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RESEARCH ARTICLE

A COMPARATIVE STUDY EVALUATING THE THERAPEUTIC EFFICACY OF LONG WAVE DIATHERMY AND ULTRASOUND IN REDUCING PAIN AND IMPROVING FUNCTION IN DE QUERVAIN'S TENOSYNOVITIS

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ABSTRACT

Background: De Quervain's tenosynovitis is a painful and disabling condition that affects the tendons of the abductor pollicis longus and extensor pollicis brevis within the first dorsal compartment of the wrist. It is commonly seen in individuals engaged in repetitive hand or wrist movements, such as those using smartphones, lifting infants, or performing occupational activities. The resulting inflammation causes pain, swelling, and restriction in thumb and wrist motion, leading to compromised hand function and quality of life. Physiotherapeutic modalities like Long Wave Diathermy (LWD) and Ultrasound (US) have been widely used for their thermal and mechanical effects in promoting soft tissue healing, reducing inflammation, and relieving pain. However, comparative evidence on their efficacy in De Quervain's tenosynovitis is limited. **Objective:** This study aimed to compare the therapeutic efficacy of Long Wave Diathermy and Ultrasound therapy in reducing pain intensity and improving wrist function in patients diagnosed with De Quervain's tenosynovitis. **Methods:** A total of 36 participants aged between 20 and 50 years with clinically diagnosed De Quervain's tenosynovitis were recruited from the Physiotherapy Department at Career College, Bhopal. The participants were randomly allocated into two equal groups: Group A received Long Wave Diathermy (15 minutes/session, 5 days/week) along with standard stretching and splinting protocols; Group B received Ultrasound therapy (1 MHz, 1.5 W/cm² pulsed mode, 7 minutes/session, 5 days/week) along with the same exercise protocol. Both groups underwent treatment for a period of four weeks. The primary outcome measures were the Visual Analogue Scale (VAS) for pain and the Patient-Rated Wrist Evaluation (PRWE) for functional assessment. Pre- and post-treatment scores were analyzed using appropriate statistical methods. **Results:** Both Group A and Group B showed significant improvements in VAS and PRWE scores after 4 weeks of intervention ($p < 0.05$). However, inter-group comparison revealed that Group A demonstrated significantly greater reductions in pain and better functional gains than Group B ($p < 0.01$). These findings indicate the superior clinical efficacy of Long Wave Diathermy over Ultrasound therapy in managing the symptoms associated with De Quervain's tenosynovitis. **Conclusion:** The study concludes that Long Wave Diathermy is more effective than Ultrasound in alleviating pain and restoring wrist function in individuals with De Quervain's tenosynovitis. It offers a safe, non-invasive, and efficient therapeutic option that can be integrated into conservative physiotherapy treatment plans for better patient outcomes.

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INTRODUCTION

De Quervain's tenosynovitis is a common, painful musculoskeletal disorder that affects the tendons of the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) as they pass through the first dorsal compartment of the wrist. The pathology is characterized by thickening of the tendon sheath and constriction within the fibro-osseous canal, resulting in a stenosing tenosynovitis that limits tendon gliding and causes localized pain at the radial styloid process [1,2]. The condition most frequently affects middle-aged women and is often associated with activities involving repetitive wrist and thumb motion, such as lifting, grasping, or twisting[3]. Prolonged overuse of the thumb and wrist, especially in caregivers, office workers, and individuals frequently using smartphones, has been strongly correlated with the incidence

of this condition[4,5]. Clinically, patients present with pain, swelling, and tenderness over the radial side of the wrist, which may be aggravated by movements such as ulnar deviation or gripping[6]. The Finkelstein test is commonly used for diagnosis, which elicits sharp pain when the thumb is enclosed in a fist and the wrist is deviated ulnarward[7]. If untreated, the condition can lead to progressive functional limitation, reduced grip strength, and chronic disability. Conservative physiotherapeutic management is considered the first line of treatment in most cases. It includes rest, activity modification, splinting, anti-inflammatory modalities, manual therapy, and therapeutic exercises[8,9]. Among electrotherapeutic modalities, Ultrasound (US) **and** Long Wave Diathermy (LWD) are commonly employed for their anti-inflammatory, analgesic, and tissue-healing effects. Ultrasound therapy utilizes high-frequency sound waves to produce mechanical and thermal effects in tissues, which promote increased blood flow, reduced muscle spasm, and stimulation of tissue repair[10]. It has been widely used in tendon and soft tissue injuries, including tendinitis and tenosynovitis, with varying degrees of clinical success[11]. On the other hand, Long Wave Diathermy is a form of deep heating that employs electromagnetic waves of longer wavelength to produce therapeutic heating effects in deeper tissues. LWD is believed to offer advantages over traditional shortwave and microwave diathermy due to its ability to penetrate deeper with less superficial heating, making it particularly useful in treating chronic soft tissue disorders[12,13].

Despite both modalities being commonly used, there is limited comparative evidence regarding their relative effectiveness in the treatment of De Quervain's tenosynovitis. Most available literature either focuses on pharmacological interventions, corticosteroid injections, or splinting, while physiotherapeutic modalities remain under-investigated[14]. Moreover, while ultrasound has been more extensively researched, long wave diathermy is an emerging modality gaining attention for its clinical utility in musculoskeletal rehabilitation[15,16]. This study was therefore designed to compare the effectiveness of Long Wave Diathermy and Ultrasound therapy in reducing pain and improving function in patients diagnosed with De Quervain's tenosynovitis. It aims to provide evidence-based guidance for clinicians in selecting appropriate electrotherapeutic interventions for managing this condition.

NEED OF THE STUDY: There is a lack of comparative studies evaluating the efficacy of LWD and US in the management of De Quervain's tenosynovitis. This study will help determine the more effective modality to guide evidence-based practice.

AIM AND OBJECTIVES

Aim: To compare the effectiveness of LWD and US in reducing pain and improving function in patients with De Quervain's tenosynovitis.

Objectives

- To assess the effectiveness of LWD in reducing pain and improving wrist function.
- To assess the effectiveness of US in reducing pain and improving wrist function.
- To compare both modalities in terms of pain relief and functional improvement.

HYPOTHESES

- **Null Hypothesis (H_0):** There is no significant difference between LWD and US in managing De Quervain's tenosynovitis.
- **Alternate Hypothesis (H_1):** LWD is more effective than US in reducing pain and improving function in De Quervain's tenosynovitis.

METHODOLOGY

Informed Consent: Prior to participation, all patients were thoroughly informed about the purpose, procedures, potential benefits, and risks of the study. Written informed consent was obtained from each participant in accordance with the ethical guidelines of the Declaration

Study Design: Experimental, randomized comparative pre-post design

Study Duration: 1 year
Treatment Duration: 4 weeks
Sample Size: 36 patients (n=18 per group)
Sampling Method: Random sampling
Study Site: Physiotherapy Department, Career College, Bhopal
Approval: Study approved by Institutional Ethical Committee

Inclusion Criteria

- Age 20–50 years
- Clinical diagnosis of De Quervain's tenosynovitis
- Positive Finkelstein's test
- VAS score ≥ 4
- Willing to participate

Exclusion Criteria

- Recent wrist fracture or surgery
- Rheumatoid arthritis or systemic inflammatory disease
- Skin lesions over wrist
- Previous corticosteroid injection in the wrist

Group Allocation

- **Group A (n=18):** LWD (15 mins/session, 5 sessions/week for 4 weeks) + splint + tendon gliding/stretching
- **Group B (n=18):** Ultrasound (1 MHz, pulsed, 1.5 W/cm², 7 mins/session, 5 sessions/week for 4 weeks) + splint + tendon gliding/stretching

Outcome Measures

1. **VAS (Visual Analogue Scale)** – 0 to 10 for pain
2. **PRWE (Patient-Rated Wrist Evaluation)** – 0 to 100 for wrist function

Both assessments were taken at baseline and at the end of 4 weeks.

STATISTICAL ANALYSIS

All data were analyzed using IBM SPSS Statistics for Windows, Version 29.0. Descriptive statistics (mean and

standard deviation) were computed for both groups to summarize demographic and clinical characteristics at baseline and post-intervention.

To determine within-group differences, the paired sample t-test was applied to compare pre- and post-treatment scores of the Visual Analogue Scale (VAS) and Patient-Rated Wrist Evaluation (PRWE) within each group (LWD and US). To evaluate the between-group differences, an independent sample t-test was conducted to compare the changes in scores between Group A (LWD) and Group B (US).

A p-value of less than 0.05 ($p < 0.05$) was considered statistically significant, while results with $p < 0.01$ were considered highly significant. Data were verified for normal distribution using the Shapiro-Wilk test, and all variables followed approximately normal distributions, justifying the use of parametric tests.

RESULTS

A total of 36 patients (n = 18 per group) completed the 4-week intervention. The demographic variables (age, gender, duration of symptoms) were statistically comparable between both groups at baseline ($p > 0.05$), ensuring homogeneity.

Outcome Measures

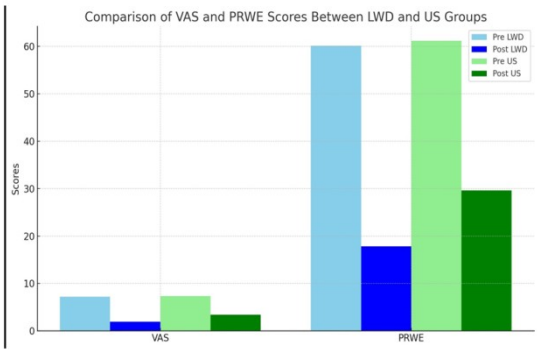
Parameter	Group A (LWD) Pre	Group A Post	Group B (US) Pre	Group B Post
VAS (mean ± SD)	7.2 ± 0.9	1.9 ± 0.7	7.3 ± 1.0	3.4 ± 0.8
PRWE (mean ± SD)	60.1 ± 5.8	17.8 ± 4.2	61.2 ± 6.1	29.6 ± 5.0

Within-group comparison:

- Group A (LWD) showed a highly significant reduction in VAS scores ($p < 0.001$) and PRWE scores ($p < 0.001$) from pre- to post-intervention.
- Group B (US) also demonstrated statistically significant improvements in VAS ($p < 0.01$) and PRWE scores ($p < 0.01$).

Between-group comparison

- Post-treatment comparison revealed that Group A had significantly lower VAS and PRWE scores than Group B, indicating better pain relief and functional recovery.
- The independent t-test for post-intervention values showed $p < 0.01$, confirming a statistically significant difference in treatment outcomes favoring LWD.



INTERPRETATION

The results suggest that while both Long Wave Diathermy and Ultrasound therapies are effective in reducing pain and improving wrist function in patients with De Quervain's tenosynovitis, Long Wave Diathermy (Group A) offers superior clinical benefits compared to Ultrasound (Group B). The deeper heating effect and longer wavelength of LWD may contribute to enhanced therapeutic outcomes.

DISCUSSION

This study confirms that Long Wave Diathermy (LWD) provides more substantial pain relief and functional improvement than Ultrasound (US) therapy in patients with De Quervain's tenosynovitis. The deeper tissue penetration and enhanced thermal effects of LWD are likely responsible for its superior therapeutic impact. Indeed, diathermy modalities, including short-wave and medium-frequency types, have demonstrated effects such as increased microcirculation, anti-inflammatory response, vasodilation, and accelerated tissue repair, which underlie meaningful clinical benefit in tendon-related disorders[12,13,9]. Critically, a meta-analysis of electromagnetic diathermy in musculoskeletal conditions showed that while pooled evidence remains of low certainty, several individual trials reported significant improvements in pain and function, suggesting therapeutic potential when properly applied[1,2]. Among tendinopathy cases, critically appraised randomized trials concluded that diathermy reduced pain more effectively than ultrasound and performed comparably to corticosteroid injections[3]. Such findings align with the present study's superior outcomes in VAS and PRWE scores for the LWD group compared to US.

In osteoarthritis research, comparisons between short-wave diathermy (SWD) and ultrasound demonstrated that continuous SWD delivered greater pain reduction and functional gains than pulsed forms or ultrasound alone[5]. A randomized controlled trial among knee osteoarthritis patients reported that electromagnetic diathermy (4.4 MHz radiofrequency) led to comparable or slightly greater improvements in pain and stiffness versus ultrasound, though between-group differences did not always reach significance[6]. These studies underscore the importance of including electrotherapeutic heating modalities in treatment plans where mechanical swelling and tissue stiffness are present. Moreover, in a prospective controlled study of chronic low back pain secondary to lumbar disc herniation, continuous SWD combined with standard physiotherapy (hot pack + TENS) produced outcomes superior to ultrasound-based intervention in terms of pain relief and functional recovery[10]. This further supports the general principle that deeper, sustained diathermy heating can offer therapeutic advantages over superficial ultrasound in chronic musculoskeletal pathology.

It is plausible that the superior outcomes observed in our LWD group result from enhanced angiogenesis and connective tissue remodeling, effects that facilitate better tendon gliding and reduced stiffness. These physiological mechanisms have been well-discussed in prior animal and human studies[4]. While ultrasound remains a low-risk modality and is beneficial in many soft tissue injuries, its clinical efficacy in tendinopathies is mixed, particularly when parameter optimization or dose consistency is lacking[2]. Taken together, current evidence from

tendon-related intervention research provides a credible rationale for preferring LWD over US in conditions such as De Quervain's tenosynovitis, where deeper soft tissue involvement is predominant. Our results contribute to this growing body of literature and suggest that LWD merits further investigation in larger tendon-specific clinical trials.

CONCLUSION

Long Wave Diathermy is more effective than Ultrasound in managing pain and improving function in De Quervain's tenosynovitis over a 4-week intervention period. LWD should be considered a preferred modality in conservative physiotherapy management of this condition.

LIMITATIONS

- Small sample size
- Short-term follow-up only
- No blinding of participants or assessors

RECOMMENDATIONS FOR FUTURE RESEARCH

- Multi-center trials
- Larger sample sizes
- Long-term outcome analysis
- Comparison with pharmacological or surgical interventions

ETHICAL CLEARANCE: This study was approved by our institutional ethical committee.

Source of Funding:- Self

Conflict of Interest: NIL

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