

EFFECTIVENESS OF ULTRASOUND THERAPY AND CRYOTHERAPY IN PAIN RELIEF AMONG PATIENTS WITH LATERAL EPICONDYLITIS

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Abstract:

Background: Lateral epicondylitis, commonly known as tennis elbow, is a painful condition involving the lateral elbow region and the common extensor tendon origin. It may cause pain during gripping, lifting, wrist movements and other daily activities. Ultrasound Therapy and Cryotherapy are commonly used non-invasive physiotherapy modalities for pain management in patients with lateral epicondylitis.

Aim: To study the effectiveness of Ultrasound Therapy and Cryotherapy in reducing pain among patients with lateral epicondylitis using the Visual Analogue Scale (VAS).

Material and Method: An experimental interventional study was conducted among 24 participants diagnosed with lateral epicondylitis. Pain intensity was assessed using the VAS before and after treatment. Ultrasound Therapy was applied over the lateral epicondyle and the origin of the common extensor tendon at a frequency of 1 MHz and an intensity of 0.8–1.2 W/cm² for approximately 20 minutes. Cryotherapy was administered using an ice pack over the lateral epicondyle region for 20 minutes. Treatment was provided four sessions per week for three weeks. Data were analysed using descriptive statistics, the Shapiro–Wilk test and the paired-sample Wilcoxon test.

Results: A progressive reduction in pain intensity was observed during the three-week intervention period. The overall mean VAS score decreased from 7.92 ± 0.83 before treatment to 1.42 ± 0.58 after treatment. The mean reduction in pain was 6.50 ± 0.88 . The improvement was statistically highly significant, with $p = 0.001$. The reported effect size was 0.89, indicating a large treatment effect.

Conclusion: The three-week intervention programme involving Ultrasound Therapy and Cryotherapy was associated with significant pain reduction among patients with lateral epicondylitis. However, the available analysis does not establish which modality was superior.

Index Terms: Lateral epicondylitis, Ultrasound Therapy, Cryotherapy, pain relief, physiotherapy, Visual Analogue Scale.

I. INTRODUCTION

Lateral epicondylitis, commonly known as tennis elbow, is one of the frequent causes of pain over the lateral aspect of the elbow. It is generally associated with degenerative changes at the origin of the common extensor tendon, particularly the extensor carpi radialis brevis. Repetitive wrist extension, gripping activities, forearm movements and occupational overuse may contribute to the development of this condition.

The major clinical features of lateral epicondylitis include localized pain over the lateral epicondyle, tenderness on palpation, reduced grip strength and pain during resisted wrist extension. These symptoms may interfere with occupational activities, sports, household tasks and other activities of daily living.

Clinical assessment of lateral epicondylitis may include special tests such as the Mills test and Cozen's test. Conservative physiotherapy management plays an important role in reducing pain and improving upper-limb function. Commonly used physiotherapy interventions include therapeutic exercises, manual therapy, Ultrasound Therapy, Cryotherapy, phonophoresis and laser therapy.

Therapeutic ultrasound uses high-frequency sound waves and may produce thermal and non-thermal effects in the treated tissues. It is commonly used with the aim of improving local circulation, promoting tissue healing and reducing pain. Cryotherapy involves the application of cold to the affected area. It may reduce tissue temperature, decrease nerve conduction velocity and provide an analgesic effect.

Although both Ultrasound Therapy and Cryotherapy are frequently used in physiotherapy practice, their effectiveness may vary according to treatment parameters, duration of symptoms, patient characteristics and the overall rehabilitation programme. Therefore, the present study was conducted to assess pain reduction among patients with lateral epicondylitis following a structured intervention programme involving Ultrasound Therapy and Cryotherapy.

II. AIM AND OBJECTIVES

Aim: To study the effectiveness of Ultrasound Therapy and Cryotherapy in pain relief among patients with lateral epicondylitis.

Objectives: (1) To study the effect of Ultrasound Therapy on pain reduction among patients with lateral epicondylitis using the Visual Analogue Scale. (2) To study the effect of Cryotherapy on pain reduction among patients with lateral epicondylitis using the Visual Analogue Scale.

III. MATERIALS AND METHODS

Parameter	Description
Study type	Experimental interventional study
Study design	Pre- and post-intervention study
Sampling	Simple random sampling, as reported in the synopsis
Study population	Patients diagnosed with lateral epicondylitis
Study duration	Three weeks
Study setting	Physiotherapy Outpatient Departments of Sangli and Miraj, Maharashtra
Sample size	24 participants
Age range	18–40 years

Participants were eligible if they were 18–40 years of age, had unilateral lateral elbow pain lasting for more than six weeks, were not taking medication during the study period, and demonstrated positive Mills and Cozen's tests. Participants were excluded if they had other predominant musculoskeletal pain, radicular or neurological symptoms, inflammatory or systemic arthritic conditions, recent physiotherapy or injection treatment, or previous tennis elbow surgery. Written informed consent was obtained before participation.

III.A. INTERVENTION PROTOCOL

Ultrasound Therapy: Ultrasound Therapy was administered over the lateral epicondyle and the origin of the common extensor tendon of the affected elbow. The participant was positioned in sitting with the elbow flexed to 90°, the forearm pronated and the wrist in a neutral position. A frequency of 1 MHz and an intensity of 0.8–1.2 W/cm² were used with ultrasound coupling gel. The transducer was moved slowly in circular movements for approximately 20 minutes per session. Treatment was provided four sessions per week for three weeks.

Cryotherapy: Cryotherapy was administered over the lateral epicondyle region of the affected elbow. The participant was seated comfortably with the forearm supported on a table. An ice pack was applied with a

towel barrier between the pack and the skin for 20 minutes per session. Treatment was provided four sessions per week for three weeks. The treated area was monitored to reduce the risk of excessive cold exposure and skin irritation.

III.B. OUTCOME MEASURES AND STATISTICAL ANALYSIS

Pain intensity was assessed using the Visual Analogue Scale (VAS), a 10-cm scale ranging from 0, representing no pain, to 10, representing the worst possible pain. The participant marked the point corresponding to the intensity of pain experienced.

Data were analysed using PSPP/JASP software. Descriptive statistics were expressed as mean and standard deviation for continuous variables and frequency and percentage for categorical variables. The Shapiro–Wilk test was used to assess normality. Since the data did not follow a normal distribution, non-parametric analysis was performed. Pre- and post-intervention VAS scores were compared using the paired-sample Wilcoxon test. The effect size was calculated using a standardized correlation coefficient. A p-value less than 0.05 was considered statistically significant, and a 95% confidence interval was used.

IV. RESULTS

Twenty-four participants were included in the study. The participants were between 21 and 38 years of age, with a mean age of approximately 28.45 ± 5.49 years. Females constituted 14 participants (58%), while males constituted 10 participants (42%).

Table 2. Gender-wise distribution of participants.

Gender	Frequency	Percentage
Female	14	58%
Male	10	42%
Total	24	100%

Table 2. Pre- and post-intervention descriptive statistics.

Assessment	Pre-treatment Mean $\pm$ SD	Post-treatment Mean $\pm$ SD	Mean Difference $\pm$ SD	Effect Size	Test Value	p-value
Week 1	7.96 ± 0.86	5.83 ± 1.05	2.13 ± 0.80	0.89	4.362	0.001
Week 2	5.83 ± 1.05	4.08 ± 0.83	1.75 ± 0.68	0.89	4.378	0.001
Week 3	4.08 ± 0.83	1.42 ± 0.58	2.67 ± 0.70	0.90	4.387	0.001
Overall	7.92 ± 0.83	1.42 ± 0.58	6.50 ± 0.88	0.89	4.362	0.001

The results demonstrated a progressive reduction in VAS scores from the first week to the third week of treatment. The overall mean VAS score decreased from 7.92 ± 0.83 before treatment to 1.42 ± 0.58 after treatment. The paired-sample Wilcoxon test showed a highly significant difference, with $p = 0.001$.

V. DISCUSSION

The present study evaluated the effectiveness of Ultrasound Therapy and Cryotherapy in reducing pain among patients with lateral epicondylitis. Pain intensity was assessed using the Visual Analogue Scale during a three-week intervention period.

The findings demonstrated a progressive reduction in pain intensity throughout the treatment period. During the first week, the mean VAS score decreased from 7.96 ± 0.86 to 5.83 ± 1.05 . During the second week, the mean VAS score decreased from 5.83 ± 1.05 to 4.08 ± 0.83 . During the third week, the mean VAS score decreased from 4.08 ± 0.83 to 1.42 ± 0.58 .

The overall mean VAS score decreased from 7.92 ± 0.83 before treatment to 1.42 ± 0.58 after treatment. The mean reduction was 6.50 ± 0.88 , and the result was statistically highly significant, with $p = 0.001$. The reported effect size of 0.89 suggests a large magnitude of change within the analysed sample.

The reduction in pain observed in the present study may be related to the analgesic effects of the physiotherapy modalities used. Therapeutic ultrasound may provide thermal and mechanical effects that support local tissue recovery and symptom relief. Cryotherapy may reduce pain through decreased tissue temperature and reduced nerve conduction velocity.

The findings are partially consistent with previous research. Studies have reported improvements in pain and functional outcomes following therapeutic ultrasound in patients with lateral epicondylitis. Other research has also described immediate improvements in pain following local Cryotherapy.

However, previous studies have reported variable results. Differences may be explained by variations in treatment parameters, duration of symptoms, sample characteristics, intervention protocols and the use of additional therapeutic exercises.

The VAS was used as the primary outcome measure. Although the VAS is useful for assessing pain intensity, lateral epicondylitis may also affect grip strength, wrist extensor function, occupational performance and upper-limb disability. Therefore, pain reduction alone may not fully represent functional recovery.

An important limitation of interpretation is that the available statistical analysis reports overall paired pre- and post-intervention results. It does not clearly provide a separate comparison between the Ultrasound Therapy group and the Cryotherapy group. Consequently, the present findings support an overall reduction in pain following the intervention programme but do not establish the superiority of either modality.

VI. LIMITATIONS AND FUTURE RECOMMENDATIONS

- The intervention period was limited to three weeks, and long-term treatment effects were not assessed.
- The sample size was small and included only 24 participants.
- The study was conducted in a limited geographical and institutional setting.
- The participants were between 18 and 40 years of age; therefore, the findings may not be generalized to other age groups.
- No long-term follow-up assessment was conducted after completion of treatment.
- Pain was assessed using the subjective VAS, which may be influenced by individual pain perception.
- Functional outcomes such as grip strength, pain-free grip strength, upper-limb disability and quality of life were not assessed.
- Occupational activities, daily physical activity and use of the affected upper limb were not fully controlled.
- Separate between-group statistical comparisons between Ultrasound Therapy and Cryotherapy were not clearly presented.
- Future studies should include larger samples, randomized controlled designs, multicentre recruitment, longer intervention periods and follow-up assessments. Direct between-group comparisons and additional outcomes such as grip strength, pain-free grip strength, PRTEE, DASH, functional ability and quality of life should also be included.

VII. CONCLUSION

The present study concluded that Ultrasound Therapy and Cryotherapy were effective in reducing pain among patients with lateral epicondylitis. A progressive reduction in VAS scores was observed during the three-week treatment period, and the overall improvement was statistically highly significant ($p = 0.001$). However, the available analysis did not clearly establish which of the two treatment modalities was superior.

VIII. CLINICAL IMPLICATIONS

The findings support the possible use of Ultrasound Therapy and Cryotherapy as non-invasive physiotherapy modalities for pain management in patients with lateral epicondylitis. Clinicians may consider these

modalities as part of a structured rehabilitation programme, while also assessing functional outcomes and individual patient response.

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X. REFERENCES

1. Manias P, Stasinopoulos D. A controlled clinical pilot trial to study the effectiveness of ice as a supplement to the exercise programme for the management of lateral elbow tendinopathy. *British Journal of Sports Medicine*. 2006;40(1):81–85.
2. Luo D, Liu B, Gao L, Fu S. The effect of Ultrasound Therapy on lateral epicondylitis: A meta-analysis. *Medicine*. 2022;101(8):e28822.
3. Radecka A, Lubkowska A. Direct effect of local Cryotherapy on muscle stimulation, pain and strength in male office workers with lateral epicondylitis: A non-randomized clinical trial. *Healthcare*. 2022;10(5):879.
4. D'Vaz AP, et al. Effect of pulsed low-intensity ultrasound therapy on chronic lateral epicondylitis. 2006.
5. Ünver HH, et al. Comparison of continuous and pulsed therapeutic ultrasound with placebo in patients with lateral epicondylitis. 2021.
6. Vulpiani MC, et al. Extracorporeal shock wave therapy versus cryo-ultrasound therapy in the treatment of chronic lateral epicondylitis. 2015.
7. Ammendolia A, de Sire A, Lippi L, et al. Cryotherapy and therapeutic ultrasound in the management of acute musculoskeletal injury. 2023.
8. Sun Z, Chen S, Liu W, et al. UCICLET trial protocol: Therapeutic ultrasound for lateral elbow tendinopathy. 2022.
9. Bijur PE, Silver W, Gallagher EJ. Reliability of the visual analog scale for measurement of acute pain. *Academic Emergency Medicine*. 2001.

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