

Effects of Middle Trapezius, Lower Trapezius, and Serratus Anterior Strengthening on Pain and Functional Status in Lateral Epicondylalgia

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ABSTRACT

Background: Lateral Epicondylalgia (LE) is described as a tendinopathy at the common extensor origin at the lateral epicondyle of the humerus ¹. Approximately 40% of people will experience LE at some point in their life. Recent studies highlighted the importance of assessing Middle Trapezius (MT), Lower Trapezius (LT) and Serratus Anterior (SA) muscle strength and also the importance of strength training in LE.

CONTEXT AND PURPOSE: LE is the most common chronic musculoskeletal pain condition, causing significant pain, disability and lost productivity. Various studies focusing on scapular muscle strength and endurance give some indication that scapular muscle may need to be screened and treated.

RESULT: There was significant effect on middle trapezius, lower trapezius and serratus anterior strengthening on reducing pain and improving functional status in patients with LE.

CONCLUSION: The study primarily tried to analyze the effects of strengthening exercises to MT, LT, and SA along with conventional therapy on pain and functional status in LE patients. And this study reveals that addition of strengthening exercises to MT, LT and SA to the regimen enhances faster recovery in patients with LE.

KEY WORDS: Lateral Epicondylalgia, Middle Trapezius, Lower Trapezius, Serratus Anterior.

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INTRODUCTION

Lateral Epicondylalgia is described as a tendinopathy at the common extensor origin at the lateral epicondyle of the humerus. Approximately 40% of people will experience LE at some point in their life. The prevalence of LE is between 1-3 % in general population and annual incidence of 4-7/1000 patients in general practice [1]. Age and sex-adjusted annual incidence of lateral elbow tendinosis decreases from 4.5/1000 people in 2000 to 2.4/1000 in 2012. The recurrence rate within 2 years was 8.5% [2]. The commonly affected arm is the dominant arm [3,4]. The clinical features are tenderness at the lateral epicondyle, normal elbow range of motion and pain on resisted movements. Cozens test, Mill test and Maudsleys test are the important special test used to differentiate the disease [5].

Traditional conservative treatment plays an important role in treating LE [6]. A recent study reported a recurrence rate of 29%- 38% in individuals who received conservative treatment for LE [7]. Another research which focused on scapular muscular strength and endurance gives some indication that scapular muscles may need to be screened and treated in patients with LE. So, the researcher is trying to find out the effects of strengthening exercises to MT, LT and SA along with conservative treatment in LE patients.

METHODS

This Pretest Posttest Experimental study design was conducted at Department of Physiotherapy, Little Flower Hospital and Research Centre, Angamaly for duration of 6 months. Ethical clearance was obtained from the central ethical committee of the institution. 30 Subjects both male and female between the ages of 30-50 years⁸ were recruited for the study based on the inclusion and exclusion criteria by using simple random sampling technique. We included patients diagnosed and referred by orthopedician as unilateral Lateral epicondylalgia with duration more than 3 months⁹, who have MT,LT and SA muscle power ranging from 6-9 and those with stable cardiovascular parameters. Subjects were excluded if they had any recent fractures,

injuries, or any derangements of upper limb or deformities of upper limb and spine, cervical spondylosis, disc prolapse, fibromyalgia, osteoporosis, malignancy, rheumatoid arthritis and other arthritis of upper limb, shoulder pathologies like adhesive capsulitis, rotator cuff tear, and other diseases that affect shoulder range of motion; who had undergone any major surgeries around shoulder girdle and upper limb and Presence of implants around elbow joint and shoulder complex and those who have neurological problems like brain and spinal cord injuries, stroke, demyelinating diseases, movement disorders etc.

A total of 40 subjects were assessed for eligibility. And 32 subjects who fulfilled the inclusion criteria were randomly assigned into two groups: 16 Control group and 16 Experimental group. Written informed consent was obtained from the subjects. Control group received conventional therapy alone, whereas, Experimental group received conventional therapy and strengthening exercises to MT, LT, and SA. For both groups, treatment was given for 10 weeks. In the first week, treatment was given for 6 days. In the second to tenth week, supervised exercise program was given once in a week. On all treatment days home exercises were given according to the exercise leaflet. NPRS score, QDQscore, MT, LT and SA muscle strength were assessed on first day before treatment and last day after treatment. The collected data was subjected to statistical analysis.

Control group received conventional therapy. 3 set of 10 repetitions (30 second rest between sets) twice a day.

- Wrist flexion and extension, radial deviation and ulnar deviation
- Pronation and supination.
- Isometric contraction of wrist extensor [10]. 6 second hold 6 repetitions, twice a day.
- Ball squeezing.25 times 3 repetitions, twice a day.
- Static stretching of wrist extensors [11,12]. 30-40 second hold,3 times (30 second rest between stretches)

Make sure that all exercises are done free of pain

· Application of Ultrasound [13,14]. Techno Med-Electronic Electrozone608 machine was used.

Mode- continuous, Frequency-3 MHz, Intensity: 1-1.5 W/cm²,

Duration: 5- 10minutes [15].

· Hot fomentation Used prior to stretching. (15-20 minutes)

Experimental group received above mentioned conventional therapy and strengthening exercises to MT, LT and SA. 3 sets of 10 repetitions (30 second rest between sets) twice a day [15].

EXERCISES

Prone-

· Shoulder abducted 90°, elbow flexed 90° external rotation.¹⁵

· Shoulder horizontal extension, elbow extension, external rotation.¹⁶

· Hands clasped behind head and ask the patient to raise the elbow from the bed towards the ceiling [16].

Supine-

· Serratus punch [17].

Sitting-

· Diagonal exercises (shoulder flexion, horizontal flexion, external rotation).¹⁸

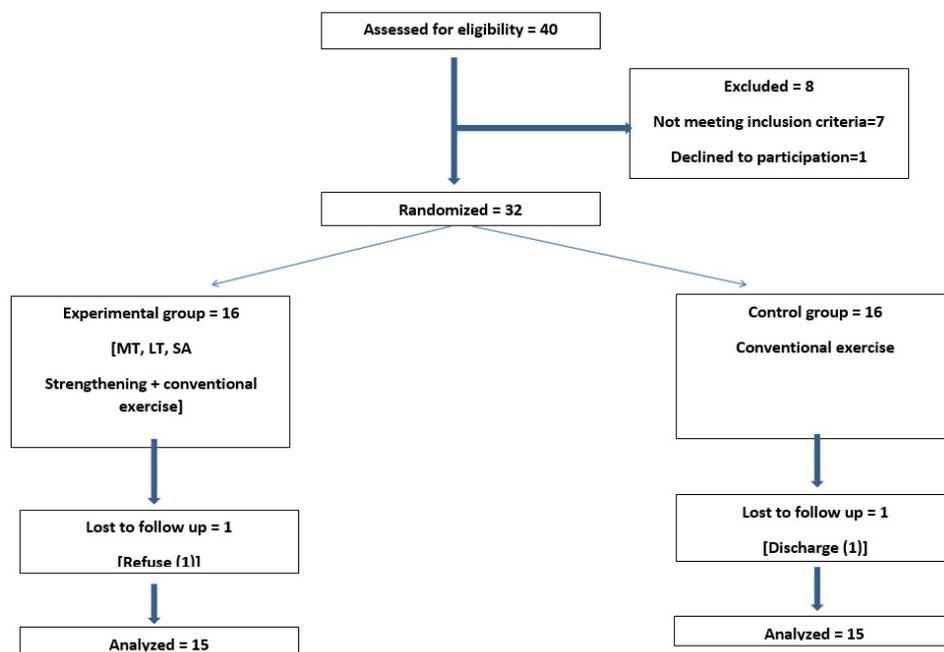
· Dynamic hug [17].

Standing-

· Shoulder abduction in plane of scapula above 120° [18]

· Wall-slide [16].

Fig. 1: CONSORT diagram of the study.



RESULTS

Table 1: Demographic presentation of subjects.

Group	Age In Years (Mean)	SD	Duration In Months (Mean)	SD
Control	39.73	±6.752	14	±10.12
Experimental	41.8	±6.752	14.06	±11.79

Table 2: Statistical results - NPRS scores.

Group	Initial Score	U -Value	Final Score	U-Value	T-Value	P Value
Control Group	7.29	102.5	3	24	120	P<0.05
Experimental Group	7.33		1.46		120	P<0.05

Table 3: Statistical results-QDQ score.

Group	Initial Score	U-Value	Final Score	U-Value	T Value	P Value
Control Group	59.84	100	20.45	7.5	120	P<0.05
Experimental Group	61.66		8.48		120	P<0.05

Table 4: Statistical results-MT strength score.

Group	Initial Score	U-Value	Final Score	U-Value	T Value	P Value
Control Group	8.07	112.5	8.07	0.5	232.5	P>0.05
Experimental Group	8.07		9.93		120.5	P<0.05

Table 5: Statistical results-LT strength score.

Group	Initial Score	U-Value	Final Score	U-Value	T Value	P Value
Control Group	8.07	112.5	8.07	0.5	232.5	P>0.05
Experimental Group	8.07		9.93		120.5	P<0.05

Table 6: Statistical results-SA strength score.

Group	Initial Score	U-Value	Final Score	U-Value	T Value	P Value
Control Group	8.07	112.5	8.07	0.5	232.5	P>0.05
Experimental Group	8.07		9.93		120.5	P<0.05

In QDQ, NPRS scores there were significant difference between pre and posttest scores in both groups. Pretest and posttest scores of both groups were analyzed using Mann-Whitney U test. In pretest scores, calculated value is greater than table value so there proved no significant difference between 2 groups. In posttest scores as the calculated value is greater than table value, there proved a significant difference between 2 groups and alternate hypothesis was accepted i.e. There was significant effect on middle trapezius, lower trapezius and serratus anterior strengthening on reducing pain and improving functional status in patients with LE. All data were analyzed using SPSS16.0 version.

DISCUSSION

30 diagnosed cases of lateral epicondylalgia were divided into two groups of 15 each, control group and experimental group. Informed consent was obtained from all patients. Control group received the conventional therapy, whereas, Experimental group received conventional therapy and strengthening exercises to MT, LT and SA. Pretest and Posttest scores on NPRS, QDQ, and muscle strength (MT, LT, SA) were assessed on the first and last day of treatment respectively.

The results showed that, both groups showed reduction in pain and improvement in functional status. There was improvement in

muscle strength of MT, LT and SA to 9/10 in the experimental group.

Control group and experimental group showed reduction in NPRS and QDQ scores, which indicates that there was reduction in pain and improvement in functional status. Even though both groups showed improvement, Experimental group showed more changes in NPRS Score and QDQ score than Control group. It indicates that strengthening exercises to MT, LT and SA are effective in patients with LE.

According to kinetic chain theory- In upper extremity dominant tasks, the energy development and output follows a proximal to distal sequencing [19]. With an impaired ability to stabilize the scapula, increased energy demands are theoretically required to the tissues in the distal upper extremity when performing a functional activity [15,20]. Lower trapezius and serratus anterior force couple provide the key scapular stabilization and continued upward rotation for overhead movements [21]. If scapular stabilizers are weak, the energy development and output may decrease and results in increased workload of distal muscles. This can aggravate pain and may lead to reduction in functional activities in patients with LE.

The middle trapezius and lower trapezius assist in maintaining scapular and humeral alignment and timing of muscle recruitment

with reaching [22]. Weakness of those muscles results in scapular abduction and that changes the humeral position and the congruence between glenoid and humeral head. This congruence is necessary for establishing adequate length tension relationship for the muscles acting on the scapula and humeral head and also for maintaining a stable base for transferring energy from proximal to distal segments [23]. When stable base is disturbed by the weakness of scapular muscles, proper energy transfer may not take place which may increase the load on Extensor carpi radialis brevis during activities of daily living. This may be the reason for aggravation of pain in patients with LE.

Lischuk et al (2010) suggests that muscles that cross 2 joints in the lower limb are more prone to fatigue and overuse [24]. Another study done by Mascall C L et al (2003) shown that strengthening the proximal hip stabilizers resulted in improved hip mechanics and functional gains in the distal 2 joint muscles [25]. In upper extremity, scapula could serve as a stable base from which 2 joint muscles may work more efficiently and strengthening of scapular stabilizers may result in functional gains in the distal 2 joint muscles. Hence the discussion be concluded that, strengthening exercises to MT, LT and SA was effective in patients with LE.

The present study had limitations of small sample size with both gender and no follow up was taken after 10 weeks. NPRS and QDQ scores were subjective measurements and the muscle strength of MT, LT and SA were not included in the outcome measures. Further studies should be undertaken which addresses these limitations.

CONCLUSION

Statistical analysis of data collected by NPRS, QDQ, and MMT recommends that strengthening exercises to MT, LT and SA along with conventional therapy has significant effect in patients with LE than conventional therapy alone. Hence this study reveals that addition of strengthening exercises to MT, LT and SA to the regimen enhances faster recovery in patients with LE. Hence we conclude that,

strengthening exercises to middle trapezius, lower trapezius, and serratus anterior along with conventional therapy is effective in reducing pain and improving functional status in patients with lateral epicondylalgia.

ABBREVIATIONS

LE- LATERAL EPICONDYLALGIA

LT- LOWER TRAPEZIUS

MT- MIDDLE TRAPEZIUS

NPRS- NUMERICAL PAIN RATING SCALE

QDQ- QUICKDASH QUESTIONNAIRE

SA- SERRATUS ANTERIOR

Conflicts of interest: None

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