Alqalam Journal of Medical and Applied Sciences. 2026;9(9):2665-2671
https://doi.org/10.54361/ajmas.269905

Original article

Clinical Effects and Safety of Deep Dry Needling for Upper Trapezius Myofascial Pain Syndrome: A Prospective Single-Group Study in Tripoli, Libya

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Abstract
Myofascial pain syndrome (MPS) is a common musculoskeletal condition characterised by myofascial trigger points, pain, and functional limitations. Although dry needling is widely used in physiotherapy for myofascial pain, locally derived clinical evidence from Libya remains limited. This study evaluated the short-term clinical effects and safety of deep dry needling in patients with upper trapezius myofascial pain syndrome. A prospective, quasi-experimental, one-group pretest–posttest case series was conducted in the physiotherapy department of Al-Kahili Specialized Clinic, Tripoli, Libya. Ten patients (5 men and 5 women; mean age 37.2 ± 15.2 years) with chronic neck and shoulder pain and a clinically confirmed active upper trapezius myofascial trigger point were recruited. Participants received three weekly sessions using Hong's pistoning dry-needling technique. Pain intensity was assessed using the Visual Analogue Scale (VAS), local tenderness using a 4-point manual palpation scale, and neck-related disability using the Neck Disability Index (NDI). Assessments were performed at baseline (T0), immediately after the first treatment session (T1), and 4 weeks after the start of treatment (T2), with the NDI assessed at T0 and T2. Adverse events were recorded throughout the treatment period. Mean VAS pain scores decreased from 7.4 ± 1.2 at T0 to 6.0 ± 1.4 at T1 and 4.0 ± 1.8 at T2. The mean reduction from T0 to T2 was 3.4 ± 1.0 points (paired $t(9) = 11.13$, $p < 0.001$), and 9 of 10 participants (90%) achieved a ≥30% reduction in pain. Manual palpation tenderness decreased from 2.5 ± 0.5 at T0 to 1.1 ± 1.0 at T2 (paired $t(9) = 6.33$, $p < 0.001$). Mean NDI scores decreased from 23.8 ± 7.5 at T0 to 15.9 ± 7.7 at T2 (paired $t(9) = 8.23$, $p < 0.001$). No serious adverse events were reported. The observed adverse events included transient post-needling soreness (40%), superficial bruising (30%), minor capillary bleeding (30%), and transient dizziness (20%), all of which resolved without further intervention. These findings suggest that deep dry needling may be associated with short-term improvements in pain, local tenderness, and neck-related disability in patients with upper trapezius myofascial pain syndrome. However, the small sample size and absence of a control group limit the strength of the conclusions, and larger controlled studies are needed to confirm these findings.
Keywords: Dry Needling; Myofascial Pain Syndrome; Upper Trapezius; Pain Intensity; Neck Disability; Physiotherapy.

Introduction

Myofascial pain syndrome (MPS) is a common musculoskeletal pain condition encountered in rehabilitation practice categorised clinically by the presence of myofascial trigger points (MTrPs), which are hyperirritable areas within taut bands of skeletal muscle. These trigger points may produce local and referred pain, contribute to movement-related limitations, and affect normal muscle function and biomechanics [1,2]. Numerous mechanisms have been proposed to explain the development and persistence of MTrPs. The integrated (energy crisis) hypothesis suggests that sustained muscle overload may result in excessive acetylcholine release at the motor endplate, persistent sarcomere contraction, local ischemia, and an energy deficit, thereby contributing to the development of pain and local muscle dysfunction [3]. Persistent nociceptive input may also contribute to peripheral and central sensitisation, potentially extending pain and hypersensitivity beyond the primary affected area [4].

Dry needling is a commonly used physiotherapy intervention for managing myofascial pain and involves inserting a thin, solid, filiform needle into or around a myofascial trigger point without injecting medication or other substances [5]. Deep dry needling techniques may involve repeated needle manipulation within the trigger point and, when present, elicitation of a local twitch response (LTR). Mechanical stimulation of the affected tissue and neural input generated during needling have been proposed as possible mechanisms underlying the clinical response to treatment [6]. Previous systematic reviews and meta-analyses have reported reductions in pain following dry needling for musculoskeletal conditions, including neck and shoulder myofascial pain, although the magnitude and durability of these effects vary among studies and methodological approaches [7,8].

Dry needling has therefore become an established intervention within physiotherapy practice, while its precise mechanisms of action and comparative clinical effectiveness continue to be investigated. Physiotherapists themselves also experience a substantial burden of musculoskeletal disorders, as reported in a recent systematic review and meta-analysis [9]. Despite the increasing international use and research interest in dry needling, clinical evidence from the Libyan healthcare setting remains limited. In particular, there is a lack of locally derived clinical data describing the response and short-term safety of dry needling in patients with upper trapezius myofascial pain. Establishing preliminary clinical evidence within the local physiotherapy setting may provide useful information for future research and clinical practice in Libya. Therefore, the present study aimed to evaluate the short-term clinical effects and safety of a standardised three-session deep dry-needling protocol in patients with chronic upper trapezius myofascial pain

Received*: 27-06-2026 -* ***Accepted****: 25-08-2026 -* ***Published****: 02-09-2026*

syndrome in Tripoli. The main clinical outcomes were pain intensity, local palpation tenderness, and neck-related disability, with adverse events recorded throughout the treatment period. We assumed that participants would demonstrate reductions in pain, tenderness, and disability following the intervention and that these improvements would be maintained at the four-week assessment.

Methods

This investigation used a prospective, quasi-experimental design employing a single-group pretest–posttest case series format. Data collection took place at the physiotherapy unit of Al-Kahili Specialized Clinic in Tripoli, Libya. The study set out to track, in a prospective manner, changes in pain severity, localised tenderness on palpation, and neck-related functional disability among patients diagnosed with chronic myofascial pain syndrome affecting the upper trapezius muscle, following a standardised regimen of deep dry needling. Every participant underwent an identical intervention protocol and was evaluated at fixed assessment points. Given the absence of a control or comparison arm in this design, any changes observed were interpreted as within-subject clinical shifts occurring over the course of the study period, rather than as conclusive proof of treatment efficacy.

A total of ten participants were enrolled through purposive sampling. To be eligible, individuals had to be between 18 and 65 years of age, report chronic neck and/or shoulder pain persisting beyond three months, present with at least one clinically confirmed active myofascial trigger point in the upper trapezius, and score above 5 out of 10 on the baseline Visual Analogue Scale (VAS) for pain. Individuals were excluded from participation if they showed clinical signs of cervical radiculopathy, fibromyalgia, or other neurological conditions, if they had a fear of needles, a diagnosed coagulation disorder, or were currently taking psychiatric, neurological, or opioid medications. Those who satisfied the eligibility requirements and signed a written informed consent form were subsequently enrolled and treated according to the standardised protocol. All ten participants completed the full course of three treatment sessions along with both follow-up evaluations, and their data were therefore retained in the final analysis.

To limit variability arising from differences in technique, all dry needling procedures were carried out by a single licensed physiotherapist with established clinical experience in the method. Sterile, single-use, rigid stainless steel filiform needles measuring either 0.25 × 30 mm or 0.30 × 40 mm were selected depending on the estimated depth of the trigger point being treated. Trigger points within the upper trapezius were located clinically through manual palpation, after which the needle was advanced into the site using Hong's fast in/fast out pistoning technique. The needle was manipulated repeatedly in an effort to provoke a local twitch response whenever one could be elicited, and it remained in place for roughly one to two minutes while this pistoning motion continued. Each session was followed by a course of low-load eccentric stretching targeting the treated muscle, intended to support post-treatment recovery and ease any discomfort resulting from the needling itself. Overall, the treatment protocol comprised three dry-needling sessions administered once weekly across three consecutive weeks.

Outcome Measures

Pain Intensity

Pain was rated using a 0–10 Visual Analogue Scale, with higher values reflecting greater pain severity. This instrument is widely employed for quantifying pain and has been reported as a sensitive tool for capturing treatment-related change [10]. Ratings were obtained at three points: before treatment (T0), immediately following the first dry-needling session (T1), and at the four-week follow-up visit (T2).

Manual Palpation Tenderness

Tenderness at the treated trigger point was assessed through manual palpation using a four-point ordinal scale, where 0 indicated no pain, 1 mild pain, 2 pain accompanied by an observable expression of discomfort, and 3 severe pain producing an involuntary jump or withdrawal response. Palpation-based scoring of this kind has been incorporated into several standardised clinical indices used to evaluate muscular and joint tenderness, though its reliability depends heavily on consistent examination technique and clearly defined scoring rules [11]. To reduce inter-rater variability, the same trained physiotherapist performed every palpation assessment in this study using a fixed scoring protocol. This measure was recorded at T0, T1, and T2.

Neck Disability Index

Functional disability related to the neck was measured using the Neck Disability Index (NDI), a ten-item, patient-completed questionnaire designed to capture the impact of neck pain on daily function. The instrument has demonstrated acceptable reliability and validity when applied to populations with neck-related disorders [12]. Each item is rated on a scale from 0 to 5, producing a total possible score of 50, with higher totals denoting greater disability. The raw score was also converted into a percentage-based disability score by doubling the total. The NDI was completed at baseline (T0) and again at the four-week follow-up (T2); it was not administered after the first treatment session, since it is designed to capture functional disability rather than immediate fluctuations in pain intensity.

Received*: 27-06-2026 -* ***Accepted****: 25-08-2026 -* ***Published****: 02-09-2026*

Adverse Events

Any adverse events linked to dry needling were tracked throughout the treatment period, with particular attention paid to post-needling soreness, superficial bruising, minor bleeding at the insertion site, and transient dizziness. The occurrence, frequency, and clinical course of these events were documented individually for each participant.

Results

Table 1. Baseline characteristics of the participants

Characteristic	Mean ± SD	Range / n (%)
Age (years)	37.2 ± 15.2	21–58
Weight (kg)	70.1 ± 15.8	45–96
Height (cm)	163.1 ± 8.2	150–174
BMI (kg/m^2)	26.5 ± 6.3	19.6–36.6
Pain duration (months)	15.9 ± 9.0	6–35
Sex		
Male	—	5 (50%)
Female	—	5 (50%)
Affected side		
Left	—	6 (60%)
Right	—	4 (40%)

SD, standard deviation; BMI, body mass index.

Ten participants with chronic upper trapezius myofascial pain syndrome completed the study and were included in the final analysis. The sample consisted of five males (50%) and five females (50%). The mean age was 37.2 ± 15.2 years, with a range of 21–58 years. The mean BMI was 26.5 ± 6.3 kg/m^2, with a range of 19.6–36.6 kg/m^2. Six participants (60%) had left-sided symptoms, while four (40%) had right-sided symptoms. The mean duration of pain was 15.9 ± 9.0 months, ranging from 6 to 35 months. The complete baseline characteristics of the participants are presented in Table 1. All participants completed the three dry-needling sessions and the scheduled outcome assessments. Therefore, all 10 participants were included in the final analysis, with no loss to follow-up or missing T0 or T2 data.

Pain Intensity

Pain intensity was assessed using the Visual Analogue Scale (VAS) at baseline (T0), immediately after the first dry-needling session (T1), and four weeks after the beginning of the treatment protocol (T2). As shown in Table 2, the mean VAS score decreased from 7.4 ± 1.2 at T0 to 6.0 ± 1.4 at T1 and further decreased to 4.0 ± 1.8 at T2. The mean reduction from T0 to T1 was 1.4 points and was statistically significant ($t(9) = 4.58$, $p = 0.001$). The reduction from T0 to T2 was 3.4 points and was also statistically significant ($t(9) = 11.13$, $p < 0.001$). The corresponding standardised within-participant effect sizes were large (Cohen's $dz = 1.45$ for T0–T1 and 3.52 for T0–T2), as shown in Table 3. Nine participants (90%) achieved a reduction of at least 30% in VAS pain intensity from T0 to T2, while one participant (10%) did not reach this threshold (Table 4).

Manual Palpation Tenderness

Manual palpation tenderness was assessed using the predefined 0–3 scale at T0, T1, and T2. As presented in Table 2, the mean palpation score decreased from 2.5 ± 0.5 at T0 to 1.5 ± 0.5 at T1. All 10 participants demonstrated a one-point reduction immediately after the first treatment session. At T2, four weeks after the beginning of treatment, the mean palpation score decreased further to 1.1 ± 1.0, representing a mean reduction of 1.4 points from baseline (Table 2). The T0–T2 reduction was statistically significant ($t(9) = 6.33$, $p < 0.001$), with a large standardised within-participant effect size (Cohen's $dz = 2.00$) (Table 3). For the T0–T1 comparison, all participants demonstrated the same one-point reduction. Therefore, there was no variability in the paired differences, and a conventional paired-samples t-test and Cohen's dz were not calculated for this comparison.

Neck Disability Index

Neck-related disability was assessed using the Neck Disability Index (NDI) at baseline (T0) and four weeks after the beginning of the treatment protocol (T2). The mean NDI score decreased from 23.8 ± 7.5 at T0 to 15.9 ± 7.7 at T2, representing a mean reduction of 7.9 points (Table 2). This reduction was statistically significant ($t(9) = 8.23$, $p < 0.001$), with a large standardised within-participant effect size (Cohen's $dz = 2.60$) (Table 3). The mean NDI disability percentage decreased from 47.6% at baseline to 31.8% at T2 (Table 2).

Adverse Events

The recorded adverse events were generally minor. Nine participants (90%) reported at least one adverse event during the treatment period. Some participants experienced more than one type of adverse event. As shown in Table 5, post-needling muscle soreness was reported by 4 participants (40%), superficial bruising by 3 participants (30%), minor

Received: *27-06-2026 -* ***Accepted:*** *25-08-2026 -* ***Published:*** *02-09-2026*

capillary bleeding by 3 participants (30%), and transient dizziness by 2 participants (20%). No serious adverse events or complications requiring additional medical treatment were recorded during the study.

Table 2. Clinical outcomes at baseline, immediately after the first session, and four weeks after the beginning of treatment

Outcome	T0 Baseline	T1 Immediately after first session	T2 Four weeks after the beginning of treatment
VAS pain score (0–10)	7.4 ± 1.2	6.0 ± 1.4	4.0 ± 1.8
Manual palpation score (0–3)	2.5 ± 0.5	1.5 ± 0.5	1.1 ± 1.0
NDI score (0–50)	23.8 ± 7.5	—	15.9 ± 7.7
NDI disability (%)	47.6	—	31.8

Values are presented as mean ± SD unless otherwise indicated. VAS, Visual Analogue Scale; NDI, Neck Disability Index; T0, before treatment; T1, immediately after the first treatment session; T2, four weeks after the beginning of the treatment protocol.

Table 3. Within-participant changes and effect sizes

Outcome	Comparison	Mean change	*t*(9)	*p* value	Cohen's *dz*
VAS pain	T0–T1	−1.4	4.58	0.001	1.45
VAS pain	T0–T2	−3.4	11.13	<0.001	3.52
Manual palpation	T0–T1	−1.0	—	—	—
Manual palpation	T0–T2	−1.4	6.33	<0.001	2.00
NDI	T0–T2	−7.9	8.23	<0.001	2.60

Note: Negative values indicate a reduction from baseline. The T0–T1 palpation comparison was reported descriptively because all participants demonstrated an identical one-point reduction, resulting in zero variance in the paired differences.

Table 4. Participants achieving a clinically meaningful reduction in VAS pain

Response at T2	n	%
≥30% reduction in VAS	9	90%
<30% reduction in VAS	1	10%
Total	10	100%

Note: Percentage reduction was calculated as [(T0 VAS − T2 VAS) / T0 VAS] × 100.

Table 5. Adverse events during the treatment period

Adverse event	n	%
Post-needling muscle soreness	4	40%
Superficial bruising	3	30%
Minor capillary bleeding	3	30%
Transient dizziness	2	20%

Note: Participants could experience more than one adverse event; therefore, percentages do not sum to 100%.

Discussion

Principal Findings

The present study evaluated the changes in pain intensity, manual palpation tenderness, and neck-related disability following a three-session dry-needling protocol in patients with chronic upper trapezius myofascial pain syndrome. The main findings were significant reductions in pain intensity and manual palpation tenderness, together with a significant improvement in neck-related disability at the four-week follow-up. Pain intensity decreased both immediately after the first treatment session and at the four-week follow-up. The mean VAS score decreased from 7.4 ± 1.2 at baseline to 6.0 ± 1.4 immediately after the first session and to 4.0 ± 1.8 four weeks after the beginning of treatment. In addition, 9 of the 10 participants (90%) achieved at least a 30% reduction in VAS pain intensity at T2. Manual palpation tenderness also decreased, while the mean NDI score decreased from 23.8 ± 7.5 to 15.9 ± 7.7 at T2. These findings suggest that participants experienced clinically relevant improvements during the study period. However, because this was a small single-group study without a control intervention, the observed improvements should be interpreted as within-participant changes and not as definitive evidence that dry needling alone caused the improvements.

Effect of Dry Needling on Pain Intensity

Pain reduction was one of the main findings of the present study. The mean VAS score decreased by 1.4 points immediately after the first session and by 3.4 points at the four-week follow-up. The large within-participant effect size observed between T0 and T2 (Cohen's *dz* = 3.52) shows a substantial change in pain intensity within this sample. The observed reduction is generally consistent with previous research investigating dry needling for myofascial and neck-

Received*: 27-06-2026 -* ***Accepted****: 25-08-2026 -* ***Published****: 02-09-2026*

related pain. Systematic reviews and clinical studies have reported reductions in pain following dry needling. However, the level of improvement seen can vary depending on the patient group being treated, the treatment method used, what it is being compared to, and how long patients are followed after treatment [1,7,8,13]. Sánchez-Infante et al. reported beneficial effects of dry needling applied by physical therapists for pain in musculoskeletal conditions, supporting its potential role within conservative physiotherapy management [7]. Similarly, studies involving patients with chronic myofascial neck pain have reported improvements following dry needling-based interventions [8,13]. The fast reduction in pain observed after the first session is also of clinical interest. Fernández-de-las-Peñas and Nijs proposed that the effects of trigger point dry needling may involve mechanisms extending beyond a purely local tissue response, including modulation of pain processing within a pain neuroscience framework [4]. Therefore, the immediate response observed in the present study may reflect changes in pain sensitivity occurring shortly after the intervention. However, the present study cannot determine whether the observed pain reduction was caused specifically by dry needling, as there was no control group. Factors such as treatment expectation, therapist interaction, natural symptom variation, and the accompanying stretching intervention may also have contributed to the improvement.

Changes in Manual Palpation Tenderness

Manual palpation tenderness decreased from 2.5 ± 0.5 at baseline to 1.5 ± 0.5 immediately after the first session, and to 1.1 ± 1.0 at the four-week follow-up. All participants confirmed a one-point reduction immediately after the first session. The significant reduction between T0 and T2, together with the large within-participant effect size (Cohen's *dz* = 2.00), suggests a substantial decrease in local tenderness during the study period. The findings are consistent with the clinical thought of myofascial trigger points, which are characterised by localised tenderness and increased sensitivity within affected muscle tissue [2,3]. Dry needling has been proposed as a treatment that may impact local mechanical sensitivity and nociceptive input associated with myofascial trigger points [5]. The local twitch response has usually received considerable attention during trigger point dry needling. However, Perreault et al. questioned whether eliciting a local twitch response is necessary for successful treatment outcomes [6]. Therefore, the improvement in palpation tenderness observed in the present study should not be taken as evidence that a local twitch response was responsible for the clinical improvement. The mechanisms underlying the reduction in palpation tenderness remain unclear. The observed changes may involve local mechanical effects as well as alterations in peripheral and central pain sensitivity [4,5]. However, these mechanisms were not directly measured in the present study.

Changes in Neck Disability

In addition to pain intensity and palpation tenderness, the present study confirmed an improvement in neck-related disability. The mean NDI score decreased from 23.8 ± 7.5 at baseline to 15.9 ± 7.7 at T2, representing a mean reduction of 7.9 points. The corresponding within-participant effect size was large (Cohen's *dz* = 2.60). This finding is clinically relevant because pain reduction does not necessarily result in improved functional ability. The reduction in NDI score suggests that the improvement observed during the study may have extended beyond pain intensity to activities affected by neck symptoms. Previous research involving patients with neck and myofascial pain has used disability measures to assess functional outcomes in addition to pain intensity [1,8,13]. The present findings are therefore consistent with the broader literature indicating that improvement following treatment of myofascial neck pain may involve both pain and functional outcomes. However, analysis should remain cautious. The NDI was assessed only at baseline and T2, and the absence of a control group means that other factors could have contributed to the observed functional improvement.

Clinically Meaningful Reduction in Pain

An important finding was that 9 participants (90%) achieved at least a 30% reduction in VAS pain intensity from baseline to the four-week follow-up. This analysis provides additional information beyond statistical significance because it describes the proportion of participants who experienced a substantial reduction in pain. The high proportion of responders suggests that the observed reduction in pain was not limited to a small number of participants. However, the 90% response rate should be interpreted cautiously. The sample consisted of only 10 participants, and the study did not include a control group. Therefore, this percentage cannot be interpreted as a definitive response rate for dry needling in the wider population. Larger controlled studies are required to determine whether a similar proportion of patients would achieve a clinically meaningful improvement.

Possible Mechanisms

Several mechanisms may explain the clinical changes observed after dry needling. Previous literature has proposed local mechanical effects, changes in nociceptive input, alterations in muscle sensitivity, and neurophysiological modulation of pain [4,5]. The theory of myofascial trigger points has evolved considerably, with increasing evidence suggesting that their clinical presentation cannot be explained solely by a local muscular abnormality [2,3]. From a pain neuroscience perspective, dry needling may influence both peripheral nociceptive input and central pain processing [4]. The role of the local twitch response remains uncertain. Although it has traditionally been considered an important response during dry needling, available evidence does not establish that producing a twitch is necessary for a successful clinical outcome [6]. More recent evidence has also reported neurophysiological effects associated with dry needling, suggesting that its

Received: *27-06-2026 -* ***Accepted:*** *25-08-2026 -* ***Published:*** *02-09-2026*

effects may extend beyond the immediate mechanical stimulation of the treated muscle [14]. However, the present study did not directly assess neurophysiological variables, muscle activity, blood flow, or biochemical responses. Therefore, these mechanisms should be considered possible explanations based on previous literature rather than mechanisms demonstrated by the present study.

Safety and Adverse Events

The adverse events recorded in the present study were generally minor. Post-needling muscle soreness was the most frequently reported event, followed by superficial bruising, minor capillary bleeding, and transient dizziness. No serious adverse events requiring additional medical treatment were recorded. Post-needling soreness is a recognized short-term response following myofascial trigger point dry needling and has been specifically discussed in previous research [15]. The minor bruising and capillary bleeding detected in the present study are also compatible with the local responses that may occur following needle insertion [5]. These findings suggest that the intervention was well tolerated by the participants included in this study. However, the small sample size limits the ability to estimate the frequency of uncommon adverse events. Larger studies are therefore needed to provide more reliable safety estimates.

Strengths of the Study

The present study has several strengths. First, the treatment protocol was standardised and consisted of three dry needling sessions. Second, the study included several clinical outcomes covering pain intensity, local tenderness, and neck-related disability. Third, the use of both an immediate post-session assessment and a four-week follow-up allowed the study to examine both early and later changes. Another strength was the recording of adverse events during the treatment period. This provided additional information regarding the short-term tolerability of the intervention.

Limitations

The most important limitation was the small sample size of 10 participants. The study also used a single-group design without a control or sham dry-needling group. Therefore, the observed improvements cannot be attributed exclusively to dry needling. Second, the follow-up period was limited to four weeks after the beginning of treatment, and therefore the longer-term persistence of the observed improvements remains unknown. Third, the study focused on patients with chronic upper trapezius myofascial pain syndrome. Consequently, the findings may not be directly generalizable to patients with myofascial pain involving other muscles or different clinical presentations. Finally, stretching was used as the only additional therapeutic intervention. Therefore, the possible contribution of stretching to the observed clinical improvements cannot be separated from the effect of dry needling. Future randomised controlled studies should include larger samples, appropriate control, sham, or placebo interventions, longer follow-up periods, and standardised treatment protocols. Such studies would provide stronger evidence regarding the specific clinical effect of dry needling.

Clinical Implications

The findings of this study suggest that dry needling may have potential as part of conservative physiotherapy management for patients with chronic upper trapezius myofascial pain syndrome. The reductions in pain intensity and manual palpation tenderness, together with the improvement in NDI scores, support further investigation of this intervention [1,5,7,8,13]. However, based on the present study design, dry needling should not be considered superior to other physiotherapy interventions, nor should the observed improvements be attributed exclusively to the needling procedure. The findings are better considered primary clinical evidence that supports further controlled investigation.

Conclusion

This study found that three sessions of dry needling were associated with reduced pain and manual palpation tenderness in patients with chronic upper trapezius myofascial pain syndrome. Neck-related disability also improved four weeks after the beginning of treatment. Most participants (90%) achieved at least a 30% reduction in pain intensity. The reported adverse events were minor, with no serious complications. Although these findings suggest that dry needling may be a useful option in physiotherapy management, the small sample size and absence of a control group limit the strength of the conclusions. Larger controlled studies with longer follow-up are needed to confirm these findings.

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Received*: 27-06-2026 -* ***Accepted****: 25-08-2026 -* ***Published****: 02-09-2026*