Original Article

Efficacy of Scapular Strengthening Exercise and Eccentric Forearm Exercise on Functional Recovery in Subjects with Lateral Epicondylitis

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Abstract

Background: Inflammation of the extensor Carpi Radialis Brevis tendon causes lateral epicondyle discomfort. Patients on the dominant side were more affected than those on the nondominant side. And also proximal muscle weakness or instability places an additional load on the distal joint, leading to distal conditions, such as lateral epicondylitis.

Purpose: To evaluate the effectiveness of scapular strengthening exercise and forearm eccentric exercise on functional recovery in subjects with lateral epicondylitis.

Materials and Methods: Thirty participants were randomly assigned to experimental (scapular strengthening with eccentric exercise) and conventional (eccentric exercise) groups. Pain-rated tennis elbow evaluation (PRTEE), the numerical pain rating scale (NPRS), and grip strength measurement using a hand dynamometer were used to evaluate the pre-test. The same test was used to determine post-treatment values after five weeks of treatment.

Results: A substantial difference was seen between the experimental and control groups (P = 0.0001). Scapular strengthening and eccentric exercises were effective in patients with lateral epicondylitis.

Conclusion: Scapular muscle strengthening and eccentric forearm training are effective in individuals with lateral epicondylitis.

Key Word: Scapular muscle strengthening, Eccentric exercise, Tennis elbow, Grip strength, Hand dynamometer.

Introduction

One of the most prevalent arm lesions is the tennis elbow. Lateral epicondyle pain is an inflammatory condition that affects the common attachment of the tendons of the extensor forearm muscles, predominantly the tendon of the extensor carpi radialis brevis[1]. This generally occurs when people perform tasks that require repeated wrist extensions. The relevant risk factors include age, poor circulation, muscular deterioration or imbalance, overuse, repeated motions, improper training, misalignment, flexibility issues, and mental concerns[1, 2]. It is among the most prevalent injuries affecting both those who are employed and those who are not[3].

Lateral epicondyle predominance peaks were observed between the ages of 30 and 60. It is predicted

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that 3–7% of the population will be affected[4]. Repetitive task workers are more vulnerable, accounting for 35–64% of all incidents. Patients experience numerous functional challenges due to pain and decreased grip strength, including trouble wringing clothes, using a firm grip, unlocking locks, and opening a jar[5, 6].

Strong indications for diagnosis include substantial pain during forced wrist extension, and tenderness when pressure is applied to the radio-humeral gap. Tennis elbow should not be diagnosed until specific findings are present[7].

Functional impairments can be caused by many different events such as discomfort, diminished grip strength, and decreased strength and endurance of the scapular muscles in lateral epicondylitis. They are not solely caused by wrist extensors. Kinetic chain theory states that every distal joint requires kinetic power generated by the proximal muscles. Proximal muscle weakening or instability puts extra strain on the distal joint and can result in distal pathologies, such as lateral epicondylitis. Subjects with lateral epicondylitis performed worse than healthy patients and showed considerable middle, lower, and upper trapezius, serratus anterior weakness, and decreased scapular endurance of the muscle. Exercises that strengthen the scapular muscles aid in improving grip strength and also minimise pain[8, 9].

Eccentric exercise lengthens the muscle-tendon unit as weight is applied, which encourages tendon healing and modifies the way the tendon is injured. However the purpose of eccentric exercise training is to stop or slow down muscle elongation. This presents a challenge to the muscle, as it increases its strength and accelerates healing and metabolism. By changing the characteristics and performance of their muscles, eccentric workouts are thought to be helpful in the rehabilitation of athletes, senior citizens, and patients[10, 11].

This study aimed to determine whether scapular strengthening and eccentric forearm exercises were effective in treating lateral epicondylitis.

Aim

To evaluate the effectiveness of scapular strengthening exercise and forearm eccentric exercise on functional recovery in subjects with lateral epicondylitis.

Material and Method

It was an experimental study conducted on 30 subjects with lateral epicondylitis, ages between 25-45 years. Samples were selected from the outpatient department of Saveetha Medical College and Hospital, Thandalam, Chennai. Using the closed-envelope method, participants were randomly assigned to one of two groups. The total duration of the study was 5 weeks, which is from July 2022 to August 2022.

Inclusion Criteria:

- An adult between the ages of 25 and 45, both genders, who has been experiencing pain in the lateral epicondyle region for the past two weeks.
- NPRS score of 3 or higher
- Presented with minimum one of the cozen`s, maudsley`s or milli`s procedure results that are positive.
- While gripping, there is discomfort at the lateral epicondyle.

Exclusion Criteria:

- Upper extremity neurological symptoms, musculoskeletal issues, neck pain, joint deformities, neurological illness, and cervical radiculopathy were all present.
- History of deformity in the affected extremity due to recent injury.
- The participant's medical history form, which includes any health concerns such as cancer, tumor or non-healing fractures.
- Injections of corticosteroids in the previous six months.

Outcome Measure:

Assessment was performed at baseline (before starting of treatment) and after five weeks of study.

- NPRS - Numerical Pain Rating Scale.
- PRTEE – Pain-Rated Tennis Elbow Evaluation.
- Grip strength measures using a Hand Held Dynamometer.

Procedure

Thirty respondents were chosen using a convenient sampling technique, based on the

inclusion and exclusion criteria. All individuals provided written informed consent before beginning the study. Assessment of all the included participants was done according to the assessment form. Pain-rated tennis elbow evaluation, a numerical pain rating scale, and grip strength measurements using a hand dynamometer were used to evaluate before and after treatment. Using the closed-envelope method, participants were randomly assigned to one of two groups.

Group A: (Scapular Strengthening and Eccentric Forearm Exercise)

Participants receive the scapular strengthening with eccentric exercise for a single session per day in the total of 5 weeks also in the scapular strengthening mainly focused on serratus anterior, upper, lower and middle trapezius muscles. The participants used dumbbells as resistance to scapular strengthening and eccentric exercise (weight 10 RM).

- Scapular plane lateral raise - For the serratus anterior, while standing, the participants were asked to raise their arms and lower their heads in the plane of the scapula.
- Dumbbell shrug - For the upper trapezius, an individual is taught to stand, shrug their shoulders, and raise their shoulders towards their ears.
- Prone single arm dumbbell - For the middle trapezius, the participants were positioned on their back, shoulders near the table's edge, shoulder 90 degree abduction, elbows bent at a straight angle, and heads turned on either side for comfort. They were then instructed to raise their elbows towards the sky.
- Prone bench Y raise - For the lower trapezius, the participants were asked to lie face-down on the floor. Squeeze your shoulder blades together, raise your arm at a 45-degree angle above your head, point your thumb to the ceiling, keep your elbow straight, and slowly raise your arms as much as possible.
- Eccentric forearm exercise-Participants wrists were fully extended, forearms were pronated, and elbows were fully extended when the participants sat. The patient's wrists were gradually lowered to flexion, and the other hand was slowly lifted back to full extension. Supination and pronation were achieved by gradually turning the palm up and then down, respectively.

Group B: (Eccentric forearm exercise)

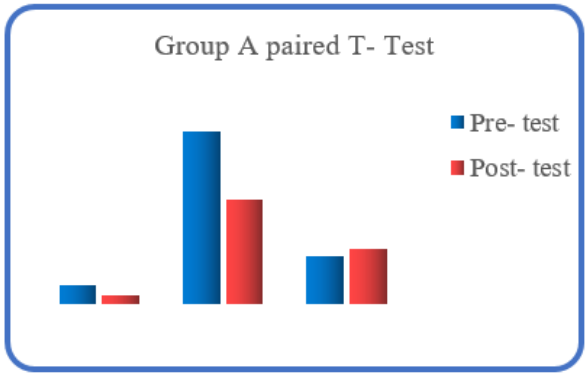
Participants receive only the eccentric exercise for a single session per day in the total of 5 weeks. The participants used dumbbells as resistance to eccentric exercise (weight 10 RM).

- Eccentric forearm exercise- Treatment application instructions were identical to those provided to the experimental group. As post- test values, the same test was performed after five weeks of treatment.

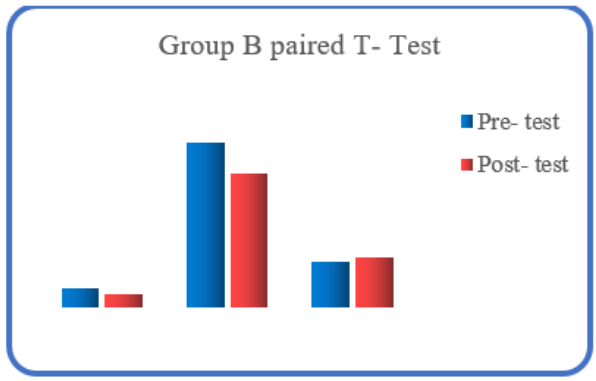
Treatment protocol:

- Duration of the session: 30- 40 minutes
- Frequency : Single session per day / 5 weeks
- Sets : 2 sets
- Repetitions: 10 repetitions
- Rest : 2-3 mins break between sets

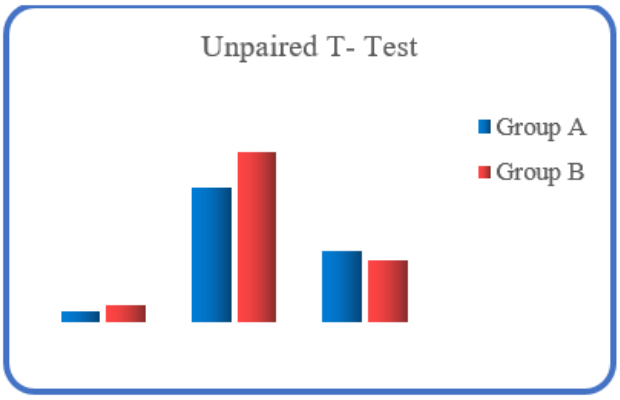
Data analysis



INTERPRETATION: Fig1 shows that the values are extremely statistically significant.



INTERPRETATION: Fig 2 shows that the values are extremely statistically significant.



INTERPRETATION: Fig 3 shows that the values are extremely statistically significant.

Result

- The study was conducted on 30 subjects. Both the groups have 15 subjects each.
- The mean for NPRS was 2.67 for Group A and 4.07 for Group B, with p value is <0.0001 and t value was 5.3572 indicating that the results were extremely statistically significant.
- The mean for PRTEE was 32.3300 for Group A and 41.00 for Group B, with p value =<0.0001 and t value was 5.8231 indicating that the results were extremely statistically significant.
- The mean for Grip Strength was 17.127 for Group A and 15.127 for Group B, with p value =<0.0001 and t value was 5.1793 indicating that the results were extremely statistically significant.

Discussion

The goal of this research was to assess the effectiveness of scapular training activity and eccentric forearm exercise on functional recovery in patients with lateral epicondylitis. The study involved 30 people aged 25 to 45. Participants with dominant sides were impacted more than patients with less dominant sides. Random group allocation separated the groupings in half. The experimental group did scapular strengthening exercises as well as eccentric forearm exercises, while the control group did only eccentric exercises. The trial lasted 5 weeks, and workouts were given 5 days each week. During the treatment, there is no drop-out.

When data from the experimental group, which received scapular muscle strengthening and eccentric forearm exercise, were analysed using paired t-tests within the study population for PRTEE, NPRS, and grip strength, there was a statistical difference in all three measures of outcome, namely discomfort, performance, and grasping power. Strengthening the scapular musculature gives proximal stability and helps to minimize tension at the musculotendinous junction, limiting pain stimulation of receptors and reducing pain by decreasing neurotransmitters in affected tissue. Decreased pain aids in the improvement of performance and the reduction of impairment. The fair distribution of kinetic energy in the kinetic chain also aids in performance. Eccentric exercise may have improved grip capacity by putting tensile strain on the muscle[12, 13].

When data was analysed using paired t-testing within the group for PRTEE, NPRS, and grasping power for conventional groups that only received eccentric exercise, there was a statistical difference in all three end measures, which are pain, performance, and grasping power. As shown in the article by Pufe T, Peterson et al. strengthening the eccentrically has helped to alleviate discomfort caused by neovascularization since exercise stops the formation of blood vessels in tendons. On the mechanical element influencing endostatin expression. It also stimulates collagen synthesis and tendon repair[14, 15.]

In all situations, the unpaired t test was employed to look for significant differences in after treatment results between both the control and experimental groups. The experimental and conventional groups have a considerable difference. As a result, the mean values of the experimental and usual groups diverge substantially. This difference is statistically significant, according to convenient criteria. The positive benefits were clearly greater in the experimental group than in the control group.

Bhide et al. investigated the effects of dynamic scapular muscle training on grip endurance in young people in order to debate the effectiveness of proximal stability on distal performance and a 4 weeks intervention consisting of dynamic scapular musculature strengthening exercises that targeted the musculature of scapular stabilizers. The findings of paired t-tests comparing grip strength before and after the intervention were highly significant, and it was concluded that grip strength in young adults increased significantly[16].

When group analysis was conducted, there was considerable variation in grip strength according to the study. This was supported by the findings of Bhargava et al. perform a case-control study that evaluates the hand endurance of players with LE in two separate wrist positions, as well as comparing athletes' and non-athletes' involved and not involved sides. This finding demonstrates that hand endurance decreases in patients with CLE. Statistical analysis revealed higher grip strength. Additionally, athletes' improved muscle strength, coordination, and neural adaptability may have had a certain influence on their outcomes[17].

There has been an increase in interest in the utilization of scapular muscle strengthening exercises and eccentric forearm exercises as prospective treatments for lateral epicondylitis in recent years. The scapular muscles help to stabilize the shoulder girdle during upper limb motions, and their failure can lead to altered biomechanics and greater load on the forearm extensor muscles. Eccentric forearm workouts, on the other hand, have been demonstrated to aid tendon repair and improve muscular strength and function. While some evidence supports the individual efficacy of scapular strengthening exercises and eccentric forearm exercises in lateral epicondylitis, little study has been conducted to investigate the combined benefits of these therapies on functional recovery in affected patients. As a result, the purpose of this research is to look into the potential synergistic efficacy of combining scapular strengthening exercise and eccentric forearm exercise into therapeutic programs for people with lateral epicondylitis, which could lead to better treatment outcomes and overall patient outcomes.

Conclusion

All outcome indicators in both groups showed significant improvement. There was a slight improvement in pain score, total pain-rated tennis elbow scale score, and grip strength in the experimental group, which was statistically significant. This study concluded that scapular muscle strengthening and eccentric forearm exercises significantly improved the function, grasping endurance, and pain reduction in patients with lateral epicondylitis. A further recommendation for this study was to conduct prospective studies to ascertain whether scapular muscle weakness existed before the onset of lateral epicondylitis and whether it might be a risk factor for the condition.

Ethical clearance: The study was approved by the committee of institutional scientific review board. The study objectives were explained to all participants in the study, and those who decided to participate signed informed consent forms.

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Conflicts of interest: The authors declare that they have no conflicts of interest.

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