



# The role of a dry needling technique in pain reduction

Eldad Kaljić\*, Namik Trtak, Dijana Avdić, Samir Bojičić, Bakir Katana, Muris Pecar

Department of Physiotherapy, Faculty of Health Studies University of Sarajevo, Sarajevo, Bosnia and Herzegovina

## ABSTRACT

**Introduction:** Dry needling is a therapeutic procedure using the insertion of thin needles through the skin into myofascial trigger points (MTrPs), muscular or connective tissue with the aim to reduce pain intensity. The objective of this systematic review is to analyze the literature for the efficacy of the dry needle technique in pain reduction in conditions of musculoskeletal pain caused by MTrPs.

**Reference Sources:** Web of Science, Scopus and EBSCOhost database were searched for studies and e-books published from January 2010 to December 2018.

**Studies Selection:** We included randomized controlled studies, prospective and longitudinal studies, and case studies which analyzed the efficacy of dry needling for musculoskeletal pain reduction.

**Data Extraction Method:** The studies, which satisfied criteria for inclusion were further analyzed. The primary instrument of the evaluation was pain intensity analyses.

**Results:** Dry needling treatment is efficient in pain intensity reduction in patients who suffer musculoskeletal pain and is more efficient compared to sham dry needling treatment. In addition, different techniques of dry needling are efficient in the treatment of myofascial pain syndrome.

**Conclusion:** Based on systematic review of the literature, dry needling, independently or as an addition to other intervention, is recommended for treatment of musculoskeletal pain conditions caused by myofascial trigger points. Various techniques of dry needling treatment are almost equally efficient in myofascial pain intensity reduction.

**Key words:** Dry needling; myofascial pain syndrome; pain intensity; trigger point

## INTRODUCTION

The myofascial trigger point (MTrPs) is the very irritable place in the narrow belt of skeletal muscle or myofascial, which is painful at touch or pressure

and can lead to a characteristic referred pattern of pain, tenderness or motor dysfunction of the muscle. Pressure on the painful trigger point may cause pain of the surrounding area called myofascial pain syndrome (MPS) (1,2).

Predisposing factors for the development of the myofascial syndrome are incomplete muscle contractions, unusual eccentric contractions, overload, and muscle fatigue, which may result in mechanical body dysfunction as an irregular front position of the head, hypermobility of joints, ergonomic stress,

\*Corresponding author: Eldad Kaljić, Faculty of Health Studies University of Sarajevo, Bolnička 25, 71000 Sarajevo, Bosnia and Herzegovina. E-mail: ekaljić@gmail.com

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poor body standing, and scoliosis. Trigger points are classified as active and latent. The active trigger points induce local and referred pain or paraesthesia while latent trigger points induce symptoms only at prior mechanical stimulation of the point (3).

The first stage in the development of a trigger point is the establishment of a narrow belt in the muscle as a result of an abnormal potential motoric plate due to excessive release of acetylcholine neuromuscular connections on the motor plate. EMG interpretation of such condition is a "spontaneous electrical activity" (SEA) so that the trigger point irritation can be objectively evaluated with the differences of the amplitudes change of SEA. Constant stimulation of the motor points can lead to a continuous contraction of sarcomere leading to ischemia and hypoxia. Accordingly, they release vasoactive and allogenic substances (noradrenaline, histamine, serotonin, and bradykinin), which stimulate the peripheral nociceptors (peripheral sensitization). Continual stimulation of peripheral nociceptors may stimulate neurons of spinal cord rear roots and supraspinal structures, leading to the clinical forms of hyperalgesia, allodynia, and referred pain (central sensitization) (4,5).

Myofascial pain origin was brought in focus in the middle of the past century by Dr. Janet Travell, who discovered that injection of the hypertonic solution in a MTrP causes referral pattern of pain, while injection of analgesic drugs leads to a reduction of pain intensity and the sensitivity of muscles to touch. Further studies have shown that insertion of a needle without the analgesic drugs leads to a reduction of pain intensity, after which began the development of the techniques of dry needling (3). The dry needling, also known as intramuscular stimulation, is a relatively new technique in the arsenal of methods of pain intensity reduction (6).

The dry needling is the therapeutic procedure which involves insertion of a fine needle through the skin into MTrPs or connective muscle tissue to reduce the pain intensity. The technique is used for the treatment of skeletal muscles dysfunction, of fascia and connective tissue in the end to minimize the continuous peripheral nociceptive stimulation and for the restoration of damaged structure and function of the body (7).

Dry needling is applied by superficial (Baldry model) or deep technique (Travell model). Deep technique acts by deactivation of the trigger point for local twitch response (LTR). A LTR is a reflex of the spinal cord, which is characterized by involuntary contraction of a contracted thin band of muscles induced by a briefly sudden blow to the muscle or by inserting a thin needle. The deep dry needling technique is associated with a reduction of the local intensity and referral pain, improving the range of motion, decrease in trigger point irritation, stabilizing chemical and pH environment, and restoring the local circulation. The superficial dry needling technique is considered that activates A $\beta$  fibers which lead to an inhibition in the spinal cord by obstruction of synaptic transmission between the A $\delta$  and C fibers and cells of the spinal cord dorsal horn due to their slower transfer of impulses. It also activates the endogenous opioid system, i.e., the three main groups of opioids  $\beta$ -endorphin, enkephalins, and dynorphins, whose analgesic effects are reflected to inhibit directly the transmission of afferent nociceptive information from the rear horns of the spinal cord (1,4,8).

The aim of this systematic review of the literature is to determine, on the basis of the available studies, the efficacy of the dry needling technique in pain intensity reduction of aching musculoskeletal painful conditions induced by MTrPs.

## METHODS

### Search strategy

We performed a search of Web of Science, Scopus and EBSCOhost databases for e-books and articles published from January 2010 to December 2018. We included randomized controlled studies, randomized clinical studies, prospective studies, longitudinal studies, and case reports with various forms of musculoskeletal pain conditions treated by dry needling technique compared to physical therapy or sham dry needle technique. We also included studies which compared the efficacy of different handling techniques with needles for dry needling as well as the treatment of both active and latent trigger points. We searched for the following terms: "Dry needling," "electro needling," "MTrPs," "MPS," "musculoskeletal conditions," and "trigger point stimulation."

### Criteria for inclusion and exclusion

In the systematic literature review we included studies consistent with the above strategy of literature survey, including patients diagnosed with painful musculoskeletal condition, one or more control measurement after the treatment, instrument of pain intensity evaluation, comparison of dry needling techniques before and after the treatment, the other treated and placebo dry needle techniques or various techniques of dry needling treatment of painful musculoskeletal conditions.

### Study selection and data extraction

Articles that met the criteria for inclusion in the systematic review of the literature underwent a detailed evaluation. The data extracted were: name of the first author, study design, the country and city of study, the number of patients in the study and control groups of research, gender, and age structure of the patients, the year of the research publication, the main objectives, methods and instruments of research, and research results and conclusion.

## RESULTS

### Selection of studies

A total of 13 studies with 540 patients were selected out of 496 articles found in Web of Science, Scopus, and EBSCOhost.

### Study characteristics

The reviews, which research met the above criteria for inclusion, had been accomplished in Cyprus, Iran, India, Australia, Spain, USA, and Canada. Our systematic searching of the literature was focused on the efficacy of the dry needle technique in painful musculoskeletal conditions and included 13 studies: Two reviews on painful lumbar syndrome (LBS) (one review on acute LBS and one review on radicular LBS), three reviews on pain in the upper part of Trapezius muscle, and one review on pain in the cervical spine, one review on plantar pain of heel, one review on effects of dry needle stimulation of quadriceps femoris muscle and pain intensity of patients after operative reconstruction of front cruciate ligaments of the knee, one review on effects of dry needle stimulation of infraspinatus muscle on pain intensity at patients with painful shoulder, one

review on effects of dry needle technique on pain reduction, one review on occipital neuralgia, and one review on effects of two different techniques of dry needle stimulation of trigger points. The survey and characteristics of the studies included in the systematic review of the literature are presented in Table 1.

### Comparison of dry needling effects and other forms of pain intensity reduction treatments

We included two studies in which were compared effects of dry needling and standard physical treatment for pain intensity reduction in patients with the painful LBS.

Tüzün et al. investigated the effects of dry needle technique (study group) and the standard physical treatment (control group) in the reduction of the pain intensity in patients with chronic LBS. A significant decrease in pain intensity was achieved of pain in the study group (visual analog scale [VAS] 2.5 before the treatment, VAS 0.6 after the treatment) compared to the control group (VAS 2.4 before the treatment, VAS 3.3 after the treatment) (9).

The influence of the standard physical treatment, with the addition of dry needling technique, in reduction of the pain intensity in patients with two radicular discogenic LBS (study group) was investigated by Mahmoudzadeh et al. The condition evaluation of the study group was performed before treatment, and directly 2 months after the treatment and was compared to the standard physical treatment (control group). It was found a more significant reduction of pain intensity in patients of the study groups (study group 78.96/37.24/25.17 and control group 74.13/45.51/42.41) (10).

In the literature review was also analyzed three reviews on the effects of dry needle techniques on trigger points of the upper/descending part of trapezius muscle.

Abbaszadeh-Amirdehi et al. have investigated the effects of dry needling in patients with trigger point of upper/descending part of trapezius muscle compared to healthy volunteers. The pain intensity was significantly reduced in patients of the study group (VAS 5 before treatment 5/after treatment 2) in healthy volunteers was decreased the pressure pain threshold (11).

**TABLE 1.** Survey of research studies

Citation	Design of study, state/ city	Number of participants (MF)	Age of subjects	Year of publication/ Diagnosis	Main objectives	Participants and methods	Results	Conclusion
Tüzün et al. (9)	RCS, Famagusta, Northern Cyprus	Study group (n=18) (10/8) control group (n=16) (4/12)	35-70 years	2017 chronic LBS	The objective of the research was to compare the efficacy of dry needling technique and the usual program of physiotherapy in patients with chronic lumbar pain syndrome caused by lumbar discus hernia	Study group: Dry needling, 2 times weekly, 6 sessions (20 minuta), control group: A home program of workouts addition hot pack, six sessions. Research instruments: Pain intensity (McGill pain questionnaire), number of trigger points and pain sensibility (palpation), Beck Depression inventory, Kinesiophobia scale	Treatment of patients of the study group showed more significant results in reduction intensity of pain (study group 2.5/0.6, contr. group 2.4/3.3), variables of trigger point (3.5/6.6) in the reduction of fear of mobility (32.9/42.3). Effects of reduction of depressive symptoms were similar in both study groups (7.5/7.5)	Dry needling is an effective technique in intensity reduction of pain, sensibility, and number of trigger points and fear of mobility in patients with lumbar pain syndrome caused from lumbar discus hernia
Mahmoudzadeh et al. (10)	RCS, Isfahan, Iran	Study group (n=29) (14/15) control group (n=29) (12/17)	Study group (36.1±7.8) control group (35.6±8.5)	2016 radicular LBS	The objective of the research was to compare the effects of dry needling technique and standard conservative approach on pain intensity and functional status in persons with discogenic radicular lumbar pain syndrome	Study group: Standard physical treatment and dry needling (45+15 min), control group: Standard physical treatment (45 min), 10 sessions. The patients' condition was evaluated before the treatment and after the completion and 2 months after the treatment. Instruments of research: VAS, persian version of the Oswestry functional disability questionnaire	The intensity of pain and stage of disablement were significantly reduced in both study groups after the conducted treatment, which was more significant 2 months after the treatment Study group (78.96/37.24/25.17) Cont. group (74.13/45.51/42.41)	Both programs of therapy significantly improve the pain intensity and stage of disablement directly after it and 2 months after the treatment, still an additional application of dry needle technique can improve effects of standard physical treatment

(Contd...)

TABLE 1. (Continued)

Citation	Design of study, state/ city	Number of participants (M/F)	Age of subjects	Year of publication/ Diagnosis	Main objectives	Participants and methods	Results	Conclusion
Abbaszadeh-Amirdehi et al. (11)	Prosp. control study Bapain, Iran	Study group (n=20) control group (n=20)	Study group (31.7±10.8) control group (30.4±5.6)	2017 Miofas. pain syndrome Trapezius muscle	The objective of the research was the evaluation of current neurophysiologic and clinical effects of dry needle technique in patients with myofascial trigger points of the upper/ descendent part of trapezius muscle	Study group: Patients with myofascial trigger points of the upper part of trapezius muscle and control group of healthy volunteers implemented treatment of one session of dry needle technique. Research instruments: The primary results are the reaction of neuromuscular connection (NMJR) and the sympathetic reaction of skin (SSR), secondary result was the intensity of pain (PI) and the threshold of pain on pressure (PPT)	SSR of patients in the study group was significantly reduced; reaction of the neuromuscular connection (NMJR) was reduced. Threshold of pain to pressure (PPT) was increased in patients in the study group but decreased in the healthy volunteers intensity of pain (PI) decreased in patients of the study group (before the treatment 5 - after the treatment 2)	Research showed that one session dry needle technique aimed to activate myofascial trigger point reduces hyperactivity of sympathetic nerves system and irritability of motor muscles endplate. The technique is effective in reduction of symptoms and deactivation of active myofascial trigger points
Gerber et al. (12)	Prosp. study, Fairfax, USA	I study group (n=45) (13/32)	I study group (37)	2017 trigger point trapezius muscle	The objective of the research was to find if the effects of dry needle technique at the treatment of myofascial trigger points, sustainable 6 weeks after the treatment implementation	Patients with the pain of the cervical spine and myofascial trigger point in the upper part of trapezius muscle underwent 3 sessions of DN treatment. The patients' condition was evaluated 6 weeks after the treatment. Primary instruments of evaluation: VAS, brief pain inventory, the status of myofascial trigger points (active, latent i non palpable knot). Secondary instruments evaluation: Threshold of pain at pressure, Profile of mood state, Oswestry disability index, SF-36 and extent of mobility of the cervical spine	After 6 weeks sustained certain improvement of pain intensity (reduction VAS -2.29) of the functional activity, and IDI score. The lateral curve of neck and pressure pain threshold in patients with unilateral trigger point maintained improvement. Found that the patients who before the treatment had higher VAS score have the risk of non-reaction to DN treatment and the patients who after the treatment have significant reduction of VAS have higher chances to maintain such effect	The conclusion of the research is DN treatment brings to sustainable reduction intensity of pain, and intervention with significantly reduced intensity of pain connects with durable clinical response

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**TABLE 1. (Continued)**

Citation	Design of study, state/ city	Number of participants (M/F)	Age of subjects	Year of publication/ Diagnosis	Main objectives	Participants and methods	Results	Conclusion
Hesari et al. (13)	RCS, Teheran, Iran	Dry needling group (n=17) Physical therapy group (n=17)	Dry needling group (23.5) Physical therapy group (23.6)	2016 trigger point trapezius muscle	The objective of the research was to compare long-term effects of dry needling and physical treatment in the healing of myofascial trigger points in the upper part of Trapezius muscle.	Study group: Dry needling treatment during 7 procedures, 2 times weekly (30 s). Control group: Physical treatment of 10 sessions, 3 times weekly (hot pack, TENS, US). Research Instruments: VAS, pressure pain threshold of range of motion of cervical spine, function of upper extremities	After the treatment was registered significant reduction of pain intensity and increase range of motion in cervical spine, pressure pain threshold and function of upper extremities, as the dry needling treatment showed more significant improvement compared to physical treatment (0.96/0.58)	Conclusion of the research was that dry needling and physical treatment are effective in treatment of myofascial trigger point in upper part trapezius muscle, including that dry needling treatment showed more significant improvement compared to physical treatment (0.96/0.58)
Shanmugam and Mathias (14)	Longit. study, Mangaluru, India	Study group (n=21) (13/8)	Study group (24.04)	2017 acute neck pain	Objective of the research was to evaluate current effects of paraspinal dry needling technique on acute neck pain and movement deficit in patients with antalgic prone position of neck caused by acute block of facet joints	The patients were treated with one session of paraspinal dry needling technique for 12–15 min. Research instruments: VAS, handheld goniometer. Control measurement implemented 24 h and 7 days after the treatment	VAS before the treatment 73.47, VAS directly after the treatment 18.80 and improved range of mobility of the cervical spine. VAS after 24 h 5.85 and VAS 1 week after implemented treatment 2.12	Paraspinal dry needling technique is effective method for the achievement of movement without feeling of the pain of the cervical spine in patients with the antalgic curved position of the neck caused by an acute block of facet joints
Anandkumar et al. (15)	Case report Chilliwack Canada	Case report (n=1)	Case report (42) female	2017 Non specif. pain in thoracic spine	The objective of the research was to find efficacy of conservative treatment of nonspecific pain in thoracic spine by using part of dry needling fascia treatment and workout treatment	The patient was treated by fascial dry needling technique 2 times weekly, 2 weeks (15) min. Research instruments: Numeric scale of pain (NPRS), specific functional scale of patients (PSFS), Functional Rating Index (FRI), Global Rating of Change (GROC).	It was found that the patient did not feel pain in thoracic part of spine and did not feel discomfort at doing various activities (NPRS before treatment 7/10, after treatment without of pain). Evaluation after 3 months found that the patient feels without pain and fully functional	Treatment of nonspecific pain in thoracic part spine using dry needling treatment of fascia and treatment by workouts is fully effective

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**TABLE 1. (Continued)**

Citation	Design of study, state/ city	Number of participants (MF)	Age of subjects	Year of publication/ Diagnosis	Main objectives	Participants and methods	Results	Conclusion
Bond et al. (16)	Case report Leavenworth, Kansas	Case report (n=1)	Case report (26) female	2015 Occipital neuralgia	Primary objective of this case study is to explain diagnosis, intervention and clinical result of a patient with diagnosis of occipital neuralgia	The patient was treated by dry needling technique 2 times weekly, for 2 weeks. During each treatment of dry needling the needles were applied in trapezius muscle and occipital muscles. Research instruments: Neck disability index, headache disability index, by which was evaluated status of the patient before, immediately after and 3 weeks after the treatment	After last period of evaluation found a significant improvement (32 scores in NDI scale and 28 scores in HDI scale)	Treatment with dry needling technique for 4 session, 2 times weekly in the patients with a diagnosis of occipital neuralgia showed significant improvement
Velázquez-Saornil et al. (17)	Random. clinical Study, Madrid, Spain	Study group (n=22) (16/6) Control group (n=22) (12/10)	Study group (31.4) Control group (34.4)	2017 Reconst. Front cruciate ligament	The objective of the research was to find pain intensity, range of movement, stability and functional improvement of knee by adding dry needling technique trigger points vastus medialis Quadriceps femoris muscle in patients with the subacuate reconstruction of front cruciate ligament	Study group: Rehabilitation program together with DN, control group: Only rehabilitation program. One DN session carried out the 1 <sup>st</sup> day of the rehabilitation. Instruments of research: Intensity of pain, the range of motion, stability and function of knee before treatment, immediately after, 24 h, 1 and 5 weeks after treatment	Intensity of pain is increased at the beginning of the treatment, while range of motion and function of knee increased 24 h 1 and 5 weeks after the treatment. VAS before treatment of the study group 6.86, control group 6.57. VAS after 5 weeks at study group 1.81, control group 2.29	DN technique vastus medialis, quadriceps femoris muscle after operative subacuate reconstruction of front cruciate ligament is effective in an increase of range of motion and function of the knee. Pain intensity did not increase except immediately after physical treatment

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TABLE 1. (Continued)

Citation	Design of study, state/ city	Number of participants (M/F)	Age of subjects	Year of publication/ Diagnosis	Main objectives	Participants and methods	Results	Conclusion
Srbely et al. (18)	RCS, Guelph, Ontario	Study group (n=20) (9/11) Control group (n=20) (12/8)	Study group (48.2) control group (45.4)	2010 right supraspinatus muscle	The objective of the research was to find if dry needle stimulation of myofascial trigger points (sensitive locus) provokes segmental anti-nociceptive effects	Study group: 1 session of dry needle technique points of right supraspinatus muscle, infraspinatus muscle or Gluteus medius muscle. Control group: 1 session of placebo dry needle technique. Research instruments: Pressure pain threshold (PPT) is noted after 1, 3, 5, 10, and 15 min after the treatment	Results of the research showed a significant increase of pressure pain threshold in subjects of the study group to 3 (0.205/-0.002 N/s) and 5 (0.187/0.003 N/s) min after the treatment compared to the control group	Dry needling stimulation of trigger points (sensitive locus) may provoke anti-nociceptive effects by modulation of segmental mechanism, which is very significant in the management of myofascial pain
Cotchett et al. (19)	RPCS, La Trobe, Australia	Study group (n=41) (17/24) control group (n=43) (27/16)	Study group (54.4) control group (57.8)	2014 plantar heel pain	The objective of the research was to evaluate the efficacy of dry needle technique at a plantar heel pain treatment	Study group: Dry needling, control group: Placebo dry needling. Treatment included one session weekly in duration of 30 min, 6 weeks. Primary instruments of the research (2, 4, 6, 12, weeks): VAS first morning leaning on the foot and pain of the foot, using the subscale Foot Health Status Questionnaire (FHSQ). Secondary instruments of the research (6, 12, week): Function foot (FHSQ), physical and mental health (SF-36), depression, anxiety and stress (DASS-21), subjective change symptoms (Likert scale) i posture of foot (FPI)	Results of the research showed decrease of pain with dry needling technique compared to sham DN technique although the difference between the study groups was below a minimum importance difference. Frequency of some lesser unwanted differences was higher at the patients of the study group. VAS Study g. Control g. Before treat. 67.7 - 58.5 2. weeks 51.6 - 52.7 4. weeks 38.1 - 42.6 6. weeks 28.6 - 38.3 12. weeks 20.9 - 29.9	Dry needle technique provided for statistically significant reduction of plantar pain intensity in foot, but level of improvement should be evaluated in accordance with frequency of smaller unwanted effects

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TABLE 1. (Continued)

Citation	Design of study, state/city	Number of participants (M/F)	Age of subjects	Year of publication/ Diagnosis	Main objectives	Participants and methods	Results	Conclusion
Taşoğlu et al. (20)	Random. prosp. study, Ankara, Turkey	Deep DN technique (n=36) (5/21) Stimulating DN technique (n=36) (3/25)	Deep DN technique (38.57) Stimulating DN technique (41.25)	2017 Myofasc. pain syndrome	Objective of the research was to compare efficacy of two different dry needle technique (deep DN i stimulating DN) in treatment of myofascial pain syndrome	Subjects (n=72) were randomly divided in two (deep and stimulating DN technique) (3 sessions). Status of the subjects was evaluated before the treatment and after the 1 <sup>st</sup> , 5 <sup>th</sup> , and 12 <sup>th</sup> weeks of the treatment implementation. Research instruments: VAS, beck depression inventory, Nottingham extended activities of daily living scale (NEADLS)	Both technique are effective in reduction intensity of pain and depressive syndromes and improvement of functional physical status after the 1 <sup>st</sup> , 5 <sup>th</sup> , and 12 <sup>th</sup> week from the treatment implementation. DDN VAS (67.81/24.65/28.38/24.30) STDNVAS (62.35/23.39/19.32/30.25). One significant difference between the elaborated techniques is a lesser sensation of pain during carrying out of the deep DN technique	Conclusion of the research was that DN technique are effective in treatment of myofascial pain syndrome, and that the effects last up to 12 weeks after the implemented treatments
Calvo-Lobo et al. (21)	Random. control clinical study, Madrid, Spain	I study group (n=33) (10/23) II study group (n=33) (13/20)	I study group (75.35) II study group (76.74)	2018 Nonspecific shoulder pain	Objective of the research was to evaluate effects of dry needle technique on simultaneous treatment of one latent and one active myofascial trigger points of infraspinatus muscle in older persons with non-specific shoulder pain	Study group: One session of one of most painful and one latent trigger point for 1 min. Control group: Only treatment of the most painful trigger points. Instruments of research: Numeric scale of pain, pressure pain threshold on front deltoideus muscle and extensor carpi radialis brevis muscle and strength of hand grip were evaluated before and after 1 week after the treatment	Statistically significant difference reduction of pain and increase of pain pressure threshold were registered immediately after (-2-25 against -1.19) and 1 week after the treatment in the study group (-3.37 against -1.73). It was not found any significant difference in strength of hand grip among study groups	One session DN treatment of latent trigger points which is connected with key active trigger point in infraspinatus muscle but short-term reduces intensity of pain and pain irritability of distant trigger points located in the area of referral pain in older persons with nonspecific pain in shoulder

SRS: Sympathetic skin reaction, VAS: Visual analog scale

Gerber et al. found that the effects of dry needling in pain reduction intensity of trigger points of the descending trapezius muscle can last for 6 weeks (reduction of VAS pain scale, final -2.29) (12).

Hesari et al. also investigated long-term effects of dry needling and physical treatment on trigger points pain intensity of descending trapezius muscle. It was found out a more significant pain reduction of the patients under dry needling treatment (0.96/0.58) (13).

Shanmugam and Mathias in their research found that the dry needling treatment of paraspinal muscles of the cervical spine reduced the neck pain intensity after the treatment (VAS 18.80), after 24 h (5.85 VAS), and after 1 week (VAS 2.12), after the treatment (14). Review of two case reports is also included. Anandkumar et al. found a significant reduction in pain intensity on a numerical scale pain (7/10–0/10 at the treatment beginning, immediately after, and 3 months after the treatment) after implementation of the dry needle technique treatment in a patient with non-specific pain of thoracic portion of the spine (15). Bond and Kinslow have identified a significant improvement of the symptoms of the patient with occipital neuralgia (32 points in the neck disability index scale and 28 scale points in headache disability index) (16).

Velazquez-Saornil et al. have found a significant reduction in pain intensity in patients after reconstruction of the anterior cruciate ligament by adding dry needling stimulation of vastus medialis of quadriceps femoris muscle. The VAS score in patients at the addition of dry needling stimulation was 6.86 at the beginning and 1.81 at the end of the treatment, while the VAS score in patients without the additional dry needling stimulation was 6.57 before the reconstruction and 2.29 after the reconstruction (17).

### **Comparison of effects of dry needling technique and sham dry needling in pain intensity reduction**

Srbely et al. investigated the effects of a one-time treatment of dry needling (study group) at the MTrP of supraspinatus muscle, infraspinatus muscle, and gluteus medius muscle to the induction of a segmented anti-nociceptive response as compared

to the sham dry needling technique. They found a significant increase of the pain threshold to pressure in patients of the study group 3 (0.205/-0.002) and 5 (0.187/0.003) min after the treatment compared to the control group (18).

Cotchett et al. compared the effects of dry needling and placebo dry needling in the treatment of plantar heel pain. It was found a more significant reduction in pain intensity compared to the beginning of the research in patients of the study group (VAS 67.7/20.9) compared to the control group (VAS 58.5/29.9) (19).

### **Comparison of two different techniques of dry needle treatment**

Taşoğlu et al. compared the effects of deep (deep dry needling) and stimulating (peppering dry needling) dry needle technique in the treatment of MPS. The results showed that both methods are equally effective in pain intensity reduction (20).

Calvo-Lobo et al. found that the simultaneous dry needling treatment of the active and latent trigger points in relation to the treatment regime of the only active point of infraspinatus muscle was more effective in the treatment of nonspecific shoulder pain immediately after it (-2-25 vs. -1.19) and a week after the treatment (vs. -3.37 -1.73) (21).

## **DISCUSSION**

The investigation results showed that dry needle treatment alone, or as an addition to standard physical treatment, was effective in reducing pain intensity in patients with LBS.

Liu et al. conducted a systematic review and meta-analysis on the effects of dry needling in the treatment of MTrP associated with LBS. The results showed that dry needling, especially in combination with other treatments, may be effective in reducing pain in patients with LBS-om (22).

By the literature survey was found that dry needling is effective in reducing pain intensity of neck and shoulders in patients with MTrPs of the upper trapezius muscle, infraspinatus muscle of paraspinal muscles or cervical part of the spine.

Liu et al. investigated the effects of dry needle technique in the treatment of MTrP associated with

pain in the neck and shoulder. They conducted a systematic review and meta-analysis, by which was determined that the dry needling is recommended for reduction of pain intensity of MTIP localized in neck and shoulder, but without long-term effects (23).

In analysis of the systematic survey results was found that dry needling treatment is effective for reduction of the pain intensity in patients with non-specific pain in the thoracic portion of spine, occipital neuralgia, after reconstruction of the anterior cruciate ligament of the knee, and to be more effective in reducing pain intensity compared to the sham dry needling treatment. It was also found that different techniques of dry needling are effective in the treatment of MPS.

Gattie et al. found by the systematic review of the literature and meta-analysis found that the dry needling treatment conducted directly by a physical therapist is more efficient than not carrying out the treatment, the sham dry needling, and other forms of treatment in instantaneous reduction of musculoskeletal pain intensity as well as 12 weeks after the treatment (24).

## CONCLUSION

The systematic survey of the literature has provided the evidence on the basis of which the dry needling alone or as an addition to other treatments' interventions is recommended in the treatment of painful musculoskeletal conditions caused by MTIPs. We found its superiority compared to sham dry needling or not carrying out the treatment. Various techniques of dry needling treatments were almost equally effective in reducing myofascial pain intensity.

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