

Comparison of Dry Needling and Manual Therapy for Mechanical Neck Pain: A Randomized Controlled Trial



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Abstract

Background: Mechanical neck pain has been listed as one of the most common musculoskeletal conditions, with pain complaints and stiffness in the neck region, which results from poor posture and muscular strain or the repetition of movements. Manual therapy and dry needling top the list among the different intervention options and modalities.

Methodology: Participants were divided into two groups using a simple random sampling envelope method. One group received dry needling sessions aimed at the cervical area trigger points. In contrast, the other group received manual therapy, including mobilization or manipulation of the cervical spine for 3 sessions/week for 4 weeks. Professionals administered interventions in a standardized protocol environment. Outcome measures included pain intensity, range of neck motion and functional disability, assessed at baseline and post-treatment.

Results: The preliminary interpretation showed no statistically significant differences in baseline characteristics between the two groups. Following intervention, the dry needling and manual therapy groups demonstrated significant improvements ($p < 0.05$) in pain intensity, neck range of motion, and functional disability compared to baseline. However, the two groups had no significant differences ($p > 0.05$) regarding treatment outcomes.

Conclusion: The study demonstrated that dry needling and manual therapy are effective interventions for reducing pain and improving function in patients with mechanical neck pain. While both modalities yielded positive outcomes, no notable differences were observed.

Keywords

Disability, Manual Therapy, Pain, Range of Motion.



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Introduction

Mechanical neck pain poses a noticeable health issue affecting approximately two-thirds of the members at a point in a lifetime, primarily during middle age¹. Recent statistics reveal that the United States spends \$88 billion annually on pain in spinal conditions and disabilities related to it, making it the 3rd highest noticeable expenditure for any health condition². Additionally, patients with moderate to severe chronic neck pain typically lose an average of eight workdays every six months, with indirect costs due to lost productivity further increasing the financial burden on businesses and society³. Pain of the neck accounts for 2.4-5% of all healthcare visits to practitioner clinics and hospitals annually, with 76% of these visits occurring at outpatient physician offices and less than 1% seen directly by physical therapists. Conversely, 10-20% of all OPD visits are associated with neck pain⁴⁻⁵.

Pain typically involves muscle spasms, reduced cervical mobility, and functional limitations or disability. Myofascial trigger points, hyper-irritable spots where nerves connect to muscle fibers, play a significant role in these conditions⁶. These points can occur in various body regions, including the hip, shoulder, and neck, and are known to restrict the range of motion (ROM) in the neck region⁶⁻⁷. The etiology of mechanical cervical pain is complex, with two-thirds of patients experiencing non-specific pain associated with posture that is inadequate, repetitive movements, and strenuous physical activities⁸⁻⁹. It is also noteworthy that in addition to ergonomic factors, such as high body mass index, a person may possess genetic predispositions for specific musculoskeletal abnormalities and or mechanical neck pain; have high-stress levels, anxiety, depression, somatization, a poor ability to cope with stress or pain; and lack exercise, smoke, or have inadequate sleeping habits¹⁰⁻¹².

Conservative treatment methods for mechanical neck pain include both pharmacological and non-pharmacological strategies. Pharmacological treatments primarily involve the use of analgesics to manage pain¹³. Non-pharmacological treatments, mainly physical therapy (PT), include techniques such as myofascial trigger point release, massage, spinal mobilization or manipulation, hot packs, active exercises, and electrical modalities like interferential therapy¹⁴⁻¹⁵. Additionally, dry needling and manual therapy have emerged as notable interventions. Dry needling targets myofascial trigger points to relieve pain and improve function, while manual therapy includes hands-on techniques to mobilize joints and soft tissues¹⁶. Nevertheless, most works examining the utility of dry needling in patients with neck pain incorporated it into combined therapy together with manual therapy or contrasted it with other therapeutic methods, like manual trigger point pressure, sham needling, kinesio-taping, electrical stimulation, extracorporeal shock wave therapy, passive stretching, exercises only, or no

intervention¹⁷. So far, few studies have focused on comparing manual therapy with dry needling in patients with neck pain.

Despite the widespread use of these treatments, more high-quality studies in the literature need to support their effectiveness. This gap is especially evident in the context of acute mechanical neck pain. Given the limited direct comparisons between dry needling and manual therapy, there is an urgent need for rigorous research, such as a randomized controlled trial, to evaluate and optimize these therapeutic approaches.

Methodology

Study Design and Setting

The randomized controlled trial included individuals diagnosed with mechanical neck pain from different physical therapy outpatient settings in Punjab, Pakistan.

Inclusion Criteria

- Adults aged 18-65 years.
- Diagnosed with mechanical neck pain.
- Experiencing pain for at least three months.

Exclusion Criteria

- History of neck surgery.
- Neck pain resulting from traumatic injury.
- Known systemic diseases affecting musculoskeletal function.

Intervention Protocol

A total of 80 participants were divided in two groups using simple random sampling, envelope method. The description of protocols is as under:

- **Dry Needling Group (n=40)**
The procedure was performed on the cervical region of the participants by trained professionals who followed the standardized protocol after identifying the myofascial trigger points by using the palpatory technique in different regions such as the upper trapezius, levator scapulae, sternocleidomastoid, and splenius capitis. Sterile, filiform needles were brought to be inserted into the trigger point areas directly. Sessions were conducted 3 times/week for 4 weeks. Adjunct therapy included TENS with a hot pack for 10 minutes before needling.
- **Manual Therapy Group (n=40)**
Subjects in this group underwent hands-on techniques, including mobilization or manipulation of the cervical spine. The procedures were carried out by trained practitioners using standardized protocols. Mobilization techniques involved rhythmic,

repetitive passive movements of the cervical joints, while manipulation techniques included high-velocity, low-amplitude thrusts aimed at restoring joint mobility, with a focus on muscles like the upper trapezius, levator scapulae, and sternocleidomastoid. These sessions were conducted 3 times/week for 4 weeks. Adjunct therapy included TENS with a hot pack for 10 minutes before treatment. Participants were also given stretching exercises for the neck muscles and strengthening exercises such as isometric and resistance bands.

Outcome Measures

Outcome measures were assessed at baseline and after 4 weeks of intervention:

Pain Intensity

- The pain was measured using the Visual Analog Scale (VAS)¹⁸. Participants were asked to mark their perception of pain level on a 10 cm scale, from “no pain” to “worst pain imaginable”. The distance from the “no pain” end to the mark were measured to quantify pain intensity.

Neck Range of Motion (ROM)

- The goniometer was used to assess the cervical flexion, extension, lateral flexion, and rotation¹⁹. The patient were asked to perform these movements while the principal investigator evaluated the mobility and flexibility of the neck.

Functional Disability

- The Neck Disability Index (NDI) index was used to assess the functional disability in patients with mechanical neck pain²⁰. The questionnaire consists of 10 items that assessed the impact of neck pain on daily activities, where each item was scored from 0 to 5, where higher score indicated greater disability and total status represented the functional disability.

Data Analysis

Data was collected at baseline and after 4 weeks of intervention. Statistical analysis were conducted to compare changes in pain intensity, ROM and functional disability. Analysis were performed on SPSS version 27. Paired t-tests were performed for within-the-group analysis, whereas an independent t-test was run for between-group analysis. The level of significance was kept at 95% of the Confidence Interval.

Ethical Consideration

The study upheld the guidelines for human subjects as provided in the Belmont report. Participants were briefed regarding the purpose of the study, and informed consent was taken before induction.

Results

A total of n=80 participants were recruited and divided into two groups, n=40 in each group, with no drop outs reported in the study. The analysis of demographic information revealed that the mean age of participants in the dry-needling group was 43.54 ± 2.36 , and in the manual therapy group was 43.49 ± 1.87 . Further, out of 40 participants in the dry needling group, 17 were males and 23 were female, whereas in the manual therapy group, 16 were male and 24 were female. The average baseline values of pain, ROM and NDI for participants in both groups are shown in Table-1:

Table-1 Baseline Values of Outcome Measures in Intervention Groups				
Variables	Dry Needling	Manual Therapy	t-test	p-value
Pain	7.5±1.35	7.52±1.26	1.25	0.07
NDI	29.54±3.36	28.57±3.55	1.54	0.08
Neck Range of Motion				
Flexion	40.35±5.2	40.41±5.3	1.55	0.07
Extension	49.56±4.9	49.78±5.1	1.05	0.08
Side Bending (Right)	30.12±3.5	30.2±2.3	1.1	0.09
Side Bending (Left)	30.02±4.1	30.03±3.9	1.5	0.07

Further, after 4 weeks of intervention, the outcome measures were again analyzed, and the values were found to be significantly better ($p < 0.05$) in both groups. The analyses provided evidence that in both the groups, the value of pain and NDI were significantly decreased ($p < 0.05$), whereas ROM had significantly increased ($p < 0.05$) (Table-2).

Table-2 Within-the-Group Comparison from Baseline to 4 Weeks of Intervention				
Variables	Baseline	After 4 weeks	t-test	p-value
Dry Needling Group				
Pain	7.5±1.35	3.2±1.1	3.26	0.001
NDI	29.54±3.36	15.4±4.2	2.55	0.001
Neck Range of Motion				
Flexion	40.35±5.2	45.1±3.2	3.25	0.001
Extension	49.56±4.9	55.23±5.9	4.1	0.001
Side Bending (Right)	30.12±3.5	33.25±3.3	2.35	0.02

Side Bending (Left)	30.02±4.1	34.25±3.5	2.25	0.001
Manual Therapy Group				
Pain	7.52±1.26	3.3±1.2	3.3	0.001
NDI	28.57±3.55	15.5±4.3	3.1	0.001
Neck Range of Motion				
Flexion	40.41±5.3	45.42±5.1	2.5	0.001
Extension	49.78±5.1	55.95±4.9	3.5	0.001
Side Bending (Right)	30.2±2.3	33.12±2.1	2.2	0.001
Side Bending (Left)	30.03±3.9	34.3±3.8	1.9	0.001

A group comparison was performed to determine the efficacy of the treatment regimens, and the findings revealed no significant mean difference ($p>0.05$) between the two treatment protocols. Details of the group comparison are provided in Table-3 as under:

Table-3 Between-the-Group Comparison				
Variables	Dry Needling	Manual Therapy	t-test	p-value
Pain	3.2±1.1	3.3±1.2	1.15	0.08
NDI	15.4±4.2	15.5±4.3	1.09	0.08
Neck Range of Motion				
Flexion	45.1±3.2	45.42±5.1	1.1	0.07
Extension	55.23±5.9	55.95±4.9	1.09	0.06
Side Bending (Right)	33.25±3.3	33.12±2.1	1.36	0.08
Side Bending (Left)	34.25±3.5	34.3±3.8	1.45	0.08

Discussion

The current RCT was planned to assess the efficacy of needling with other manual therapy methods in patients with mechanical neck pain. The present study shows meaningful effects of both interventions on the reduction of perceived pain intensity, improvements in the neck range of motion, and levels of functional disability according to the NDI within the four weeks of the study. The within-group comparisons demonstrated substantial reductions in pain and NDI scores, alongside notable increases in cervical ROM for the dry needling and manual therapy

groups. However, between-group comparisons revealed no statistically significant differences in treatment outcomes, suggesting that dry needling and manual therapy are equally effective in managing mechanical neck pain. The results of our study align with previous research comparing different physical therapy interventions for neck pain. A study at the District Headquarters Hospital Pakistan explored the effectiveness of post-isometric relaxation, myofascial trigger point release, and routine physical therapy on acute mechanical neck pain. Similar to our findings, this study reported significant improvements in pain, disability, and cervical ROM across all treatment groups. Specifically, scores for the Neck Disability Index and numeric pain rating scale and cervical rotation to the right and left showed significant differences among the groups post-treatment, with the post-isometric relaxation group demonstrating the most rapid and pronounced improvements²¹. According to a systematic review, dry needling showed comparable efficacy to various noninvasive manual therapy methods in alleviating symptoms associated with myofascial pain. Specifically, while no significant differences were observed in outcomes between dry needling and other manual therapy approaches, both modalities consistently improved pain intensity, neck disability index, PPT, and cervical range of motion. These findings highlight dry needling as a viable treatment option alongside traditional manual therapies for managing neck and shoulder pain, underscoring the need for further research to explore long-term effects and optimize treatment strategies²². In another review, it was observed that the comparison between both treatments in managing MPS in the cervical and upper back yielded comparable outcomes in pain terms reduction and functional improvement. Specifically, differences (Cohen's d) between DN and TPMT were non-significant for VAS. These results suggest that both interventions offer comparable benefits in managing MPS symptoms over the term, with neither showing superiority over the other regarding pain relief or functional improvement²³. The strengths include its robust randomized controlled design, which enhances internal validity through random participant allocation and standardized treatment protocols administered by trained practitioners. Comprehensive outcome measures, encompassing pain intensity, neck range of motion, and functional disability, provide a thorough assessment of treatment efficacy. However, limitations include the relatively short four-week study duration, which limits the evaluation of long-term treatment effects. The differences and fluctuations in practitioners' skills and responses can influence the outcomes extensively. Furthermore, the setting is also restricted. Moreover, the selection of settings might restrict generalization to other cultural or geographic contexts. Addressing these limitations in future research could refine the understanding of optimal treatment strategies for mechanical neck pain.

Conclusion

The study is worthy of literature in determining the differences between dry needling and manual therapy. Pain, neck range of motion and functional disability scores of both groups showed improved functionality after four weeks of treatment. Yet, no statistically significant difference was found between the two groups. Both therapies are potentially effective management strategies for mechanical neck pain in patient-orientated approaches. For future studies, it should be considered to have a longer follow-up, more significant sample size and more diverse population range to confirm the above findings and provide a more beneficial approach to treating patients with neck pain in clinical practice.

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Conflict of Interest

None.

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None.

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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

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Acquisition, Analysis or Interpretation of Data: Kayani A, Kiani SA, Azfar H

Manuscript Writing & Approval: Kiani SA, Saman J, Khan M

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.



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