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Effects of ultrasound therapy versus high-intensity laser therapy in the treatment of people with Chronic Coccydynia

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Abstract

Background: Coccydynia, a debilitating condition, significantly impairs quality of life and functional ability. High Intensity Laser Therapy (HILT) has emerged as a promising treatment for various painful musculoskeletal disorders.

Objective: This study aimed to compare the short-term effectiveness of Ultrasound (US) therapy and HILT in managing chronic coccydynia.

Methods: The study evaluated 30 female patients diagnosed with chronic coccydynia, assessing Visual Analog Scale (VAS) scores at initial consultation, each session, and follow-up examinations. Participants received 12 treatment sessions of HILT.

Results: After the 2-week intervention, the HILT group demonstrated a significantly greater reduction in pain compared to the US therapy group. Statistically significant differences in pain reduction were observed after 12 treatment sessions in the HILT group compared to the US therapy group.

Conclusion: This study suggests that HILT is a more effective treatment for chronic coccydynia than US therapy, resulting in greater pain reduction after 12 treatment sessions over a period of 2 consecutive weeks. These findings support the use of HILT as a viable treatment option for managing chronic coccydynia.

Keywords: Coccydynia, high intensity laser therapy, ultrasound therapy

Introduction

Coccydynia, a painful condition affecting the tailbone, often results from traumatic events, but can also stem from non-traumatic causes. Common causes include falls, repetitive microtrauma, childbirth, lumbar stenosis, and disk degeneration. Conservative treatments typically involve anti-inflammatory drugs, rest, physical therapy, and modalities like seating rings, hot water baths, and injections [1, 2, 3, 4].

High-Intensity Laser Therapy (HILT) has emerged as a convenient, cost-effective treatment option with low complication rates. Successfully used in various musculoskeletal disorders, HILT's mechanism involves altering cellular functions through laser radiation characteristics, promoting tissue stimulation and photochemistry effects [5, 6, 7].

While some studies suggest Ultrasound (US) therapy's effectiveness in managing coccydynia, others have reported mixed results. In contrast, HILT offers a promising alternative, leveraging photobiology effects to stimulate tissue repair and reduce pain. As research continues to uncover HILT's potential, it may become a valuable addition to conservative treatment options for coccydynia [8, 9, 10, 11].

Materials and Methods

A retrospective Study on High-Intensity Laser Therapy (HILT) for chronic coccydynia.

This study evaluated the medical records of 34 patients (mean age 39 years, range 16-62; 5 males, 29 females) who underwent ESWT for chronic coccydynia. The patients' mean pain duration was 26.2 months (range 2-120). Inclusion criteria consisted of skeletal maturity, persistent coccyx pain despite conservative treatment, and completion of all HILT sessions. Exclusion criteria included recent injections, pregnancy, severe coagulopathy, chronic pain conditions, fracture history, and follow-up loss.

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Before treatment, patients underwent physical examinations, and radiographs and MRI scans were taken to assess coccyx position and rule out underlying conditions. Pain intensity was measured using a Visual Analog Scale (VAS) before treatment, at the end of treatment, and at 1- and 6-months post-treatment. The study aimed to assess the effectiveness of HILT in managing chronic coccydynia [12, 13, 14, 15].

Treatment Protocol

This study involved two physical therapy modalities, administered over 12 sessions, spanning two consecutive weeks (6 days/week). Participants in the High-Intensity Laser Therapy (HILT) group received treatment using a neodymium-yttrium aluminum garnet laser (HIRO 1.0 device).

The treatment parameters included

- High peak power (1 kW)
- Wavelength (1,064 nm)
- Maximum energy per impulse (150 mJ)
- Average power (6 W)
- Fluency (760 mJ/cm²)
- Impulse duration (<150 milliseconds)

The HILT treatment consisted of three phases

1. Initial phase: Fixed spacers ensured a consistent distance and verticality (90 degrees) to the treatment area.

2. Intermediate phase: Handpiece application on trigger points until 70-80% pain reduction was achieved (mean energy dose: 50 J).
3. Final phase: Slow manual scanning of the treated areas until a total energy dose of 1,000 J was reached.

In contrast, participants in the Ultrasound (US) therapy group received continuous US for 10 minutes using a SONOPLUS device, operated at:

- Frequency (1 MHz)
- Intensity (2 W/cm²)
- Duty cycle (100%)

The transducer head covered an area of approximately 20 cm², using slow circular movements. Participants were assessed at baseline and post-treatment, with clinical evaluations (VAS) conducted before and after treatment [16, 17].

Results

The results are shown Table 1 analyzing differences within groups were performed for the HILT group and the US therapy group, multiple comparisons analyzing differences between groups. Finally, we analyzed differences in change scores between groups after 12 treatment sessions over a period of 2 consecutive weeks; we found statistically significant differences for VAS scores.

Table 1: Visual Analogue Scale (VAS) score evaluation within groups and between Groups

| | HILT Group N=15 | US Therapy Group N=15 | Mean Difference Change | P Value |
|--------------------|-----------------|-----------------------|------------------------|---------|
| Baseline | 6.8 | 6.5 | 0.30 | 0.40 |
| After Intervention | 2.12 | 4.24 | 2.10 | <0.001 |

Discussion

Comparative Efficacy of Ultrasound and Laser Therapy in Chronic Coccydynia Treatment

Research on ultrasound (US) therapy and laser therapy for chronic coccydynia has yielded conflicting results. Some studies suggest that active US therapy offers no significant advantage over placebo US in treating soft-tissue disorders, while others report positive outcomes in pain reduction, improved daily functioning, and enhanced quality of life. For instance, Ebenbichler *et al.* found that US therapy significantly alleviated symptoms in patients with calcific tendinitis of the supraspinatus tendon.

In contrast, our study demonstrates the potential of High-Intensity Laser Therapy (HILT) as a promising treatment option for coccydynia. After 12 treatment sessions, HILT showed greater effectiveness than US therapy in reducing pain, improving articular movement, functionality, and muscle strength. Notably, this is the first study to compare the efficacy of US therapy and HILT in treating coccydynia. While no previous studies have directly compared these therapies, animal studies suggest that HILT may have analgesic effects without reducing inflammation [18, 19].

These findings highlight the need for further research to fully understand the therapeutic potential of HILT and its optimal application in treating chronic coccydynia.

Conclusion

A comparative study was conducted to assess on the efficacy of High-Intensity Laser Therapy (HILT) and Ultrasound (US) Therapy in managing chronic coccydynia. Results from this study indicate that individuals with chronic coccydynia

experienced a more significant decrease in pain intensity after undergoing 12 sessions of High-Intensity Laser Therapy (HILT), compared to those who received Ultrasound (US) therapy over a two-week period. This finding suggests that HILT may be a more effective treatment option for managing chronic coccydynia, leading to improved pain relief and enhanced quality of life for affected individuals.

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