

# Dry Needling in Chronic Neck Pain

Subjects: Rehabilitation

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Chronic Neck Pain (CNP) is one of the main causes of disability worldwide, and it is necessary to promote new strategies of therapeutic approach in the treatment of chronic pain. Dry needling (DN) is defined as an invasive physiotherapy technique used in the treatment of neuromusculoskeletal disorders.

Keywords: chronic pain ; dry needling ; neck pain ; physical therapy

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## 1. Introduction

Cervical pain, or neck pain, can be defined as that unpleasant sensory and emotional experience associated with actual or potential tissue damage that affects the cervical region <sup>[1][2]</sup>. It may range from the suboccipital line to the level of the spine of the scapula <sup>[1][2]</sup>. Therefore, this condition is one of the main causes of disability worldwide, with a prevalence above 30% <sup>[1][3][4]</sup>, which entails significant socioeconomic costs <sup>[1][4][5][6][7]</sup>. It becomes persistent in half of the cases, which exhibit chronic symptoms and recurrent pain episodes <sup>[3]</sup> that can extend beyond six months <sup>[5]</sup>. However, the updated classification of chronic pain allows people to understand chronic neck pain (CNP) as a primary entity that is not associated with a specific etiology, and lasts with functional limitation and emotional affectation for more than three months <sup>[8]</sup>.

Studies indicate a female predominance in terms of the distribution by sex of neck pain, and in the age range of 35–49 years <sup>[9]</sup>, especially from the age of 45 <sup>[10]</sup>. Typically, research indicates that the risk of neck pain is linked to physical and psychosocial factors, and may be related to lack of movement, sustained postures, and office work <sup>[11][12]</sup>.

Usually, neck pain is nonspecific. This way, it is not attributable to fractures, trauma, or any other specific recognizable pathology (such as infectious, vascular, or oncological conditions). Therefore, examination and clinical analysis can rule out the warning signs that may relate the cases to specific systemic origins <sup>[1][3][5][13]</sup>. The assessment of patients with neck pain involves determining: (a) pain intensity by means of pain assessment scales (VAS or NPRS); (b) associated functionality or disabilities (Neck Disability Index, NDI) <sup>[14]</sup>; and (c) mobility of the cervical region (Range of Motion, ROM) <sup>[5]</sup>. Furthermore, in the complete evaluation of the neck, it is convenient to attend to the neurological assessment based on myotomes, dermatomes, and reflexes <sup>[15][16][17]</sup>.

In addition, the assessment of patients with CNP should necessarily objectify comorbidities and associated symptoms <sup>[18]</sup>, such as anxiety, depression, stress (DASS Scale) <sup>[19][20][21][22]</sup>, and sleep disorders (Pittsburgh Sleep Quality Index) <sup>[20]</sup>. At present, it is essential to deepen the investigation of new strategies of therapeutic approach in the treatment of chronic pain, especially motivated by the low efficacy of the available pharmacological treatments. Therefore, it becomes convenient to look for alternatives that are effective and tolerable for patients <sup>[7][13]</sup>.

In regard to physical therapy in the management of neck pain, the effect of conventional treatments is limited. Electrotherapy modalities (transcutaneous electrical nerve stimulation) could improve symptoms in CNP, but the evidence in this regard is not conclusive <sup>[23]</sup>, and passive mobilization or manipulative therapy is no better than an exercise program <sup>[24]</sup>.

Dry needling (DN) is defined as a minimally invasive physiotherapy technique used in the treatment of neuromusculoskeletal disorders <sup>[25][26][27]</sup>. Needling the most painful point of the muscle is also contemplated in traditional Chinese medicine acupuncture, where it is described as Ah Shi needling <sup>[28][29]</sup>. Its goal is to restore the physiological state of the tissue, reduce pain levels, and increase mobility through the application of mechanical stimuli caused by the insertion of acupuncture needles. These techniques are typical of physiotherapy, in which the physical agents pass through patient's skin <sup>[25][26][27]</sup>. With respect to the classification of the needling technique, the purpose of classifying it as “dry” is to emphasize the condition of the physical agent, i.e., in this type of technique, there is neither pharmacological substances nor chemical agents introduced nor any fluid extracted <sup>[25][27][30]</sup>.

Regarding the DN techniques, it is possible to define two modalities based on the depth of needle insertions [26][30]. The first is superficial DN, which confers analgesia by hyperstimulation. In this case, the needle goes through the skin and the subcutaneous cellular tissue without reaching the muscle. The other modality is deep DN, which functions directly on myofascial trigger points, since the needle penetrates the muscle tissue and has the ability to produce a local twitch response [26][30][31]. Local twitch response is an involuntary contraction reaction of the muscles to the mechanical stimulus of the puncture [31].

Thus, DN could be a treatment option for myofascial trigger points (hypersensitive areas of muscle fibers associated with motor abnormalities) [27]. However, precision during needling and the performance of the procedure seems to be essential for its correct development, with the ability of the physiotherapists being vital to perform the treatment properly [25][32]. The mechanism of action of DN is related to the effects achieved on myofascial trigger points [27]. The persistence of these points can favor the phenomenon of central sensitization. Therefore, it is possible to apply these invasive physiotherapy techniques in chronic pathologies [33], and it can be recommended for the treatment of CNP [27].

## **2. DN in Physical Therapy Treatment for CNP**

Pain intensity was the most studied variable. Depending on the study, the VAS scale or the NPRS scale were used, both of which showed high reproducibility and validity for short- and long-term assessments of CNP [34][35][36]. Focusing on pain, the shorter-term outcomes were found in the study conducted by Stieven et al. [37], who demonstrated the immediate effects of a single-session treatment. That study showed that a single application of unilateral DN at the level of the upper trapezius or a myofascial release treatment of that musculature could generate a superior response than a placebo intervention, with pain reduction and increased PPT.

Along the same lines, Sobhani et al. [38] performed a treatment of five sessions distributed over ten days, collecting the outcomes at the end of the intervention. These authors observed a decrease in the intensity of pain, a reduction in the NDI and catastrophic thoughts, and increased mobility. Disability is one of the important variables to assess in CNP, and usually the NDI scale is used, but it is also possible to use other scales [39]. Manafnezhad et al. [35] found similar effects in the follow-up performed one week after the intervention and after three weeks of treatment at the rate of one session per week.

On the other hand, it was possible to find the outcomes achieved by carrying out a long-term follow-up of up to one year (Gattie et al. [40]), also in comparison to a placebo-type sham DN treatment. These authors did not observe differences between DN treatment and placebo. Alternatives interventions based on placebo could suggest that the use of placebo could have a place within the treatments. In the same way, Irnich et al. [29] compared the effects of DN intervention versus traditional acupuncture treatment and sham laser treatment in the same group of patients.

Most studies performed intermediate follow-ups ranging from three to six months [34][41][42], with four to six treatment sessions distributed over two to four weeks or one-month follow-up after two sessions with a one-week interval [43]. Regarding the periodicity of the follow-ups, it is worth highlighting the study conducted by Cerezo-Téllez et al. [34], whose analysis included up to six post-intervention assessments.

Upper trapezius and levator muscles are the most frequent locations to DN intervention [35][37][38][43]; usually, the treatment of studies includes DN in this musculature, and combine with other neck or back muscles [34][40][41][42]. Another aspect to analyze would be the performance of the technique unilaterally or bilaterally, although this would be related to the lateral predominance of the symptoms and to the proprioceptive control at the cervical level, as in cases in which there is a structural alteration [44].

In general, the applications of DN techniques were performed following the action protocols described by Travell and Simons [34][41][43], with rapid needle entry and exit movements under the principles of the Hong's technique, in which the needle is retracted into the subcutaneous tissue and then redirected to another region of the trigger point without leaving the tissue [34][39][41] by means of the therapists' wrist flexion and extension movements [35]. The procedure affected the musculature bilaterally [38], for one to two minutes [35], seeking to trigger local spasm reactions [34][41][42][43]. In many cases, DN was accompanied by ischemic compression or post-needling stretching [34][36][38][41][42][43].

The mechanism of action of DN can be determined based on chemical and neurophysiological changes associated with mechanical effects derived from the stimulus provided by invasive therapy on soft tissue [35], which modifies the activation and perpetuation of myofascial trigger points [43]; usually, the DN intervention causes a local twitch response [29][34][35][40][41][42]. The methodology proposed in the assessed studies focused on DN interventions on the myofascial trigger points of

the upper trapezius and the levator scapulae muscles [35][37][38][43], and, to a lesser extent, on splenius, multifidus, or middle trapezius, among others [34][40][41][42].

In the studies that performed placebo interventions with sham DN [37][40][43], sham needles were used to simulate the puncture without penetrating the skin [40][43]. Therefore, three of the studies apply sham DN as a placebo treatment option, making it necessary to delve into the conditions of this intervention. In addition, the alternative treatment was performed by means of stretching [34][41], therapeutic physical exercises [40][42], or manual therapy techniques (myofascial treatment or cervical and thoracic mobilization) [37][38][40][42][43], or by means of instrumental techniques, such as TENS and microwaves [44], kinesiotaping [38], and waves shock [35].

The research of Leon-Hernandez et al. [36] stands out for the comparison between two treatment modalities based on the percutaneous needle electrical stimulation after application of the DN. In these treatments, the DN of the upper trapezius is performed (with local twitch response), and then a low or high frequency current is applied. This option shows that DN can be combined with associated electrotherapy and can obtain similar results regardless of the stimulation frequency.

Specifically, in the comparison between DN interventions and alternative treatments, it should be noted that the results may be favorable to invasive treatments [34][41][43]. However, the differences may be slight [42], or the beneficial effects achieved may be similar to those produced by the control treatment [35][38].

In general, it highlights the relationship of the treatment proposals of the trials with therapeutic exercise, and this reinforces the need to direct physiotherapy to a relationship between passive techniques and active movement. Exercise has positive effects on pain and functionality, and it should be oriented according to the interests and individual goals of the patient, and could be combined with instrumental techniques [45][46]. Is it possible to achieve the same effects with manual stimulation of the treatment points? [47].

The positive outcomes that support the success of DN with respect to the study variables in CNP are in line with the conclusions of other previous reviews that considered this type of intervention useful [48]. In addition, the changes achieved are in line with what has been observed in other related pathologies, such as headache [49][50]. In the same way, it would be possible to point out that these effects could help reduce over-medicalization, and represent a non-pharmacological treatment option [2], which will also reduce the socioeconomic costs associated with neck pain.

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