

**PHYSICAL THERAPY BASED INTERVENTIONAL APPROACHES IN THE  
MANAGEMENT OF TENNIS ELBOW-----AN EXPERIMENTAL STUDY**

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## **Abstract**

### **Introduction**

The purpose of the research on the role of physical therapy in LE treatment is to examine the efficacy and results of these interventions at various stages, providing significant insights into optimizing patient care and expanding understanding of the condition's varied therapeutic approach.

### **Methodology**

The treatment program included five weekly sessions lasting 25 to 30 minutes each. Ultrasound therapy with characteristics such as a frequency of 3 MHz and pulsed mode, ice, and a series of strengthening exercises targeting grip strength, supination, wrist extension, wrist flexion, towel twists, finger extension, and ball squeezes were among the therapies.

### **Results**

The mean wrist ROM improved from  $44.06 \pm 6.47$  to  $62.04 \pm 4.68$  degrees after the intervention, demonstrating a significant improvement in flexibility. The statistically significant t-statistic of -16.586, with a p-value less than 0.001 in both one-tailed and two-tailed tests, further supports this positive improvement. The comparison of grip strength in pounds between lateral epicondylitis patients before and after physical therapy-based treatment demonstrated significant improvements. Prior to the intervention, the mean grip strength was  $74.04 \pm 6.49$  pounds that improved to  $97.46 \pm 8.12$  pounds.

### **Conclusion**

The study investigated the effectiveness of a comprehensive physical therapy intervention in people with lateral epicondylitis. After the four-month intervention, the subjects, showed significant improvement in wrist range of motion and forearm supination and grip strength.

**Keywords:** Lateral Epicondylitis, Range of Motion, Grip Strength

## Introduction

Lateral epicondylitis (LE) is a common upper extremity condition that considerably impairs functioning and productivity. The abandoning of the name "lateral epicondylitis" or "tennis elbow" originates from growing findings that question the inflammatory etiology, favoring a degenerative approach<sup>1-2</sup>. Throughout the course of elbow tendinopathy, histopathologic studies have consistently indicated the lack of inflammatory mediators. LE primarily affects the lateral epicondyle of the humerus, encompassing four forearm muscles: extensor carpi radialis brevis, extensor digitorum communis, extensor digiti minimi, and extensor carpi ulnaris, with special emphasis on the susceptibility of the extensor carpi ulnaris. LE is most common in those aged 30-64, affects 1-3% of the population, has no gender bias, and usually affects the dominant upper extremity<sup>3-4</sup>. Current or previous smoking, as well as type 2 diabetes mellitus, have been identified as risk factors. Repetitive elbow flexion/extension and wrist extension (> 2 h/day), tendon overloading (> 5 kg for > 2 h/day), extended exposure to vibrating tools (> 2 h/day), or forceful power grip (e.g., overhead throwing, tennis, or golf) all increase the risk of common extensor tendon injury<sup>3</sup>. Prolonged repeated stress causes multiple microtears, which sets off a chain reaction of degenerative processes inside the tendon, ending in tendinosis<sup>5</sup>. As a common overuse illness in primary care, lateral epicondylitis (LE) affects 1% to 3% of the population, primarily middle-aged people, with no gender discrepancy<sup>6-7</sup>. The impact of LE extends beyond the person, notably contributing to societal and economic expenses through lost workdays and, in some cases, weeks of job incapacity. Despite continued progress in LE treatment, the lack of well-established standards provides a difficulty. While the problem frequently runs its course on its own and the majority of cases—up to 80%—resolve without intervention within a year, individuals with persistent symptoms may require extra conservative or surgical procedures<sup>8-10</sup>. With its many stages, lateral epicondylitis (LE) provides a therapeutic challenge, and the function of physical therapy (PT) emerges as critical in its entire care. To reduce pain and promote healing, PT therapies in the acute phase focus on activity reduction and the use of local modalities such as cold, heat, electrotherapy, massage, and therapeutic ultrasound<sup>11</sup>. Once the discomfort has subsided, isometric exercises and range of motion (ROM) activities are initiated to improve elbow and wrist functions. PT's influence continues into the subacute phase, which lasts 6 weeks to 3 months and is useful for people who have not reacted well to initial therapy or

PT alone. The treatment regimen includes bracing in a neutral wrist posture as well as therapies such as ultrasound-guided corticosteroid injections, platelet-rich plasma (PRP), and prolotherapy<sup>12</sup>. As a cornerstone, physical therapy assists in rectifying kinetic chain dysfunction and resolving aberrant biomechanics throughout recovery<sup>13</sup>. After three months of persistent complaints, the patient enters the chronic stage, which includes continued PT therapies such as progressive eccentric exercise and percutaneous needle tenotomy. The purpose of the research on the role of physical therapy in LE treatment is to examine the efficacy and results of these interventions at various stages, providing significant insights into optimizing patient care and expanding understanding of the condition's varied therapeutic approach.

## **Methodology**

### **Study Design**

The study used an experimental methodology and focused on a particular sample of people diagnosed with lateral epicondylitis (LE). The treatment strategy included ultrasound therapy, ice, and strengthening exercises.

### **Study Setting**

The research was carried out at two healthcare facilities: DarulSehat Hospital in Gulistan-e-Johar, Karachi, and Al Mumtaz Medical Complex at Darakhshan Co-operative Housing Society in Kala Board, Karachi.

### **Sample Size**

The research comprised a total of n=50 subjects, all of whom were diagnosed with lateral epicondylitis. The therapy lasted four months, with each subject receiving five sessions each week.

### **Inclusion Criteria**

Participants that met the inclusion criteria ranged in age from 40 to 50 years old and had a clinical diagnosis of lateral epicondylitis. They had to show pain in certain tests, such as the resisted middle finger test, the resisted wrist extension test, Cozen's test, Mill's test, the coffee cup test, Chair's test, and Maudsley's test. Participants also had to show soreness on palpation of the lateral epicondyle and declare a willingness to participate, as well as fill out questionnaires and provide informed consent.

### **Exclusion Criteria**

Specific medical disorders affecting the elbow joint, such as fractures, tumors, a history of elbow surgery, carpal tunnel syndrome, cardiovascular illnesses, skin infections, and other conditions that exclude physical treatment, were excluded.

### **Intervention Strategy:**

The treatment program included five weekly sessions lasting 25 to 30 minutes each. Ultrasound therapy with characteristics such as a frequency of 3 MHz and pulsed mode, ice, and a series of strengthening exercises targeting grip strength, supination, wrist extension, wrist flexion, towel twists, finger extension, and ball squeezes were among the therapies<sup>10</sup>. The study's goal was to determine the effectiveness of intervention in treating lateral epicondylitis over a four-month period.

### **Outcome measures**

#### **Range of Motion Assessment**

The range of motion examination used a specialized goniometer to test participants' elbow flexibility. Participants were sat with their arms relaxed during the procedure, and the goniometer was positioned with the humerus and forearm to precisely collect flexion and extension angles. The participants were instructed to completely flex and extend their elbows, and the range of motion in degrees was precisely measured and recorded. The evaluation was completed twice, first before the intervention and again four months later, to ensure consistency by using the same trained evaluator for all metrics. To minimize any confounding variables, participants were advised to refrain from vigorous activities or exercises before to the examinations. Wrist extension and Forearm Supination were performed for ROM assessment. Normal Wrist extension was 0-70 degree whereas Forearm supination was 0 to 90 degree<sup>14</sup>.

#### **Grip Strength Assessment**

The grip strength examination used a portable dynamometer to estimate the participant's handgrip strength. Participants sat in a sitting position with their elbows flexed at 90 degrees and their forearms neutral. Participants clutched the dynamometer with maximum force after receiving explicit instructions, and the resulting maximum force, measured in pounds, was recorded. To guarantee consistency, the test was performed three times with short gaps between attempts, and the average grip strength was obtained for further investigation. This complete

process gave quantitative insights into the participant's handgrip strength and was carried out both before and after the intervention, with consistency maintained by the involvement of the same trained evaluator throughout<sup>15</sup>.

### **Ethical Consideration**

Throughout the study, ethical concerns were crucial, assuring the preservation of participants' rights and well-being. Confidentiality was strictly upheld in order to protect sensitive information while also protecting the privacy of each participant. Individuals were given complete autonomy, allowing them to join willingly, withdraw at any time, and make educated judgements about their involvement. In accordance with ethical guidelines, all participants provided express informed permission before the study began, detailing the nature, goal, and potential risks and benefits of their involvement. The research procedure was approved by Al Shifa Hospital and Executive Clinic IRB # ASHEC-PT-0133/12/22 demonstrating the study's ethical rigor and conformity to recognized norms.

### **Results**

The study included a heterogeneous group of 50 participants, 20 men and 30 females. The population's total mean age was  $45.42 \pm 2.25$  years. The male-to-female ratio in the research was around 2:3, indicating a larger representation of females. This balanced demographic combination was intended to ensure a thorough examination of effects across gender lines. (Table 1)

<b>Table 1: Demographic Characteristics of Participants</b>	
<b>Variables</b>	<b>Mean age in years <math>\pm</math> SD</b>
<b>Age</b>	45.42 $\pm$ 2.25
<b>Gender Distribution</b>	<b>Frequency (%)</b>
<b>Male</b>	20 (40%)
<b>Female</b>	30 (60%)
<b>Male Female Ratio</b>	2:3

The comparison of wrist range of motion (ROM) before and after a four-week physical therapy session produced convincing results. The mean wrist ROM improved from  $44.06 \pm 6.47$  to

62.04±4.68 degrees after the intervention, demonstrating a significant improvement in flexibility. The statistically significant t-statistic of -16.586, with a p-value less than 0.001 in both one-tailed and two-tailed tests, further supports this positive improvement. The estimated t-statistic considerably above the threshold t-values for both one-tailed (1.676) and two-tailed (2.009) tests, indicating that the improvement was statistically significant. The Pearson correlation coefficient of 0.0834 indicates a slight positive association between the two variables, showing that the increase in wrist ROM is not significantly related to the baseline data. Finally, the evidence strongly supports the efficacy of the four-week physical therapy intervention in improving wrist range of motion, offering important insights for clinical applications. Further the pre-post effects of a physical therapy-based intervention on forearm supination also revealed substantial improvements. The mean forearm supination increased from 54.76±5.89 to 82.64±5.07 degrees after the intervention, indicating a significant improvement in rotational movement. The Pearson correlation value of 0.429 reveals a moderate positive connection between the two variables, indicating that a rise in forearm supination was substantially related to baseline measures. In both one-tailed and two-tailed tests, a highly significant t-statistic of -33.398 was found, with a p-value of less than 0.001. The estimated t-statistic considerably above the required t-values for both one-tailed (1.676) and two-tailed (2.009) tests, confirming the improvement's statistical significance. (Table 2)

<b>Table 2: Effects of Intervention on Range of Motion Assessment</b>					
<b>Variables</b>	<b>ROM±SD Baseline</b>	<b>ROM±SD Post</b>	<b>t-stat</b>	<b>t-critical</b>	<b>p-value</b>
<b>Wrist Flexion</b>	44.06±6.47	62.04±4.68	-16.5	1.67	<0.001
<b>Forearm Supination</b>	54.76±5.89	82.64±5.07	-33.39	1.67	<0.001

The comparison of grip strength in pounds between lateral epicondylitis patients before and after physical therapybased treatment demonstrated significant improvements. Prior to the intervention, the mean grip strength was  $74.04 \pm 6.49$  pounds that improved to  $97.46 \pm 8.12$  pounds. The Pearson correlation coefficient of 0.173 indicates a slight positive association between the two variables, implying that the observed gain in grip strength is not highly related to baseline measures. In both one-tailed and two-tailed tests, the statistical analysis produced a very significant t-statistic of -17.46, with a p-value less than 0.001. The estimated t-statistic considerably above the required t-values for both one-tailed (1.676) and two-tailed (2.009) tests, confirming the improvement's statistical significance. (Table 3)

<b>Variables</b>	<b>Baseline in pounds</b>	<b>Post value</b>	<b>t-stat</b>	<b>t-critical</b>	<b>p-value</b>
<b>Grip Strength</b>	$74.04 \pm 6.49$	$97.46 \pm 8.12$	-17.46	1.67	<0.001

### **Discussion**

The study included 50 individuals, 20 males and 30 women, representing a population with a mean age of 45.42 years. The gender distribution favored females, with about 2:3 ratio. The study looked at how a four-week physical therapy intervention affected wrist range of motion (ROM), forearm supination, and grip strength in individuals with lateral epicondylitis. All three outcome indicators improved significantly as a result of the findings. The mean wrist ROM increased from 44.06 to 62.04 degrees following intervention, as evidenced by a very significant t-statistic and a low correlation with baseline measurements. Similarly, with a significant positive connection, forearm supination rose from 54.76 to 82.64 degrees. Grip strength in pounds increased from 74.04 to 97.46 pounds. The statistical studies consistently backed up the relevance of these enhancements. These data support the efficacy of physical treatment in improving wrist ROM, forearm supination, and grip strength in individuals with lateral epicondylitis. In a case presentation, a 40-year-old lady diagnosed with tennis elbow is treated



with a complete physiotherapy program. The patient had continuous discomfort in her right elbow, which was exacerbated by repetitive hand motions. The physiotherapy regimen included three 60-minute sessions of Transcutaneous Electrical Nerve Stimulation (TENS), Short Wave Diathermy (SWD), and targeted exercise treatment<sup>17</sup>. The Numeric Rating Scale (NRS) was used to assess pain, Manual Muscle Testing (MMT) was used to test muscle strength, a goniometer was used to examine range of motion (ROM), and the Patient-Rated Tennis Elbow Evaluation (PRTEE) was used to assess functional capacity. The physiotherapy program sought to reduce pain, increase muscular strength, joint range of motion, and functional capacities. The patient's discomfort, which was originally prompted by activities such as personal hygiene, carrying burdens, and typing, significantly improved after three physiotherapy sessions. The intervention helped to reduce discomfort, increase range of motion, increase muscular strength, and improve functional capacity. The multimodal treatment, which included TENS, SWD, and exercise therapy, addressed many elements of tennis elbow pathology, with an emphasis on pain management, muscular control, and functional rehabilitation. In a systematic review, researchers sought to determine the efficacy of physical therapy interventions for chronic lateral elbow tendinopathy (LET) by examining randomized controlled trials (RCTs) that used pain-free grip strength and/or the patient-rated tennis elbow evaluation questionnaire as outcome measures. Only 22 RCTs out of 2,906 citations satisfied the qualifying criteria. The evaluation found substantial differences in the design, physical therapy techniques, treatment durations, assessment periods, and results across the chosen studies. These discrepancies were identified by a methodological quality evaluation utilizing the PEDro scale. Despite the variety, the findings indicated that there was insufficient evidence to support or reject the efficacy of various existing physical therapy strategies for chronic LET<sup>18</sup>. Notably, mobilization with elbow joint movement exhibited potential immediate efficacy, but myofascial release approaches demonstrated short-term efficacy. In a three-month research that was conducted to evaluate the efficacy of incorporating exercises targeting spatula stabilizers in physical therapy for individuals with chronic documentary tendinopathy of the elbow joint (DTEJ). The study included 32 patients divided into two groups: the main group (MG), which had 17 participants, and the control group (CG), which had 15 people. Patient education, exercises for the shoulder blade and forearm (elbow/wrist), deep soft tissue massage using Mill's manipulation, and phonophoresis with hydrocortisone were all part of the PT program for MG. The CG got the same program but

without the spatula stabilizer exercises. Pain intensity (Visual Analogue Scale - VAS), forearm and wrist muscular strength (dynamometry), and the Disability of the Arm, Shoulder, and Hand Outcome Measure (DASH) questionnaire were used as evaluation criteria<sup>19</sup>.

The findings underlined the advantages of including shoulder blade stabilizer exercises, as well as deep soft tissue massage and Mill manipulation, into the PT program for patients with DTEJ. Within a brief evaluation time, the rehabilitation complex outperformed PT with exercises focused primarily on the forearm, resulting in substantial favorable improvements in both VAS and the DASH scale (p0.005 and p0.001, respectively). The findings imply that this complete rehabilitation method may be useful for those with chronic documentary tendinopathy of the elbow joint.

### **Conclusion**

The study investigated the effectiveness of a comprehensive physical therapy intervention in people with lateral epicondylitis. After the four-month intervention, the subjects, showed significant improvement in wrist range of motion and forearm supination and grip strength. Overall, this study supports the use of ultrasound treatment, ice, and targeted workouts as a potential method for lateral epicondylitis management, emphasizing the necessity of including these modalities into complete rehabilitation programs.

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