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Original Research

The Difference in the Effects of Dry Needling (DN) and Low Level Laser Therapy (LLLT) on Pain Reduction in Upper Trapezius Spasms

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ABSTRACT

Background: *Upper trapezius muscle spasm pain often occurs due to excessive forward head posture and persistent muscle tension, thereby hindering functional activities. Various physiotherapy modalities are used to reduce pain, including Dry Needling (DN) and Low Level Laser Therapy (LLLT). The purpose of this study was to compare the effectiveness of DN and LLLT in reducing upper trapezius muscle spasm pain.*

Methods: *This study was an experiment with a two-group pre- and post-test design. A sample of 30 patients from the Physiotherapy Clinic at Dr. Ramelan Hospital in Surabaya was selected using simple random sampling and divided into two groups of 15 people each. Group I received DN intervention, while group II received LLLT for four weeks at a frequency of three times per week. The research instrument used the Visual Analog Scale (VAS), which has a reliability of 0.97 and validity of 0.925. Data analysis was performed using the paired sample t-test and independent sample t-test.*

Results: *There was a significant difference between the VAS scores before and after treatment in both groups (p=<0.001). The pain reduction score was higher in the DN group (Δ=3.5) than in the LLLT group (Δ=1.75), proving that DN is more effective in reducing upper trapezius muscle spasm pain.*

Conclusion: *DN is more effective than LLLT in reducing upper trapezius muscle spasm pain. DN intervention can be used as the primary choice in the management of neck muscle spasm and combined with therapeutic exercises for optimal results.*

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INTRODUCTION

Advances in technology and changes in modern lifestyles have had a significant impact on the increasing incidence of musculoskeletal disorders in the global population. Repetitive activities performed in non-ergonomic work positions increase the risk of muscle tension, particularly in the neck area. Musculoskeletal disorders (MSDs) are commonly found in office workers, drivers, and people who work in static positions for long periods (Sihombing et al., 2015; Wirayani et al., 2020). Poor work posture alters the mechanical load on muscles and can cause disturbances in the body's biomechanical function (Kalichman et al., 2016).

Muscle spasms in the neck, particularly in the upper trapezius muscle, are a common complaint resulting from repetitive muscle strain. Spasms are characterized by uncontrolled contractions that cause pain, stiffness, and limited movement. Forward head posture due to prolonged bending over a computer screen can trigger a spasm-pain-spasm cycle, resulting in decreased muscle oxygenation and increased chronic neck pain (Hidayati & Oktavanti, 2020; Wangko, 2014). This disorder can reduce work productivity and impact the quality of life of sufferers (Rodríguez-Huguet et al., 2017).

Neck pain remains a global health issue, with a prevalence of 71% in various countries and ranking fourth among the causes of disability worldwide (Rodríguez-Huguet et al., 2017). An epidemiological survey in Indonesia shows that around 16.6% of adults experience neck pain due to monotonous work activities (Palayukan, 2017). This condition requires effective physiotherapy intervention to relieve pain, restore movement function, and prevent recurrence of symptoms.

Physical therapy has various modalities for treating myofascial pain syndrome of the upper trapezius muscle, including myofascial release, muscle energy technique, instrument-assisted soft tissue mobilization (IASTM), dry needling (DN), and low-level laser therapy (LLLT) (Kaur & Kumar, 2018; Basu et al., 2020; Agung et al., 2018). The dry needling technique works by stimulating trigger points to relax muscles and improve blood circulation, while LLLT uses non-thermal light exposure to modulate cellular biological processes and reduce pain (Motavalian et al., 2020; Clijsen et al., 2019). Studies show that both methods are effective in reducing pain and improving joint range of motion in patients with chronic neck pain (Sacristán et al., 2022).

Based on this review, it is important to conduct a comparative study to determine the most effective physiotherapy modality for treating upper trapezius muscle spasms. This study aims to analyze the differences in the effects of DN and LLLT on reducing upper trapezius muscle spasm pain so that it can be used as a clinical reference in neck pain treatment therapy.

MATERIALS AND METHOD

This study used an experimental design with a two-group pre- and post-test design. This design was chosen because it allowed researchers to directly compare the effectiveness of DN and LLLT in reducing upper trapezius muscle spasm pain in two different groups under equivalent conditions. The groups were divided randomly based on the day of arrival to ensure objective distribution and minimize bias.

The research was conducted at the Physiotherapy Clinic of Dr. Ramelan Hospital in Surabaya. The study was carried out from December 2022 to January 2023, a time frame chosen to allow sufficient observation of changes in pain before and after the four-week intervention. The clinic facilities and number of patients at this location were adequate to meet the research requirements.

The study population consisted of patients with upper trapezius muscle spasm pain who visited Dr. Ramelan Naval Hospital. The sampling technique used purposive sampling with the following inclusion criteria: patients aged 18–65 years, a minimum VAS score of 40 mm, and willing to sign an informed consent form. The exclusion criteria were patients with needle phobia, acute wounds/inflammation in the neck, or uncontrolled diabetes mellitus.

The sample size was determined to be 30 patients divided into two groups (15 people each). The independent variable was therapeutic intervention (DN and LLLT), while the dependent variable was the level of upper trapezius muscle spasm pain

measured using the Visual Analog Scale (VAS). The VAS instrument used had a reliability of 0.97 and validity of 0.925, ensuring the reliability and accuracy of measurements in this study.

The data collection procedure began with pain measurement (pretest) using VAS, followed by DN intervention in group I and LLLT in group II according to a schedule of three times a week for four weeks, and ended with posttest measurement. All subjects were scheduled consistently, instructed to adhere to the schedule, and given a detailed explanation of the research procedure and informed consent statement before the intervention. All stages of the study were conducted in accordance with ethical criteria, based on the approval letter from the Dr. Ramelan Hospital Research Ethics Committee No. 01/EC/KEP/2023, which stated that this study complied with WHO and CIOMS ethical standards and was valid from January 11, 2023, to January 11, 2024.

Data analysis was performed by first testing for normality using the Shapiro-Wilk test and for homogeneity using the Levene test. If the data were normally distributed and homogeneous, the paired sample t-test was used to compare the pre- and post-values in each group, and the independent sample t-test was used to compare the final results between the DN and LLLT groups.

RESULTS

Table 1. Respondent Characteristics Based on Age

Group	Minimum Age (years)	Maximum Age (years)	Average ± SD (years)
DN Group	29	63	44.33 ± 9.63
LLLT Group	32	64	48.20 ± 9.05

Table 1 shows that the average age of respondents in the DN group was 44.33 years and in the LLLT group was 48.20 years. Both groups were in the adult to early elderly age range. This indicates that the age distribution was relatively balanced and did not show any significant differences between the groups.

Table 2. Respondent Characteristics Based on Gender

Variable	DN Group n (%)	LLLT Group n
Gender		
Male	5 (33.3)	5 (33.3)
Female	10 (66.7)	10 (66.7)
Total	**15 (100)**	**15 (100)**
Occupation		
Civil servant	5 (33.3)	3 (20.0)
Housewife	8 (53.3)	8 (53.3)
Field Worker	2 (13.3)	4 (26.7)
Total	**15 (100)**	**15 (100)**

Table 2 shows that most respondents were female, accounting for 66.7% in both groups. The majority of respondents were housewives (53.3%) in both groups.

The results of the normality test using the Shapiro–Wilk test showed that all pre-test and post-test data in both groups had p-values > 0.05, namely p = 0.247 for the DN group and p = 0.326 for the LLLT group. These results indicate that the data are normally distributed, so the statistical tests used next are parametric tests (paired sample t-test and independent t-test).

Table 3. Mean Visual Analogue Scale (VAS) Scores Before and After Treatment and Test Results

Group	Measurement Stage	Mean ± SD	Mean Difference	p
DN	Before (Pre-test)	6.65 ± 0.95	3.50	<0.001
DN	After (Post-test)	3.15 ± 0.69	-	
LLLT	Before (Pre-test)	6.77 ± 1.06	1.75	<0.001
LLLT	After (Post-test)	5.02 ± 0.89	-	
DN vs LLLT (Post-test)	-	3.15 vs 5.02	-	<0.001

Table 3 shows that both *DN* and *LLLT* therapies can significantly reduce pain intensity (p < 0.05). The average decrease in VAS scores in the DN group was 3.50, which was greater than that in the LLLT group, which was 1.75. In addition, the results of *the independent t-test* showed a significant difference between the post-test scores of the two groups (p = <0.001), which means that DN therapy is more effective in reducing upper trapezius muscle spasm pain than LLLT therapy. Clinically, this indicates that the effect of needle stimulation on myofascial points is capable of providing a stronger analgesic response than low-intensity laser exposure.

DISCUSSION

This study shows that DN is more effective in reducing upper trapezius muscle spasm pain than LLLT. The results prove that all subjects in both groups experienced pain reduction after intervention, but the DN group showed a greater average reduction. This finding is in line with the results of Sacristán et al. (2022), who also stated that DN is effective for chronic neck pain.

Analysis of the results reinforces the consistency of DN in improving pain and spasm complaints through the release of local twitch response and increased microcirculation in the muscles. The study by Motavalian et al. (2020) explains that the effects of DN include neurotransmitter modulation and vasodilation, which increase muscle tissue perfusion, accelerate pain reduction, and improve joint function. Another study by Ziaeifar et al. (2016) also states that DN is effective in reducing pain and increasing range of motion in patients with trigger points in the upper trapezius.

LLLT has also been proven to reduce pain intensity in patients with upper trapezius muscle spasms. Research by Agung et al. (2018) and Clijsen et al. (2019) proved that LLLT significantly reduced pain and improved tolerance and muscle function in patients with neck myofascial pain. LLLT works by increasing tissue oxygenation and inhibiting inflammatory mediators that play a role in the chronic muscle pain cycle.

The implications of these research results recommend that DN can be used as the primary therapy in the management of upper trapezius muscle spasm pain. However, LLLT remains an alternative option, especially for patients who have contraindications or a phobia of needles. The implementation of these two therapies has great potential to improve the quality of physiotherapy services in cases of myofascial pain syndrome according to the clinical needs of each patient.

This study has several methodological limitations, including the limited number of samples and the characteristics of the subjects, most of whom were housewives, so the results may not be directly generalized to the entire population. Additionally, patients' activities outside of the study sessions and other therapies from referring physicians that were conducted in parallel had the potential to influence the final results. Technical obstacles were also found in the limitations of LLLT equipment in some clinics and the subjects' reluctance to undergo DN intervention.

Further research is recommended involving a larger sample and more varied subject characteristics, as well as stricter monitoring of patient compliance with the intervention. Further studies are also recommended to explore the combination of DN and LLLT therapy with other modalities or functional exercises to obtain more optimal clinical results. Physical therapists can apply DN as the primary therapy in cases of upper trapezius spasm with appropriate patient screening, supported by scientific findings and current recommendations.

CONCLUSION

The results of this study indicate that DN therapy is more effective than LLLT in reducing pain in patients with upper trapezius muscle spasm. Both therapies provided significant pain reduction, but the average pain reduction in the DN group was greater than in the LLLT group. This suggests that mechanical stimulation through needle insertion provides a stronger analgesic and muscle relaxation effect. Based on these results, DN therapy can be recommended as the primary choice for treating acute or severe muscle pain, while LLLT can be an alternative for patients who are intolerant to needles.

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