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Edorium J Disabil Rehabil 2023;9(2):1–7.
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CASE REPORT PEER REVIEWED | OPEN ACCESS

Activation of middle and lower trapezius and strengthening of serratus anterior muscle for the rehabilitation of a patient with chronic lateral epicondylalgia: A case report

Abdullah Ibn Abul Fazal, Md Golam Kibria, Samima Akter, Suraiya Salek, Md Mostafijur Rahman

ABSTRACT

Introduction: The most quintessential elbow condition among athletes, especially tennis players, is lateral epicondylalgia, familiar as lateral epicondylitis. Individuals employed in professions that involve frequent physical exertion or repetitive movements are also susceptible to potential risk. This case report intents to present a brief overview of the patient's treatment and rehabilitation for lateral epicondylalgia by using specific problem-oriented treatments.

Case Report: In this case report, we report a case of a 35-year-old female patient who had chronic lateral epicondylitis on right elbow for three months. On physical examination, Numeric Pain Rating Scale (NPRS), Quick DASH, and Patient-rated Tennis Elbow Evaluation score and activities were evaluated on the initial visit to physical therapy and after discharge. By the time she attended three times a week for four weeks, she received conventional therapy lateral epicondylitis. Additionally, she also received a wide range of physiotherapy to stabilize the scapula, more specifically the middle and lower trapezius and strengthening of serratus anterior muscle. This helped to correct deformities, reduce pain, and restore elbow function. The patient reported NPRS = 8/10, Quick DASH = 72.7, and PR-TEE = 89 on the initial visit. At discharge the patient reported a 3 on NPRS, Quick DASH = 15.9, and PR-TEE = 34 with ability to return to full work and no associated symptoms or complaints.

Conclusion: The combination of conventional physiotherapy intervention with scapular muscle activation and strengthening was comparatively effective in relieving the patient's lateral epicondylalgia and push the patient to a higher level of functional activity within only four weeks.

Keywords: Lateral epicondylalgia, Manual therapy, Physiotherapy

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Received: 05 May 2023
Accepted: 26 June 2023
Published: 27 July 2023

How to cite this article

Fazal AIA, Kibria MG, Akter S, Salek S, Rahman MM. Activation of middle and lower trapezius and strengthening of serratus anterior muscle for the rehabilitation of a patient with chronic lateral epicondylalgia: A case report. Edorium J Disabil Rehabil 2023;9(2):1–7.

Article ID: 100054D05AF2023

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doi: 10.5348/100054D05AF2023CR

INTRODUCTION

Lateral epicondylalgia, dexterously recognized as chronic tennis elbow [1], affects both athletes and the general public inevitably which is characterized by persistent lateral elbow pain when conducting gripping-intensive manual tasks [2]. It is caused by overuse or recurring use (mostly of the extensor carpi radialis brevis), forced extension, or direct trauma to the epicondyle. Typically, chronic lateral epicondylalgia (CLE) has been related to repetitive mechanical overloading at the lateral elbow or arm is more susceptible to be injured, where the tendon loses its capacity for self-healing, this results in microscopic tendon tears [3]. Chronic lateral epicondylalgia often affects the dominant arm, resulting in substantial pain, severe functional limitations, and reduced productivity in routine tasks such as grasping and lifting objects [4]. These issues are commonly reported by most individuals with CLE [5]. In the majority of cases, conservative management alone is sufficient for managing CLE. However, a poor prognosis occurs [6] when it affects the tendon of the muscles responsible for wrist extension, particularly the extensor carpi radialis brevis (ECRB) [7]. Factors that are closely related to CLE include office job, older age, feminine gender, prior cigarette usage, and sequential rotator cuff pathology [8]. Women between the ages of 35 and 50 are more likely than men to experience lateral epicondylalgia [9]. Globally, the prevalence rate of CLE affects 1–3% of the population aged 35–54 years. In a recent study, it was shown that 26.1% of participants had lateral epicondylitis in at least one elbow [10]. It was also found that individuals with CLE were more likely to have diabetes, hypertension, metabolic syndrome, ipsilateral biceps tendon injury, and ipsilateral rotator cuff tear. A series of therapeutic approaches, such as the recommendation of rest, drugs, surgery, have been proposed to treat CLE [11]. The initial curative step is usually protection and the administration of drugs that provide short-term pain relief but have deleterious long-term effects on the resolution of the problem and the prevention of relapses [12]. Furthermore, research has demonstrated the positive impact of physiotherapy intervention and appropriate rehabilitation on pain control [13]. It is crucial for this treatment approach to incorporate manual therapy techniques aimed at alleviating pain and enhancing the joint range of motion (ROM) [14].

CASE REPORT

Mrs. Reshma, a 35-year-old housewife who had been experiencing pain, paresthesia, and tingling in her right arm for the last three months, visited the outdoor department of the CRP-Mirpur branch for the initial physiotherapy assessment. Due to her repetitive chores at home, she was initially diagnosed with lateral epicondylalgia (at supra-condylar ridge). She described her discomfort as being severe, achy as it became worse, and reporting alleviation after resting. She had no prior traumatic experiences. She had hypertension and type-ii diabetes mellites.

Clinical findings

At first, she was assessed for her posture and gait. Active movements of the neck and shoulders were pain-free and had full range of motion. The elbow joint's ability to flex, extend, supinate, and pronate was examined passively and with resistance. There were no reports of discomfort throughout the passive motions, and the end feel was normal. Flexion and extension were the wrist joint motions that were assessed. Both passively and with resistance, these motions were evaluated. With the exception of the Rt wrist extensor, which was painful and scored a G-III on the Oxford scale, the resisted movements were all painless. Compared to the left hand, the right hand had impaired sensation. Cozen's test, alternatively referred to as the "resisted wrist extension test," yielded a positive result, with a sensitivity of 91% and specificity ranging from 80% to 90% [15]. There was pain over the supra-condylar ridge of the lateral epicondyle of the humerus by palpation. The patient stated the pain as 8/10 on the numerical pain rating scale (NPRS) when aggravated. Nerve conduction velocity (NCV) was done as she had unbearable pain. The test result interpreted normal as electrophysiological findings were consistent.

Outcome measurement tool

Before the rehabilitation phase began and at the conclusion of the four-week period, the physiotherapist conducted an assessment each time, collecting various measurement parameters and having the patients complete the DASH-Score (score for the disabilities of the arm, shoulder, and hand).

Primary Goal Parameter:

- Course of pain on the Numerical Pain Rating Scale (0–10)

Secondary Goal Parameter:

- DASH-Score (from 0 = no limitations to 100 = strong limitations)
- PR-TEE (Patient Rated Tennis Elbow Evaluation) where best score = 0, worst score = 100 (pain and disability contribute equally to score)

Therapeutic intervention

The therapist clarified to the patient the findings of the examination, the suspected condition, and the proposed treatment based on the observations that has been made during the clinical reasoning process. Both patients received a four-week conventional physiotherapy program with our specific strategy for trapezius and

serratus anterior muscle for lateral elbow epicondylalgia at the supra-condylar ridge. At the beginning, physiotherapy started with active ROM (AROM) exercises and implementing soft tissue mobilization techniques [16]. Deep Transverse Friction Massage (DTFM) was administered on the supra-condylar ridge, followed by biceps tendon release and stretching of the extensor group of muscles [17, 18], Later application of Ultrasound Therapy (UST) (Gymna-400 series) in continuous mode with 1.5 MHz frequency and 1 W/cm2 power were applied with a 5-cm diameter applicator for 10 minutes and ice compression for 7–10 minutes were applied [19].

Starting in the second week, the patient underwent supervised exercise therapy, consisting of wrist extensor isometric exercises, static stretching activities, and gradual progressive eccentric exercises, with the eccentric contraction following the completion of the isometric contraction [20]. Each treatment session consisted of three sets of 10 slow-progressive wrist extensor exercises (eccentric and isometric), with a 1-minute rest period in between each set [21]. The patient was told to continue the activity even if she experienced some discomfort. The patient underwent functional activity (e.g. elbow supination pronation, radial and ulnar deviation), closed kinetic chain exercise that improved proprioception such as gripping, pinching small objects, finger exercises [22, 23]

In the third week, patient started activation of middle and lower trapezius muscle and strengthening of serratus anterior muscle (see Table 1 and Figure 1). Strengthening and activation activities, such as preventive activity (e.g., catching, reaching, and throwing), were administered to the patient once 50% of the discomfort had reduced [24]. Moreover, with a 1 kg dumbbell and gradually increasing weight as needed, the biceps, triceps, and brachioradialis muscles were strengthened.

Figure 1: (A and B) Activation of lower trapezius muscle in prone position; (C) Diagonal exercise for strengthen SA; (D) Activation of middle trapezius muscle with therapist support.

Outcomes and follow-up

Prior to starting treatment, the patient was closely monitored over and assessed, and a target was set for the discharge goal. The patient received treatment for roughly four weeks, with a further two months of follow-up. Table 2 summarizes the observed clinical findings and follow-up results of the patient. The patient's scores on the NPRS, Patient Rated Tennis Elbow Evaluation (PR-TEE), and DASH questionnaire vary during the course of the treatment, from the baseline to end of the treatment. Numeric Pain Rating Scale, PR-TEE, and DASH findings from the first to fourth weeks are shown in Figure 2.

Table 1: Interventions for lower trapezius, middle trapezius, and serratus anterior muscle

Muscles involve	Patient position	Doses of exercise
Lower trapezius	a. Arm raise above the head with upper extremity in line with lower trapezius muscle fibers in prone position	5–10 rep × 1 set × 3 times daily
	b. Shoulder horizontal extension with external rotation in prone position	3–5 rep × 1 set × 3 times daily
Middle trapezius	a. Unilateral row shoulder external rotation with the shoulder abducted 90°, elbow flexed 90° in prone position with elbow supported on the table	3–5 rep 1 set × 3 times daily
Serratus anterior	a. Shoulder abduction in plane of scapula above 120° in standing position	3–5 rep × 1 set × 3 times daily
	b. Diagonal exercise with a combination of shoulder flexion, horizontal flexion and external rotation in sitting position	5–10 rep × 1 set × 3 times daily

Table 2: Observed clinical findings for the patient with lateral epicondylalgia from baseline to follow up

	Baseline (visit 1)	Discharge (visit 12)	Follow-up (2-months later)
Inspection: shoulder, wrist region	Unremarkable	Unremarkable	Unremarkable
Cervical spine screen: ROM testing	Full ROM and pain-free	Full ROM and pain-free	Full ROM and pain-free
U/E neurological screen: reflex, motor, sensory	DTRs 1+ bilateral C5-7 Motor 3/5 C6 (Rt) Sensory impaired C6-C7 (Rt)	DTRs 1+ bilateral C5-7 Motor 4/5 C6 (Rt) Sensory intact bilaterally C5-T1	DTRs 2+ bilateral C5-7 Motor 5/5 bilateral C5-T1 Sensory intact bilaterally C5-T1
Elbow: AROM	Flexion: 35° and pain-free Extension: 15° and pain-full Radial deviation: 0° Ulnar deviation: 10°	Flexion: 40° and pain-free Extension: 25° and pain-free Radial deviation: 20° Ulnar deviation: 20°	Full AROM and pain-free
Location of symptoms	Over the right supra-condylar ridge and common extensor tendon	Nil	Nil
Palpatory findings	Recreate chief complaint with palpation of supra-condylar ridge	No recreation of symptoms	No recreation of symptoms
Strength	Wrist extension: 3/5, with pain	Wrist extension: 4/5, without pain	Wrist extension: 5/5, without pain
Orthopedic test	+ Cozen's + Mill's	– Cozen's + Mill's	– Cozen's – Mill's

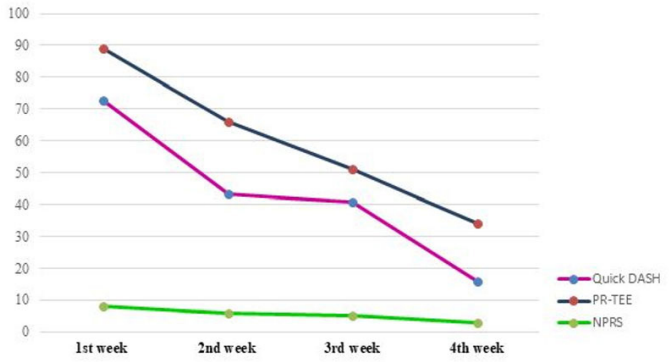

Figure 2: Scores on the NPRS, DASH questionnaire, and PR-TEE over the course of treatment and at 2-month follow-up. NPRS scores 10 to 0, 0 indicates no symptoms of pain. Both DASH and PR-TEE scores vary from 100 to 0, with a lower score showing improvement in function.
Abbreviations: NPRS: Numerical Pain Rating score; DASH: Disabilities of the Arm, Shoulder and Hand; PR-TEE: Patient Rated Tennis Elbow Evaluation Score.

From an initial score of 72.7, the patient's DASH score dropped 56.8 points by 4th week visit. Numeric Pain Rating Scale from 1st day to end of the 4th week. There is also changes in the patient's NPRS scores for activities such as cleaning the shower, opening a doorknob, as well as some sort of spinning activity over the course of therapy and at two months follow-up. At the end of 4th week there was a noticeable decrease in pain. This might have been due to combination of regular treatment along with strengthening and activation of scapular muscles. The patient reported no pain two months after therapy, and the patient's pain level at the last therapy session was 0/10. Additionally, the strength of the middle and lower trapezius was 5/5 at the final therapy session, an important improvement from 3+/5 and 4–/5, respectively, at the initial evaluation.

DISCUSSION

Tendinitis affects both the general population and athletes often, and various conservative treatments fail to effectively recover from these conditions. In this case study, a patient with primary lateral elbow pain symptoms is evaluated, treated, and the results are discussed. The patient saw success with a regimen designed to strengthen the scapular adductors. Symptoms subsided and full function was reclaimed in conjunction with the standard treatments for lateral epicondylalgia (eccentrics, stretching and strengthening of the wrist extensors, joint mobilization, and cross-friction massage). Many authors emphasize the significance of testing the shoulder and scapular muscle strength in individuals who've had elbow pain. In a previous study, Alizadehkhaiyat et al. [25] revealed that individuals with lateral epicondylalgia

had shoulder strength that was 25–35% lower than that of control subjects. In accordance with prior studies by Mandalidis and O'Brien [26], lower grip strength appears to be adversely linked with lower shoulder isokinetic strength. Lucado et al. [27] found that female tennis players with the condition had decreased lower trapezius and wrist extensor strength when compared to a control group without lateral epicondylalgia. Heales et al. [28] additionally found that patients with unilaterally identified tendinopathies in both the lower and upper extremities had bilateral sensory and motor impairments on the unaffected side. But in our study patient had unilateral sensory and motor impairment only on affected side of lateral epicondylalgia and also reduced muscle strength on oxford muscle grade. In this study, it was found that a reduction in pain on the NPRS, improved DASH and PR-TEE scores at the end of the third week, and possible combined effects of middle and lower trapezius muscular activation and functional serratus anterior strengthening. The same kind of discovery was also obtained in a different study. In the study they conducted, Bhatt et al. [29] discovered that in this patient, pre-intervention passive manual scapular repositioning into adduction resulted in a decrease in symptoms as well as an improvement in hand grip strength. The patient's hand grip strength increased by 38% after the intervention while experiencing no pain. Manual muscle testing indicates as this improvement was accompanied by a clinically significant increase in middle and lower trapezius strength. The literature indicates that muscles in the extremity that cross two joints are more susceptible to overuse and fatigue. Despite the limitations of the evidence, the scapula can act as a solid base from which two joint muscles in the upper extremity may function more efficiently.

LIMITATION

As it is a case report, it is difficult to draw assumptions causality and consequences. Although the patient's pain and impairment improved, it is unclear which component of whole session was most useful, why this strategy was beneficial, and to what extent natural history was responsible for her recovery.

CONCLUSION

The patient was effectively treated with CLE who responded quickly after effective treatment of scapular muscle activation and strengthening, according to the current case report. More investigation is needed to determine the most appropriate treatment plan for impeding pain and disability caused by lateral epicondylalgia.

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Author Contributions

Abdullah Ibn Abul Fazal – Conception of the work, Analysis of data, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Md Golam Kibria – Design of the work, Acquisition of data, Interpretation of data, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Samima Akter – Conception of the work, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Suraiya Salek – Design of the work, Acquisition of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Md Mostafijur Rahman – Design of the work, Analysis of data, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Guarantor of Submission

The corresponding author is the guarantor of submission.

Source of Support

None.

Consent Statement

Informed consent with both verbal and written documentations had taken before intervention and for publication.

Conflict of Interest
Authors declare no conflict of interest.

Data Availability
All relevant data are within the paper and its Supporting Information files.

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