SYSTEMATIC REVIEW

EFFECTIVENESS OF DRY NEEDLING IN THE MANAGEMENT OF UPPER TRAPEZIUS TRIGGER POINTS: A SYSTEMATIC REVIEW

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ABSTRACT

Introduction: Dry needling is relatively new invasive technique, which could be used for the management of myofascial trigger points. Dry needling is considered as one of the effective treatment techniques for reducing pain as it enhances pain threshold levels related to myofascial trigger points. This research aims to assess evidence for dry needling effects and its general feasibility in reducing pain, increasing pain threshold and increasing ROM of cervical spine.

Material & Methods: A systematic review was conducted according to PRISMA guidelines. Relevant searches were performed through PubMed and PEDro databases. Eligible quasi-experimental and randomized controlled trials using different Mesh terms related to upper trapezius trigger points and dry needling intervention were used. Three main outcome parameters (pain, pain pressure threshold and ROM) were assessed on short-, medium- and long-term effects. Quality of the included studies was assessed while using PEDro scale.

Results: Initial searches produced 41 relevant articles which were reduced to 11 articles after screening. The included studies provided evidence regarding effectiveness of dry needling for decreasing pain and increasing pressure threshold compared to sham /kinesio-taping/manual pressure or no intervention. Improvement in ROM by dry needling remained ineffective in the included trials.

Conclusion: The evidence of moderate quality suggested that dry needling performed by physiotherapist are effective compared to other techniques in patients of upper trapezius points to decreasing pain and increasing pain pressure threshold. Studies with relatively with low quality suggested effectiveness of range of motion in the patients with upper trapezius trigger points.

Key Words: dry needling, trigger pain, upper trapezius muscle

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INTRODUCTION

Myofascial trigger points (MTrPs) are palpable nodules within the taut band of skeletal muscle's fascia, 2-10mm in size, caused by constant contraction of muscles, certain repeated movement or stress related to muscle tension.[1] MTrPs are classified as either active or latent trigger points.[2] Active trigger point (AMTP) causes referral pain either on palpation or in certain movements; stretch or compression.[3] Latent myofascial trigger point (LMTP) is one that does not cause spontaneous pain.[4] Trigger points have adverse effects on activities of daily life and causes neck pain and occupational disability in areas like shoulder.[5] The trapezius muscle in the shoulder area is one the mostly affected muscles.[6] Common manifestation include a painful taut band in the belly of muscle, pain in cervical region, stress headache, vertigo and limited range of motion in cervical and shoulder regions.[5,7] Pain due to myofascial trigger points is a prevailing pathology in leading countries, with epidemiological studies showing that up to 85% of the general population at least experienced single episode of chronic myofascial pain throughout their lifespan.[8] The spread of knots was 21% of patients in department of orthopaedics, 30% of patients in medical clinics with peak discomfort and 85% -93% at pain care centres.[9] Patients reported 100% prevalence of chronic myofascial pain with non-specific neck pain. Prevalence of myofascial trigger points in muscles vary and were reported as follows; trapezius muscles 93.75%, levator scapulae 82.14%, multifidi 77.68% and splenius cervicis 62.5%.[10] Several ways of therapeutic management have been suggested for MTrPs.[11-13] Rehabilitation therapy plays important part in the management and control of symptoms in patients with MTrPs.[9] Non-invasive techniques used in physical therapy comprise laser therapy, stretching, transcutaneous electrical nerve stimulation, therapeutic ultrasound, and biofeedback therapy. Dry needling (DN) is an invasive technique, which is mostly used for the management of MTrPs.[10] It is commonly executed by a clinician using a 32-gauge 80 acupuncture needle injected into the palpably painful nodules using a superficial (10-20 mm) or deep (25-40mm) needling technique. Provocation of one or more local twitch responses is an objective of dry needling which of compensate pain due to secondary to MTrPs.[14]

Sedighi et al. suggested implementation of dry needling in the upper trapezius muscles for an increased in function for the patients with trigger point tenderness. Manafnezhad et al. reported application of dry needling for the treatment of upper trapezius MTrPs. Pecos et al. proposed application of dry needling into the trapezius muscle active trigger points for decreasing pain and pain pressure threshold. Abbaszadeh et al. showed that dry needling appeared to be effective in improving symptoms and deactivating active MTrPs**.** Ziaeifar et al. reported improvement in the intensity of pain and pain threshold by use of dry needling. Gerber et al. concluded significant effects on pain reduction with dry needling. Segura et al. showed significant reduction in pain intensity of upper trapezius muscle with dry needling.

In Pakistan, researches conducted in the field of physiotherapy focused on the use of manual pressure techniques to handle the trigger points and no work was done on the techniques of dry needling. Thus, a research gap was identified. This research aimed to provide strong evidence for dry needling effects and its general feasibility in reducing pain by enhancing the pain threshold.

MATERIAL AND METHODS

The inclusion criteria for this systematic review included all randomized controlled trials and quasi experimental studies published in English language, addressing the effectiveness of dry needling in patients of upper trapezius trigger points without any restrictions on subject age, sex or ethnicity. Practicing the PICO (Participant, Intervention, Comparison and Outcome), Studies evaluating (I) the effects of DN (P) in patients with TPs in the upper trapezius (C) compared with no treatments (O) on functional ROM, pain intensity and pressure threshold were included in this systematic review. The years considered were earliest record August 2020. All unpublished articles, articles other than English language, Editorials, Short communications, Conference papers were excluded.

Literature searches were performed using PubMed and Physical Therapy evidence database from inception 1997 to August 16, 2020. The latter database started from 1998 and PubMed started from 1997. Last literature was searched on August 20, 2020.

In this systematic review, eligible studies were included with regard to participants with upper trapezius trigger points treated through dry needling intervention by physical therapist. Both randomized controlled trials and quasi experimental studies were included. Primary investigators searched the electronic databases PubMed, PEDro and Google scholar independently. Initially, searches were performed in PubMed using the combination of the following MeSH terms or search terms: (“upper trapezius trigger point” [Mesh] OR “upper trapezius myofascial trigger pain” [Mesh] OR “upper trapezius triggers pain”) AND (“Trigger Points” [Mesh] OR “Trigger Area”) AND (“dry needling” OR “myofascial trigger point dry needling” OR “trigger point dry needling”).

After whole research, we imported references into Endnote X7 in order to remove duplicates. For study selection, the criteria were only applied to the title and abstract of studies. For all the studies of eligible criteria, articles of full texts were retrieved. The retrieved studies or article references lists were also checked to find additional studies or articles. Initially, three independent reviewers (UI, BK and NF) screened the studies titles and abstracts and excluded the irrelevant studies (which were not according to eligibility criteria). In case where the title and abstracts were not sufficient to determine eligibility criteria than full texted articles were studied. Discrepancies between three viewers (UI, BK and NF) were resolved by consensus.

Data extraction was performed by the three independent reviewers, and the extracted data were compile into a standardized table form. Data included the first author, publication year, study design, country, and sample size, number of males and females, mean age of the population, type of intervention (technique, and duration), main outcomes, time to outcome, and additional outcomes reported. Three independent reviewers (UI, BK and NF), using the PEDro (Physiotherapy Evidence Database) score, analyzed included studies.

RESULTS

Initial searches performed through PubMed and PEDro produced 22 and 11 research articles, respectively. Additional searches performed while using Google Scholar produced 30 more articles. In total 63 articles, 22 articles were duplicates which were removed thus leaving a total of 41 articles. Titles and abstracts of remaining 41 articles were screened and 30 articles were excluded because they were not fulfilling the eligibility criteria. After these 11 full texted articles were assessed for eligibility and these 11 studies were included in qualitative synthesis. Please see figure 1 for study selection criteria.

This systematic review focused on effectiveness of dry needling in the treatment of upper trapezius myofascial triggers and included 11 studies: 10 studies were randomized controlled trials (dry needling compared with other interventions) and one study was quasi experimental. The eligibility criteria were remarkably same throughout the studies (table 1). Out of these 11 studies, the total number of participants were 457 in which the majority of articles studied were dry needling technique effectiveness in the upper trapezius trigger pain management. The ten studies used control groups and compared dry needling with variety of other techniques. In all studies, dry needling was performed by physical therapists and its effectiveness was measured from baseline immediately.

PEDro quality score assessed the risk of bias individually in the studies which was done by UI, BK and NF. The PEDro scale consisted of total 11 criteria, of which 10 criteria is devoted to the quality score, representing risk of bias and methodological quality assessment (table 2). A low-quality study represents scoring between 1/10 to 4/10, moderate quality study scores between 5/10 and 6/10, and studies scoring 7/10 to 8/10 represent high score. For the details of result kindly see table 1. Moreover, results have been thoroughly presented and discussed in the discussion part.

DISCUSSION

The aim of this study was to sum up evidence about dry needling effectiveness in patients of upper trapezius trigger points. Intensity of pain, PPT and functional range of motion were the outcome measures of this study. In 11 studies, only two studies[14,18] showed the dry needling effects in the trigger pain of upper trapezius

while remaining studies showed the intervention of dry needling with other techniques. There is moderate to high evidence of controlled trials [4,5,7,9,15,17-20] showing dry needling as effective intervention for increasing pain pressure threshold and reducing pain intensity compared with other or no interventions. Among all, five studies [4,5,14,17,19] reported pain values before baseline and immediately after treatment on visual analogue scale, while six studies [7,9,15,16,18,20] used numerical pain rating scale, the pain pressure threshold was reported before and after treatment through algometer.

There are discrepancies between the studies regarding dry needling that should be narrated when discussing the conclusion. The comparison and contrast among study is complicated because of the contention in techniques, for example, techniques compared, size of needles used and amount of time needle inserted.

Pain intensity

Earlier studies revealed a substantial reduction in the VAS for pain in dry needling group at short term, compared with the baseline in the Kinesio taping group although with a low quality of evidence.[19] The study showed that VAS and BPI as means scores were improved after treatment.[14] Participants who received dry needling had a compelling effects in decreasing the pain intensity in contrast with the patients receiving sham needling.[15] There was significant difference in pain intensity in both dry needling and PB groups compared to PR group.[4]

Pain pressure threshold

Pain pressure threshold significantly improved in all patients receiving dry needling compared to sham needling technique.[15] There was a significant increase in the short and medium stages in dry needling group and only in the medium-term in comparison to KT.[19] An expressive improvement in patients' pain threshold receiving dry needling was observed.[9] Application of both Sham SCS and dry needling 1 session in patients with upper trapezius tightness resulted in pain improvement.[17]

Range of motion

The degree of improvement in the range of motion of neck was significantly higher in patients in dry needling group compared to sham needling group.[15] patients in dry needling group showed superior clinical outcomes compared to the patients in sham needling; it was less effective in terms of other treatments in improving function and ROM gain during the treatment.[19] Patients in SDN group improved ROM only in lateral flexion while patients in DDN significantly improved all ROM including flexion, lateral flexion and extension.[17] Both ipsilateral and contralateral movements of the cervical region improved after the dry needling together with improvement in comparison group.[14]

CONCLUSION

The evidence having moderate quality level on PEDro suggested effectiveness of dry needling performed by physiotherapist compared to other techniques in patients with upper trapezius trigger points. The effectiveness of the dry needling was measured in terms of decreasing pain, increasing pain pressure threshold and improving functional range of motion. Studies with low quality levels measured by PEDro suggested effectiveness of dry needling in terms of improving range of motion in the patients with upper trapezius trigger points.

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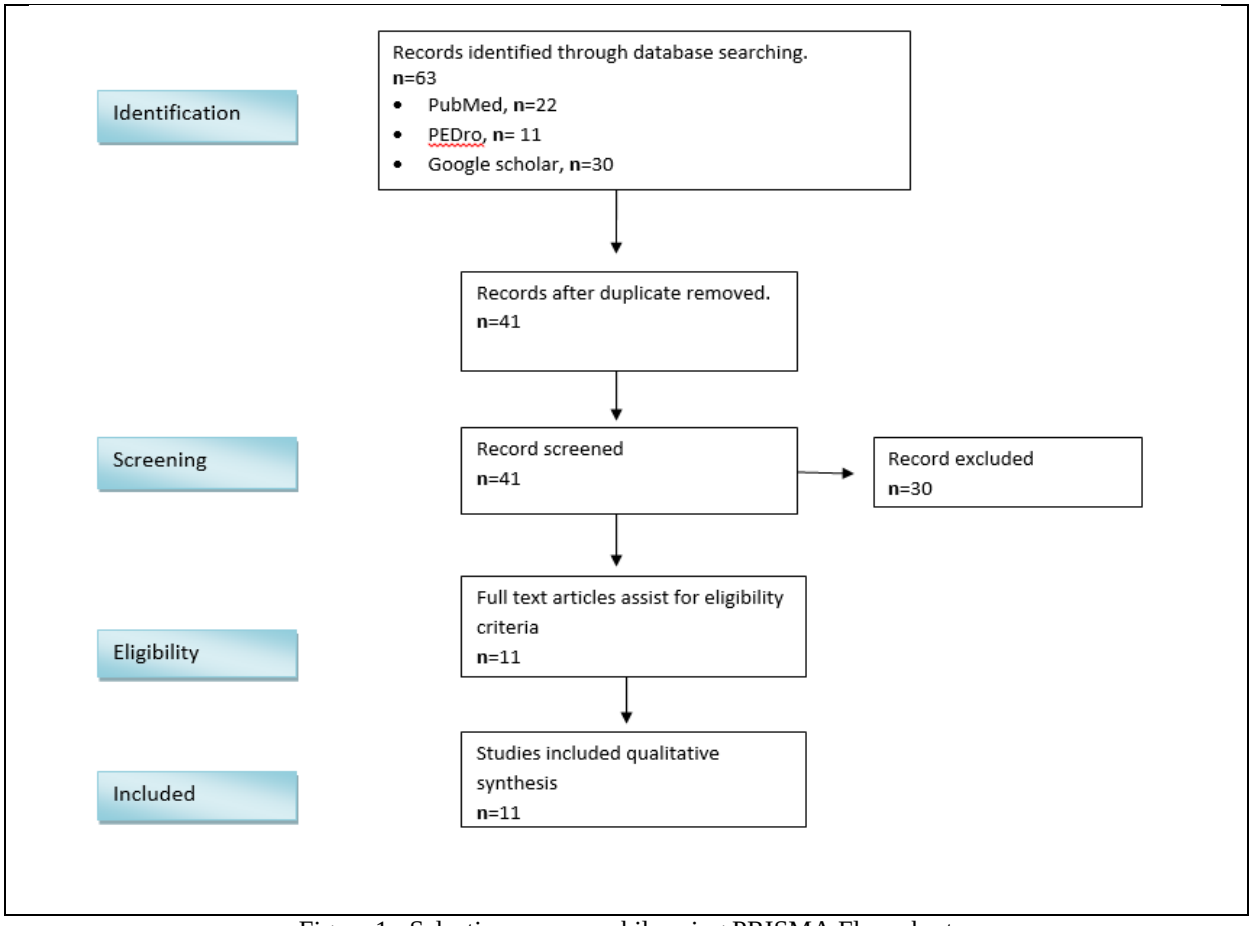

Figure 1: Selection process while suing PRISMA Flow chart

Table 1: Summary of the included studies

Study	Participant	Intervention			Main outcomes			Additional outcomes
					Pain	PPT	ROM	
Tsai et al. [15] 2010/Taivan/RCT	35 participants selected (14 male participants and 21 female participants) with MTrps in upper trapezius muscles	EG: 17 participants of age, years (range) 46.4 ± 10.4 (22-68) (male:7, female:10) were assigned to dry needling		CG: 18 participants of age, years (range) 41.5 ± 12.2 (25-68) (male:7 and female:11) were assigned to sham needling	Pain was reported before and immediately after DN through NPS	For PPT 3 repetitive measurements were perform at interval of 30-60 seconds	Active ROM was measure by a goniometer before and after the treatment.	Not reported
Abbaszadeh et al. [16] 2013/USA/Prospective clinical trial	30 participants (15 healthy participants and 15 participants with active MTrPs in upper trapezius)	EG: 15 participants of aged 20-40 years were assigned to dry needling.		CG: 15 participants of aged 20-40years were healthy	Pain intensity was recorded through NPS between 9:00 and 12:00 before and immediately after DN treatment	PPT was measure through pressure algometer three times at 40 s intervals.	Not Reported	SSR was assessed through (A Tonnies electromyography instrument) NMJR was assessed by technique of (repetitive nerve stimulation)
Gerber et al. [14] 2015/US/Quasi experimental	52 participants of MTrps were recruited (23 male,33 female)	52 participants with mean age of 35.8 years received three treatments of DN per week.			Pain was measured after the 3rd treatment at 3 weeks through VAS	PPT was obtained using pressure algometer	ROM was determined in 3 planes of movement using CROM at the end of treatment	Disability was measured by Oswestry disability scale POMS was determined by (SF36), a health status questionnaire
Segura et al. [17] 2015/Spain/RCT	34 participants (male:9 and female:25) of upper trapezius active MTrps	EG: 12 participants (male=4, female=8) of mean age (9.5yr) received 1 session of DN in total 3weeks	CG: 10 participants (male=3, female=7) of mean age (11.5yr) received 2 session of SCS in total 3weeks	CG: 12 participants (male=2, female=10) of mean age (9.5yr) received Sham SCS in total 3weeks	Pain perception was assessed using VAS before and after treatment	For PPT 3 repetitive measurements were performed through analogue algometer	Not reported	NDI questionnaire assessed perceived level of disability as a result of neck pain
Sedighi et al. [18] 2016 /Iran/RCT	30 participants (8male & 22 female) with trigger points of sub occipital and upper trapezius muscles	EG:15 participants of aged 19-60 years (male =11, female =4) received 1 session of SDN		CG:15 participants of aged 19-60 years (male =11, female =4) received 1 session of DDN	Pain intensity was calculated through NRS at baseline, immediately and		Neck ROM was assessed in 3 planes (Flexion, extension, lateral flexion) through Rating scale	HI was calculated (Multiplying the headache intensity in the days with headache)

				1 week after treatment			Muscle tenderness was measured using for rating scale
Ziafier et al. [9] 2016/Iran/RCT	31 women participants with MTrps of upper trapezius	EG: 14 participants of age 20-48 years received 1 week treatment session	CG: 17 participants of aged 20-48 years received 1 session of IC	Pain intensity calculated through NPS before and after treatment	PPT measured through pressure threshold algometer before and after treatment	Not reported	Not reported
Abbaszadeh et al.[7] 2017/USA/RCT	40 participants: (20 patients: male=3 female=17 with Upper trapezius latent MTrps and 20 healthy volunteer: male=4, female=16 of active MTrps)	EG: 20 participants (aged 31.7 ±10.8 years) received 1 session of DN	CG: 20 participants were healthy (aged from 30.4±5.6 years) received 1 session of DN	Pain intensity was measured using NRS before and immediately after the intervention	PPT was assessed through digital ergometer before and immediately after the intervention	Not reported	SSR was recorded at base line and immediately after DN at three repetitive stimulations at 1 min interval by toennies neuro screen plus NMJR was assessed using RNS technique
Tabatabaiee et al. [4] 2018/Iran/RCT	60 men (mean± SD age, 23.6 ± 2.1 y) with latent MTrps in upper trapezius	EG: 20 men with age of (23.6 ± 1.8) received DN for 2 weeks	CG: 20 men with age of (23.6 ± 1.8) received PR for 2 weeks	CG: 20 men with age of (23.9 ± 3.09) received PB for 2 weeks	Pain intensity was measured before and after intervention using VAS in all sessions	PPT was measured through digital algometer before and after treatment in all session	Active cervical ROM was measured by CROM instrument	Not reported
Ziaeifar et al. [5] 2019/USA/RCT	33 participants of trigger point in the upper trapezius.	EG: 16 participants with age (30.06± 9.87) received DN for three session over one week	CG:17 participants with age (26.5± 8.57) received trigger point compression for three session over one week	Pain intensity assessed using VAS before and immediately after treatment session.	Not reported	Not reported	Neck disability was measured before and after treatment through NPQ Shoulder disability was measured by DASH
Dogan et al. [19] 2019/turkey/RCT	42 female participants of MTrps in upper trapezius	EG: 19 participants (Age (years) Mean ± SD: 33.6 ± 09.1) received DN (performed three times five days apart)	CG: 23 participants (Age (years) Mean ± SD: 32.4 ± 12.4) received KT (tape was applied three times five days apart)	Pain intensity was measured using at baseline, at short- and medium-term stages after treatment (VAS)	PPT was measured by taking the average of the three measurements in one-minute intervals using	Cervical ROM was assessed with a standard 0–180-degree goniometer before and after treatments	Not reported

					analogue algometer		
Manafnezhad et al. [20] 2019/Iran/RCT	70 participants (women=49, men=21) of MTrps in upper trapezius	EG: 35 participants (Age (years) Mean ± SD: 39.2 ± 7.2) received DN once a week for total of 3 session.	CG: 35 participants (Age (years) Mean ± SD: 37 ± 9.1) received ESWT once a week for total of 3 session.	Pain intensity was measure using (NPRS) four times before each treatment session and 1 week after last session.	PPT was measured using digital algometer four times before each treatment session and 1 week after last session.	Not reported	Disability was measured by NDI questionnaire

MTrps: myofascial trigger points, DN: dry needling, SCS: strain counter strain, PR: pressure release, PB: phonophoresis with betamethasone, KT: kinesiotaping, EG: exposed group, CG: control group, VAS: visual analogue scale, NDI: neck disability index, PPT: pain pressure threshold, ROM: range of motion, NPQ: Northwick Park Neck Pain questionnaire, ESWT: extracorporeal shock wave therapy, DASH: Disability of the arm, hand and shoulder, NRS: numerical rate scale, NMJR: neuromuscular junction reaction, CROM: cervical range of motion machine, SSR: sympathetic skin response, POMS: profile of Mood States, SF-36: short form 36, NPRS: numerical pain rating scale, NPS: numerical pain scale,

PEDro Scale Scores for Individual Study

Study	1	2	3	4	5	6	7	8	9	10	Total
Tsai et al. (15)	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	8/10
Abbaszadeh et al. (16)	No	No	Yes	No	No	No	Yes	Yes	Yes	No	4/10
Gerber et al. (14)	No	No	Yes	No	No	No	Yes	Yes	Yes	Yes	5/10
Segura et al. (17)	Yes	Yes	No	Yes	Yes	No	Yes	No	Yes	No	6/10
Abbaszadeh et al. (7)	No	No	Yes	No	No	No	Yes	No	Yes	Yes	4/10
Sedighi et al. (18)	Yes	No	Yes	No	No	No	Yes	No	Yes	Yes	5/10
Ziafier et al. (9)	Yes	Yes	Yes	No	No	No	Yes	No	Yes	Yes	6/10
Tabatabaiee et al. (4)	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	7/10
Ziafier et al. (5)	Yes	Yes	Yes	No	No	No	Yes	No	Yes	Yes	6/10
Dogan et al. (19)	Yes	No	Yes	Yes	No	No	Yes	No	Yes	No	5/10
Manafnezhad et al. (20)	Yes	No	No	Yes	Yes	No	Yes	No	Yes	Yes	6/10

PEDro: Physiotherapy Evidence Database; 1 random allocation,2 concealed allocation, 3 baseline comparability, 4 blinding of subject, 5 blinding of therapists, 6 blinding of assessors, 7 more than 85% follow-up, 8 intention-to-treat analysis, 9 reporting of between-group statistical comparisons, 10 reporting of point measures and measures of variability