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Isometric Exercise, Active-Passive Stretching, And Deep Tissue Manipulation In Managing Lateral Epicondylagia: A Case Study Report

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ABSTRACT

This study investigates the effects of isometric, active, and passive stretching, alongside deep tissue manipulation, on a patient with chronic lateral epicondylalgia. The aim is to examine the therapeutic efficacy of these interventions on pain reduction and functional improvement. A 23-year-old female patient with confirmed lateral epicondylalgia, evidenced by positive Mill's and Cozen's tests, participated in a 4-week therapeutic program. The program included isometric exercises, active and passive stretching, and deep tissue manipulation tailored to lateral epicondylalgia. Pain and functional disability were assessed using the Patient-Rated Tennis Elbow Evaluation (PRTEE), while muscle strength was measured through Manual Muscle Testing (MMT). Post-treatment results showed a 10% decrease in PRTEE scores and an improvement in MMT grading by one level. These findings suggest that a combination of isometric, active, and passive exercises, along with deep tissue manipulation, can significantly reduce pain and enhance muscle strength in patients with lateral epicondylalgia. The 4-week intervention led to notable improvements in both pain and functional capacity, indicating a potential effective therapeutic strategy for accelerated recovery in such patients.

Keywords: *Isometric exercise, stretching, deep tissue manipulation, lateral epicondylalgia, tennis elbow.*

INTRODUCTION

Tennis elbow, commonly referred to as lateral epicondylitis, has evolved in terminology to be more accurately described as lateral epicondylalgia (Waugh et al., 2005). Lateral epicondylalgia is a prevalent condition encountered by physical therapists, especially in populations engaged in occupations requiring repetitive upper extremity use (Vicenzo et al., 2003). This overuse often leads to injury, as seen in athletes and individuals performing repetitive tasks.

This case study focuses on a 23-year-old female patient who sustained her first acute injury to her left elbow in 2017 while practicing Silat, a martial art. The injury occurred during a fall, resulting in an elbow sprain. Over time, the patient's pain progressively worsened, affecting her daily activities. In 2019, she experienced a recurrence of pain in the same elbow while weight training for rugby, which led her to

discontinue training. The patient underwent both objective and subjective assessments, including Mill's test, which involved palpating the lateral epicondyle while the patient performed pronation, wrist flexion, and elbow extension. This test elicited pain near the lateral epicondyle. Additionally, the Cozen's test was conducted, requiring the patient to perform dorsiflexion against resistance, further confirming the injury and pain levels. The aim of this study is to develop an effective therapeutic treatment plan to reduce the patient's pain and improve overall function. Research suggests that therapeutic interventions can be more effective than surgical options. Previous systematic review concluded that surgery is not more effective than nonsurgical treatments based on substantial evidence (Bateman et al., 2019). The patient's progress was monitored using the Patient-Rated Tennis Elbow Evaluation (PRTEE) and Manual Muscle Testing (MMT) before and after treatment. This study seeks to provide evidence on the efficacy of a structured therapeutic regimen involving isometric, active, and passive stretching exercises, combined with deep tissue manipulation, for the treatment of lateral epicondylalgia.

METHODOLOGY

Case Description

A 23-year-old female patient, previously diagnosed with a sprained left elbow, reported experiencing pain during sports training. The patient had been actively involved in martial arts (Silat) and rugby. She sustained her initial injury in 2017 during a martial arts training session when she fell with her elbow flexed. In 2019, the pain recurred during a gym session while performing weight training, gradually limiting her daily activities. She also reported occasional tightness in her left shoulder accompanying the elbow pain. The patient was referred to a sports rehabilitation clinic to manage her pain. In a previous rehabilitation session, she received massage therapy on her left shoulder and was given an exercise prescription at the end of the treatment session. However, this rehabilitation approach, which included basic stretching and strengthening exercises without specific focus on isometric, active, or passive stretching, did not significantly alleviate her symptoms. The pain persisted, particularly during activities involving carrying medium-weight items, and prolonged or resisted elbow extension. Her sleep was also disturbed by cold weather at night. During sports tournaments, the patient relied on cold spray to temporarily relieve the elbow pain. Her primary goal was to return to sports activities without pain, aiming for a complete elimination of discomfort to resume her athletic pursuits effectively. This case study focuses on developing a comprehensive therapeutic treatment plan involving isometric, active, and passive stretching, along with deep tissue manipulation, to address her chronic lateral epicondylalgia and improve her functional outcomes.

Examination

The physical assessment of the patient included both active and passive range of motion (ROM) evaluations for the following movements: elbow flexion and extension, wrist supination and pronation, wrist flexion and extension, wrist radial and ulnar deviation, shoulder flexion and extension, shoulder abduction and adduction, and shoulder internal and external rotation. All these movements were performed actively and passively. The patient exhibited a full range of motion in all active and passive movements but experienced difficulty when resistance was applied. She reported pain several times, particularly on the lateral side of the elbow during resisted elbow extension. The therapist observed a slight shaking in the patient's hand during these movements, although it was not excessive. Based on the physical assessment and palpation of the elbow, the pain was localized to the lateral epicondyle, suggesting lateral epicondylalgia. To confirm this, two specific tests were administered: the Cozen's test and Mill's test. These tests were chosen for their high accuracy in diagnosing lateral elbow tendinopathy (LET). Cozen's test and grip strength measurement present high accuracy in diagnosing LET but are not extensively investigated (Karanasios et al., 2022). Mill's test has shown excellent reliability for pain assessment (Soares et al., 2023). The patient tested positive on both Cozen's and Mill's tests, supporting the diagnosis of tennis elbow.

Despite achieving a full range of motion, the patient displayed muscle weakness in her left elbow. Manual Muscle Testing (MMT) was conducted to assess her muscle strength, revealing a score of 5/5 on the right arm and 3/5 on the left arm. Additionally, the patient completed the Patient-Rated Tennis Elbow Evaluation

(PRTEE), which provides a reliable estimate of arm pain and function in patients with lateral epicondylitis (Overend et al., 1999). At the end of the treatment session, the patient was given an exercise prescription that included isometric, active, and passive stretching exercises aimed at improving muscle strength and reducing pain.

Exercise Therapy

The therapist recommended a combination of isometric, active, and passive stretching exercises, with or without a resistance band, to the patient. Stretching exercises were performed actively and passively before each session. The exercises targeted strengthening the elbow and shoulder muscles, including elbow flexion and extension, wrist supination and pronation, and shoulder flexion and extension. Patients were instructed to perform these exercises daily, completing 3 sets of 12 repetitions each. For exercises involving resistance bands, patients were encouraged to adjust the tension according to their comfort level. If the patient found it difficult to withstand the tension, they could perform the exercises isometrically using the opposite hand for resistance. Throughout the four-week intervention period, the patient occasionally reported minor pain during exercise, but it remained tolerable. Despite experiencing occasional discomfort, the patient consistently demonstrated great effort during all treatment sessions in pursuit of her rehabilitation goals. Regular and diligent adherence to the prescribed exercises is crucial for optimal rehabilitation outcomes.

RESULTS AND DISCUSSION

The case study involves a student of Sport Science and Coaching who sought rehabilitation treatment for a left elbow injury at the Rehabilitation Clinic located in Block 6 of the Faculty of Sport Science and Coaching. Upon initial assessment using the clinic's evaluation form, a comprehensive examination was conducted, including the Mill's test (positive) and Cozen test (positive), recognized as highly sensitive tests for diagnosing lateral epicondylalgia (LE). The Cozen test exhibited 91% sensitivity, followed by the Mill test with 76% sensitivity (Dones et al., 2014). Previously, the case study had an acute left elbow injury during a fall at a Silat Tournament in 2017. Although the injury initially subsided, it recurred in 2019 during weight training for rugby at the gym, leading to chronic lateral epicondylitis and persistent pain during load-bearing and repetitive movements. The case study's progress was monitored using the Patient-Rated Tennis Elbow Evaluation (PRTEE) and manual muscle testing (MMT) for elbow flexion and extension both pre and post-treatment. Pain intensity was assessed using the Visual Analog Scale (VAS scale).

Table 1. Pre and Post Test Results

		MMT Grade			
		Right Elbow		Left Elbow	
Timeline	**PRTEE Score**	**Flexion**	**Extension**	**Flexion**	**Extension**
Pretest	58/100	5/5	5/5	3/5	3/5
Posttest	48/100	5/5	5/5	4/5	4/5

Abbreviation: PRTEE = Patient-Rated Tennis Elbow Evaluation, MMT = Manual Muscle Testing

Based on the results of the Patient-Rated Tennis Elbow Evaluation (PRTEE), the case study indicates a notable 10% reduction in pain following the treatment. The PRTEE serves as a valuable tool for efficiently estimating arm pain and function in patients with lateral epicondylitis (Olaussen et al., 2015). Throughout the treatment process, the patient's pain intensity was closely monitored using the Visual Analog Scale (VAS scale) following the prescribed exercise treatment plan. The case study underwent a comprehensive intervention involving isometric, passive, and active stretching exercises. Additionally, deep tissue manipulation was applied to the trigger point pressure area in her scapula, considering her lateral epicondylitis and its associated reciprocal pain towards her shoulder.

The intervention yielded promising results, evidenced by a 10% decrease in the PRTEE score and an improvement in her Manual Muscle Testing (MMT) grading scale. Notably, these outcomes are significant given that the patient is currently inactive in sports activities.

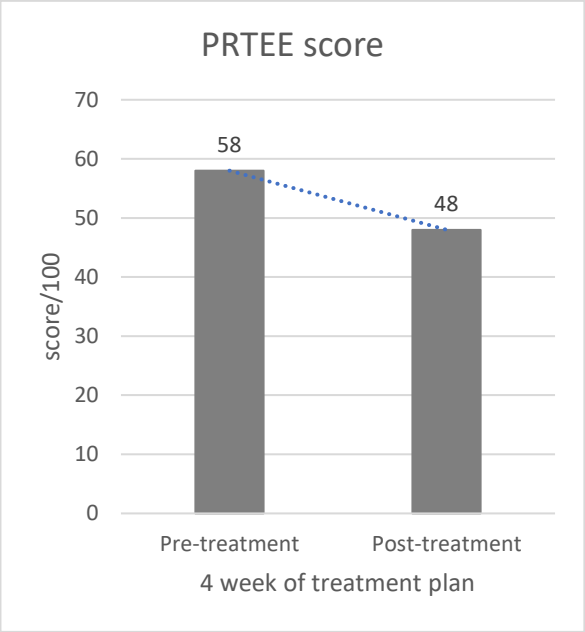

Figure 1: PRTEE Score before and after intervention.

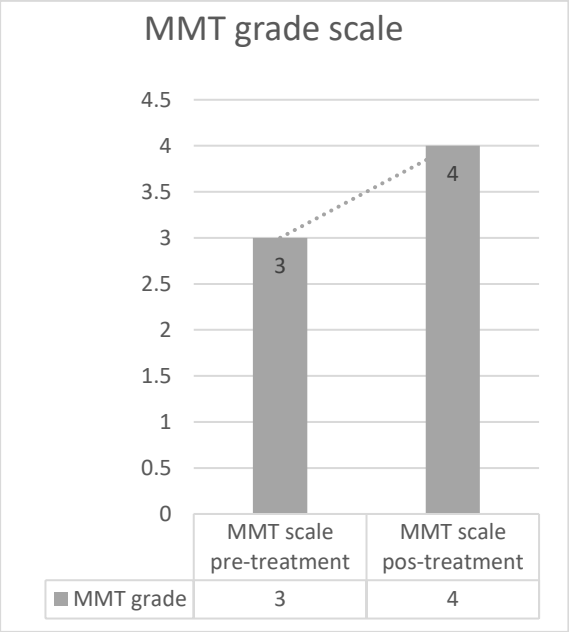

Figure 2: MMT Score before and after intervention

Patient Rated Tennis Elbow Evaluation (PRTEE)

In this case study, a progressive reduction in pain was observed throughout the rehabilitation intervention, with a notable 10% improvement noted weekly. Prior to treatment, the patient reported significant pain during both recreational and sporting activities, registering a VAS score of 9/10, which decreased to 8/10 post-treatment. The intervention also led to enhanced functional capabilities, as evidenced by the patient's ability to perform tasks such as turning a doorknob, lifting a cup of coffee, opening a jar, and pulling up pants without experiencing pain. These activities, involving forearm rotation and lifting of lightweight objects, each saw a reduction of one or two VAS scales. It is plausible that the prescribed stretching exercises influenced the pain experience by inducing muscle tension, consequently alleviating strain during elbow movement (Hassan et al., 2016). The overall improvement of 10 points in the PRTEE scores before and after treatment underscores the efficacy of the intervention. Deep tissue manipulation and stretching exercises likely played pivotal roles in achieving these outcomes. As highlighted by Yi et al. (2017), deep friction massage offers sustained therapeutic benefits, particularly advantageous for patients averse to or unsuccessful with cortisone steroids. This may indicate stretching exercises and deep tissue manipulation effectively reduce pain and improve function by alleviating muscle tension and enhancing blood flow, contributing to the observed improvements in PRTEE scores and functional capabilities (Hassan et al., 2016; Yi et al., 2017).

Manual Muscle Testing (MMT)

Manual muscle testing of elbow flexion and extension revealed a pre-treatment score of 3/5, indicative of the patient's ability to execute these movements against gravity with minimal discomfort. This aligns with typical presentations of lateral epicondylitis, a condition commonly provoked by mechanical stress, resulting in pain upon muscle activation related to the wrist, forearm, and elbow (Briggs & Elliot, 1985). To address this deficit, a structured regimen of strengthening exercises targeting elbow flexion and extension was implemented, utilizing a resistance band to provide controlled resistance. The patient was instructed to perform these exercises once daily, completing three sets of twelve repetitions.

Isometric strengthening exercises were also offered as an alternative modality when discomfort during resistance band usage exceeded tolerable limits. Following 4 weeks of intervention, reassessment of the

patient's MMT revealed a tangible enhancement in muscle strength, with a post-treatment score of 4/5. Strengthening exercises with controlled resistance and isometric routines improve muscle strength and reduce pain by addressing mechanical stress and muscle activation, as evidenced by the enhanced MMT scores (Briggs & Elliott, 1985; Overend et al., 1999).

CONCLUSION

In conclusion, this case study highlights the effectiveness of a multifaceted approach comprising isometric, passive, and active exercises, along with deep tissue manipulation in expediting recovery from lateral epicondylalgia. Further exploration through randomized controlled trials is necessary to confirm its effectiveness.

ACKNOWLEDGEMENTS

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CONFLICT OF INTREST

The author(s) have no conflicts of interest relevant to this paper.

AUTHORS CONTRIBUTIONS

All authors were involved in the conceptualization and design of the paper. MKHM and FIMA played key roles in planning the research design, validating the results, and interpreting the findings. ANHA and DM were responsible for data collection and its interpretation. EWMC took the lead in preparing and finalizing the manuscript.

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Appendix

Appendix A: Pre-Treatment Patient-Rated Tennis Elbow Evaluation

PATIENT-RATED TENNIS ELBOW EVALUATION

Name: Date 18/5/23

*The questions below will help us understand the amount of difficulty you have had with your arm in the past week. You will be describing your **average** arm symptoms **over the past week** on a scale 0-10. Please provide an answer for all questions. If you did not perform an activity because of pain or because you were unable ,then you should circle a "10". If you are unsure please estimate to the best of your ability. Only leave items blank if you never perform that activity. Please indicate this by drawing a line completely through the question.*

1. PAIN in your affected arm	
*Rate the average amount of pain in your arm **over the past week** by circling the number that best describes your pain on a scale from 0-10. A **zero** (0) means that you **did not have any pain** and a **ten** (10) means that you had **the worst pain imaginable.***	
RATE YOUR PAIN: No Pain	Worst Imaginable
When your are at rest	0 1 2 (3) 4 5 6 7 8 9 10
When doing a task with repeated arm movement	0 1 2 3 4 5 (6) 7 8 9 10
When carrying a plastic bag of groceries	0 1 2 3 4 5 (6) 7 8 9 10
When your pain was at its least	0 1 2 3 4 (5) 6 7 8 9 10
When your pain was at its worst	0 1 2 3 4 5 6 7 8 (9) 10

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2. FUNCTIONAL DISABILITY

A. SPECIFIC ACTIVITIES

*Rate the **amount of difficulty** you experienced performing each of the tasks listed below, over the past week, by circling the number that best describes your difficulty on a scale of 0-10. A zero (0) means you did not experience any difficulty and a **ten (10)** means it was **so difficult you were unable to do it at all**.*

	No Difficulty										Unable To Do
Turn a doorknob or key	0	(1)	2	3	4	5	6	7	8	9	10
Carry a grocery bag or briefcase by the handle	0	1	2	3	4	(5)	6	7	8	9	10
Lift a full coffee cup or glass of milk to your mouth	0	1	(2)	3	4	5	6	7	8	9	10
Open a jar	0	1	(2)	3	4	5	6	7	8	9	10
Pull up pants	0	1	(2)	3	4	5	6	7	8	9	10
Wring out a washcloth or wet towel	0	1	(2)	3	4	5	6	7	8	9	10

B. USUAL ACTIVITIES

*Rate the **amount of difficulty** you experienced performing your **usual** activities in each of the areas listed below, over the past week, by circling the number that best describes your difficulty on a scale of 0-10. By "usual activities", we mean the activities that you performed **before** you started having a problem with your arm. A **zero** (0) means you did not experience any difficulty and a **ten** (10) means it was so difficulty you were unable to do any of your usual activities.*

1. Personal activities (dressing, washing)	0	1	2	(3)	4	5	6	7	8	9	10
2. Household work (cleaning, maintenance)	0	1	2	3	4	(5)	6	7	8	9	10
3. Work (your job or everyday work)	0	1	2	3	4	5	6	(7)	8	9	10
4. Recreational or sporting activities	0	1	2	3	4	5	6	7	8	(9)	10

Comments:

1. 29
2. 29

TOTAL: 58

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Appendix B: Post-Treatment Patient-Rated Tennis Elbow Evaluation

PATIENT-RATED TENNIS ELBOW EVALUATION

Name: Date: 21/6/2023

*The questions below will help us understand the amount of difficulty you have had with your arm in the past week. You will be describing your **average** arm symptoms **over the past week** on a scale 0-10. Please provide an answer for all questions. If you did not perform an activity because of pain or because you were unable ,then you should circle a "10". If you are unsure please estimate to the best of your ability. Only leave items blank if you never perform that activity. Please indicate this by drawing a line completely through the question.*

1. PAIN in your affected arm	
*Rate the average amount of pain in your arm **over the past week** by circling the number that best describes your pain on a scale from 0-10. A **zero** (0) means that you **did not have any pain** and a **ten** (10) means that you had **the worst pain imaginable.***	
RATE YOUR PAIN: No Pain	Worst Imaginable
When your are at rest	0 1 **(2)** 3 4 5 6 7 8 9 10
When doing a task with repeated arm movement	0 1 2 3 4 **(5)** 6 7 8 9 10
When carrying a plastic bag of groceries	0 1 2 3 4 **(5)** 6 7 8 9 10
When your pain was at its least	0 1 2 3 **(4)** 5 6 7 8 9 10
When your pain was at its worst	0 1 2 3 4 5 6 7 **(8)** 9 10

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2. FUNCTIONAL DISABILITY

A. SPECIFIC ACTIVITIES

*Rate the **amount of difficulty** you experienced performing each of the tasks listed below, over the past week, by circling the number that best describes your difficulty on a scale of 0-10. A zero (0) means you did not experience any difficulty and a **ten (10)** means it was **so difficult you were unable to do it at all**.*

	No Difficulty										Unable To Do
Turn a doorknob or key	(0)	1	2	3	4	5	6	7	8	9	10
Carry a grocery bag or briefcase by the handle	0	1	2	3	(4)	5	6	7	8	9	10
Lift a full coffee cup or glass of milk to your mouth	(0)	1	2	3	4	5	6	7	8	9	10
Open a jar	(0)	1	2	3	4	5	6	7	8	9	10
Pull up pants	(0)	1	2	3	4	5	6	7	8	9	10
Wring out a washcloth or wet towel	0	(1)	2	3	4	5	6	7	8	9	10

B. USUAL ACTIVITIES

*Rate the **amount of difficulty** you experienced performing your **usual** activities in each of the areas listed below, over the past week, by circling the number that best describes your difficulty on a scale of 0-10. By "usual activities", we mean the activities that you performed **before** you started having a problem with your arm. A **zero** (0) means you did not experience any difficulty and a **ten** (10) means it was so difficulty you were unable to do any of your usual activities.*

1. Personal activities (dressing, washing)	0	1	(2)	3	4	5	6	7	8	9	10
2. Household work (cleaning, maintenance)	0	1	2	(3)	4	5	6	7	8	9	10
3. Work (your job or everyday work)	0	1	2	3	4	5	(6)	7	8	9	10
4. Recreational or sporting activities	0	1	2	3	4	5	6	7	(8)	9	10

Comments:

1. 24
2. 24

TOTAL: 48

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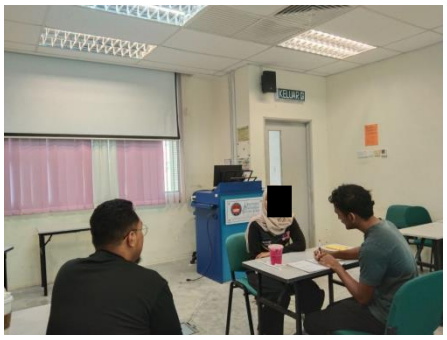
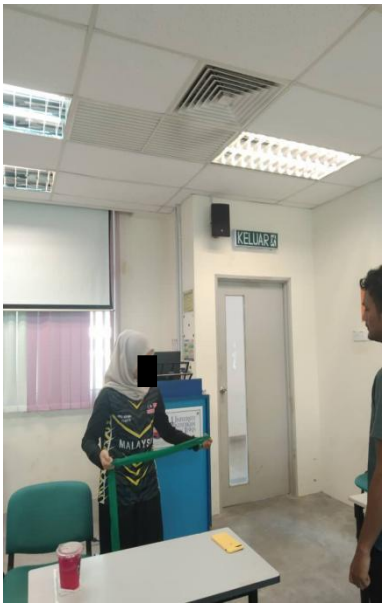
Appendix C: Consultation with Case Study





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