion and exclusion criteria. The detailed procedure for performing the study was explained to the subjects, and the informed consent form was collected from them before starting the study. The pre and post test values were measured using the numerical pain rating scale (NPRS) and pain rated tennis elbow evaluation (PRTEE). The subjects selected based on the inclusion and exclusion criteria were divided into two groups: concentric group and Eccentric group (n = 34). Study period : November 2022 to April 2023.

Results: Statistical analysis of numerical pain rating scale and pain rated tennis elbow evaluation post test result revealed that both groups show similar effect but Eccentric exercise Group (Group B) exceeds Concentric Exercise group (Group A) with p VALUE of $p < 0.0001$.

Conclusion: When comparing the concentric group to the Eccentric group, the Eccentric group indicates significant effects in improving the strength of the elbow, improving the functional activity and strength of the forearm

Key Word: Concentric exercise, Eccentric exercise, lateral epicondylitis, NPRS scale, PRTEE

Introduction

Lateral Epicondylitis is one the most common overuse injury that affects the lateral epicondyle of

the elbow and it is caused by a rupture of extensor tendon of forearm.¹ The tendon of extensor carpi radialis brevis is majorly affected and extensor

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digitorum, extensor carpi radialis longus and extensor ulnaris gets affected in a smaller scale. It is characterized by pain, limited range of motion and decreased functional activity. Lateral elbow tendinopathy (LET) causes discomfort at work or during athletic activity instead of inflammatory or degenerative alterations. LET is accompanied with pain in the lateral epicondyle that is related to poor tendon repair.² The prevalence of LET peaks between the age of 30 to 60, and mostly affects the dominant hand. In women the symptoms last longer and are more severe.³ Patients frequently stop participating in daily activity such as employment and sports because of wide range symptoms they encounter such as pain, loss of function for example due to prolonged healing period, cost associated with loss of wages and decreased daily activities are frequently high⁴. The discomfort is often restricted to the epicondyle however in more severe cases it may radiate to the shoulder and wrist. Between 1% to 3% of the people have tennis elbow. Instead of being an inflammatory issue it is regarded as overuse injury that started in extensors in the wrist. Sports and work related activities requires a strong grip or repetitive wrist motion.⁵ Rather than tennis player the disorder more frequently affects occupations such as plumber, butcher and auto repairmen. Predispositions to the condition are all systemic intrinsic factors. Age may cause histological abnormalities that are comparable to or identical to those of lateral epicondylitis.⁶

Lateral epicondylitis is hyaline degeneration and it is also known as forearm extensor tendinopathy, frequently brought by excessive or repetitive use, forceful extension or direct trauma to the epicondyle. The presence of fibroblasts, vascular hyperalgesia and disorganized collagen are histological indicators of tendon degeneration. Palpable pain at the lateral epicondyle is a sign of lateral epicondylitis such as wrist pain when making a fist, pronating a forearm, turning the wrist, or resisting wrist extension and experiencing pain when passively extending the elbow.⁷ Middle finger and wrist pain from resistance to extension, ache when grabbing things. The utilization of patient's history, differential diagnosis, physical examination should be done and information should be collected. The most popular therapeutic exercise program now used to treat tendinopathy incorporates Eccentric activities

that mechanically load the uncomfortable or dysfunctional tissue. Ice, low level light treatment, ultrasound and iontophoresis are typical methods for pain relief. The musculotendinous unit is lengthened during Eccentric exercise when a load is applied to it. Eccentric strengthening has been practiced in recent times until recently, little was known about how Eccentric muscle strengthening was carried out with free weights (determined by the 10RM). The patient should be seated with elbow fully extended, forearm pronated and wrist fully extended.

Flexion for a count for 30, then extends the wrist to its fullest extend with the hand on the other hand⁶. Based on patient's repetition maximum load is increased for who execute Eccentric exercise without experiencing the pain or discomfort or pain. Each treatment consists of three sets of ten repetitions.⁸

Warmup : For 2 to 3 minutes move the wrist lightly Sets: 3.Repetitions:10 to 15,The patient is seated in full elbow extension, forearm pronation and wrist in neutral position a concentrated strengthening exercise was carried out using free weights determined by 10RM.⁹

Aim

To compare the effectiveness of concentric and Eccentric training program for lateral epicondylitis by reducing pain.

To compare Material and Method

Study type: Comparative study

Subjects: Patients with lateral Epicondylitis

Sampling technique: Convenient sampling

Sampling size: 68

Study duration: 4 weeks

The 68 subjects were selected based on the inclusion and exclusion criteria. The detailed procedure for performing the study was explained to the subjects, and the informed consent form was collected from them before starting the study. The pre and post test values were measured using the numerical pain rating scale (NPRS) and pain rated tennis elbow evaluation (PRTEE). The subjects selected based on the inclusion and exclusion

criteria were divided into two groups: concentric group (Group A, n=34) and Eccentric group (Group B, n=34)

Study period : november 2022 to april 2023.

Inclusion criteria

- Both men and women
- Age 18-45 years
- NPRS score more than 5
- Patients with lateral Epicondylitis

Exclusion criteria

- Subjects with recent injury
- Subjects with NPRS score less than 5
- Active infection
- Subjects with no cooperation.

Outcome measures

Numerical pain rating scale

This scale is considered to be one of the most accurate pain outcome measure available. A straight line was drawn on the evaluation sheet with 0 at the start and 10 at the end. The patients were asked to mark on the line based on impression of pain 0 indicating no pain and 10 indicating severe pain¹³

Pain Rating tennis elbow evaluation

PRTEE Allows the patient to rate the levels of tennis elbow pain and disability from 0 to 10, and consists of 2 subscale¹²

1. PAIN SUBSCALE (0=No pain, 10=worst imaginable)

Pain=5 item

2. Functional subscale (0=No difficulty, 10=Unable to do)

Specific activity=6 item

Usual activity=4

Procedure

The 68 subjects were selected based on the inclusion and exclusion criteria. The detailed procedure for performing the study was explained to the subjects, and the informed consent form was collected from them before starting the study. The

pre and post test values were measured using the numerical pain rating scale (NPRS) and pain rated tennis elbow evaluation (PRTEE). The subjects selected based on the inclusion and exclusion criteria were divided into two groups: Group A Concentric group and Group B Eccentric group. Each group consists of 34 samples. The subjects received Concentric Exercise and Eccentric exercise. Concentric Exercises (Group A) include wrist extension with resistance, pronation with resistance, Supination with resistance. Eccentric exercises (Group B) include Eccentric wrist extension with Dumbbells or 1 kg weight, Eccentric supination, Eccentric pronation. warm up exercise are given before the treatment.

Concentric Exercise

Concentric exercise is performed by applying resistance to the wrist for strengthening the muscles. Resistance is applied for wrist extension, wrist supination, wrist pronation etc. warm up exercises should be given before the treatment.

Wrist extension:

- Sit or stand with your forearm supported on a table or your thigh, palm facing downwards.
- Hold a light dumbbell or resistance band in your hand.
- Slowly lift your hand upward, bending your wrist and keeping your forearm stationary.
- Hold for a second, then slowly lower your hand back to the starting position.
- Repeat for 10-15 repetitions, gradually increasing the weight or resistance as tolerated.

Wrist supination:

- Hold a 1 kg weight or resistance band in your hand, palm facing upward.
- Keep your elbow bent at a 90-degree angle and your forearm resting on a table or your thigh.
- Slowly rotate your wrist and hand outward, moving from a palm-up to a palm-down position.
- Hold for a second, then slowly return to the starting position.
- Perform 10-15 repetitions, gradually increasing the weight or resistance as you progress.

Wrist Pronation

- Similar to the supination exercise, hold a 1 kg weight or resistance band in your hand, palm facing downward.
- Keep your elbow bent at a 90-degree angle and forearm supported on a table or your thigh.
- Slowly rotate your wrist and hand inward, moving from a palm-down to a palm-up position.
- Hold for a second, then slowly return to the starting position.
- Perform 10-15 repetitions, gradually increasing the weight or resistance over time.

ECCENTRIC EXERCISES

Eccentric exercises can be particularly effective in the rehabilitation of lateral epicondylitis, as they help to strengthen the tendons and promote healing. Here are some eccentric exercises that target the muscles and tendons involved in lateral epicondylitis. warm up exercises should be given before the session.

Eccentric Wrist Extension:

- Sit or stand with your forearm supported on a table or your thigh, palm facing downwards.
- Hold a lightweight or resistance band in your hand.
- Use your unaffected hand to assist in lifting the weight.
- Slowly lower the weight by extending your wrist against the resistance.
- Allow the affected wrist to return to the starting position with the assistance of your unaffected hand.
- Repeat for 10-15 repetitions, gradually increasing the weight or resistance as tolerated.

Eccentric Wrist Pronation:

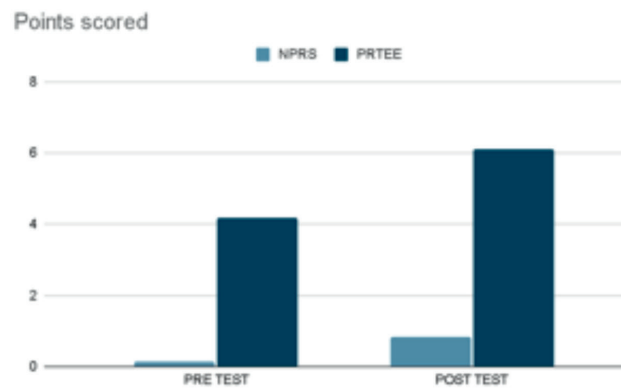
- Hold a 1 kg weight or resistance band in your hand, palm facing downward.
- Keep your elbow bent at a 90-degree angle and forearm supported on a table or your thigh.
- Use your unaffected hand to assist in rotating your wrist and hand inward.

- Slowly release the resistance and allow your wrist and hand to return to the starting position.
- Repeat for 10-15 repetitions, gradually increasing the weight or resistance over time.

Eccentric Supination:

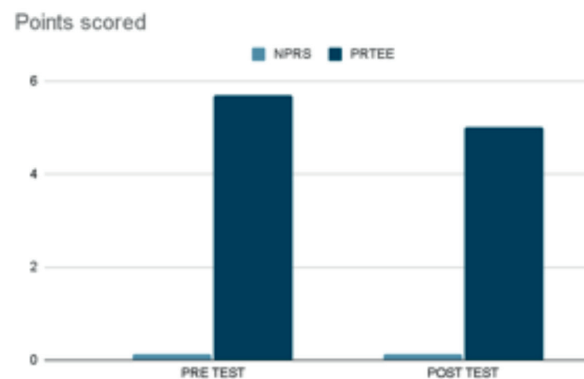
- Hold a 1 kg weight or resistance band in your hand, palm facing upward.
- Keep your elbow bent at a 90-degree angle and forearm supported on a table or your thigh.
- Use your unaffected hand to assist in rotating your wrist and hand outward.
- Slowly release the resistance and allow your wrist and hand to return to the starting position.
- Perform 10-15 repetitions, gradually increasing the weight or resistance as you progress

Data Analysis



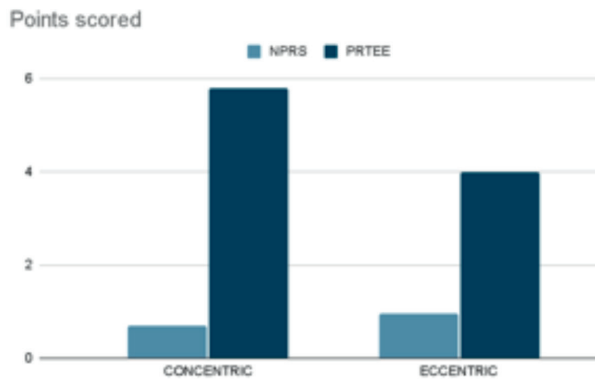
Graph No 1:

Pre-test and Post-test values of concentric group using NPRS and PRTEE (Group A)



Graph No 2

Represents pre and post test values of Eccentric training Group B



Graph No 3

Represents post test values of concentric and Eccentric group A and B.

Result

Statistical analysis of quantitative data showed statistically significant difference not only Eccentric group but also in Concentric group. The numerical pain rating scale post-Test MEAN value in the Concentric group was 5.8 (4.65) while it was 6.7 (3.9), in Eccentric exercise program for lateral epicondylitis. The Pain Rating tennis elbow evaluation for Concentric Exercise group A is 58.88, Whereas for Eccentric exercise Group is 65.29. This indicates that score was comparatively higher in Eccentric group with P VALUE $p < 0.0001$. Statistical analysis of numerical pain rating scale and pain rated tennis elbow evaluation post test result revealed that both groups show similar effect but Eccentric exercise Group (Group B) exceeds Concentric Exercise (Group A)

Discussion

The goal of the present study is to compare the effectiveness of concentric and Eccentric training program for lateral epicondylitis and also to assess the effectiveness in terms of reducing pain and improving the function. This comparison is demonstrated with duration of 4 weeks. The outcome results were measured by NPRS scale and PRTEE scale before and after treatment. Beneficial effects were significantly greater in Eccentric Exercise than the Concentric

exercise. when the response was compared between both groups, the result showed a significant difference in Eccentric group than concentric group. In concentric group pre-intervention mean of NPRS was 8.06. After treating the subject with Concentric Exercise the mean value of NPRS is decreased to 6.97 which shows statistically significant difference between the groups. In Eccentric group the pre-Test value is 7.97, After treating the subject with Eccentric Exercise the mean value of NPRS is decreased to 6.79 which shows statistically significant difference between the groups based on the statistical analysis, both groups showed improvement in NPRS. However, subjects who received Eccentric exercise showed better improvement in NPRS than the subjects in the Concentric group.

In an early study by SeoYeon Yoon et al 2021, eccentric exercise along with adjuvant therapy had positive outcomes in terms of reducing pain and enhancing muscle strength. Comparisons between eccentric exercise and other exercises revealed that eccentric exercise had favorable effects on pain relief, but there was no statistically significant difference between the groups in terms of muscular strength or function. We could not be confident in the calculated effects and recommended beneficial effects of eccentric exercise on LET with insufficient evidence because of the small number of included studies and different eccentric exercise characteristics. Future research with the ideal eccentric exercise device and protocol are advised, as well as a study design that isolates the demonstrated Eccentric exercise.¹⁰

M Padasala et al., 2020 Study findings concluded that group B eccentric-concentric training combined with supinator strengthening gave better response and is more effective than eccentric-concentrating of wrist extensors with static stretching in reducing pain and increasing grip strength in lateral epicondylitis.¹¹

A early study by Magnus Peterson et al., (2014) stated that Eccentric graded exercise reduced pain and increased muscle strength in chronic tennis elbow more effectively than concentric graded exercise.¹²

Conclusion

The collected data was statistically analyzed using an unpaired t-test. When comparing the concentric

group to the Eccentric group, the Eccentric group indicates significant effects ($p < 0.0001$) in Improving the strength of the elbow and improving the functional activity. Eccentric exercise are more effective in strengthening the extensor muscles of forearm.

Ethical Clearance: ISRB: This research has been approved by ISRB committee.

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Conflict of Interest: Nil

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