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Functional Task Performance and Patient Satisfaction in Lateral Epicondylitis: Unraveling the Effects of Physical Therapy Interventions

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Abstract

Background: Physiotherapy is a feasible lateral epicondylitis (LE) method with many practical combined options. This study aims to determine the effects of strengthening exercises, ultrasound, and icing on functional task parameters in patients with LE.

Methods: A quasi-experimental design was conducted on LE patients to determine the combined effects of strengthening exercises, ultrasound and icing on functional and modified functional task parameters. The intervention was implemented five days/week for three months, each lasting 25 to 30 minutes.

Results: The findings revealed a significant improvement ($p<0.05$) in the performance of functional and modified functional tasks. The baseline values of the functional task were 2.5±0.37 for reaching, 1.9±0.25 lifting, and 1.63 ± 0.75 carrying had improved to 3.34±0.56, 2.8±0.45 and 3.45±0.4, respectively.

Conclusion: It was concluded that combined LE treatment was significantly effective ($p<0.05$) in improving both functional and modified functional tasks, highlighting this holistic approach's potential benefits. Future studies must consider combining approaches over individualized treatments in LE management.

Keywords

Inflammation, Lateral Epicondylitis, Physical Therapy, Strength Training.

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Introduction

Lateral epicondylitis (LE), or "tennis elbow," is an orthopedic condition affecting 1% to 3% of the population worldwide[1]. It primarily affects adults over the age of 40 and both genders equally[1-2]. Research shows that, after a year of treatment, a considerable proportion of patients with lateral epicondylitis—between 70% and 90%—have a clinical course that either resolved spontaneously or responds well to conservative care such as orthopedic devices, Non-Steroidal Anti-Inflammatory drugs (NSAIDs), physical therapy and rest[3]. Initially, therapy usually consists of rest and medication for temporary pain relief; however, these approaches may not be effective for resolving issues or preventing relapses. 80–97% of surgical results show rapid pain alleviation; however, a small percentage need a second treatment within 18–24 months[4-5].

Physiotherapy has demonstrated effectiveness, particularly in alleviating pain and enhancing joint Range of Motion (ROM), primarily by incorporating manual treatments. Notably, strengthening of the afflicted region is typically beneficial for lateral epicondylitis and another tendinopathy, offering continuous mechanical stimulation for tendon remodeling and boosting collagen production in injured tendons further; eccentric exercise has also been shown to lessen discomfort and improve functioning[6]. Physiotherapy is a viable treatment option for lateral epicondylitis, with a wide range of available choices. The effects of strengthening exercises can be enhanced with ultrasound therapy, which helps fix tissue damage and lowers inflammation, and icing, which has analgesic and anti-inflammatory properties.

Furthermore, ultrasound therapy employs a device to produce and transmit sound waves to interior injury locations for healing[7]. The well-established benefit of this approach lies in its ability to provide deep heating to soft tissues, including muscles, tendons, joints, and ligaments[8]. Even though ultrasound therapy has been studied and used extensively in clinical settings to treat diseases like tennis elbow, there remains discussion on combining ultrasound with other physical therapy-based treatment approaches to get the desired results[9]. Hence, the present study aims to combine the effects of strengthening exercises, ultrasound and icing on functional task parameters that include dynamic reaching and lifting test involving the assessment of three tasks: reaching, lifting and carrying, along with an overall assessment of all three tasks and modified functional task that include assessment of task like opening jar, turning doorknobs and carrying groceries.

Methodology

Study Design

A quasi-experimental design study was conducted to determine the combined effects of strengthening exercises, ultrasound, and icing on patients with lateral epicondylitis' functional and modified functional task parameters.

Patient Recruitment Criteria

Individuals diagnosed with lateral epicondylitis based on imaging results and clinical examination who were between the ages of 18 and 60 years were eligible for inclusion. Those who had recently suffered upper limb fractures or had undergone operations in the last six months, had concurrent neurological conditions impairing upper limb function like stroke, spinal cord injuries, etc. or were not candidates for ultrasound treatment were excluded. Furthermore, no comparable LE intervention should have been performed on the subjects during the previous six months. In order to guarantee statistical power and insightful analysis, the study sought to enlist N=50 patients in the sample size. Before enrolling in the study, prospective participants who met the inclusion criteria were contacted and allowed to provide written informed permission.

Intervention Criteria

The intervention plan included five weekly sessions for three months, each lasting 25 to 30 minutes, as part of a planned therapy program. The intervention approach comprised the following:

i. ***Cryotherapy (Icing)***

The cryotherapy was given during the first part of LE management to control pain, reduce inflammation and numb the affected area to enhance blood flow and wash out toxins. The gel cold pack was wrapped in the towel and applied on the patient's affected side for 10 minutes. The patient was monitored throughout the duration to ensure that the temperature of the cold pack stayed within a range that the patient could tolerate, avoiding any discomfort[10].

ii. ***Ultrasound Therapy***

The ultrasound was aimed to enhance tissue healing and reduce inflammation in managing LE. The Enraf Endomed 582 ultrasound device was used at a frequency of 3 MHz in pulsed mode 1:4, with an intensity of 0.1-0.3 W/cm2 for 10 minutes. The liquid gel was applied on the affected area to deliver focused and controlled ultrasound waves while the patient was comfortably seated in a proper chair[11].

iii. **Strengthening Eccentric Exercises**

The following exercises were performed to improve the strength of targeted muscles:

- ***Grip Strength***
  These exercises were used to enhance the endurance and strength of the hand muscles on LE side. The exercise included grasping portable objects such as stress balls or handgrips[12].

- ***Supination***
  They used a resistance band or other lightweight item while concentrating on deliberate supination motions. The exercises were performed to improve muscle strength[12].

- ***Wrist Extension***
  These exercises were used to strengthen forearm extensor muscles. The patients were instructed to raise their hands and fingers using a dumbbell or body weight.

- ***Wrist Flexion***
  Wrist flexion exercises were designed to concentrate on wrist bending motions. These workouts, which may have included wrist curls or other comparable movements, focused on the forearm flexor muscles.

- ***Towel Twist Exercises***
  Towel twists usually require using both hands to twist a frequently folded towel. This exercise strengthened and extended the forearm muscles involved in rotation[13].

Outcome Measures

- ***Functional Task***
  The dynamic reaching and lifting assessment aimed to evaluate the patient's proficiency in performing dynamic movements that stressed the elbow joint, providing insights into functional stability. Patients were instructed to reach for an object at or above shoulder height for the reaching task. The evaluator observed elbow joint movements, noting hesitations, tremors, or compensatory actions. Grading ranged from 4 for smooth and controlled motions to 1 for significant instability. The lifting task involved patients lifting a lightweight object, with the evaluator observing joint stability. The carrying task assessed the patient's ability to carry an object while walking or turning. Overall grading combined scores from reaching, lifting, and carrying tasks, reflecting the patient's dynamic stability. An Excellent overall grade indicated a total score of 12, reflecting proficient performance in all tasks, while lower scores signified varying degrees of instability or compensatory movements affecting functional tasks[14-16].

- ***Modified Functional Task***
  Modified functional tasks, including opening jars, turning doorknobs, and carrying groceries, were examined in assessing patients with lateral epicondylitis. The patient's methods for doing these tasks included compensating approaches, wrist movement, and grip strength, which were methodically examined. An excellent grade showed the best

technique without pain, whereas a poor rating indicated serious difficulties requiring treatment[14-16].

Ethical Considerations

The study was conducted in the physical therapy department of Dar-ul-Sehat Hospital, Karachi IRB#029-15/01/23. Ethical standards in all parameters were fulfilled, including confidentiality of information, autonomy and non-malfeasance as provided in the Helsinki declaration[17] for studies incorporating human subjects.

Results

A total of n=50 participants were included, comprised of 36 males and 14 females. The mean age of the participants was found to be 49.58±2.56 years. Further demographic characteristics suggested that n=24 were bankers, n=16 were teachers, n=6 were only doing household activities, and n=4 were labourers. The detailed illustrations are shown in Table-1.

Table-1 Demographic characteristics of participants

Variables	n (%)
Age (years)	49.58±2.56
Gender	
Female	14 (28%)
Male	36 (72%)
Occupation/ Work Related Activities	
Bankers	24 (48%)
Teachers	16 (32%)
House Hold Activities	6 (12%)
Labors	4 (8%)

Mean±S.D.

The findings were analyzed at two different intervals for functional tasks and modified functional tasks at baseline and after 12 weeks of intervention. The findings revealed a significant improvement $p<0.05$ in the performance of functional tasks and modified functional tasks. The baseline values of the functional task were 2.5±0.37 for reaching, 1.9±0.25 lifting, and 1.63 ± 0.75 for carrying, had improved to 3.34±0.56, 2.8±0.45 and 3.45±0.4 (Table-2). Further improvements

were also noticed on a modified functional task where at baseline, the value for the jar opening task was 1.56±1.1, turning doorknobs 1.32±0.85 and carrying groceries 1.45±0.66 that had improved significantly to 2.58±0.9, 3.58±1.2 and 3.7±0.9 respectively (Table-2).

Table-2 Within-group analysis for functional task and modified functional task

Variables	Pre Mean±S.D.	Post Mean±S.D.	T-value	t- crit	p-value
Functional Task Assessment					
Reaching	2.5±0.37	3.34±0.56	2.56	1.66	<0.05
Lifting	1.9±0.25	2.8±0.45	3.41		
Carrying	1.63 ± 0.75	3.45±0.4	2.25		
Overall	1.56 ± 1.2	2.66±1.1	1.58		
Modified Functional Task Assessment					
Jar Opening	1.56±1.1	2.58±0.9	1.56	1.65	<0.05
Turning Doorknob	1.32±0.85	3.58±1.2	2.6		
Carrying Groceries	1.45±0.66	3.7±0.9	1.85		

Discussion

The study findings provided compelling evidence that strength training combined with ultrasound therapy and cryotherapy significantly improved ($p<0.05$) functional and modified functional tasks among individuals with lateral epicondylitis. The analysis were conducted at two different intervals, at baseline and after 12 weeks of intervention. The baseline values for functional tasks, including reaching (2.5±0.37), lifting (1.9±0.25), and carrying (1.63 ± 0.75), demonstrated notable enhancements to 3.34±0.56, 2.8±0.45, and 3.45±0.4, respectively. Moreover, substantial improvements were observed in modified functional tasks. At baseline, the jar opening task was 1.56±1.1, turning doorknobs was 1.32±0.85, and carrying groceries measured 1.45±0.66. These values significantly improved to 2.58±0.9, 3.58±1.2, and 3.7±0.9, respectively. A single-blinded, randomized, controlled study examined the short-term effects of steroid injection, Kinesiotaping (KT), or a combination of both among LE. Three groups of eighty-four patients were randomly assigned to different treatments: Group-1 had KT, Group-2 got steroid injections, and Group-3 got both[18]. Effects of interventions were noticed before and after treatment, as well as at the third and twelfth weeks, on outcome measures of pain, shoulder and arm function questionnaire and grip strength[18]. According to the research, all groups showed statistically significant improvements following therapy, with Group-3 (steroid injection and KT) outperforming the other groups in several assessment measures[18]. In a cross-sectional online poll, 275 responses were received, most from seasoned physiotherapists and consultant

surgeons. According to the results, 81% of respondents supported exercise-based physical therapy as the main course of treatment. The most common second-line treatment, corticosteroid injections, accounted for 27% of the total. Other popular therapies included shockwave therapy, platelet-rich plasma injection, surgery, acupuncture, and a wait-and-see approach. The study draws attention to the extensive range of therapies used following physical therapy and emphasizes the lack of evidence for many second-line interventions[18].

A double-masked, randomized, controlled experiment examined the effectiveness of KT, sham taping, and exercises alone in treating lateral epicondylitis. Thirty patients with fewer than 12 weeks of lateral epicondylitis were randomly divided into three groups: KT plus exercises, sham taping plus exercises, and an exercise-only control group. Each group underwent a two-week home exercise program, including strengthening and stretching activities. The KT and sham taping groups had their tapings replaced every three to four days. The Patient-Rated Tennis Elbow Assessment (PRTEE) was the primary end measure[19]. The secondary outcomes were the visual analogue scale (VAS) for pain and grip strength and the QuickDASH scores for arm, shoulder, and hand impairments. The study showed that KT with exercise was superior to sham taping and exercise alone in reducing discomfort and arm weakness brought on by lateral epicondylitis during everyday activities. While comparing original KT to sham taping, the early benefits were more prominent in muscle strength and pain, as measured by grip strength and VAS.

The findings of this study indicated the efficacy of KT as a beneficial approach for LE. However, it was emphasized that combination treatments were more beneficial than individual approaches, so preference must be given to a single therapeutic regime19. The study has particular strengths, i.e. it implies a holistic practice for LE considering clinical assessment and diagnosis of each participant's condition. Thus, it demonstrated a multi-modal approach, including cryotherapy, ultrasound treatment, and eccentric and strengthening exercises for LE management. It recruited the patients with well-established inclusion criteria to avoid confounders.

Further, using reliable and standard outcome measures makes the study one of its kind in the management of LE. Moreover, the study has a few limitations, i.e., it lacks long-term follow-up and a sham intervention group, which may lead to bias in interpreting study findings. The sample size was modest, which may impact the generalizability of the study findings. Despite these limitations, the study provides valuable insights into a comprehensive treatment approach for LE.

Conclusion

It was concluded that combined LE treatment was significantly effective ($p<0.05$) in improving both functional and modified functional tasks, highlighting this holistic approach's potential benefits. Future studies must consider combining approaches over individualized treatments in LE management.

Acknowledgment
None.

Conflict of Interest
None.

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None.

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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design: Tabassum S, Faiz A

Acquisition, Analysis or Interpretation of Data: Haq S, Ghani SA, Sohail S

Manuscript Writing & Approval: Tabassum S, Faiz A, Haq S, Ghani SA, Sohail S

All the authors 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.