

Original Research

Efectivity Between Dry Needling And Laser Combined With Core Stability Exercise For Pain Reduction On Complaints Of Myogenic Low Back Pain

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ABSTRACT

Background: The majority of people who experience myogenic low back pain (LBP) do so while going about their normal lives. Compared to other physical therapy technology applications, the combination of laser and dry needling with core stability exercises for LBP myogenic pain has not been utilized as frequently in clinical practice.

Methods: Purposive sampling is used to select subjects. Subjects were those who fit the criteria of the study and reported experiencing myogenic LBP. The number of subjects in group I was 35 subjects and group II was 34 subjects. Experimental study with two groups participating in pre and post-testing. Phase I of the research was conducted in 2021 at the Sunafa physiotherapy practice, Colomadu, and Karanganyar. Phase II of the research was conducted there in 2022. After discovering that the research data was not normally distributed, a nonparametric test was conducted.

Results: The combination of core stability exercises and dry needling reduced myogenic LBP complaints ($p = 0.000$), using laser therapy along with core stability exercises significantly reduced the number of complaints of myogenic LBP ($p = 0.000$). Dry needle and core stability exercise, as well as laser and core stability exercise, both reduced pain in the same way as myogenic LBP complaints ($p = 0.242$).

Conclusion: Both laser therapy and dry needling combined with core stability exercises are useful in easing myogenic LBP complaints.

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INTRODUCTION

Low back pain is a leading cause of lost years worldwide as a disability, and its burden continues to grow as the population ages. The incidence of complaints of myogenic low back pain (LBP) occurs in many daily activities. The global prevalence of LBP in 2015 reached 7.3%, meaning that 540 million people experienced it and it had an impact on activity limitations (Hartvigsen et al., 2018). The incidence of LBP in

adolescent athletes for 12 years is estimated at 36%–68%, and for the 6-month incidence, it reaches 14%–22% (Wall et al., 2022).

Many people complain of myogenic LBP. Physiotherapy modalities for myogenic LBP in the form of dry needling or laser in combination with each other and core stability exercise (CSE) are rarely used in physiotherapy services. Therefore, studies are required to demonstrate the effectiveness of dry needling and laser therapy combined with CSE on the pain associated with myogenic LBP symptoms.

Zuhri & Rustanti, (2021) conducted a phase I study on the same topic, where it was discovered that dry needling outperformed lasers when both were paired with CSE. In the study's initial stage (2021), male and female research subjects were involved. The first phase of the research had not been able to analyze the relationship between gender and the effectiveness of the treatment, in which each subject from the two research groups consisted of both men and women.

Meanwhile, research by Wang et al., (2022) found that the incidence of LBP was more dominant in women. However, no studies of myogenic LBP with all subjects being women and dry needling versus laser comparative technology for each combination of core stability exercise had been found, so all subjects were women in this phase II study. Therefore, the findings of this phase II study will help improve the effectiveness of the technology when used to treat myogenic LBP.

MATERIALS AND METHOD

A pre- and post-test with two groups comprised the experimental research design. The study was carried out in the second year of 2022, at the physiotherapy practice of Sunafa, Colomadu, and Karanganyar. The results of the data analysis were not normally distributed, so they were tested by a nonparametric test. Patients with myogenic LBP who matched the research criteria served as the study's subjects.

The inclusion standards included: subjects expressing myogenic LBP complaints, 18 to 75 years old, ready to participate as a research subject. The exclusion standards included: low back posture abnormalities, low back stability disorders, use of pacemakers, changes in sensitivity, and the presence of malignant tumors in the lower back. The dropout criteria were: did not participate in the treatment program >1 time, experienced a worsening of the condition, and did not participate in the final study evaluation. VAS research instruments measure the degree of pain.

The researcher submitted a research permit from the director of the Health Polytechnic of the Surakarta Health Ministry to the head of the physiotherapy practice, Sunafa. In addition, the research team explained to patients how to obtain consent as research subjects by completing informed consent. Research tools and materials that must be prepared include: a research form, a consent form, and stationery, dry needle, alcohol swab, hand sanitizer, handscoon, DLTO laser device, laser gel, mask, gown, VAS form.

The School of Medicine's Institutional Review Board gave its approval to this study, Universitas Muhammadiyah Surakarta No. 3572/B.2/KEPK-FKUMS/V/2021.

RESULTS

The research entitled "Effectivity between Dry Needling and Laser Combined with Core Stability Exercise for Pain Reduction On Complaints of Myogenic Low Back Pain". This study was divided into two research groups. Group I (dry needling intervention with core stability exercise) got 35 subjects. Group II (laser intervention with core stability exercise) consisted of 34 subjects. Group descriptive data I gathered

from 35 participants, being at least 19 years old and no older than 74 years old for all women, had a minimum of 30 mm and a maximum of 70 mm, with an average of 47.23 mm, making up the initial VAS score.

In the descriptive data of Group II, 34 subjects were obtained, whose ages ranged from at least 17 years to a maximum of 55 years, all women. The initial VAS value ranged from at least 28 mm to 80 mm, with an average of 44.24 mm. With an average VAS value of 47.23 mm, group I's first data ranges from a minimum VAS value of 30 mm to a maximum of 70 mm, and group II's VAS value ranges from 28 to 80 millimeters, with an average of 44.24 millimeters. Then the final data for group I minimum VAS value of 0 mm and a maximum of 40 mm with an average of 8.00 mm, and group II had a minimum VAS value of 0 mm and a maximum of 40 mm with an average of 10.65 mm.

The data normality test for the initial VAS test resulted in a p value of 0.022, and the final VAS test resulted in a p value of 0.000 in the normality test of group I data. In the normality test, group II's data showed an initial VAS p value of 0.004 and a final VAS p value of 0.000. In group I, for the initial VAS, the results of the data normality test were displayed ($p = 0.022$), the data did not follow a normal distribution ($p = 0.05$), while the final VAS ($p = 0.000$) showed the data was not distributed regularly ($p = 0.05$). Therefore, using a nonparametric test, an inferential test was conducted.

Then, for the normality test of group II data for the initial VAS ($p = 0.004$), the data did not follow a normal distribution ($p = 0.05$), and the final VAS ($p = 0.000$) showed the data were not distributed regularly ($p = 0.05$) and the final VAS data ($p = 0.000$) were not normally distributed ($p < 0.05$). A non-parametric inferential test is then used. Furthermore, for the comparison of the two groups' differences, because the initial data gathered by groups I and II were not regularly distributed, the inferential test used a nonparametric test in the form of the Mann-Whitney test.

Both group I and group II's initial VAS data did not pass the normality test, which revealed that the data were not regularly distributed, so the homogeneity test was used using the Mann-Whitney test and obtained $p = 0.188$, which indicates that the data are homogeneous ($p > 0.05$). The results of the homogeneity test of the data with $p = 0.188$ showed that the data was homogeneous ($p > 0.05$), and the difference test between groups was the post-test data between groups I and II. Hypothesis I test is pain in myogenic LBP complaints can be decreased by dry needling in combination with core stability exercises. Hypothesis I test with Wilcoxon test obtained $p = 0.00$, it is shown that there are differences in VAS data before and after treatment ($p < 0.05$).

Hypothesis II test is pain in complaints of myogenic low back pain is reduced when laser therapy is combined with core stability exercises. The results of the second hypothesis test with paired t-test obtained $p = 0.00$, it is shown that there are differences in VAS data before and after treatment (< 0.05). Hypothesis III: The effects of dry needling and core stability exercises on myogenic back pain symptoms are different from those of laser therapy and core stability exercises. Hypothesis test III with the Mann-Whitney test, which obtained $p = 0.279$, showed that there was no difference in VAS data after treatment between groups I and II ($p > 0.05$).

Hypothesis Test IV: Dry needling with core stability exercise is more effective than laser with core stability exercise to relieve the pain associated with myogenic low back pain. According to the different test results before and after treatment, group I with the Wilcoxon test and group II with the Wilcoxon test showed a difference ($p < 0.05$).

Furthermore, the group I and II difference test with the Mann-Whitney test showed no difference between groups I and II after receiving treatment ($p > 0.05$).

The difference in the decrease in complaints of myogenic LBP was greater in group I, which was 5.64 mm. Group I treatment, dry needling with core stability exercises, proved to be a slight difference in pain reduction with VAS than group II treatment, laser with core stability exercises on pain in myogenic complaints LBP. But inferentially, statistical tests are insignificant.

DISCUSSION

Hypothesis I test is pain in myogenic LBP complaints can be decreased by dry needling in combination with core stability exercises. Hypothesis I test with Wilcoxon test obtained $p = 0.00$, it is shown that there are differences in VAS data before and after treatment ($p < 0.05$). Hypothesis II: Pain in complaints of myogenic low back pain is reduced when laser therapy is combined with core stability exercises. The results of the second hypothesis test with paired t-test obtained $p = 0.00$, it is shown that there are differences in VAS data before and after treatment (< 0.05).

Hypothesis III: The effects of dry needling and core stability exercises on myogenic back pain symptoms are different from those of laser therapy and core stability exercises. Hypothesis test III with the Mann-Whitney test, which obtained a $p = 0.279$, showed that there was no difference in VAS data after treatment between groups I and II ($p > 0.05$). Hypothesis Test IV: Dry needling with core stability exercise is more effective than laser with core stability exercise.

There were 35 research participants in Group I, and they were all women. Their average age was 28.91 years. Group II's research participants totaled 34 individuals, all of whom were female, with an average age of 25.44 years. From the data of the two research groups, it was shown that all subjects were female. Since low back pain is more common in women than in men, this is crucial for all female research participants.

This is in reference to a study by Wang et al., (2022) titled Epidemiological Trends in Low Back Pain at Global, Regional, and National Levels, which found that men are less likely than women to experience low back pain. It was also demonstrated in the study by Wang et al., (2022) that the incidence rate of LBP was also dependent on age differences, and in the study individuals, the individuals' average age ranged from 25 to 30 years old, which was relatively balanced even though group I was relatively older than the average group II, which was 3.47 years old. At the same time, the initial VAS was relatively balanced, although group I was slightly more painful than group II, with a difference of 2.99 mm.

In this study, both dry needling and core stability exercises were found to lessen the feeling of pain. Dry needling involves inserting the needle at the trigger point. Endorphins, pain-inhibiting neurotransmitters, can be released by the lower back muscles.

Dry needling stimulates the hypothalamic-pituitary-adrenal axis, elicits immunological cells, and activates the supraoptic nucleus to produce peripheral, spinal, and supraspinal analgesia through numerous pathways. The sympathetic nervous system and endogenous cannabinoids are involved in opioid-based pain relief as a result of stimulation of these locations (Roberson et al., 2019). Dry needling affects supraspinal and spinal analgesia by stimulating opioid receptors, causing unlimited peripheral analgesia, reducing second-order neuronal hyperalgesia, and decreasing pain perception in the central nervous system (Roberson et al., 2019).

Nitric oxide or beta-endorphins have been linked to the local release after dry needling. The release of nitric oxide has the effect of dilating blood vessels, promoting the improvement of local microcirculation, which results in the washing effect of the sensitizing agent. Nitric oxide has also been demonstrated to enhance beta-endorphin-mediated antinociception, in which beta-endorphin levels rise upon puncture.

The reduction in pain perception may be explained by this local release of chemicals. Additionally, dry needling has the capacity to activate the serotonergic and noradrenergic descending inhibitory systems and excite A fibers (Martin-Corrales et al., 2020). To relieve the pain associated with myogenic low back pain. According to the different test results before and after treatment, group I with the Wilcoxon test and group II with the Wilcoxon test showed a difference ($p < 0.05$).

Furthermore, the group I and II difference test with the Mann-Whitney test showed no difference between groups I and II after receiving treatment ($p > 0.05$). The difference in the decrease in complaints of myogenic LBP was greater in group I, which was 5.64 mm. Group I treatment, dry needling with core stability exercises, proved to be a slight difference in pain reduction with VAS than group II treatment, laser with core stability exercises on pain in myogenic complaints LBP. But inferentially, statistical tests are insignificant.

The effect of dry needling on pain reduction is also consistent with the study by Rajfur et al., (2022), titled *The Effectiveness of Dry Needling in Patients with Chronic Low Back Pain: A Prospective, Randomized, Single-Blind Study*, reported in this article, which reported that dry needling is effective in reducing pain as measured by VAS. The muscles, subcutaneous tissues, and skin are all penetrated by the dry needle piercing. By relaxing the punctured area through the use of targeted muscle tremors, this puncture technique lowers the surrounding tension and pain (Rajfur et al., 2022).

Core Stability Exercise (CSE) can be used to alleviate symptoms of myogenic LBP, according to Zheng et al., (2022). The transversus abdominis and lumbar multifidus may become more active after CSE. According to research employing ultrasound imaging, transversus abdominis muscle thickness is related to balance stability in persons with LBP (Ge et al., 2022). As the first muscle to contract and activate before limb movement, the transversus abdominis is crucial for everyday movements like standing and walking.

Strengthening core muscles like the transversus abdominis, one of the most efficient treatments for balance performance in LBP, can be accomplished with core stability exercises (Ge et al., 2022). This coordinated muscular activity may lessen discomfort and reinstate proper posture. Normal posture and steady static and dynamic balance promote smoother blood circulation and more optimal local metabolism, which reduces discomfort.

Deep stabilizing spinal muscles that are key in lumbar rotation are the transversus abdominis and the lumbar multifidus. According to studies, persons with chronic nonspecific LBP show considerable transverse abdominal and lumbar multifidus muscle atrophy, fatty infiltration, and/or impaired muscular activation. Exercises for core stability have been demonstrated to boost the lumbar multifidus and transversus abdominis' activation, which is good for lowering pain and enhancing functional movement in nonspecific chronic LBP (Zheng et al., 2022).

This study also demonstrated that exercising your core stability while receiving laser therapy can help you feel less pain. Low-intensity laser therapy helps individuals with LBP feel less discomfort (Yang et al., 2022). Laser impact biostimulation provides

up to three months of pain relief for generalized LBP. People with more severe pain are more sensitive to pain reduction (Chen et al., 2022).

The laser is used to treat lower back muscle discomfort because it increases blood flow, has a biostimulating impact, and boosts the region's local metabolism (Schindl et al., 2003). The tightness of the lower back muscles will be relaxed by increasing local metabolism and blood flow to the area. This will lessen nerve sensitivity and entrapment, which will lessen discomfort.

Laser as a photobiomodulation therapy has an analgesic effect, accelerates healing, reduces swelling and inflammation, reduces scar tissue, increases vascular activity, increases metabolic activity, stimulates nerve function, and improves functional movement (Elvir-Lazo et al., 2020). One or more of the following mechanisms-collagen proliferation, an anti-inflammatory effect, enhanced circulation, and peripheral nerve stimulation-can be used by lasers to lessen pain. Laser has the effect of reducing pain according to research by Enwemeka et al., (2004) titled: The Efficacy of Low-Power Lasers in Tissue Repair and Pain Control: A Meta-Analysis Study, according to reports, the treatment tool of choice for pain reduction and tissue restoration is laser therapy, also known as laser phototherapy.

The results of dry needling versus laser intervention (LLLT) on reduction of non-specific LBP were conducted by Ilayaraja et al., (2020), titled: Effectiveness of dry needling and of low-level laser therapy in non-specific low back pain, results dry needling and laser (LLLT) were also effective in reducing non-specific LBP. The findings of this study are consistent with those of this study, demonstrating the usefulness of laser therapy and core stability exercise in reducing myogenic LBP complaints. Although in research by Ilayaraja et al. (2020) without core stability exercise.

Compared to the results of the first phase of research in 2021, there are several distinctions where laser plus core stability exercise is less effective than dry needling plus core stability exercise. A significant difference in research stages I and II is that in stage I the sex of the subject is male and female, whereas in stage II they are all women, and the incidence of LBP is more dominant in women (Wang et al., 2022). For this phase II study to be more specific for all female subjects and for the research results between dry needling and laser with a combination of the two doing the core stability exercise to prove equally effective in accordance with the research results of Ilayaraja et al. (2020).

In this study, core stability exercise was combined with the pain-relieving effects of laser and dry needling on patients with myogenic LBP. This is also consistent with research by Zuhri and Rustanti, (2021) titled: Different Effectiveness of Dry Needling with Laser After Myofascial Release Added on Complaints of Myogenous Back Pain. Mechanical stimulation-induced analgesia is produced by dry needling of myofascial trigger points.

The local twitch response (LTR) occurs when there is a rapid, involuntary contraction of the pricked muscle. The LTR results from a spinal reflex and follows mechanical stimulation. Studies have shown electrical and biochemical changes after LTR became a therapeutic parameter. Some practitioners assume that the appearance of LTR during dry needling is evidence of an "inactivation" trigger point and is necessary for successful treatment (Koppenhaver et al., 2017).

LTR is a spinal reflex contraction of muscle fibers in the junction band, the increased muscle blood flow and oxygenation seen after TrP-DN would support the

reduction of sarcomere contractures not seen with laser application. Additionally, dry needling has a more powerful impact on pain inhibition at synaptic and metabolic levels Fernández-De-Las-Peñas & Nijs, (2019) while the lasing effect manifests as collagen proliferation, an anti-inflammatory effect, increased circulation, stimulation of peripheral nerves, and metabolism (Elvir-Lazo et al., 2020). This is indicated by the long-term effect in second-order neurons that occurs for dry needs compared to first-order neurons, where the lasing effect is dominant.

Next action research, both groups received a core stability exercise that had the effect of improving posture Ge et al., (2022) along with a core muscle stabilization exercise that affected metabolism, strengthening the core muscles of static and dynamic balance. The effect of laser therapy with core stability exercise and dry needling with core stability exercise on complaints of myogenic LBP, as a consequence, demonstrates significant and balanced efficacy.

CONCLUSION

Dry needling with core stability exercises had an effect on pain reduction in myogenic low back pain complaints ($p = 0.000$). Laser with core stability exercise has an effect on pain reduction in myogenic low back pain complaints ($p = 0.000$). There was no difference in the dry needling effect with core stability exercises and laser with core stability exercises on pain relievers with myogenic back pain complaints ($p = 0.242$).

Dry needling with core stability exercises and lasers with core stability exercises are equally effective in reducing pain in complaints of myogenic low back pain. Further studies are needed to compare the effectiveness of dry needling versus laser therapy, respectively, followed by core stability exercise in pain management, with subjects in both groups being all male. So that the effect of each of the treatments is not biased by the different sexes of the subjects. Then the results of the following study are compared with the results of the previous study in 2021, where subjects were divided between groups of men and women.

More research is needed to compare the efficacy of dry needling versus laser in pain management in all-female subjects. So that the effect of each treatment is not biased by the effect of other treatments, such as the combination with core stability exercise in this study, and the specific subjects are all women. Then, in 2021 and 2022, compare the results of previous studies, namely the combination of the two treatments with the addition of each core stability exercise.

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