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Efficacy of the dry needling of myofascial syndrome in the trapezius muscle: A systematic review

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Abstract

Objective: To analyze the efficacy of the dry needling technique in the treatment of trigger points of the trapezius muscle. Material & Methods: A systematic search was carried out in the databases: PubMed, Scopus and Web of Science with the terms neck pain, trapezius, dry needling and acupuncture therapy. The results were analyzed following two inclusion criteria: studies published after 2014, and studies that aimed to evaluate the effects of dry needling on trapezius muscle. Seventeen articles were obtained, which were evaluated according to their methodological quality with the JADAD Scale and analyzed according to: study objective, experimental design, sample, intervention applied, variables analyzed, instruments used to quantify the results and results obtained.

Results: Thirteen articles were selected in which, practically all, show that dry needling decreases pain intensity, improves range of motion, increases the painful threshold to pressure and eliminates, in most cases, trigger points.

Conclusions: The dry needling has effects on cervical pain and disability, generated by myofascial dysfunction, have been identified. This technique did not show significant improvements compared to other techniques analyzed, but it did prove to be a treatment as valid as other more conventional ones.

Keywords: Dry needling; Trigger point; Cervical pain; Trapezius; Rehabilitation

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Introduction

From 15 to 25% of adults suffer chronic pain at some point in their lives. Its prevalence increases to 50% in people over 65 years of age [1]. Pain is also the most frequent cause of medical consultation and at the time when it occurs it requires multidisciplinary attention [2]. Its impact is enormous since, for example, the pain caused by the dysfunction of the different spinal segments generates an annual average cost that amounts to more than one fifth of the total health expenditure of a country [3]. Specifically, the cervical region is one of the areas with the highest prevalence of

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the development of injuries [4], presenting frequent pain in the labour force that results in both work losses and economic losses [1,4]. Myofascial pain syndrome is the set of sensory, motor and autonomic symptoms caused by trigger points (TP) [5]. TPs are sensitive to pressure and are located in palpable tense bands of a muscle. They can be classified according to various criteria: based on their symptoms, they are divided into active and latent [6]. An active TP is one that causes spontaneous pain: it is always painful to pressure, it prevents complete elongation of the muscle and it reduces its ability to generate strength; it refers a pain recognizable by the patient and a local spasm response (LSR) when pressed. It can also cause referred motor and autonomic phenomena and pressure hypersensitivity. On the other hand, a latent TP is clinically sleeping and it only generates pain when stimulated by palpation. Despite this, it can have all the characteristics of an activeTP [6,7].

The most accepted hypothesis for the development of TPs is called "integrated hypothesis". This hypothesis stipulates that dysfunctional motor plates release an excessive amount of acetylcholine, which leads to localized and sustained contractions in the time of sarcomere [6]. The nodules cause a decrease in blood flow within the tissue which, in turn, can lead to local ischemia, lower pH in the area and release of algal substances [6,8]. The trapezium is a tripartite muscle with upper, middle and lower section. Its motor function is the elevation of the scapula in its upper and middle portion; adduction, in its middle portion; and the descent, in its lower portion. Its main dysfunctions are the entrapment of the spinal nerve at the level of the occipital (either due to a contracture, hypertrophy or tumor); or due to the contracture itself, which generates pain. This muscle has TPs, when activated, remit pain to the posterolateral area of the neck and head (including the jaw), to the shoulder (mainly in the acromial area), and to the scapular area [7]. Within the therapeutic possibilities of Physiotherapy, one of the techniques used for the treatment of myofascial pain syndrome is a so-called dry needling (DN [8].This technique is based on the puncture with a needle with a diameter between 0.15 to 0.3 mm and of variable length between 30 mm and 50 mm, on the TP that is intended to be treated. The puncture, with the needle inserted, is performed intermittently or statically [7]. With all this in mind, and in light of the limited study on DN for the treatment of TP, this review aimed to analyse the evidence available so far about the effects of this technique on the trapezius muscle [7,8].

Materials and Methods

Literature Search

Taking into account the previously stated objective, a bibliographic search was carried out during the month of May 2019. The databases selected were Web of Science (WOS), Scopus and PubMed. The terms used for the search were: “acupuncture therapy”, “neck pain” and “trapezius” (belonging to the descriptor “superficial back muscles”), all of them included in the Medical Subjects Headings (MeSH). In addition, the term “dry needling” was used, which due to its recent appearance has not yet been included in the MeSH. The search equations used were: (a) in PubMed: [("acupuncture therapy" [MeSH]) AND "neck pain" [MeSH]] and [dry needling AND "neck pain" [MeSH] AND trapezius]; (b) in Scopus: [“acupuncture therapy” AND “neck pain”] and [“dry needling” AND “neck pain” AND trapezius]; and, (c) in WOS: [“acupuncture therapy” AND “neck pain”] and [“dry needling” AND “neck pain” AND trapezius]. After the search, the results were analyzed following the following inclusion criteria: (a) studies published after 2014, and (b) studies that aimed to evaluate the effects of DN on TP of the trapezius muscle. The search and selection process is represented in Figure 1.

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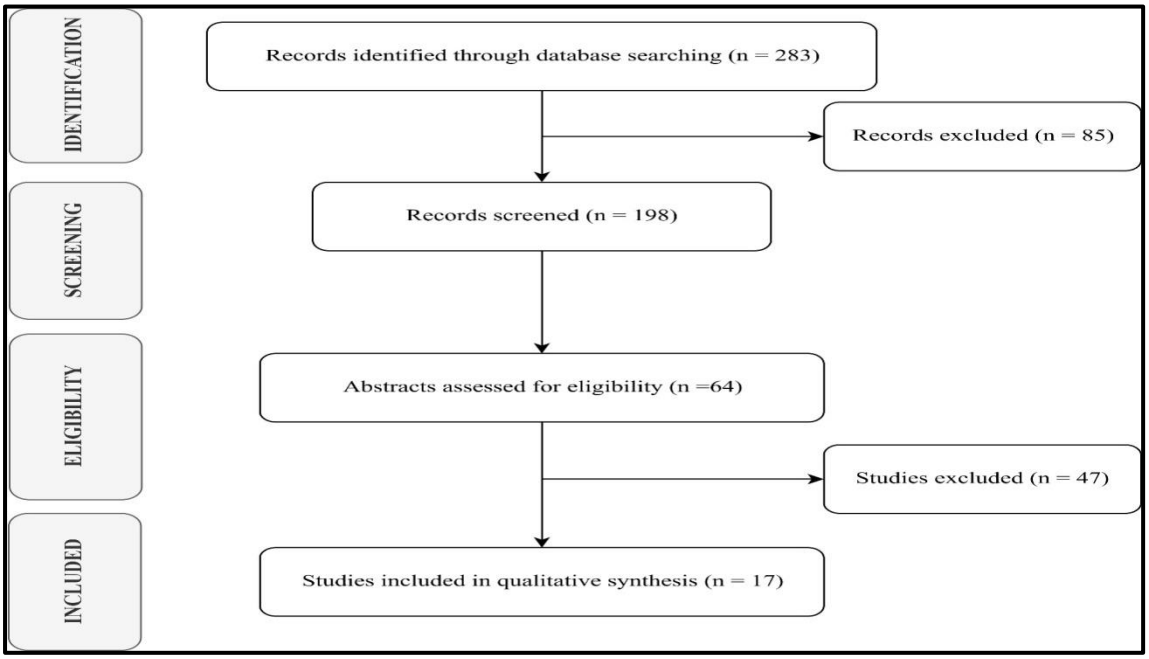

Figure 1: PRISMA flow diagram.

Results

After the search and selection process, 17 articles were obtained, which were evaluated according to their methodological quality with the JADAD Scale (Table 1). In addition, for their analysis, they were divided according to the intervention they carried out in: studies that only applied DN, studies that applied it in combination with other techniques and studies that compared its effectiveness with other interventions.

Studies that exclusively applied the DN

Fernández-Carnero et al. [9], had the objective of evaluating the effects of different doses of DN on the upper trapezius in subjects with cervical pain. The sample was composed.

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Table 1: Methodological characteristics of the studies analyzed.

Article	Design	Intervention	Samplesize	JADAD Scale
Cerezo-Téllez et al. (2016a)	Simple-blind randomized and controlled clinical trial	Comparison between the DN a in combination with streching and only streching	44 patients	3
Cerezo-Téllez et al. (2016b)	Simple-blind randomized clinical trial	Comparison between the DN in combination with streching and only streching	128 patients	3
Fernández-Carnero et al. (2017)	Double-blind randomized clinical trial	Different doses (LSR induced) of DN	84patients	4
Gerber et al. (2015)	Experimental study	Threesessions of DN	56patients	1
Gerber et al. (2017)	Experimental study	No informed	45patients	2
Hayta y Umdu (2016)	Randomizedclinical trial	Comparisonbetween DNand Kinesio Taping®	60patients	3
León-Hernández et al. (2016)	Simple-blind randomized clinical trial	Comparisonbetween the DN and DN in combination with PENS	62patients	3
Llamas-Ramos et al. (2014)	Randomizedclinical trial	Comparisonbetween DN and manual therapy (sustained manual pressure, transverse massage and stretching)	94patients	3
Martín-Pintado-Zugasti et al. (2015)	Double-blind randomized and controlled clinical trial	Comparisonbetween the combination of DN and ischemic compression	90 participants	4
Martín-Pintado-Zugasti et al. (2018)	Double-blind randomized and controlled clinical trial	Different doses (LSR induced) of DN	120patients	4
Mejuto-Vázquez et al. (2014)	Randomizedcontrolledclinical trial	One sesión of DN	17patients	3
deMeulemeester et al. (2017)	Randomizedclinical trial	Comparisonbetween DNand sustained manual pressure	42patients	3
Pecos-Martínet al. (2015)	Randomizedcontrolledclinical trial	Onesesion of DN	72patients	2
Segura-Ortí et al.(2016)	Double-blind randomized and controlled clinical trial	Comparison between DN and Strain Counter-Strain technique	34patients	3

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DN: dry needling; LSR: local spasm response; PENS: Percutaneous Electrical Nerve Stimulation.

Table 1: Methodological characteristics of the studies analyzed (cont).

Article	Design	Intervention	Samplesize	JADAD Scale
Sobhani et al. (2016)	Single-blind randomized clinical trial	Comparisonbetween Kinesio Taping®, manual therapy (ischemic compression and mobilizations), and the DN a in combination with streching	39 patients	3
Yaghoubi et al. (2018)	Case study	Combination of DN and masotherapy	1 patient	0
Ziaeifar et al. (2016)	Randomizedclinical trial	Comparisonbetween DNand ischemic pressure	31patients	3

DN: dry needling.

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of 84 patients, divided into four intervention groups: group 1, which brought together the subjects that did not present LSR; group 2, which received DN until generating four LSRs; group 3, in which six were provoked and group 4, in which DN was performed until the LSRs were depleted. One session was held in each group. The inclusion and exclusion criteria of this study, as well as the rest, are detailed in Table 2. The intervention began with the manual localization following the criteria of Simons et al. [10] of the active TPs in the upper trapezius. The puncture was performed following the Hong [11], paying attention to the number of LSR generated. The dimensions of the needle used were 0.32x40 mm. Once the puncture was finished, the area was compressed with a cotton pad for 90 seconds. The variables to be analyzed were: pain intensity, with the Visual Analog Scale, the pressure pain threshold with an altimeter, the cervical range of motion with a goniometer and neck disability, assessed by the Cervical Disability Index. These variables were measured before, immediately after, 24, 48 and 72 hours after treatment and one week after the intervention. The results revealed improvement in pain in all groups, but significant differences were found from the six responses of local spasm. The pressure pain thresholdimproved significantly in all groups, but there were no differences between them. These threshold improvements were most noticeable after 48 hours post-treatment. Regarding the range of motionand the Cervical Disability Index, significant improvements were evident in all groups, despite there being no significant differences between them. Mejuto-Vázquez et al. [12], conducted a study with the objective of evaluating the effects, in the short term, of the use of DN as a treatment for TPs in the upper trapezius and its relationship with acute cervical pain. The sample consisted of 17 patients, which were divided into two groups: one intervention and one control, which did not receive any treatment. A treatment session with DN was performed, placing the patients in prone position. The intervention began with the localization by clapping of the active TP of the trapezium. Once the shot was taken, the needle was inserted until the first LSR was generated, after which the puncture was continued using the Hong method [11], for 25-30 seconds. The needle used was 0.3x30 mm. Pain intensity was analyzed, with Visual Analog Scale; the pressure pain threshold, with a digital algometer; and the cervical range of motion, with a goniometer. The subjects were analyzed before the intervention and at ten minutes and one week after the treatment.Significant differences were evident, in pain intensity, pressure pain threshold and range of motion, between the control group.

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Table 2: Inclusion and exclusion criteria of the samples.

Article	Inclusioncriteria	Exclusión criteria
Cerezo-Téllez et al. (2016a)	(a) Presence of TP in trapezium according to the criteria of Simons et al.	(a) Use of analgesics, anti-inflammatories, antidepressants… (b) Diagnosis of fibromyalgia. (c) Presence of contraindications: fear of needles, fever, infections ...
Cerezo-Téllez et al. (2016b)	(a) Presence of active TPs in trapezium, splenios, multifides and scapula elevator according to the criteria of Simons et al.	(a) Use of analgesics, anti-inflammatories ... (b) Diagnosis of hormonal, inflammatory or neurological disorders; tendinopathies in the musculature; and/or fibromyalgia (c) Speak non Spanish. (d) Presence of contraindications: pregnancy, fear of needles, cancer...
Fernández-Carnero et al. (2017)	(a) Cervical pain of more than a month. (b) Score > 3 in VAS. (c) Presence of active TP in upper trapezium according to the criteria of Simons et al.	(b) Diagnosis of non-myofascial cervical pain, radiculopathies, whiplash, fibromyalgia, and/or thyroid disorders. (b) Antecedent of cervical surgery, treatment of DN. (c) Presence of dizziness and/or vertigo.
Gerber et al. (2015)	(a) Age between 18-65 years. (b) Spontaneous pain > 3 months progression in the cervical and periescapular area. (c) Presence of TP in upper trapezium.	(a) Diagnosis of chronic fatigue syndrome, fibromyalgia, Lyme's desease, and/or radiculopathies. (b) Antecedent of surgeries in the area and/or treatment with acupuncture. (c) Additional drug treatment.
Gerber et al. (2017)	(a) Age between 18 and 65 years. (b) Presence of TP in upper trapezium.	(a) Diagnosis of chronic fatigue syndrome, fibromyalgia, Lyme's desease, and/or radiculopathies. (b) Antecedent of surgeries in the area and/or treatment with acupuncture. (c) Additional drug treatment.
Hayta y Umdu (2016)	(a) Myofascial pain syndrome > 3 months of progression. (b) Presence of active TP in upper trapezium according to the criteria of Simons et al.	(a) Diagnosis of fibromyalgia, cervical disc injury, radiculopathies, myelopathies, scoliosis, psychiatric disorders, and/or inflammatory disorders. (b) Antecedent of surgeries in the shoulder. (c) Presence of contraindications: pregnancy and/or no collaboration. (d) Recent injection in the TP. (e) Treatment of myofascial syndrome in the last 6 months.
León-Hernández et	(a) Neck pain > 6 months of evolution.	(a) Diagnosis of radiculopathies, whiplash, dizziness, migraines, and/or

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al. (2016)	(b) Score > 3 in the VAS. (c) Presence of active TP in upper trapezium. (d) LSR and local or referred pain to TP compression.	fibromyalgia. (b) Antecedent of DN treatments.
TP: trigger point; VAS: Visual Analog Scale; DN: dry needling; LSR: local spasm response.		

Table 2: Inclusion and exclusion criteria of the samples (cont.)

Article	Inclusioncriteria	Exclusión criteria
Llamas-Ramos et al. (2014)	(a) Presence of active TP in upper trapezium.	(a) Diagnosis of fibromyalgia, whiplash, and/or radiculopathies. (b) Antecedent of cervical surgeries. (c) Physiotherapy in the previous year. (d) Presence of contraindications: fear of needles, anticoagulants treatment...
Martín-Pintado-Zugasti et al. (2015)	(a) Presence of latent TP in upper trapezium according to the criteria of Simons et al.	(a) Diagnosis of cervical or facial pain, circulatory problems, and/or fibromyalgia. (b) Previous treatment with DN. (c) Treatment of TP in the last 3 months. (d) Antecedent of cervical surgeries. (e) Presence of contraindications: fear of needles.
Martín-Pintado-Zugasti et al. (2018)	(a) Cervical pain > 1 month of progression. (b) Score > 3 in the VAS. (c) Presence of active TP in upper trapezium according to the criteria of Simons et al.	(a) Diagnosis of non-myofascial cervical pain, radiculopathies, whiplash, fibromyalgia, thyroid disorders, dizziness, and/or vertigo. (b) Antecedent of cervical surgeries. (c) Previous treatment with DN.
Mejuto-Vázquez et al. (2014)	(a) Presence of active TP in upper trapezium according to the criteria of Simons et al.	(a) Diagnosis of whiplash, fibromyalgia, vertebrobasilar insufficiency, and/or instability of the interspinous ligament. (b) Antecedent of cervical surgeries. (c) Physiotherapy in the last year. (d) Presence of contraindications: fear of needles, anticoagulants treatment...
deMeulemeester et al. (2017)	(a) Women. (b) Minimum use of 20 hours per week of the PC. (c) CDI > 10.	(a) Diagnosis of neurological problems, systemic diseases, and/or trauma injuries. (b) Treatment with a therapy secondary to the study. (c) Presence of contraindications: pregnancy
Pecos-Martínet al. (2015)	(a) Unilateral cervical pain for > 3 months course. (b) Presence of active TP in lower trapezium according	(a) Diagnosis of radiculopathies and/or cognitive deficits. (b) Antecedent of cervical trauma, previous cervical or shoulder surgery, and/or

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	to the criteria of Simons et al.	DN treatment in the area in the previous 6 months. (c) Presence of headaches. (d) Presence of contraindications: fear of needles.
Segura-Ortí et al. (2016)	(a) Presence of active TP in upper trapezium.	(a) Diagnosis of circulatory disorders, fibromyalgia, cancer, and/or allergies. (b) Antecedent of cervical or shoulder surgeries. (c) Use of opioids. (d) Presence of contraindications: fear of needles, anticoagulants treatment...
TP: trigger point; DN: dry needling; VAS: Visual Analog Scale; CDI: Cervical Disability Index.		

Table 2: Inclusion and exclusion criteria of the samples (cont.).

Article	Inclusioncriteria	Exclusión criteria
Sobhani et al. (2016)	(a) Bilateral involvement of upper trapezius and scapula lift. (b) Pain > 3 months. (c) Score of > 2 in the VAS. (d) Pain caused by postures or cervical movements. (e)CDI> 15. (f) Presence of active TP in upper trapezium and scapula lift.	(a) Diagnosis of temporomandibular disorders, fibromyalgia, neurological disorders, and/or radiculopathies. (b) Antecedent of cervical traumatic injuries and/or surgeries (c) Presence of orofacial pain, associated headaches and/or unilateral pain only. (d) Presence of contraindications: fear of needles, irritable skin ... (e) Physiotherapy treatment in the previous 6 months. (f) Contraindicated manipulations.
Yaghoubi et al. (2018)	*	*
Ziaeifar et al. (2016)	(a) Score > 3 in the VAS. (b) Presence of active TP in upper trapezium.	(a) Diagnosis of fibromyalgia, whiplash, radiculopathies, systemic diseases, and/or multiple sclerosis. (b) Antecedent of cervical surgery. (c) TP treatment in the last month. (d) Use of secondary drugs: anticoagulants, steroids... (e) Presence of contraindications: pregnancy, infections…
VAS: Visual Analog Scale; CDI: Cervical Disability Index; TP: trigger point. *Undefined.		

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and the intervention group, 10 minutes after the intervention. From this point, the difference increased with the passing of days. Pecos-Martín et al. [13], wanted to check the efficacy of DN in the lower trapezius as a treatment for mechanical neck pain. The sample was 72 subjects, divided into two equal groups: one intervention and one control. A treatment session was conducted. For the detection of active TPs, the criteria of Simons et al. [10], were followed. The DN was performed in lateral recumbency on these TPs, following an intermittency method similar to that of Hong [11] and performing between 8 and 10 punctures. The control group received the same treatment, but in separate areas more than 1.5 cm of the selected TPs. The needles used in both groups were 0.25x25 mm. Pressure was applied with a cotton pad each time the needles were removed. The variables studied were: pain intensity, measured with Visual Analog Scale; neck disability, assessed with the Numerical Pain Questionnaire; and the pressure pain threshold, analyzed with an analog algometer. They were measured previously, immediately after the intervention, one week and one month later. Positive results were evident in the intensity of pain in both groups, but significant only in the DN group, especially one week and one month after the intervention. The same happened with the results of the Numerical Pain Questionnaire, with the difference that the effects lost strength after a month after the intervention. As for the pressure pain threshold, immediate improvement was evident after the intervention, one week and one month after the session in both groups, highlighting the one that received DN. In addition, in the control group, improvements in the pressure pain thresholddid not persist for more than a week. Gerber et al. [14], conducted a study in order to verify the effects of DN on TPs in the upper trapezius, in patients with chronic myofascial neck pain. The sample was 56 participants. They received three treatment sessions over three weeks. The TPs were located bilaterally, in two main areas: 2 cm medially with respect to the acromio-clavicular joint and laterally to the spiny C7. An active TP was selected in each hemibody (the most symptomatic). Some subjects only presented TP unilaterally. The DN was performed intermittently, sometimes executing rotations around the nodule until generating a small LSR. The needle used during the sessions was 0.32 mm. The variables analyzed were: pain intensity, measured with Visual Analog Scale; the changes in the TP (from active to latent or non-existent) evaluated by the physiotherapists; cervical range of motion, measured with a goniometer; the pressure pain threshold, quantified with a digital algometer; and the perception of pain, self-assessed with the Brief Inventory of Pain. Several questionnaires were also conducted to evaluate the perceived changes in quality of life: the SF-36 health questionnaire, the Profile of States of Mood and the Oswestry Disability Index. All variables were evaluated before the first session and at the end of the third week. The results in the range of motionshowed obvious improvements in cervical rotation and lateral inclinations, together with a significant increase in pressure pain threshold, both in subjects with unilateral and bilateral pain. Regarding the intensity of pain, it was significantly diminished after treatment, also reporting improvements in the Brief Inventory of Pain. In addition, the active TPs went into a state of latency or disappearance in 41 participants (73%). Finally, the results obtained in the SF-36 and in the Profile of Mood States also revealed relevant improvements in the quality of life. Gerber et al. [15], conducted a study with the objective of analyzing the effects, six weeks after the application of DN in TP of the upper trapezium, in patients with chronic neck or shoulder pain. The sample was composed of 45 subjects. No information was provided on the intervention performed. The variables to be analyzed were: the intensity of pain measured with Visual Analog Scale; pain self-perception, quantified with the Brief Inventory of Pain; the changes generated in the TPs,

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identified by the physiotherapists during the exploration; and the pressure pain threshold, measured with a digital algometer. The SF-36 questionnaire, Oswestry Disability Index and the Profile of Moods were also used. The results revealed a significant improvement in pain intensity and pressure pain thresholdin the treated TP, although in patients presenting bilateral pain, it required more time. They also improved the results in the SF-36 and Oswestry Index. Regarding the changes in the TPs, significant improvements were revealed in about 50% of the patients, which remained until 6 weeks later. It was also detected that the variables did not change significantly in subjects whose TP did not change their status. Martín-Pintado-Zugasti et al. [16], conducted a study in order to analyze the pain and sensitivity generated after treatment with different doses of DN in TP of the upper trapezius. The sample was 120 participants, divided into four groups, based on the LSR generated: the control group, without LSR, since the puncture was applied 1.5 cm from the TP; group 2, with four LSR; group 3, with six LSR; and group 4, in which DN was applied until the LSRs were used up. A treatment session was conducted in each group. The intervention began with the detection, following the criteria of Simons et al. [10], of the most symptomatic active TP in the upper trapezius. A tissue was taken in a clamp, and the needle was inserted 30 mm deep. The puncture was applied intermittently following the objectives of each group (in the control group, the puncture was static). The needle was removed and the area was compressed for 90 seconds with a cotton pad. The needle used was 0.32x40 mm. The variables that were measured were pain after puncture, evaluated with Visual Analog Scale; the pressure pain threshold, measured with digital algometer; anxiety levels, through the Inventory of Anxiety Traits; depression, assessed with the Beck Depression Inventory; needle phobia, determined by the Tampa scale; and the importance of pain for each patient, measured with the Pain Catastrophizing Scale. They were measured before treatment, immediately after and 24, 48, 72 hours and one week after treatment. The results showed a direct relationship between the LSR and the pain generated after the treatment, that is, more pain at a higher number of LSR. Groups 3 and 4 maintained this pain until 48 hours after treatment. The effects on this variable disappeared at 72 hours. As for the pressure pain threshold, it was significantly reduced immediately after the session in all groups, to subsequently increase progressively, although this improvement was only maintained over time in group 3 (up to one week after the session). The results did not reflect a significant influence of treatment on psychological variables.

Studies that conducted a comparison of the efficacy of DN and other interventions

Segura-Ortí et al. [17] conducted a study with the intention of comparing of effects between DN and the strain counter-strain technique described by Jones [18]. The sample was composed of 34 participants. Three groups were created: a group that received DN, another that received strain counter-strain techniqueand a last one that was treated with a placebo strain counter-strain technique (not performed correctly). The group that received DN did it once a week, while the remaining two held two weekly sessions. The intervention took place over 3 weeks. DN sessions were held in prone position. The location of the active TPs was based on the pincer palpation of the painful points, with a subsequent isometric contraction and passive stretching of the trapezium, which generated localized pain. In the DN group, the puncture was performed intermittently until the LSRs were used up; after this, the patients performed eight ipsilateral shoulder abductions and eight trapezius shrinks; and the sessions with passive stretching of the trapezium were terminated according to the patient's tolerance. The needle used was 0.25x25mm. As for the

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strain counter-strain group, the trapezium was placed in shortening 90 seconds and an ipsilateral lateralization was performed with respect to the TP position along with a contralateral rotation of the cervical spine. Once the palpation of the TP did not generate pain, the position was maintained 90 seconds. For the analysis of the variables, the Cervical Disability Index was used in order to evaluate the cervical disability and the Visual Analog Scalethat evaluated the intensity of pain. The results showed that all interventions with DN, strain counter-strain techniqueand false strain counter-strain helped significantly decrease pain intensity, without significant differences between them. Cervical disability only obtained significant results in the group treated with strain counter-strain technique. Llamas-Ramos et al. [19] conducted a study with the aim of comparing the effects of DN and manual therapy on pain generated by TP of the upper trapezius. The manual therapy intervention included sustained manual pressure, transverse massage and stretching. The sample consisted of 94 participants divided into two equal groups: one group received DN while the other received manual therapy. The treatment was done in a weekly session in each group for two weeks. The TPs were manually located by the physiotherapist. In the group that received DN treatment, following the Hong method [11], it was performed on the active TPs, for 25-30 seconds after the first LSR. The needle used in this study was 0.3x30 mm. The intervention with manual therapy began with maintained manual pressure, locating the TP by means of clamp palpation and increasing the pressure up to three times. After this, transverse massage of the tense band was performed, to end with passive stretching for 45 seconds. The Visual Analog Scalewas used to assess the intensity of pain; the Neck Pain Questionnaire to measure cervical disability; the pressure pain thresholdevaluated with a mechanical algometer and the cervical range of motion, measured with a goniometer. They were analyzed before, immediately after treatment, at the end of the first week and at the end of the second. Patients experienced a significant reduction in pain in both groups. In the pressure pain threshold, the significant improvement was in the DN group (the maintenance of the benefits was also greater in it). Regarding the range of motion, there were no significant differences in either group. The results showed no difference between the two treatments, since the two reported practically the same benefit after the two sessions.

De Meulemeester et al. [20], carried out a study with the aim of comparing the effects of two myofascial techniques, the DN and the manual pressure maintained, in the treatment of neck and/or shoulder pain in office workers. The sample was 42 subjects. The participants were divided into two groups: one group that received DN and another that was treated with the manual pressure maintained. The intervention in both groups was applied once a week for four weeks. First, six TPs were located bilaterally between the upper and middle trapezius, scapula lift, supra and infraspinatus: the four most painful TPs were selected. For this, 50 Newtons of pressure were applied to the different TPs, asking the patients the degree of pain they felt, following the Visual Analog Scale. The DN was performed in prone position, using the Hong method [11], until the LSRs were depleted. The needle used was of type J, characteristic of acupuncture, and 0.3x30 mm. The intervention with maintained manual pressure was carried out in sitting and with a wooden cone, placing the vertex of the same on the TP. The pressure started in 10 Newtons, and increased until pain was generated. From that moment, the pressure was maintained 60 seconds. The variables to be analyzed were: the intensity of pain, measured with the Visual Analog Scale; neck disability quantified through the Cervical Disability Index; the pressure pain threshold, analyzed with a digital algometer; and muscle tone, elasticity and stiffness, measured with the specific digital device MyotonPRO (Myoton®, Estonia). The

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results were measured before treatment, at four weeks and after three months. The results showed significant improvement in pain intensity, in cervical disability and in pressure pain thresholdin both groups, from the first month. On the other hand, the muscular tone did not show improvements, but the elasticity (bilaterally) and the stiffness (only in the TPs on the right side), both after four weeks. Hayta y Umdu [21] conducted a study with the objective of comparing the effects of DN and Kinesio Taping® (KenzoKase, Japan) on the upper trapezius, as a treatment of myofascial pain syndrome. The sample consisted of 60 patients, divided into two groups: the one who received DN, twice a week for two weeks, and the one who was treated with Kinesio Taping®, three alternate days for two weeks. The location of active TPs in the upper trapezium was performed following the criteria of Simons et al. [10], being marked with a marker. The intervention with DN was carried out in sitting position, inserting the needle into the TP and keeping it between ten and twenty minutes, rotating it clockwise. The needle, in this case, was 0.25x25 mm. For the placement of the Kinesio Taping®, the participants were placed in a sitting position, with the cervical spine flexed and rotated ipsilaterally. A 0.5x20 cm band was placed, with a maximum stretch in the zone of insertion of the trapezoid over the acromion, and following the fibers of the upper trapezoid to the hairline. The variables evaluated were pain intensity, measured with Visual Analog Scale; cervical disability, assessed with the Cervical Disability Index; and physical, emotional and social factors, with the Nottingham Health Profile. They were measured before treatment, at four and at twelve weeks. The results in pain intensity, the Cervical Disability Indexand the Nottingham Health Profile, showed significant improvements in both groups at 4 weeks post-treatment. These positive effects also progressed significantly until reaching twelve weeks. There were no significant differences between the intervention groups. Ziaeifar et al. [22] conducted a study with the aim of comparing the effects between DN and ischemic pressure, in the treatment of TPs in the upper trapezius. The sample was composed of 31 participants, which were divided into two groups: the one to which DN was applied and another that received ischemic pressure. There were three treatment sessions in each group, spread over a week, with a minimum of 48 hours of rest between them. The detection of active TPs in the trapezius muscle was performed following criteria similar to those set out by Simons et al. [10]. Ischemic pressure was performed in supine or prone position digitally on these detected TPs, reaching the painful threshold of each patient and maintaining the pressure until this sensation decreased its intensity by at least 50%, after which the exerted force This process was repeated for a total time of 90 seconds. For its part, the intervention with DN was carried out in prone position, intermittently on the active TP, until the LSRs were exhausted. The needle used was 0.3x50 mm. The variables analyzed were pain intensity, measured with the Visual Analog Scale; and the pressure pain threshold, evaluated by means of a digital algometer. Variables were measured before treatment, immediately after and 48 hours after each session. The results showed significant differences in both variables, in the DN group, immediately and two days after each session. On the other hand, in patients who received ischemic pressure, only relevant changes in the pressure pain thresholdwere reflected immediately after treatment, but these effects were not lasting, disappearing after 48 hours.

Studies that applied DN in combination with other techniques

León-Hernández et al. [23] conducted a study with the objective of checking and comparing the effects, in the short term, of the application of DN combined with Percutaneous Electrical Nerve Stimulation in the upper trapezius, in patients with myofascial chronic pain. The sample consisted of 62 patients, which were

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divided into two groups of equal size. In one of them DN and Percutaneous Electrical Nerve Stimulation were applied, while in the other only DN. A treatment session was applied. In the group that received only DN, the intermittent puncture method, described by Hong [11], was applied to the active TPs of the upper trapezius. It was performed until two LSRs were generated at each treated point, after which the physiotherapist removed the needle and compressed the area for 90 seconds. The dimensions of the needle used in this case were 0.32x40 mm. In the group treated with DN and Percutaneous Electrical Nerve Stimulation, the puncture followed the same method and, immediately after it, the Percutaneous Electrical Nerve Stimulationwas applied, with the parameters: symmetric and biphasic wave; low frequency (2 Hz); 120 µs pulse and 15 minutes of time. In this case, the needle placed was the negative pole and a positive adhesive pad, placed 1 cm laterally. The variables to be analyzed were: cervical disability, evaluated with the Cervical Disability Index. Pain intensity was also measured, measured with Visual Analog Scale; pressure pain threshold, which was measured with a digital algometer and cervical range of motion, using a goniometer. They were registered before treatment, immediately after and 24, 48 and 72 hours after the intervention. The results showed immediate improvement after the end of the treatment, in the intensity of pain and Cervical Disability Index, significant in both groups, but more prominent in the group that received DN and Percutaneous Electrical Nerve Stimulation. Despite this, the effects on cervical disability were lost over the hours, reaching the status of the groups at 72 hours. Regarding range of motionand pressure pain threshold, no significant differences were found in intra and intergroup comparisons. Cerezo-Téllez et al. [24] presented a clinical trial that studied the hypothetical benefit of DN over the trapezius muscle, as a treatment for neck pain in office workers. The sample consisted of 44 subjects, which were divided into two groups of equal size: the intervention group, which received DN treatment with passive trapezius stretching; and the control group, to which only stretches were applied. Five treatment sessions were conducted over three weeks (two weekly sessions initially and one session last week). To locate the active TPs, the criteria of Simons et al. [10], were followed, and marked with a marker. In the group where DN was applied, the patients were placed in prone position, for the upper section; and in lateral recumbency for the middle and lower portions. Puncture was performed following the Hong method [11] until four LSRs were produced at each marked point. The needle used was 0.32x40 mm. Once the puncture was over, the needle was removed and the trapezius was passively stretched. On the other hand, the group that received stretching was placed supine for the upper section and laterally for the middle and lower areas: the muscle was brought to tension (without pain) and the position was maintained 4 seconds, with 8 seconds of break. This procedure was repeated three times. The variables measured were: pain intensity with Visual Analog Scale; the pressure pain threshold, measured with an analog algometer; the cervical range of motionwith a goniometer and muscular strength with a digital dynamometer. The results showed a significant reduction in pain in the intervention group, but not in the control group. The pressure pain thresholdshowed significant improvements in both groups, despite being also more prominent in the intervention group. Range of motionand muscle strength only improved significantly in participants who received DN and stretching. Cerezo-Téllez et al. [25] conducted other trial in order to analyze the effects of DN on chronic and idiopathic neck pain. The trapezius muscles, scapula elevator, multiphids, and splenios were studied. The sample was 128 participants, divided into two equal groups, an intervention group, which received DN and stretching; and another control, to which only stretching was applied. The treatment for both groups was carried out

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in four sessions spread over two weeks, with a minimum of three days between each intervention. In the group that received DN, the treatment was performed in all active TPs, detected by the criteria of Simons et al. [10] of the muscles already mentioned. The puncture was performed using the Hong method [11], until generating five LSR. The dimensions of the needle were 0.32x40 mm. After the treatment, the area was compressed and passive stretching of the musculature was performed. In the control group, the stretching was carried out using the following pattern: 4 seconds of tension and 8 seconds of rest, until reaching a total of 36 seconds. This procedure was repeated four times per session. Pain intensity was measured with Visual Analog Scale, cervical range of motionwith a goniometer, pressure pain thresholdwith a digital algometer, muscle strength with a digital dynamometer; and cervical disability, which was evaluated with the Cervical Disability Index. The variables were measured before, immediately after each session, at the end of the two weeks and 15, 30, 90 and 180 days after the end of the intervention. There was a significant reduction in pain in both groups, more marked and maintained in the group that received DN (up to 6 months after treatment). The pressure pain thresholdimproved significantly in both groups, but more lastingly in the intervention group, highlighting the results in the trapezium. In the latter, range of motionand muscle strength were also significantly increased, unlike the control group. Finally, cervical disability was significantly reduced in both groups, more markedly in the DN group. Sobhani et al. [26] conducted a study with the objective of comparing the therapeutic effects, on the upper and upper scapula trapezius, of the DN with stretching, manual therapy and the Kinesio Taping®, in patients with chronic myofascial neck pain. The sample consisted of 39 participants, which were divided into three groups of equal size: one that received the DN with stretching, another that was treated with manual therapy and a third, to which Kinesio Taping® was applied. The treatment was carried out over five sessions for ten days. The intervention by DN was performed in the upper and upper scapula trapezius, bilaterally in the active TPs detected, for twenty minutes. After this, passive stretching of both muscles was performed. As for manual therapy, this was based, in order of application, on: bilateral ischemic compression, soft tissue mobilization (for four minutes), and cervical and neuro-thoracic mobilizations, for four minutes each one. Finally, the Kinesio Taping® was applied in sitting position, with elastic bands of 0.5x50 mm in size. Four bands were applied, forming a star, on the TP to be treated in the upper trapezium (it was not applied in the angular). The tension of the bands was 50%. The variables analyzed were: pain intensity, measured with Visual Analog Scale; the importance of pain for the patient, assessed by the Pain Catastrophizing Scale; cervical range of motion, measured with a goniometer, and neck disability, quantified by the Cervical Disability Index.The results showed significant improvements in all variables in the three groups after treatment. He highlighted cervical range of motion, which improved significantly in the three groups, but more positively in which he received manual therapy (mainly in rotations). No significant differences were identified between each of the techniques in terms of the effects caused.Yaghoubi et al. [27] Conducted a case study applied to a 34-year-old woman. Its objective was to analyze the effect of DN on the upper trapezius, in order to reduce cervical pain. The patient, a hairdresser by profession, had a long history of chronic pain associated with the neck, shoulders and high back. He had been suffering from sleep problems for 3 years because of these pains, which often prevented him from sleeping more than 3 to 4 hours a day. The intervention was applied once a week for six weeks, in half-hour sessions. Two active and several latent TPs were located by palpation in the upper right trapezium, while only latent TPs were observed in the contralateral. Prior to DN, superficial

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masotherapy was performed in the area. The patient was placed supine, with the shortened trapezium, and the DN was performed anteroposteriorly and intermittently until the LSRs were exhausted. The variables that were included were: pain intensity, assessed with Visual Analog Scale; and cervical range of motion, measured with a goniometer. They were measured before treatment, immediately after each session, at 72 hours and at the end of the treatment as a whole. The results indicated significant improvements in pain and range of motionafter the first session, going from 8 to 3 out of 10 on the Visual Analog Scale. This improvement was also maintained at 72 hours and throughout the treatment, until at the end of six weeks the pain reached 1-3 out of 10, depending on the work hours performed. It was also observed improvement in sleep quality, which remained until one year after the intervention (getting sleep between 7 and 8 hours a day on average). Martín-Pintado-Zugasti et al. [28] in another study analyzed whether ischemic pressure, after treatment of latent TP with DN in the upper trapezius, significantly improves pain after puncture. The sample consisted of 90 participants, divided into three equal groups: one intervention, to which DN and ischemic pressure were applied in the TP; a placebo group, to which the pressure was made 2 cm from the TP; and a control group, which received no intervention. One session was held in each group. The detection of latent TPs in the upper trapezius was performed manually and bilaterally by the physiotherapist, selecting the most symptomatic TP for treatment. The intervention with DN was performed in prone position, following the intermittent puncture method described by Hong [11], until obtaining two LSRs, after which the needle was removed and the area was pressed with a cotton pad. The needle used in this case was 0.32x40 mm. Ischemic pressure was performed following the protocol described by Simons et al. [10], digitally pressing the TP until reaching the pressure pain threshold, after which the pressure was maintained. Once the painful sensation diminished, the applied force was increased. This process was repeated until two minutes were completed. The variables analyzed were pain intensity after puncture, evaluated with Visual Analog Scale; and range of motion, measured with a cervical goniometer. They were measured before the intervention, immediately after the treatment and 24, 48 and 72 hours after it. The results showed a total disappearance of pain after 72 hours in all groups. In the group treated with ischemic pressure, the pain immediately after the puncture was less than in the other groups, this difference being maintained until 48 hours. Regarding cervical range of motion, significant results were obtained in the intervention group, in lateral and contralateral rotations. There were also significant improvements in contralateral flexion, in this case in the control group and in the intervention group.

Discussion

The objective of this bibliographic review was the analysis of the effectiveness of the treatment by DN of the TP of the trapezius muscle. In the light of the exposed results it has been proven that this myofascial technique, in general terms, reduces the intensity of cervical pain, increases the range of motionand improves the pressure pain threshold and neck disability caused by the dysfunction of this cervical muscle. As far as the sex of the participants is concerned, there are many heterogeneous samples, in which there is a clear predominance of female samples. In fact, there is no currently existing study in which the male sample exceeds the female. At the same time, no study analyses whether the effects of PS are different in both sexes. The authors probably did not believe such a comparison was necessary because there was no physiological justification that could cause different effects of this intervention in men and women [10,29].

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The variables analyzed by the studies, for the analysis and discussion of the results, were divided into two groups: objective and subjective. Among the former, cervical range of motionwas included [9,12,14,16,19,23-27], strength [24,25] and intrinsic muscle characteristics (tone, elasticity and stiffness) [20]. The subjective variables evaluated were intensity (in all studies analyzed) and self-perception of pain [14-16], pressure pain threshold [9,12-16,19,20,22-25], cervical disability [9,13,17,19-21,23,25,26]; the changes in the quality of life of the participants [14,15] and influence of emotional factors (anxiety, depression, fear of needles, social factors...) [16,21]. In relation to the specific effects achieved, the studies that evaluated cervical range of motionagree that the DN generated significant improvements in this variable, highlighting the study by Sobhani et al. [26]. A plausible explanation for this is that three techniques that have in common positive effects on the range of motionwere applied [30]. As detailed in the study itself, these techniques have a large neural component, generating feedback at the nervous level that reduces tension in the tissues and allows a greater range of motion. On the contrary, in the studies by León-Hernández et al. [23] and Llamas-Ramos et al. [19], there were no relevant improvements. In the first one, the difference might have occurred due to the complementary treatment to the technique (Percutaneous Electrical Nerve Stimulation), since among its therapeutic effects no improvement in range of motionhas been noted. Strength, on the other hand, did improve significantly in the two studies that studied it [24,25], showing that DN does have an effect on muscle contractile capacity. One possible explanation is that, by correcting the TPs, whose characteristic clinical sign is the reduction of the capacity to generate strength [7], the intrinsic contractile dysfunction was corrected as well. Muscle elasticity and stiffnessalso improved significantly after the application of DN and sustained manual pressure [20]. This probably happened because both techniques are based on the specific performance on TP, and the resolution of the sustained muscular contraction on which the integrated hypothesis is based [8]. Regarding pain, this variable is included in all the studies reviewed, either according to an acute [12] or chronic origin [13-15,19,23,25-27]. However, it should be noted that there were studies [9,16,17,20-22,28] that did not specify the type of pain they intended to study. Significant reductions were revealed in all the studies analyzed, highlighting the study by León-Hernández et al. [23], possibly due to the complementary use of DN and Percutaneous Electrical Nerve Stimulation: when only DN is performed, the main analgesic route is mediated by stimulation of the spinal afferent pathways, which block the nociceptive stimulus. As for Percutaneous Electrical Nerve Stimulation, the hypoalgesia effect occurs due to the mechanism of opioid release and the activation of serotonergic and adrenergic systems [31]. For this reason, the combined use of both methods resulted in a greater analgesic effect. The study by Fernández-Carnero et al. [9] that focused on specifically analysing the relationship between pain reduction and the number of LSR in TPs should also be mentioned: it was evidenced that analgesia was more positive and lasting at a greater number of patients. In the same study, highlighting the results from the six LSR, the authors indicate that a possible explanation for this phenomenon was the mechanical destruction of dysfunctional motor plates, which would in turn result in a decrease in the production of acetylcholine. In contrast to this concept, the research by Martín-Pintado-Zugasti et al. [16], stands out, in which the influence of LSRs on pain generated after treatment with DN was analyzed. In this study, a direct relationship was observed between the number of LSR and the pain caused (also known as post-puncture pain). The pain remained present up to three days after the intervention, but there was a lack of long-term follow-up in order to check if analgesia was generated from the post-

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treatment week. The pressure pain threshold increased significantly in practically all studies [9,13-15,19,20,24,25], except those of León-Hernández et al. [23], Mejuto-Vázquez et al. [12], and Martín-Pintado-Zugasti et al. [16]. One possible explanation for this phenomenon is the short-term evaluation they performed, since the DN can generate hypersensitivity in the treated area. This hypothesis agrees with the studies that evaluate this very same variable in the medium and long term, in which positive results are reported. In addition, corroborating this theory, the study by Martín-Pintado-Zugasti et al. [16] also revealed a disappearance of hypersensitivity after 72 hours after treatment with DN. The exception to this pattern occurs in the research of Pecos-Martín et al. [13], and Ziaeifar et al. [22], where the pressure pain thresholdimproves significantly immediately after the treatment of DN. In the first, no mention was made of the number of LSRs generated: an explanation for this phenomenon would be that the LSRs were scarce and for this reason the post-puncture pain was not generated, demonstrating this relationship between the LSRs and the pain caused in the study by Martín-Pintado-Zugasti et al. [16]. As for the second one, it is argued that both DN and ischemic pressure have corroborated effects at the microcirculatory level, increasing blood flow in the TP (vasodilation) and facilitating cellular metabolism, which favors the increase in pressure pain threshold [22].This concept is demonstrated in the article by Martín-Pintado-Zugasti et al. [28]. The cervical disability also evolved positively in all articles [9,13-15,19,20,24,25] that studied this variable, except for those of León-Hernández et al. [23], where the effects diminished rapidly until disappearing at 72 hours after the end of treatment; and in those of Segura-Ortí et al. [17], and Fernández-Carnero et al. [9], in which the improvements after the application of DN were not significant. It should be mentioned that in the last two studies, a possible cause for such results could be the small number of sessions carried out: two and one, respectively. This hypothesis is consistent with the study by Ziaeifar et al. [22], who followed up this longer post-intervention variable, obtaining better results, possibly because cervical disability has a large postural component and, therefore, it requires a process of muscular re-education. From this finding it follows that, if the treatment objective is to improve this parameter, the number of sessions applied should be at least two or more. Changes in quality of life were only evaluated in the two studies by Gerber et al. [14,15], these changes being significant in both studies. This improvement may be associated with the marked reduction in pain that was identified in these studies. Regarding the influence of emotional factors, which were studied in the articles by Hayta y Umdu [21] and Martín-Pintado-Zugasti et al. [16], no relevant variation in the results was evident. In general terms, anxiety, depression or fear of needles did not affect the rest of the variables, although they did improve after the interventions performed, possibly since after reducing pain and improving quality of life, these negative psychological factors decreased. It is important to mention, in addition, that in studies whose objective is to compare DN with other technique [17,19-22], DN did not show significantly greater effects than the manual pressure maintained, the Kinesio Taping®, the strain counter-strain technique... The techniques that presented worse results than DN were ischemic pressur [22,26,28], and passive stretching [19,24,25]. This may be due to the fact that when using such treatments as the only intervention modality, no significant but positive results are generated. This aspect is consistent with the studies that apply these two techniques in combination with DN [24,28], obtaining better results. Regarding the investigations that carry out complementary applications with other techniques (masotherapy, ischemic pressure, Percutaneous Electrical Nerve Stimulation...) [23-28] it was observed that the analgesia generated by the treatment was greater than those that only performed DN. This

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occurrence is possibly due to the fact that among the main effects of the complementary techniques used is the decrease in pain, and when combined, this variable obtains more significant results.Regarding the limitations of the articles, there is the lack of a control group [9,14,15,20,22], that allows handling foreign variables as a possible placebo effect; the small sample chosen [9,22,27] that makes it difficult to extrapolate the results to the general population; the lack of analysis of other muscles [9,13,23] that may be involved in certain variables such as cervical pain; and the need for long-term follow-up [9,12,13,25,28] in order to verify the maintenance of the effects generated over time, to name a few. Another limiting aspect regarding the extrapolation of the results is the age of the majority of the selected subjects, which varies between 18 and 75 years. In many studies that, for example, select only students, the results were obtained in a small population sector, so they may not be applicable to the physical conditions and abilities of the elderly. It should be mentioned that a high percentage of the studies included in this review was carried out by very similar research groups, causing a low diversity of authors. Thus, figures such as Pecos-Martín [9,16,19,28], Cerezo-Téllez [24,25], Fernández-Carnero 9,16,23,28 or Martín-Pintado-Zugasti [16,28] are present in several of the articles analyzed. This is where the limitation of this review lies, as it is an obstacle when it came to extrapolating results to other research, since a high percentage of these has been carried out by the same authors. A final highlight was the low attention to changes in TPs. In both studies [14,15] where they were analyzed, the patients who reported improvements in their status also obtained more positive results, which could indicate that this aspect is of great importance for a more effective treatment. This aspect is consistent with the study byFernández-Carnero et al. [9], where the most positive results were obtained in the TPs that exhausted their LSR. A possible cause of this is the mentioned mechanical destruction of the motor plates, generating a latency step by the active TP. As a methodological strength of studies in general, the detail with which they define the inclusion and exclusion criteria stands out. This is a good security method for the participants, but also for the elimination of possible strange variables in the analysis of the results.Given all the above, these have been identified as possible lines of research in the future: greater follow-up on changes in the status of TPs; the increase in sample sizes that would allow for the generalization of the therapeutic effects of DN; the comparative study of the effects of DN among different age groups; the use of control groups in order to be able to more effectively compare the results; and attention to other muscles involved in the pathophysiology of cervical pain (such as the angle of the scapula, the multifids or the splenios). Finally, different treatment protocols should be evaluated to achieve maximum efficacy of this therapeutic method. For instance: determine the number of sessions required; the size or the angle of the approach of the needles; the influence of the LSR number; and the most appropriate combination with other techniques.

Conclusions

After carrying out this review, it can be affirmed that DN is beneficial for trapezium TPs. Its advantageous effects on cervical pain and disability, generated by myofascial dysfunction, have been identified. In addition, all studies agree on its positive effect on objective clinical variables and characteristics of this dysfunction such as range of motion, loss of strength or changes in muscle characteristics. At the same time, in the few studies that evaluated the variations in the status of the TP, changes were observed to the state of latency or even disappearance, concluding these modifications with a greater perception of improvement in the symptoms by the patients. Besides, the DN reported significant improvements as far as their life

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quality is concerned. In spite of everything, the DN did not show significant improvements compared to other techniques analyzed in this review, but it did prove to be a treatment as valid as other more conventional ones (masotherapy, ischemic pressure, stretching ...). Furthermore, its combination with other techniques of electrotherapy, massage therapy or manual therapy has demonstrated significant analgesic effects, supporting its validity as a complementary treatment in pathologies with myofascial component. DN is, therefore, a technique to consider in the treatment of myofascial pain syndrome in the trapezius muscle.

References

1. Capo-Juan MA. 2015. Cervical myofascial pain syndrome. narrative review of physiotherapeutic treatment. An Sist Sanit Navar 38: 105-115. Ref.: https://bit.ly/2YdPWJo
2. Hooshmand H. 2018. Chronic pain: Reflex sympathetic dystrophy, prevention, and management. Florida: Taylor & Francis Group.
3. Park PW, Dryer RD, Hegeman-Dingle R, et al. 2016. Cost burden of chronic pain patients in a large integrated delivery system in the united states. Pain Pract .16: 1001-1011. Ref.: https://bit.ly/2y0IrLv
4. Kääriä S, Laaksonen M, Rahkonen O, et al. 2012. Risk factors of chronic neck pain: A prospective study among middle-aged employees. Eur J Pain 16: 911-920. Ref.: https://bit.ly/3bZgOkk
5. Shah JP, Thaker N, Heimur J, et al. 2015. Myofascial trigger points then and now: A historical and scientific perspective. PM R 7: 746-761. Ref.: https://bit.ly/2xiLez3
6. Weller JL, Comeau D, Otis JA. 2018. Myofascial pain.Semin Neurol. 38: 640-643. Ref.: https://bit.ly/2xiLez3
7. Donnelly J. 2018 Travell, Simons & Simons' myofascial pain and dysfunction: The trigger point manual. Philadelphia: Lippincott Williams & Wilkins.
8. Fernández-Peñas C, Layton M, Dommerholt J. 2015. Dry needling for the management of thoracic spine pain. J Man Manip Ther. 3: 147-153. Ref.: https://bit.ly/2Sj76BB
9. Fernández-Carnero J, Gilarranz-Frutos L, León-Hernández JV, et al. 2017. Effectiveness of different deep dry needling dosages in the treatment of patients with cervical myofascial pain: A pilot RCT. Am J Phys Med Rehabil. 96: 726-733. Ref.: https://bit.ly/3aTk4wE
10. Simons DG, Travell JG, Simons LS. 1983. Myofascial pain an dysfunction: The trigger point manual. Philadelphia: Williams and Wilkings. Ref.: https://bit.ly/2VM6WFb
11. Hong CZ. 1994. Lidocaine injection versus dry needling to myofascial trigger point. the importance of the local twitch response. Am J Phys Med Rehabil. 73: 256-263. Ref.: https://bit.ly/2YeeLF5
12. Mejuto-Vázquez MJ, Salom-Moreno J, Ortega-Santiago R, et al. 2014. Short-term changes in neck pain, widespread pressure pain sensitivity, and cervical range of motion after the application of trigger point dry needling in patients with acute mechanical neck pain: A randomized clinical trial. J Orthop Sports Phys Ther .44: 252-260. Ref.: https://bit.ly/3bN0PWP
13. Pecos-Martín D, Montañez-Aguilera FJ, Gallego-Izquierdo T, et al. 2015. Effectiveness of dry needling on the lower trapezius in patients with mechanical neck pain: A randomized controlled trial. Arch Phys Med Rehabil. 96:775-781. Ref.: https://bit.ly/3cYv7G5
14. Gerber LH, Shah J, Rosenberger W, et al. 2015. Dry needling alters trigger points in the upper trapezius muscle and reduces pain in subjects with chronic myofascial pain. PM R 7: 711-718. Ref.: https://bit.ly/3aGtOdq
15. Gerber LH, Sikdar S, Aredo JV, et al. 2017. Beneficial effects of dry needling for treatment of chronic myofascial pain persist for 6 weeks after treatment completion. PM R. 9: 105-112. Ref.: https://bit.ly/2KFxcuB
16. Martín-Pintado-Zugasti A, del Moral OM, Gerwin RD, et al. 2018. Post-needling soreness after myofascial trigger point dry

DOI: https://doi.org/10.36811/gjpr.2020.110006 **GJPR: May-2020: Page No: 17-37**

needling: Current status and future research. J Bodyw Mov Ther. 22: 941-946. Ref.: https://bit.ly/3d9qMAb
17. Segura-Ortí E, Prades-Vergara S, Manzaneda-Piña L, et al. 2016. Trigger point dry needling versus strain–counterstrain technique for upper trapezius myofascial trigger points: A randomised controlled trial. Acupunct Med. 34: 171-177. Ref.: https://bit.ly/3bZiCdv
18. Wong CK. 2012. Strain counterstrain: Current concepts and clinical evidence. Man Ther.17: 2-8. Ref.: https://bit.ly/2KF8FWu
19. Llamas-Ramos R, Pecos-Martín D, Gallego-Izquierdo T, et al. 2014. Comparison of the short-term outcomes between trigger point dry needling and trigger point manual therapy for the management of chronic mechanical neck pain: A randomized clinical trial. J Orthop Sports Phys Ther. 44: 852-861. Ref.: https://bit.ly/3aKvl2c
20. De Meulemeester KE, Castelein B, Coppieters I, et al. 2017. Comparing trigger point dry needling and manual pressure technique for the management of myofascial neck/shoulder pain: A randomized clinical trial. J Manipulative Physiol Ther. 40: 11-20. Ref.: https://bit.ly/2SiOn9i
21. Hayta E, Umdu NM. 2016. A randomized trial to study the comparison of trigger point dry needling versus kinesio taping technique in myofascial pain syndrome during a 3-month follow-up. Int J Physiother. 3: 490-496. Ref.: https://bit.ly/3d23Ke7
22. Ziaeifar M, Arab AM, Nourbakhsh MR. 2016. Clinical effectiveness of dry needling immediately after application on myofascial trigger point in upper trapezius muscle. J Chiropr Med. 15: 252-258. Ref.: https://bit.ly/3cYIXYW
23. León-Hernández JV, Martín-Pintado-Zugasti A, Frutos LG, et al. 2016. Immediate and short-term effects of the combination of dry needling and percutaneous TENS on post-needling soreness in patients with chronic myofascial neck pain. Braz J Phys Ther 20: 422-431. Ref.: https://bit.ly/2Sia2ia
24. Cerezo-Téllez E, Lacomba MT, Fuentes-Gallardo I, et al. 2016. Dry needling of the trapezius muscle in office workers with neck pain: A randomized clinical trial. J Man Manip Ther. 24: 223-232. Ref.: https://bit.ly/2yaArr1
25. Cerezo-Téllez E, Torres-Lacomba M, Fuentes-Gallardo I, et al. 2016. Effectiveness of dry needling for chronic nonspecific neck pain: A randomized, single-blinded, clinical trial. Pain.157: 1905-1917. Ref.: https://bit.ly/3bNYBpP
26. Sobhani V, Shamsoddini A, Khatibi-Aghda A, et al. 2016. Effectiveness of dry needling, manual therapy, and Kinesio Taping® for patients with chronic myofascial neck pain: A single-blind clinical trial. Trauma Mon. 22: 39261-39269. Ref.: https://bit.ly/2VK8QpH
27. Yaghoubi Z, Pardehshenas H, Takamjani IE. 2018. The effect of upper trapezius muscle dry needling treatment on sleep quality: A case report. J Bodyw Mov Ther. 22: 333-336. Ref.: https://bit.ly/2VNO7kI
28. Martín-Pintado-Zugasti A, Pecos-Martin D, Rodríguez-Fernández ÁL, et al. 2015. Ischemic compression after dry needling of a latent myofascial trigger point reduces postneedling soreness intensity and duration. PM R. 7: 1026-1034. Ref.: https://bit.ly/2ShYkUy
29. Fricton JR, Kroening R, Haley D, et al. 1985. Myofascial pain syndrome of the head and neck: A review of clinical characteristics of 164 patients. Oral Surg Oral Med Oral Pathol. 60: 615-623.Ref.: https://bit.ly/2VJQTHU
30. Puerma-Castillo MC, García-Ríos MC, Pérez-Gómez ME, et al. 2018. Effectiveness of kinesio taping in addition to conventional rehabilitation treatment on pain, cervical range of motion and quality of life in patients with neck pain: A randomized controlled trial. J Back Musculoskelet Rehabil. 31: 453-464. Ref.: https://bit.ly/2ShYBqy
31. Perryman LT. 2019. Peripheral nerve stimulation: From nerve blocks to wireless neuromodulation. Clin Neuro Neurological Res Int J. 2: 180007-180017.