VIMS Journal of Physical Therapy

PILOT STUDY

IMMEDIATE EFFECTS OF DRY NEEDLING ON PRESSURE PAIN THRESHOLD IN RHOMBOID MUSCLE MYOFASCIAL TRIGGER POINTS: A PRE-POST EXPERIMENTAL PILOT STUDY.

Patil Vibhuti[1], Syed Saqib T[2]., Anap Deepak[3]

[1]Post Graduate Student, [2] Associate Professor, [3]Professor and HOD (Dept. of Musculoskeletal Physiotherapy), Dr. Vithalrao Vikhe Patil Foundation's College of Physiotherapy, Ahilyanagar.

ABSTRACT:

Background: Myofascial pain syndrome (MPS) is a common musculoskeletal disorder characterised by hyperirritable nodules within taut bands of skeletal muscle, known as myofascial trigger points (MTrPs). These trigger points are often implicated in upper back pain and postural dysfunction, with the rhomboid muscles playing a crucial role in stabilising the scapula. Dry needling (DN) has emerged as an effective intervention for deactivating MTrPs and providing immediate pain relief, yet limited evidence exists regarding its effects on the rhomboid muscle. Hence, the purpose of this study was to evaluate the immediate effects of a single session of dry needling on pressure pain threshold (PPT) in patients with active myofascial trigger points in the rhomboid muscle.

Methodology: A pre-post pilot study was conducted on 30 participants with active MTrPs in the rhomboid muscle. Pressure pain threshold was measured using a digital algometer at the identified trigger point site before and immediately after dry needling intervention. A single DN session was administered using static dry needling. Data were analyzed using paired t-tests, with a significance level set at $p < 0.05$.

Results: Data was analyzed by using instat version 3.0 . A statistically significant increase in pressure pain threshold was observed immediately following dry needling intervention ($p < 0.0001$). The mean PPT increased from 42.316±5.578 N pre-intervention to 55.632±6.618 N post-intervention, reflecting an immediate reduction in local mechanical hyperalgesia at the treated MTrPs.

Conclusion: A single session of dry needling significantly increases pressure pain threshold in rhomboid muscle myofascial trigger points, suggesting its effectiveness as an immediate hypoalgesic intervention. These findings support the inclusion of dry needling in early-phase management of upper back myofascial pain syndromes involving scapular stabilizing muscles.

Keywords: Myofascial pain syndrome, Dry needling, Rhomboid muscle, Trigger point, Pressure pain threshold.

INTRODUCTION:

Myofascial pain syndrome (MPS) is a highly prevalent yet frequently under-recognized musculoskeletal disorder characterized by the presence of hyperirritable nodules known as myofascial trigger points (MTrPs) located within taut bands of skeletal muscle[1]. These trigger points are clinically associated with local tenderness, referred pain, restricted range of motion, and muscle dysfunction, contributing to chronic musculoskeletal pain conditions that can significantly impact an individual's functional capacity and quality of life.

*Corresponding author: Patil Vibhuti
Email : vibhutipatil18@gmail.com
Address: Dr. Vithalrao Vikhe Patil Foundation's College of Physiotherapy, Ahilyanagar.

The upper back and scapular region, in particular, are common areas affected by MTrPs, often resulting from poor postural habits, prolonged static postures, repetitive overhead activity, or scapular dyskinesis.[2]

Among the scapular stabilizing muscles, the rhomboids play a critical role in scapular retraction, downward rotation, and postural alignment. Dysfunction in these muscles due to active MTrPs can disrupt scapulothoracic rhythm, leading to altered shoulder biomechanics, compensatory movement patterns, and secondary pain in adjacent muscle groups[2]. Despite the recognized clinical importance of the rhomboids in upper quadrant musculoskeletal pain syndromes, they have been less frequently targeted in interventional studies compared to other upper quarter muscles like the upper trapezius or levator scapulae.[4]

A wide range of therapeutic interventions have been proposed for the management of MTrPs, including manual therapy, ischemic compression, stretching, dry needling, electrotherapy, and pharmacological modalities[3]. Among these, dry needling (DN) has gained considerable attention in recent years as a minimally invasive, cost-effective technique for inactivating trigger points and relieving pain[4]. DN involves the insertion of a thin monofilament needle directly into the MTrP, without the injection of any medication, to produce therapeutic effects through mechanical, biochemical, and neurophysiological mechanisms.[5]

Numerous studies have documented the efficacy of DN in reducing pain, improving pressure pain threshold (PPT), enhancing range of motion, and restoring muscle function in patients with myofascial pain affecting various muscles . The immediate hypoalgesic effects of DN are particularly notable, as evidenced by rapid improvements in PPT values immediately following treatment, which is a reliable and objective indicator of mechanical hyperalgesia at MTrP sites.[4,6]

Despite this growing body of evidence, there remains a relative paucity of research specifically examining the immediate effects of DN on the rhomboid muscles, even though these muscles are frequently implicated in upper back pain and postural syndromes. Considering their essential role in scapular control and upper quadrant stability, it is clinically valuable to determine whether DN can produce similar rapid pain-relieving effects in the rhomboids as reported in other muscles.[8]

Therefore, the primary objective of this study was to evaluate the immediate effects of a single session of dry needling on pressure pain threshold in patients with active myofascial trigger points in the rhomboid muscle. It was hypothesized that DN would result in a statistically significant and clinically meaningful increase in PPT values immediately after the intervention, reflecting a reduction in local mechanical hyperalgesia and offering evidence to support its use as an adjunct in early-phase rehabilitation programs for upper back myofascial pain syndromes.

METHODOLOGY

A, Pre-Post Pilot study design was conducted on 30 participants aged 18–26 years presenting with active myofascial trigger points (MTrPs) in the rhomboid muscle. MTrPs were identified based on clinical palpation criteria including the presence of a taut band, hypersensitive nodule, referred pain pattern, and jump sign.[1,2]

Pressure pain threshold (PPT) at the identified MTrP was measured using a digital pressure algometer (in kg/cm²) before and immediately after the intervention.[16,17]

The exclusion criteria ruled out participants who had Bleeding disorders (e.g., haemophilia) or anticoagulant therapy. Skin infections or open wounds at the treatment site. Recent Injury or Surgery: History of trauma, fractures, or surgery in the upper back, neck, or shoulder region within the past 6 months. Fear of needles (trypanophobia). Regular Use of Pain Medication

PROCEDURE

Ethical Committee approval was obtained from the Institutional Ethics Committee (IEC) prior to the commencement of the study. Screening was done as per the inclusion and exclusion criteria. The random sampling method was used to conduct the study; 30 samples were taken to draw conclusions during the study duration of two months. The study was conducted among participants with rhomboid muscle trigger points admitted to Physiotherapy OPD Ahilyanagar. The purpose of the study was explained, and written informed consent was obtained from all participants.

Pre-intervention readings were taken. The intervention was administered according to the defined criteria. Post-intervention readings were taken immediately after the intervention , and analysis was performed using the T-test [15] .

Pain pressure threshold was measured using an pressure algometer. The baseline value was determined and have high reliability (intraclass correlation coefficient [ICC = 0.99][16,17]

Intervention

The intervention included Dry Needling Intervention Protocol for Rhomboid Muscles:

Patient Positioning

- The patient was positioned side-lying, then turned to prone (to reduce pneumothorax risk).
- Firmly held the rhomboids in a pincer grasp to locate the trigger point.
- The monofilament needle was directed upward across the muscle mass while fingers guarded against lung penetration. [10]
- The patient's head was supported in neutral or turned to one side.

Trigger Point Identification

- The area between the medial scapular border and the spine was palpated.
- Taut bands or tender nodules indicative of MTrPs were identified.
- The presence of the trigger point was confirmed by reproducing the patient's familiar pain.[9]

Needle Selection

- A sterile, single-use filiform needle was used.
- Needle length ranged between 13–25 mm depending on muscle thickness and body habitus.

Needling Technique

- After skin antisepsis, the needle was inserted at a 45° angle toward the identified TrP.
- The needle was advanced slowly until a Local Twitch Response (LTR) or deep ache was elicited.
- The needle was retained for approximately 15 minutes.[9]

Post-Needling Care

- Gentle pressure was applied to minimize bruising.
- The patient was educated about possible post-treatment soreness and advised to perform gentle stretching. [11]

Figure 1: Right side Rhomboids dry needling at 45 degree angle

Rhomboids specific Rehabilitation exercise:

Pectoralis Stretch

- The patient stood in a doorway, leaned forward, and held the stretch for 15–30 seconds, repeated 3 times, 5 days per week for 2 weeks.

Thoracic Extension

- While sitting in a chair, the patient clasped both arms behind the head, arched backward, and repeated the movement 10 times, 5 days per week for 2 weeks.

Door Frame Stretch

- The patient grasped the door frame with the affected arm, leaned back, and held for 15–30 seconds, repeated 3 times, 5 days per week for 2 weeks.

Scapular Squeeze

- The patient squeezed the scapulae together, held for 5 seconds, and performed 3 sets of 10 repetitions , 5 days per week for 2 weeks.

Middle Trapezius Exercise

- The patient lay prone with arms outstretched, raised them upward while squeezing the scapulae, and performed 3 sets of 15 repetitions, 5 days per week for 2 weeks.
- Progression was achieved by adding small weights.

Thoracic Flexion Stretch

- While seated, the patient curled the head and neck toward the belly button, held briefly, and repeated 3 times, 5 days per week for 2 weeks

Thoracic Side Stretch

- The patient twisted the trunk with the elbow pointed forward, held the stretch for 10–15 seconds, and repeated 3 times on each side, 5 days per week for 2 weeks.

Rowing Exercise

- The patient performed resisted rowing using elastic tubing, pulling backward while squeezing the scapulae together, for 3 sets of 10 repetitions, 5 days per week for 2 weeks [13,14,15]

Rationale for incorporating stretching and strengthening of periscapular muscles helps restore normal scapulothoracic rhythm, maintain the therapeutic effects of dry needling, prevent recurrence of trigger points, and improve functional outcomes. Thus, even though immediate effects were assessed, the rehabilitation exercises were prescribed to support long-term correction of biomechanical impairments.

POST INTERVENTION READING:

It was evaluated the same way as the pre-intervention reading.

RESULT

The raw data of 30 participants were analyzed and subjected to statistical analysis using SPSS software version 21 to compare pre- and post-treatment scores using Student's Dependent 't' test for all outcome measures. 'p' values < 0.05 were considered statistically significant, with an alpha error of 5%. PPT ($p < 0.0001$), showed significant improvement in all outcome measures after the intervention immediately

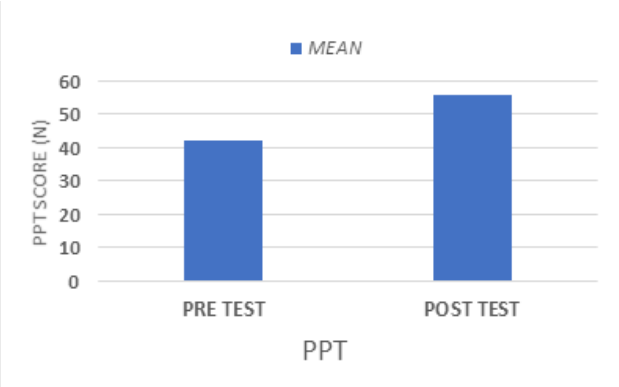

Figure 2: Comparison of pretest and posttest scores of Pain pressure threshold for Pain

Table 1: Comparison of pretest and post-test scores of Pain pressure threshold for Pain.

PPT	Mean ± SD	p Value	Significance
Pre Test	42.316± 5.578	<0.0001	Extremely Significant
Post Test	55.632± 6.618		

DISCUSSION:

The present study investigated the immediate effects of dry needling (DN) on the pressure pain threshold (PPT) of active myofascial trigger points (MTrPs) in the rhomboid muscle and found a statistically significant increase in PPT immediately following treatment. This suggests that DN is effective in reducing local mechanical hyperalgesia in the short term. While previous research has extensively examined the effects of DN on commonly affected muscles, such as the upper trapezius, levator scapulae, and infraspinatus, there is limited data regarding its application on the rhomboids, which play a crucial role in scapular stabilization, maintaining posture, and facilitating functional upper quadrant movement. The findings of this study, therefore, provide clinically relevant insights for managing upper back myofascial pain syndromes.

These results are consistent with those reported in earlier studies. Kietrys et al. (2013) performed a systematic review and meta-analysis and confirmed that DN significantly increases PPT in muscles of the upper quarter immediately after intervention, supporting its effectiveness in managing myofascial pain syndromes[1]. Similarly, Uygur et al. (2019) observed an immediate increase in PPT in patients treated with DN for upper trapezius MTrPs, attributing the improvement to mechanical and neuro-physiological changes induced by the needling process[2]. Although the present study focused on the rhomboid muscle, a similar trend was observed, implying that DN's pain-modulating effects are likely consistent across various muscles affected by trigger points.

The immediate analgesic effects of DN can be attributed to multiple interrelated mechanisms. One widely recognized mechanism involves the mechanical disruption of the taut band within the trigger point. According to Hong (1994), insertion of a needle into the MTrP mechanically disrupts the contracted sarcomeres, reduces abnormal endplate activity, and deactivates the trigger point, thereby reducing nociceptive input and mechanical hyperalgesia[3,4]. This mechanical effect alone is often sufficient to induce immediate changes in pain perception, as reflected by increased PPT values in the present study.

Additionally, elicitation of local twitch responses (LTRs) during DN has been associated with a greater reduction in pain sensitivity. Dommerholt et al. (2015) emphasized that LTRs, which are reflexive spinal cord-mediated contractions of muscle fibers in response to mechanical stimulation, contribute to the normalization of endplate noise, reduction of spontaneous electrical activity, and resetting of dysfunctional motor endplates[3]. Although this study did not document the number of LTRs elicited, it is reasonable to hypothesize that their occurrence may have contributed to the observed immediate increases in PPT.

Another important mechanism involves the reduction of biochemical irritants in the vicinity of the trigger point. Shah et al. (2005) demonstrated that active MTrPs are associated with elevated concentrations of nociceptive and inflammatory substances such as substance P, calcitonin gene-related peptide (CGRP), bradykinin, protons, and cytokines, which contribute to peripheral sensitization and pain[5]. DN has been shown to reduce the local concentration of these irritants through mechanical disruption and improved micro-circulation, thus alleviating localized nociceptive input and enhancing PPT values.

CONCLUSION :

The study concludes that a single session of dry needling produces an immediate increase in pressure pain threshold in individuals with active rhomboid muscle trigger points. This indicates effective short-term relief of myofascial pain, supporting the clinical use of dry needling as a beneficial intervention in early management of upper back musculoskeletal dysfunction.

Conflict of interest: The authors declare no conflict of interest related to this case report.

Funding: No funding

Acknowledgement: I would like to thank my parents Manoj Patil and Aarti Patil, my guide Dr.Saqib Syed, my HOD, Dr. Deepak Anap Sir for his unwavering support and scholarly guidance,Dr. Shyam D Ganvir, Principal and Professor, COPT, Ahilyanagar for his kind endless help, generous advice and support during the study.

REFERENCES:

1. Simons DG, Travell JG, Simons LS. Travell & Simons' Myofascial Pain and Dysfunction: The Trigger Point Manual. 2nd ed. Baltimore: Williams & Wilkins; 1999.
2. Dommerholt J, Fernández-de-las-Peñas C. Muscle Pain Syndromes. In: Braddom RL, editor. Braddom's Physical Medicine and Rehabilitation. 5th ed. Philadelphia: Elsevier; 2018. p. 370–88.
3. Shah JP, Danoff JV, Desai MJ, Parikh S, Nakamura LY, Phillips TM, Gerber LH. Biochemicals associated with pain and inflammation are elevated in sites near to and remote from active myofascial trigger points. Arch Phys Med Rehabil. 2005 Jan;86(1) :70–7.
4. Kietrys DM, Palombaro KM, Azzaretto E, Hubler R, Schaller B, Schlussel JM, Tucker M. Effectiveness of dry needling for upper-quarter myofascial pain: a systematic review and meta-analysis. J Orthop Sports Phys Ther. 2013 Sep;43(9):620–34.
5. Dommerholt J, Mayoral del Moral O, Gröbli C. Trigger point dry needling. J Man Manip Ther. 2016;24(4):234–40.
6. Uygur E, Aktaş B, Karahan AY, Bayrakçı Tunay V. Immediate effects of dry needling on pain, pressure pain threshold, and grip strength in patients with myofascial trigger points in upper trapezius: a randomized controlled trial. J Back Musculoskelet Rehabil. 2019;32(3):389–95.
7. Cagnie B, Dewitte V, Barbe T, Timmermans F, Delrue N, Meeus M. Physiologic effects of dry needling. Curr Pain Headache Rep. 2013 Dec;17(12):348.
8. Melzack R, Wall PD. Pain mechanisms: a new theory. Science. 1965 Nov 19;150(3699) :971–9.
9. Shah JP, Danoff JV, Desai MJ, et al. Biochemicals associated with pain and inflammation are elevated in sites near and remote from active myofascial trigger points. Arch Phys Med Rehabil 2008;89:16-23.
10. McCutcheon L, Yelland M. Iatrogenic pneumothorax: Safety concerns when using acupuncture or dry needling in the thoracic region. Phys Ther Rev. 2011;16(2):126-132. doi:10.1179/1743288X11Y.0000000012.
11. Dunning J, Butts R, Mourad F, Young I, Flannagan S, Perreault T. Dry needling: a literature review with implications for clinical practice guidelines. Physical therapy reviews. 2014 Aug 1;19(4):252-65.
12. Marathe S, Noor A. Immediate effect of dry needling on pain and functional ability in computer workers with myofascial trigger points of rhomboid muscle – A randomized clinical trial. Int J Res Anal Rev (IJRAR). 2023;10(2):535-543.1

13. Al-Bahadli SAZH, Al-Tamimi AFA. The effect of a rehabilitation program for rhomboid muscles (shoulder) and fibrous strain on young and advanced wrestlers (Free and Roman). Int J Res Soc Sci Humanit. 2022;12(2):150-176. doi:10.37648/ijrssh.v12i02.010.
14. Yildiz TI, Turgut E, Duzgun I. Neck and scapula-focused exercise training on patients with nonspecific neck pain: a randomized controlled trial. J Sport Rehabilitation. 2018;27(5):403-412. doi:10.1123/jsr.2017-0024
15. ZT, Altay Z, Çolak C. Effects of scapular stabilization exercises in patients of chronic neck pain with scapular dyskinesis: A quasi-experimental study. Turk J Phys Med Rehab. 2021;67(1):77-83. doi:10.5606/tftrd.2021.6775.
16. Nussbaum EL, Downes L. Reliability of clinical pressure-pain algometric measurements obtained on consecutive days. Phys Ther 1998;78:160-9.
17. Reeves JL, Jaeger B, Graff-Radford SB. Reliability of the pressure algometer as a measure of myofascial trigger point sensitivity. Pain 1986;24:313-21
18. H A Ali, A K Elzohiery, M M Arafa, N A Elkadery, Dry needling versus ultrasonic in treating cervical myofascial pain syndrome, QJM: An International Journal of Medicine, Volume 113, Issue Supplement 1, March 2020.
19. Matsel K, Davies C, Uhl T. The long-term effectiveness of trigger point dry needling and exercise for individuals with shoulder pain: A critically appraised topic. J Sport Rehabil. 2021;30(2):333-338. doi:10.1123/jsr.2019-0525.
20. Gattie, Eric et al. "The Effectiveness of Trigger Point Dry Needling for Musculoskeletal Conditions by Physical Therapists: A Systematic Review and Meta-analysis." The Journal of orthopaedic and Sports Physical Therapy Vol. 47, 3 (2017): 133-149. doi:10.2519/jospt.2017.7096.
21. Chys, Marjolein et al. "Clinical Effectiveness of Dry Needling in Patients with Musculoskeletal Pain-An Umbrella Review." Journal of clinical medicine vol. 12,3 1205. 2 Feb. 2023, doi:10.3390/jcm120312052.
22. Park S-H, Kim S-H, Kim M, Jung JB, Choi K, Lee D, et al. A novel therapeutic approach targeting spinal accessory and dorsal scapular nerves for the relief of posterior neck, trapezius, and interscapular pain. J Clin Med. 2024;13(7754). doi:10.3390/jcm13247754.