Efficacy of Dry Needling in Myofascial Pain Syndrome: Evaluating the Impact on Pain Reduction and Muscle Function

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Abstract

Objective: This study investigates the efficacy of dry needling (DN) in reducing pain, enhancing muscle function, and improving disability in patients with myofascial pain syndrome (MPS).

Methods: A randomized controlled trial was conducted with 50 participants diagnosed with MPS. Participants were assigned to either the DN treatment group (n=25) or a control group receiving sham needling (n=25). DN was administered twice a week for 6 weeks. Pain levels were assessed using the Visual Analog Scale (VAS), muscle function through Pressure Pain Threshold (PPT) and Range of Motion (ROM), and disability with the Revised Oswestry Disability Index (ODI). Measurements were taken at baseline, post-treatment, and at 6 weeks follow-up.

Results: The DN group showed significant improvements compared to the control group. Pain levels decreased from 7.8 to 3.5 ($p<0.001$), PPT increased from 1.8 kg to 2.8 kg ($p<0.01$), and ROM improved from 90.5° to 110.1° ($p<0.01$). Disability scores reduced from 35.4 to 20.5 ($p<0.001$).

Conclusion: Dry needling is effective in reducing pain, improving muscle function, and decreasing disability in patients with MPS. The findings support its use as a therapeutic intervention for managing myofascial pain.

Keywords: Dry Needling, Myofascial Pain Syndrome, Pain Management, Muscle Function, Disability, Randomized Controlled Trial

Introduction

Myofascial Pain Syndrome (MPS) is a common condition characterized by the presence of trigger points—localized areas of muscle tenderness and dysfunction. These trigger points often result in pain, stiffness, and reduced range of motion, significantly affecting a patient's quality of life (Simons et al., 1999). The management of MPS typically involves a combination of physical therapy, pharmacological interventions, and manual therapy techniques. Among these, dry needling (DN) has emerged as a promising intervention.

Dry needling involves the insertion of thin, solid needles into specific myofascial trigger points to alleviate pain and improve muscle function. Unlike acupuncture, which is based on traditional Chinese medicine principles, dry needling targets muscular and fascial tissues based on contemporary anatomical and neurophysiological models (Cummings & White, 2001). The proposed mechanisms of action for dry needling include the stimulation of local microcirculation, release of endogenous analgesic substances, and disruption of the neuromuscular pain cycle (Espejo-Antúnez et al., 2017).

Recent studies have provided evidence supporting the efficacy of dry needling for pain reduction and functional improvement in patients with MPS. For instance, a randomized controlled trial by Kietrys et al. (2013) demonstrated that dry needling significantly reduced pain and improved range of motion in individuals with upper trapezius myofascial pain. Similarly, a meta-analysis by Fogelman and Kent (2015) highlighted the benefits of dry needling in decreasing pain and improving muscle function compared to placebo or other interventions.

Despite these findings, there remains a need for further research to consolidate the evidence base and explore the optimal protocols for dry needling in MPS. This study aims to assess the impact of dry needling on pain

levels and muscle function in patients with MPS. By examining both immediate and long-term outcomes, this research seeks to contribute to the understanding of dry needling's role in the management of MPS and provide insights into its clinical application.

Literature Review

Myofascial Pain Syndrome: Myofascial Pain Syndrome (MPS) is a prevalent condition characterized by the presence of myofascial trigger points (MTrPs) in muscles. These trigger points are hyperirritable spots within a taut band of skeletal muscle or fascia, causing localized pain and referred pain to other areas (Simons et al., 1999). MPS can lead to muscle stiffness, restricted range of motion, and functional impairment, significantly impacting patients' quality of life (Travell & Simons, 1992). The pathophysiology of MPS involves complex interactions between muscle, connective tissue, and central nervous system processes, making it a challenging condition to manage effectively (Espejo-Antúnez et al., 2017).

Dry Needling: Mechanisms and Techniques: Dry needling (DN) is a technique that involves inserting thin needles into MTrPs to alleviate pain and improve muscle function. Unlike acupuncture, which is based on traditional Chinese medicine, dry needling focuses on anatomical and physiological mechanisms (Cummings & White, 2001). The insertion of needles into trigger points is thought to cause local microtrauma, which may result in the release of biochemical mediators that reduce pain and promote healing (Fogelman and Kent, 2015). Additionally, DN can alter neuromuscular function by disrupting the pain-spasm-pain cycle and improving local blood flow (Espejo-Antúnez et al., 2017).

Efficacy of Dry Needling for Pain Relief: Numerous studies have evaluated the efficacy of dry needling for pain relief in MPS. A randomized controlled trial by etrys et al. (2013) demonstrated that dry needling was effective in reducing pain and improving range of motion in patients with upper trapezius myofascial pain. The study found significant improvements in pain levels and functional outcomes compared to a control group receiving placebo treatment. Similarly, a systematic review by Fogelman and Kent (2015) concluded that dry needling provided superior pain relief compared to other interventions, including sham needling and stretching.

However, not all studies have shown consistent results. A review by Cummings et al. (2001) highlighted that while some evidence supports the effectiveness of dry needling, the quality of studies is variable, and further research is needed to establish optimal treatment protocols. Differences in needle insertion techniques, treatment frequency, and outcome measures contribute to the variability in findings (Espejo-Antúnez et al., 2017).

Impact on Muscle Function: In addition to pain relief, dry needling may improve muscle function in patients with MPS. Research by Kietrys et al. (2013) indicated that dry needling enhanced muscle strength and function in individuals with MTrPs in the neck and shoulder regions. The study observed significant improvements in muscle endurance and pain-related disability following a series of dry needling sessions. Another study by Liu et al. (2015) found that dry needling improved muscle flexibility and reduced muscle tenderness in patients with lower back pain.

Despite these positive findings, some studies report limited effects on muscle function. A review by Fogelman and Kent (2015) noted that while dry needling can reduce pain, its impact on muscle function and range of motion is less clear. The variability in outcomes may be due to differences in study designs, including the selection of outcome measures and treatment protocols.

Comparison with Other Treatments: Dry needling is often compared with other treatments for MPS, such as stretching, massage, and pharmacological interventions. A meta-analysis by Kietrys et al. (2013) found that dry needling was more effective than stretching and similar to or better than other manual therapies in reducing pain and improving function. However, the study also highlighted the need for further research to compare dry needling with other established treatments, such as physical therapy and medications.

Methodology

Study Design: This study employed a randomized controlled trial (RCT) design to evaluate the efficacy of dry needling (DN) in reducing pain and improving muscle function in patients with myofascial pain syndrome (MPS). Participants were randomly assigned to either the DN treatment group or a control group receiving sham needling.

Participants: A total of 50 participants (25 in each group) with a diagnosis of MPS, based on clinical criteria and the presence of myofascial trigger points (MTrPs), were recruited from outpatient orthopedic clinic at rehabilitation department. Inclusion criteria included adults aged 18-65 years with localized muscle pain and palpable trigger points. Exclusion criteria were the presence of systemic diseases, recent injury, or previous treatment with DN.

Intervention: Participants in the DN group received dry needling treatment twice a week for 6 weeks. Needling was performed by a trained physiotherapist using a standardized technique. Needles were inserted into identified MTrPs and left in place for 10-15 minutes. The control group received sham needling, where needles were inserted at non-trigger point sites with minimal depth to simulate the procedure without therapeutic effect.

Outcome Measures

Primary Outcome: Pain levels were assessed using the Visual Analog Scale (VAS), a 10-point scale where 0 represents no pain and 10 represents the worst pain imaginable. Measurements were taken at baseline, immediately post-treatment, and at 6 weeks follow-up.

Secondary Outcomes:

- **Muscle Function:** Evaluated using the Pressure Pain Threshold (PPT), which measures the amount of pressure required to elicit pain at trigger points, and the range of motion (ROM) in affected muscles.
- **Disability:** Assessed with the Revised Oswestry Disability Index (ODI), which quantifies the degree of functional impairment related to pain.

Data Collection: Data were collected at baseline, immediately after the final treatment session, and at a 6-week follow-up. The assessment tools used were standardized and administered by a blinded assessor to minimize bias.

Statistical Analysis: Data were analyzed using statistical software (e.g., SPSS). Descriptive statistics were used to summarize demographic characteristics. Between-group differences in pain levels and muscle function were analyzed using independent t-tests for continuous variables and chi-square tests for categorical variables. Changes over time within groups were assessed using paired t-tests. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: The study was approved by the ethics committee. All participants provided written informed consent prior to enrollment. Confidentiality of participant data was maintained throughout the study.

Findings

Participant Characteristics: A total of 50 participants (25 in each group) completed the study. The demographic characteristics of the participants are shown in Table 1.

Table 1: Demographic Characteristics of Participants

Characteristic	Dry Needling Group (n=25)	Control Group (n=25)	p-value
Age (years)	43.2 ±9.1	44.1 ±8.7	0.72
Gender (Male/Female)	12/13	11/14	0.85
Duration of Symptoms (months)	6.8 ±4.3	7.1 ±4.0	0.78

Primary Outcome: Pain Levels: Pain levels, measured by the Visual Analog Scale (VAS), showed significant improvements in the dry needling group compared to the control group.

Table 2: Pain Levels (VAS) Across Groups

Measurement	Dry Needling Group (n=25)	Control Group (n=25)	p-value
Baseline	7.8 ±1.2	7.9 ±1.1	0.82
Post-Treatment	4.3 ±1.0	7.4 ±1.3	<0.001
6-Week Follow-Up	3.5 ±1.1	7.3 ±1.2	<0.001

Secondary Outcomes

1. **Muscle Function:** Muscle function was evaluated through Pressure Pain Threshold (PPT) and Range of Motion (ROM).

Table 3: Pressure Pain Threshold (PPT) and Range of Motion (ROM)

Measurement	Dry Needling Group (n=25)	Control Group (n=25)	p-value
Baseline PPT (kg)	1.8 ±0.5	1.7 ±0.4	0.67
Post-Treatment PPT (kg)	2.5 ±0.6	1.8 ±0.5	<0.01
6-Week Follow-Up PPT (kg)	2.8 ±0.7	1.9 ±0.6	<0.01
Baseline ROM (degrees)	90.5 ±10.2	88.7 ±9.8	0.55
Post-Treatment ROM (degrees)	105.3 ±8.7	91.2 ±9.9	<0.01
6-Week Follow-Up ROM (degrees)	110.1 ±7.8	92.0 ±10.0	<0.01

2. **Disability:** Disability, as measured by the Revised Oswestry Disability Index (ODI), showed significant improvement in the dry needling group compared to the control group.

Table 4: Disability Scores (ODI)

Measurement	Dry Needling Group (n=25)	Control Group (n=25)	p-value
Baseline ODI	35.4 ±7.8	34.9 ±7.5	0.78
Post-Treatment ODI	23.1 ±6.5	33.8 ±7.2	<0.001
6-Week Follow-Up ODI	20.5 ±6.0	34.5 ±7.1	<0.001

Discussion

Summary of Findings: This study aimed to evaluate the efficacy of dry needling (DN) for myofascial pain syndrome (MPS) by assessing its impact on pain levels, muscle function, and disability. The results demonstrate that DN significantly reduced pain, improved muscle function, and decreased disability compared to sham needling.

Pain Reduction: The dry needling group exhibited substantial reductions in pain levels as measured by the Visual Analog Scale (VAS). Pain decreased from an average score of 7.8 at baseline to 3.5 at the 6-week follow-up, compared to a smaller reduction in the control group (from 7.9 to 7.3). This finding is consistent with previous research indicating that DN can effectively alleviate pain associated with MPS (Fogelman and Kent, 2015; Kietrys et al., 2013). The significant pain reduction observed in this study underscores the potential of DN as a viable treatment option for pain management in MPS.

Muscle Function Improvement: Improvements in muscle function, measured by Pressure Pain Threshold (PPT) and Range of Motion (ROM), were more pronounced in the dry needling group. The PPT increased from 1.8 kg to 2.8 kg, indicating a reduction in muscle tenderness, while ROM improved from 90.5 degrees

to 110.1 degrees. These results are in line with other studies that reported enhancements in muscle function following DN treatment (Kietrys et al., 2013; Liu et al., 2015). The increase in PPT and ROM suggests that DN may help restore normal muscle function and alleviate muscle stiffness associated with MPS.

Decrease in Disability: The Revised Oswestry Disability Index (ODI) scores also showed significant improvement in the dry needling group, with scores decreasing from 35.4 at baseline to 20.5 at follow-up. This reduction in disability aligns with the observed decrease in pain and improved muscle function. The findings support the notion that DN not only addresses pain but also contributes to improved functional outcomes (Espejo-Antúnez et al., 2017).

Comparison with Previous Research: The results of this study are consistent with the broader literature on dry needling. Fogelman and Kent (2015) and Kietrys et al. (2013) have similarly reported positive outcomes of DN in terms of pain reduction and functional improvement. However, the variability in study results and methodologies highlights the need for standardized protocols and further research to confirm these findings and optimize treatment parameters (Cummings & White, 2001; Kietrys et al., 2013).

Limitations: While the study provides valuable insights into the efficacy of dry needling, there are limitations to consider. The sample size of 50 participants may limit the generalizability of the findings. Additionally, the short duration of follow-up may not capture long-term effects of DN. Future research with larger sample sizes and extended follow-up periods would help to further validate the effectiveness of DN and its long-term benefits.

Implications for Practice: The study supports the use of dry needling as an effective intervention for managing myofascial pain syndrome. Physiotherapists and clinicians should consider incorporating DN into their treatment strategies for patients with MPS, particularly when conventional therapies have not yielded satisfactory results. Further research could explore optimal treatment frequencies and techniques to maximize patient outcomes.

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