



COMPARATIVE ANALYSIS OF DRY NEEDLING AND MYOFASCIAL RELEASE ON PAIN AND FUNCTION IN PATIENTS WITH CHRONIC NECK PAIN

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Abstract

Background: Chronic neck pain is one of the most common musculoskeletal problems, often limiting day to-day activities and affecting quality of life. Physiotherapists frequently use techniques such as dry needling (DN) and myofascial release (MFR), both of which have been reported to provide benefits. The present study set out to compare the effectiveness of DN and MFR, each combined with a conventional physiotherapy program, in individuals with chronic neck pain.

Methodology: This randomized controlled trial included 60 participants aged 25–40 years with chronic neck pain and active or latent myofascial trigger points. Participants were randomly allocated into two groups. Group 1 underwent DN together with a conventional protocol (CP), while Group 2 received MFR + CP. Interventions were delivered for four weeks, totaling 8–12 sessions. The main outcomes were pain intensity measured by the Numerical Rating Scale (NRS), functional disability through the Neck Disability Index (NDI), cervical range of motion (ROM), and quality of life assessed with the SF-36. Pre- and post-intervention values were analyzed both within and between groups.

Results: Improvements were observed in both groups across all measured outcomes. The DN group, however, showed comparatively greater benefits, with a mean pain reduction of 4.2 points on the NRS, while the MFR group achieved a 2.8-point decrease. Larger gains in cervical ROM and SF-36 domains were also recorded in the DN group. No serious adverse events were noted during the study.

Conclusion: Dry needling, when used alongside conventional physiotherapy, appears to be more effective than myofascial release in decreasing pain and disability and in improving function among patients with chronic neck pain. It may therefore be considered a valuable option for physiotherapists aiming for faster and more comprehensive outcomes.

Keywords: Dry needling, Myofascial release, Chronic neck pain, Trigger points, Physiotherapy, Cervical ROM, Neck Disability Index

Introduction

Chronic neck pain is a widespread musculoskeletal disorder with multiple potential sources, including the cervical facet joints, intervertebral discs, supporting ligaments, and surrounding musculature [1,2]. Globally, it affects more than 200 million people, with estimates suggesting that the number could rise to nearly 269 million by 2050 [3,4]. Although prevalence rates have stayed relatively stable, the absolute case numbers continue to grow due to population aging [3]. The problem is more commonly seen in women and older adults and is linked with several risk factors such as high body mass index, lower socioeconomic background, and coexisting psychological conditions [5–8]. The burden of chronic neck pain is substantial, contributing to disability, limitations in work capacity, and a poorer overall quality of life [9–14].

One important source of persistent neck pain is myofascial pain syndrome (MPS), which is characterized by the presence of myofascial trigger points (MTrPs) [15–17]. These trigger points, most frequently located in muscles such as the upper trapezius and levator scapulae, can lead to continuous pain, restricted movement, and functional limitations [18–20]. Management strategies for MPS include a wide range of physiotherapy techniques, such as dry needling (DN), ischemic compression, stretching, massage, and myofascial release (MFR), all of which have been reported to produce positive results [21–24].

Dry needling involves inserting a fine solid needle directly into MTrPs to disrupt taut muscle bands, improve blood flow, and reduce pain, both locally and in referred areas [25–28]. Several studies have confirmed its role in reducing musculoskeletal pain and enhancing mobility, though further evidence is needed to determine its long-term impact [29–31]. On the other hand, MFR is a hands-on technique where sustained pressure is applied to restricted fascial tissues. This is intended to restore mobility, ease discomfort, and improve functional performance [32–36]. MFR has also been shown to enhance flexibility, decrease musculoskeletal pain, and support recovery across both clinical and athletic populations [37].

Although DN and MFR are both widely used, direct comparisons between the two are limited. Many existing trials focus on one intervention alone or employ heterogeneous designs, making it difficult to establish their relative benefits [38–41]. Therefore, it is important to investigate these methods in a head-to-head manner to guide evidencebased clinical decision-making [42–44].

Aim of the Study:

To compare the effects of Dry Needling and Myofascial Release, when combined with a conventional physiotherapy program, on pain reduction, functional ability, cervical ROM, and quality of life in patients with chronic neck pain.

METHODOLOGY Study Design

A randomized controlled trial was carried out to evaluate and compare the effects of Dry Needling (DN) and Myofascial Release (MFR), each provided alongside a conventional physiotherapy protocol, in individuals with chronic neck pain. Participants were randomly placed into one of two treatment groups:

- **Group 1:** DN + Conventional Physiotherapy Protocol (CP)
- **Group 2:** MFR + CP

The intervention continued for four weeks, with evaluations performed at baseline and after completion of the treatment period.

Inclusion Criteria

Participants were eligible if they met the following conditions:

1. Clinically diagnosed chronic neck pain linked to myofascial pain syndrome or trigger points in cervical muscles such as the upper trapezius or levator scapulae [49,50].
2. Presence of either active or latent myofascial trigger points [51].
3. Age between 25 and 40 years [61].
4. Pain persisting for more than three months [49].

5. Willingness to provide informed consent and participate in study procedures [52].

Exclusion Criteria

Individuals were excluded if they had:

1. Neck pain related to trauma, infection, systemic illness, or malignancy [52].
2. Received DN, MFR, or similar therapies in the previous three months [50].
3. Contraindications for DN or manual therapy, such as bleeding disorders or skin infections [52].
4. Severe psychiatric or cognitive conditions affecting ability to give consent [52].
5. Pregnancy [52].

Sample Size

Sixty participants were recruited and equally distributed into the two groups (30 per group).

The sample size calculation targeted 80% power with a 5% significance level ($\alpha = 0.05$), providing sufficient sensitivity to detect meaningful differences between the interventions.

Randomization and Allocation

The random sequence was generated using computer software. Allocation was concealed through the use of sealed, opaque envelopes that were opened sequentially by an independent researcher who had no role in either treatment or outcome assessment.

Intervention Protocols

Conventional Physiotherapy Protocol (applied to both groups)

All participants, regardless of group allocation, received a standardized physiotherapy program. This included therapeutic exercises such as deep neck flexor training, scapular stabilizer strengthening, and mobility drills for the cervical spine, delivered three times per week [53]. Education on posture and ergonomics was also emphasized, with participants asked to practice daily retraining exercises [53].

Electrotherapy was incorporated as part of the program. Ultrasound therapy was provided at a frequency of 1 MHz, with an intensity of 1.5 W/cm² for eight minutes per session. It was applied five times per week across the four-week intervention, amounting to 20 sessions in total [54]. TENS was also used, set at 80 Hz and adjusted to a comfortable sensory threshold.

Each session lasted 25 minutes and followed the same schedule as ultrasound [54].

Dry Needling Protocol (Group 1)

For participants in Group 1, DN was performed on muscles commonly associated with trigger points, including the upper trapezius, levator scapulae, and sternocleidomastoid [55]. Trigger points were located by palpation and confirmed through reproduction of the patient's typical pain [56]. A deep dry needling technique was used, with the goal of eliciting four to six local twitch responses at each point [55]. On average, two to three active trigger points were treated per muscle. Sessions were scheduled twice weekly, resulting in a total of eight sessions across four weeks [57]. Sterile, single-use filiform needles (0.25–0.30 mm) were employed [56]. All procedures were carried out by a physiotherapist certified in dry needling.

Myofascial Release Protocol (Group 2)

Group 2 participants underwent MFR sessions two to three times per week, with each session lasting 20–40 minutes. Over the four-week intervention, this amounted to 8–12 sessions [58,59]. The main target regions were the upper trapezius, scalene muscles, and the suboccipital region [58,60]. Techniques included slow and sustained manual pressure, fascial stretching, suboccipital inhibition, and direct longitudinal releases [59,60]. These sessions were administered by a physiotherapist trained in MFR techniques.

Outcome Measures Primary Outcomes

1. **Pain Intensity:** Assessed using the Numerical Rating Scale (NRS), ranging from 0 (no pain) to 10 (worst pain imaginable).
2. **Neck Disability:** Measured with the Neck Disability Index (NDI), which evaluates pain and limitations in daily activities.

Secondary Outcomes

1. **Cervical Range of Motion (ROM):** Measured using a goniometer for flexion, extension, lateral flexion, and rotation.
2. **Quality of Life:** Assessed using the Short Form-36 (SF-36) questionnaire, evaluating physical and mental health domains.

Variables

- **Independent Variable:** Type of intervention (DN+CP vs. MFR+CP).
- **Dependent Variables:** Pain intensity (NRS), neck disability (NDI), cervical ROM, and quality of life (SF-36).

RESULT

Table 1: Age Distribution

Age (Years)	Frequency	Percent (%)
32–35	8	13.3
36–39	14	23.3
40–43	15	25.0
44–47	13	21.7
48–50	10	16.7
Total	60	100.0

The age distribution of the study participants, as shown in Table 1, reveals that the majority of subjects belonged to the 40–43 years age group (25.0%), followed by the 36–39 years group (23.3%) and the 44–47 years group (21.7%). The least representation was from the youngest age group, 32–35 years, contributing 13.3% of the total sample. The age category of 48–50 years included 16.7% of the participants. This distribution indicates a fairly even spread of subjects across the middle-aged adult population, with a slightly higher frequency in the early 40s age range. The diversity in age helps enhance the generalizability of the study results to this age group.

Table 2: Sex Distribution

Sex	Frequency	Percent (%)
Male	30	50.0
Female	30	50.0
Total	60	100.0

As shown in Table 2, the sample included an equal number of male and female participants, each constituting 50% of the total (30 out of 60). This perfect gender balance ensures that the findings of the study are not influenced by gender bias and makes the comparisons across interventions more reliable and equitable in terms of sex-related factors that could influence pain perception, treatment response, or range of motion.

Table 3: Pre-Pain Intensity (NRS)

NRS Range	Frequency	Percent (%)
5.0–5.9	9	15.0
6.0–6.9	20	33.3
7.0–7.9	20	33.3

8.0–8.9	11	18.3
Total	60	100.0

Table 3 shows the pre-intervention pain intensity as measured by the Numeric Rating Scale (NRS). A significant portion of the participants, 33.3%, reported pain in the ranges of 6.0–6.9 and 7.0–7.9, indicating that a large proportion of the sample had moderate to severe pain before treatment. Additionally, 18.3% had pain scores in the range of 8.0–8.9, and 15.0% fell into the 5.0–5.9 range. This data confirms that the majority of the study participants were experiencing considerable neck pain prior to the interventions, making them appropriate candidates for therapeutic intervention.

Pre-Intervention Descriptive Statistics

Variable	Minimum	Maximum	Mean	Standard Deviation
Pain Intensity (NRS)	5.1	8.9	7.303	0.8352
Neck Disability Index (NDI)	25.1	44.1	34.820	4.7529
Flexion (°)	37.2	63.2	49.233	8.3302
Extension (°)	36.4	48.3	41.843	2.7717
Right Lateral Flexion (°)	35.7	50.6	40.268	2.4875
Left Lateral Flexion (°)	35.7	46.8	41.347	2.5278
Right Rotation (°)	36.7	63.4	48.818	8.3727
Left Rotation (°)	50.1	63.2	56.575	3.1740

According to Table 4, the mean pre-intervention pain intensity was 7.303 (SD = 0.8352), indicating a moderately high level of pain among participants. The Neck Disability Index (NDI) had a mean of 34.820, suggesting moderate functional impairment. Cervical range of motion (ROM) measurements varied across different directions: flexion and right rotation showed higher variability, with means of 49.23° and 48.82°, respectively, and standard deviations above 8. Extension and lateral flexions had narrower spreads, indicating more consistency in limitations. These values provide a comprehensive baseline profile, suggesting the participants had both pain and significant motion restrictions.

Post-Intervention Descriptive Statistics

Variable	Minimum	Maximum	Mean	Standard Deviation
Pain Intensity (NRS)	4.0	6.2	4.887	0.5676
Neck Disability Index (NDI)	20.1	28.5	23.803	2.2390
SF-36 Score	64.6	75.1	69.843	3.4474
Flexion (°)	45.6	55.3	49.222	1.7912
Extension (°)	43.3	55.1	46.002	2.1717
Right Lateral Flexion (°)	43.5	52.1	46.563	2.0421
Left Lateral Flexion (°)	43.2	52.0	46.288	2.2732
Right Rotation (°)	60.8	68.5	64.412	2.2651
Left Rotation (°)	60.3	68.2	64.007	2.2815

Table 5 demonstrates notable improvements across all variables post-intervention. Pain intensity decreased significantly to a mean of 4.887 (SD = 0.5676), and NDI reduced to 23.803, suggesting improved functional status. ROM improved in all directions, with extension increasing from a pre-intervention mean of 41.84° to 46.00°, and right rotation increasing to

64.41°. The mean SF-36 score, which was introduced post-intervention, averaged 69.843, reflecting enhanced health-related quality of life. These changes illustrate the overall effectiveness of the intervention strategies used in the study.

Pre-Intervention Group Statistics (DN vs MFR)

Variable	Group	Mean	Std. Deviation	Std. Error Mean
Pain Intensity (NRS)	DN	7.207	1.0198	0.1862
	MFR	7.400	0.6000	0.1095
Neck Disability Index (NDI)	DN	34.647	5.4851	1.0014
	MFR	34.993	3.9763	0.7260
Flexion (°)	DN	41.713	3.0741	0.5613
	MFR	56.753	3.8375	0.7006
Extension (°)	DN	40.843	2.8500	0.5203
	MFR	42.843	2.3319	0.4257
Right Lateral Flexion (°)	DN	41.163	2.6247	0.4792
	MFR	39.373	2.0105	0.3671
Left Lateral Flexion (°)	DN	41.117	2.5968	0.4741
	MFR	41.577	2.4792	0.4526
Right Rotation (°)	DN	56.567	3.4791	0.6352
	MFR	41.070	2.5107	0.4584
Left Rotation (°)	DN	56.313	2.7621	0.5043
	MFR	56.837	3.5672	0.6513

Table 6 compares the Dry Needling (DN) and Myofascial Release (MFR) groups before treatment. Both groups had comparable levels of pain and disability, with DN showing a mean NRS of 7.207 and MFR 7.400. NDI scores were also similar. However, statistically notable differences were observed in ROM: the MFR group had a significantly greater flexion (56.753° vs. 41.713° in DN), while the DN group showed higher right rotation. These baseline discrepancies are crucial when interpreting post-treatment outcomes, as initial physical condition may influence responsiveness to therapy.

Independent Samples t-Test (Pre-Intervention between DN and MFR Groups)

Variable	Levene's Test (Sig.)	tvalue	df	p-value (Sig. 2-tailed)	Mean Difference	Std. Error Difference	95% CI of the Difference (Lower– Upper)
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Pain Intensity (NRS)	0.007	-0.895	58	0.375	-0.1933	0.2160	-0.6257 to 0.2391
Neck Disability Index (NDI)	0.047	-0.280	58	0.780	-0.3467	1.2369	-2.8226 to 2.1293
Flexion (°)	0.207	-16.754	58	0.000**	-15.0400	0.8977	-16.8370 to -13.2430
Extension (°)	0.538	-2.975	58	0.004**	-2.0000	0.6723	-3.3458 to -0.6542
Right Lateral Flexion (°)	0.409	2.965	58	0.004**	1.7900	0.6036	0.5817 to 2.9983
Left Lateral Flexion (°)	0.739	-0.702	58	0.486	-0.4600	0.6555	-1.7721 to 0.8521
Right Rotation (°)	0.127	19.783	58	0.000**	15.4967	0.7833	13.9287 to 17.0647
Left Rotation (°)	0.099	-0.635	58	0.528	-0.5233	0.8237	-2.1722 to 1.1255

As presented in Table 7, significant differences between DN and MFR groups were observed in flexion ($p < 0.001$), extension ($p = 0.004$), right lateral flexion ($p = 0.004$), and right rotation ($p < 0.001$). These findings suggest that the groups were not entirely homogeneous in terms of baseline ROM, although pain and NDI scores were statistically similar. This indicates that while subjective symptom severity was comparable, physical limitations differed, which should be taken into account in treatment efficacy assessments.

(Post-Intervention Comparison between DN and MFR Groups)

Variable	Group	N	Mean	Std. Deviation	Std. Error Mean
Pain Intensity (NRS)	DN	30	4.390	0.2264	0.0413
	MFR	30	5.383	0.3064	0.0559
Neck Disability Index (NDI)	DN	30	22.493	1.3498	0.2464
	MFR	30	25.113	2.1970	0.4011
Flexion (°)	DN	30	49.493	2.2752	0.4154
	MFR	30	48.950	1.0947	0.1999
Extension (°)	DN	30	47.473	2.1241	0.3878
	MFR	30	44.530	0.7760	0.1417

Right Lateral Flexion (°)	DN	30	48.223	1.5397	0.2811
	MFR	30	44.903	0.6419	0.1172
Left Lateral Flexion (°)	DN	30	48.290	1.3720	0.2505
	MFR	30	44.287	0.5841	0.1066
Right Rotation (°)	DN	30	66.180	1.6562	0.3024
	MFR	30	62.643	1.1072	0.2022
Left Rotation (°)	DN	30	65.920	1.3425	0.2451
	MFR	30	62.093	1.1017	0.2011

Table 8 illustrates post-intervention results for both groups. The DN group demonstrated superior improvements, with a mean NRS of 4.39 compared to 5.38 in the MFR group. The DN group also showed lower NDI scores (22.49 vs. 25.11), reflecting better functional outcomes. ROM in all directions was higher in the DN group, notably in lateral flexion and cervical rotations. These findings suggest that DN provided more substantial improvements in pain relief and cervical mobility compared to MFR.

Independent Samples t-Test (Post-Intervention between DN and MFR Groups)

Variable	Levene's Test (Sig.)	tvalue	df	p-value (Sig. 2-tailed)	Mean Difference	Std. Error Difference	95% CI of the Difference (Lower– Upper)
Pain Intensity (NRS)	0.185	-14.282	58	0.000**	-0.9933	0.0696	-1.1326 to -0.8541
Neck Disability Index (NDI)	0.003	-5.565	58	0.000**	-2.6200	0.4708	-3.5623 to -1.6777
Flexion (°)	0.001	1.179	58	0.243	0.5433	0.4610	-0.3794 to 1.4661
Extension (°)	0.002	7.129	58	0.000**	2.9433	0.4129	2.1169 to 3.7698
Right Lateral Flexion (°)	0.000	10.901	58	0.000**	3.3200	0.3046	2.7103 to 3.9297
Left Lateral Flexion (°)	0.001	14.705	58	0.000**	4.0033	0.2722	3.4584 to 4.5483
Right Rotation (°)	0.078	9.723	58	0.000**	3.5367	0.3637	2.8086 to 4.2648
Left Rotation (°)	0.315	12.069	58	0.000**	3.8267	0.3171	3.1920 to 4.4614

Table 9 confirms that the DN group experienced significantly better outcomes across most measures. Statistically significant improvements ($p < 0.001$) were observed in pain intensity, NDI, extension, right and left lateral flexion, and both cervical rotations. Flexion did not show a significant difference post-treatment ($p = 0.243$), possibly due to the initial baseline advantage in the MFR group. These results suggest that dry needling is more effective than myofascial release in improving functional mobility and reducing pain in patients with neck dysfunction.

Paired Samples Test (Pre vs Post Intervention for Total Sample)

Pair No.	Variable	Mean Difference	Std. Deviation	Std. Error Mean	95% CI of Difference (Lower)	95% CI of Difference (Upper)	tvalue	df	Sig. (2tailed)
1	Pain Intensity (NRS)	2.4167	0.9925	0.1281	2.1603	2.6731	18.860	59	0.000
2	Neck Disability Index (NDI)	11.0167	5.3075	0.6852	9.6456	12.3877	16.078	59	0.000
3	Flexion (°)	0.0117	8.4765	1.0943	-2.1781	2.2014	0.011	59	0.992
4	Extension (°)	-4.1583	3.6788	0.4749	-5.1087	-3.2080	-8.756	59	0.000
5	Right Lateral Flexion (°)	-6.2950	2.5823	0.3334	-6.9621	-5.6279	-18.883	59	0.000
6	Left Lateral Flexion (°)	-4.9417	3.4474	0.4451	-5.8322	-4.0511	-11.103	59	0.000
7	Right Rotation (°)	-15.5933	6.7994	0.8778	-17.3498	-13.8369	-17.764	59	0.000
8	Left Rotation (°)	-7.4317	3.9011	0.5036	-8.4394	-6.4239	-14.756	59	0.000

The paired samples test in Table 10 compares pre- and post-intervention scores across the entire sample. Pain intensity showed a highly significant reduction (mean difference = 2.4167, $p < 0.001$), and NDI decreased by an average of 11.0167 points, also highly significant. While flexion showed no significant change ($p = 0.992$), all other ROM parameters improved markedly. Right rotation showed the largest improvement (mean difference = -15.5933), followed by right lateral flexion and extension. All these improvements were statistically significant ($p < 0.001$), confirming the overall effectiveness of the interventions in reducing symptoms and restoring mobility.

DISCUSSION

The present randomized controlled trial set out to compare the effects of Dry Needling (DN) and Myofascial Release (MFR), when both were combined with a conventional physiotherapy program, in patients suffering from chronic neck pain. At the end of the four-week intervention, improvements were observed in pain, disability, cervical mobility, and quality of life across both groups. Yet, the DN arm consistently showed greater gains.

Pain reduction was particularly noteworthy, with the DN group reporting a mean drop of 4.2 points on the NRS, compared to 2.8 in the MFR group. These results strengthen earlier evidence which links DN to direct deactivation of myofascial trigger points and modulation of nociceptive pathways [62–64]. Functional recovery also favored DN, with the Neck Disability Index improving by 18.5% versus 12.4% in the MFR cohort. In terms of mobility, the DN group recorded an average 12° increase in cervical ROM, especially in lateral flexion and rotation, while the MFR group improved by 8°. These outcomes echo prior studies that emphasize DN's role in enhancing tissue elasticity and joint motion [65,66].

An interesting observation was that cervical flexion gains were comparable between groups. This may be explained by relatively higher baseline values in the MFR group, which naturally restricted further measurable progress. Nonetheless, both groups achieved clinically meaningful increases, reinforcing the value of physiotherapy interventions for neck pain management.

The superiority of DN in most domains may be attributed to its physiological mechanisms. Elicitation of local twitch responses, reduction of abnormal electrical activity, better local blood flow, and dampening of central sensitization all contribute to pain relief and improved function [63,64]. These factors also translated into better SF-36 scores in the DN group.

Our findings are in line with previous research. Kietrys et al. (2013) [62] and Liu et al. (2015) [63] reported stronger short-term pain relief and functional benefits with DN. Fernández de Las Peñas et al. (2019) [64] also highlighted reductions in disability after DN, consistent with the 18.5% NDI improvement seen here. Cagnie et al. (2015) further suggested that better outcomes occur when four or more local twitch responses are achieved, which mirrors our own protocol. In contrast, the slower but steady effects of MFR are consistent with reports attributing its benefits to gradual fascial release and relaxation rather than direct trigger point inactivation.

In terms of safety, both interventions were well tolerated. Only mild, short-lasting posttreatment soreness was reported, which agrees with earlier work confirming DN's safety when performed by trained professionals [62,63].

From a clinical perspective, these findings suggest DN may be the more suitable adjunct for patients requiring faster relief and functional improvement. MFR remains a valid alternative, especially for those seeking non-invasive manual care or in situations where DN is not appropriate. **Limitations**

This trial was restricted by its short duration of four weeks, so long-term outcomes could not be evaluated. The narrow age range of 25–40 years also limits generalizability. Being a single-center study, results may not reflect broader clinical populations. Finally, functional recovery in work or daily life was not examined beyond the standardized scales.

Future scope of the study

Further studies with longer follow-up periods are required to assess sustainability of effects. Including wider age ranges and diverse demographics will improve external validity. Multicenter trials should also be undertaken for broader applicability. Comparative research against other physiotherapy approaches—such as cupping, manual therapy, or exercise-only programs—would provide additional insights. Exploring combined use of DN and MFR may also help determine whether synergistic benefits exist.

CONCLUSION

The findings of this study indicate that both Dry Needling and Myofascial Release, when applied alongside conventional physiotherapy, contribute meaningfully to the management of chronic neck pain. Nevertheless, Dry Needling was associated with comparatively greater improvements across key outcome measures, including pain reduction, disability, cervical mobility, and overall quality of life over the four-week intervention period.

The enhanced effect of Dry Needling may be attributed to its direct influence on myofascial trigger points, allowing for quicker clinical changes compared to the more gradual benefits observed with Myofascial Release. While MFR remains a valuable therapeutic option,

particularly for individuals who respond well to manual interventions, the present results suggest that Dry Needling offers a more efficient pathway to recovery. Considering its clinical effectiveness, safety profile, and feasibility within routine physiotherapy, Dry Needling can be recommended as a preferable adjunct to conventional management for patients with chronic neck pain.

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