Dry needling in the treatment of myofascial trigger points and painful shoulder dysfunctions: narrative review of the literature

Agulhamento a seco no tratamento de pontos-gatilho miofasciais e disfunções dolorosas do ombro: revisão narrativa da literatura

Jhonatan Zimmermann Antônio[1], Heloísa Alonso Matielo[2], Fabíola Minson[1], Camila Squarzoni Dale[2,3]

DOI 10.5935/2595-0118.20230064-en

ABSTRACT

BACKGROUND AND OBJECTIVES: Shoulder painful dysfunctions comprises one of the most common musculoskeletal disorders that requires specialized assistance. Dry Needling (DN) became an adjuvant approach with increased use in clinical practice to treat this type of condition. The present study discusses the literature related to DN in the treatment of myofascial trigger points (MTPs), shoulder dysfunctions and associated pain.

METHODS: A narrative review through search of articles from 2010 to 2022 written in Portuguese, English or Spanish was performed in Latin American and Caribbean Literature on Health Sciences (LILACS), Health Information from the National Library of Medicine (Medline), Web of Science and the Scientific Electronic Library Online (Scielo) databases using the keywords: <"Dry Needling">; <"*Agulhamento a Seco*">; <"Myofascial Trigger Points">; <"*Pontos-Gatilhos Miofasciais*">; <"Shoulder Dysfunctions">; <"*Disfunções do ombro*">. The qualitative analysis was performed determining the level of evidence for DN treatment of MTPs, shoulder dysfunctions and pain.

RESULTS: A total of 45 citations were found, 22 citations were excluded because they did not meet the selection criteria. The 23 remaining citations were examined for titles and abstracts and duplicate studies were removed. Finally, 10 articles met the selection criteria and were included in the present review. No articles were excluded after full-text screening. The analysis showed poor advances and knowledge regarding the application of DN for the treatment of pain, painful and general shoulder dysfunctions and MTPs, with few evidence regarding treatment effectiveness, patient's pain scores data, mechanisms of action and statistical analysis.

CONCLUSION: There is still a lack of concrete scientific evidence to assess DN effectiveness in modulating pain in patients with MTPs shoulder. More systematic reviews and meta-analyses together with experimental and clinical searches must be conducted to provide stronger evidence of this modality to relief painful symptoms in the shoulder, as well as a treatment of MTPs and general shoulder disorders.

Keywords: Dry needling, Myofascial pain syndromes, Pain, Shoulder pain.

RESUMO

JUSTIFICATIVA E OBJETIVOS: As disfunções dolorosas de ombro constituem uma das disfunções musculoesqueléticas mais comuns que requerem assistência especializada. O agulhamento a seco (AS) tornou-se uma abordagem adjuvante com uso crescente na prática clínica para tratar esse tipo de condição. O objetivo deste estudo foi rever na literatura aspectos relacionados ao AS no tratamento de pontos-gatilho miofasciais (PGMs), disfunções do ombro e dores associadas.

MÉTODOS: Foi realizada uma revisão narrativa através da busca de artigos de 2010 a 2022 escritos em português, inglês ou espanhol, na Literatura Latino-Americana e do Caribe nos bancos de dado Ciências da Saúde (LILACS), Informações em Saúde da Biblioteca Nacional de Medicina (Medline), *Web of Science e Scientific Electronic Library Online* (Scielo) utilizando as palavras-chave <"*Dry Needling*">; <"Agulhamento a Seco">; <"*Myofascial Trigger Points*">; <"Pontos-Gatilhos Miofasciais">; <" Disfunções do ombro">. A análise qualitativa foi realizada determinando o nível de evidência para tratamento de AS para o tratamento de PGMs, disfunções do ombro e dor.

RESULTADOS: Um total de 45 citações foram encontradas, 22 citações foram excluídas porque não atenderam aos critérios de

Jhonatan Zimmermann Antônio – https://orcid.org/0009- 0001-4325-3097;
Heloísa Alonso Matielo – https://orcid.org/0000-0002-3616-4192;
Fabíola Minson – https://orcid.org/0000-0001-9057-9690;
Camila Squarzoni Dale – https://orcid.org/0000-0002-3421-7799.

1. Albert Einstein Israeli Faculty of Health Sciences, São Paulo, SP, Brazil.
2. Institute of Biomedical Sciences University of São Paulo, Anatomy Department, São Paulo, SP, Brazil.
3. School of Medicine, Department of Surgical Technique, University of São Paulo, São Paulo, SP, Brazil.

Submitted on March 06, 2023.
Accepted for publication on August 25, 2023.
Conflict of interests: none – Sponsoring sources: Authors received HAM [Grant 2020/12120-4] funding from *Fundação de Amparo à Pesquisa do Estado de São Paulo* (FAPESP - São Paulo State Research Foundation).

HIGHLIGHTS

- Dry needling can treat myofascial trigger points, shoulder dysfunctions and associated pain.
- So far, few studies address the importance of dry needling in the clinical practice.
- Dry needling has low to medium benefits, while it can be used with multiple therapies.

Correspondence to:
Camila Squarzoni Dale
E-mail: camila.dale@usp.br

seleção. As 23 citações restantes foram examinadas para títulos e resumos e estudos duplicados foram removidos. Finalmente, 10 artigos atenderam aos critérios de seleção e foram incluídos na presente revisão. Nenhum artigo foi excluído após a triagem de texto completo. A análise mostrou poucos avanço e conhecimento sobre a aplicação de AS para o tratamento da dor, disfunções dolorosas e gerais do ombro e PGMs, com poucas evidências sobre a eficácia do tratamento, dados dos escores de dor do paciente, mecanismos de ação e análise estatística.

CONCLUSÃO: Ainda faltam evidências científicas concretas para avaliar a eficácia do AS na modulação da dor em pacientes com PGMs no ombro. Mais revisões sistemáticas e meta-análises associadas a pesquisas experimentais e clínicas devem ser realizadas para fornecer evidências dessa modalidade promissora para alívio de sintomas dolorosos no ombro, bem como tratamento de PGMs e distúrbios gerais do ombro.

Descritores: Agulhamento seco, Dor, Dor de ombro, Síndromes da dor miofascial.

INTRODUCTION

Pain and disorders in the upper limbs are a major worldwide problem and an enormous economic burden, with high health costs and time off work[1]. Shoulder pain is in the top three of the major causes for primary care seek related to musculoskeletal painful disorders, affecting 22.3% of the population, mainly women over 50 years[2], and lasting for 1 year or more in 60% of the cases[3]. Almost half of the population experiences an episode of shoulder pain at least once a year, which might be originated from different causes such as neuronal or vascular disorder, disturbances in the cervical spine, neoplasm and referred pain[4]. This condition impairs quality of life, besides being associated to generalized anxiety, depression, social exclusion and work absence, what makes the socioeconomic impact and the decreased quality of life a hallmark of shoulder pain, since patients require constant specialized medical assistance[4].

The literature has suggested the existence of trigger points (TPs) as one of the causal agents of shoulder pain and functional limitations[3]. Myofascial trigger points (MTPs) are defined as hyperirritable points in the muscle that are associated with palpable, hypersensitive nodules in tense bands which become painful after compression, generating localized and radiating pain[5].

Recently published epidemiologic studies showing prevalence and incidence data confirm that TPs are indeed very common in a wide variety of conditions, generating muscle pain in one or more muscles, and may be associated with muscle spasms, increased tenderness, stiffness, muscle weakness, decreased Range of Motion (ROM), fatigue and anatomical dysfunction[6]. There are two types of TPs, either latent or active, and both present themselves as tight bands within the muscles and, under mechanical stimulation, produce local or referred pain, hyperalgesia, and allodynia. Latent TPs produce pain only after mechanical stimulation, such as direct pressure or needling, while active TPs spontaneously cause painful symptoms at rest or during activity[6]. TPs can act as sources of persistent peripheral nociceptive input independent of tissue damage and inhibit general muscle function, leading to muscle weakness without atrophy or motor inhibition[6].

Several therapeutic techniques have been used to treat MTPs, such as ultrasound, ischemic compression, muscle energy techniques, massage, electrical stimulation and the Dry Needling (DN), a recent approach used in the clinical practice with great analgesic and modulatory benefits[6]. The DN procedure aims to inhibit MTPs by a mechanical tissue stimulation through a needle insertion, which may increase mechanical and pressure thresholds of sensitized nociceptors, alleviate muscle tone and induce analgesia[6].

On the other hand, DN is frequently discussed regarding benefits compared to other common used pharmacological approaches. In a systematic review and meta-analysis[5], the authors compared the efficacy of DN with lidocaine treatment, suggesting that both promote similar analgesia for the management of MTPs. Similarly, in the more recent literature, in another study[7], a low-quality based data also suggested higher efficacy of lidocaine injections to treat MTPs, with no concrete data regarding pain intensity decrease after lidocaine or DN. In this sense, the small sample analyzed in the meta-analysis associated to unclear investigation of DN mechanisms of action restricted and impaired literature knowledge to this day and pointed that a more detailed, updated emphatic discussion should be made to guide the next points needed to be elucidated in future research.

Therefore, the present narrative review aimed to discuss the DN procedure used to relieve MTPs to treat shoulder dysfunctions and the associated painful symptoms based on the literature published in the past 12 years and what its effects and benefits while promoting analgesia and improved patient's quality of life.

METHODS

A narrative literature review of publications in national and international journals.

A bibliographic manual search of articles published from 2010 to 2022 and written in Portuguese, English or Spanish was performed in Latin American and Caribbean Literature in the Health Sciences (LILACS), Health Information from the National Library of Medicine (Medline), Web of Science and in the Scientific Electronic Library Online (Scielo) online platforms using the following English or Portuguese keywords: <"Dry Needling">; <*"Agulhamento a Seco*">; <"Myofascial Trigger Points">; <"*Pontos-Gatilhos Miofasciais*">; <"Shoulder Dysfunctions">; <"*Disfunções do ombro*">.

The mentioned descriptors were chosen as they are found In the Health Sciences Descriptors (DeCS). Boolean operators "AND", "OR" and "AND NOT" were used to build advanced search strategies, where "AND" equals intersection, "OR" equals union, and "AND NOT" equals exclusion. Thus, for the question "Dry needling in the treatment of myofascial trigger points and painful shoulder dysfunctions", two following strategies of literature search were used: (i) < Dry needling> "OR" <*Agulhamento a Seco*>; (ii) <Dry Needling> "AND" <Shoulder Dysfunctions> "AND" <Myofascial Trigger Points> "AND"

<Dry Needling> "AND" <*Pontos-Gatilhos Miofasciais*> "AND" <*Agulhamento a Seco*>.
The search sorted relevant artIcles for inclusion according to the eligible criteria, and only selected articles which were analyzed and included in the discussion of this review. Data collection took place during the month of September 2022.
Eligible criteria used the following steps of confirmation to be considered in this review: adherence of the article titles, which should contain the keywords searched; relevance of the abstracts to the purpose of the research; and full text content and its consonance with the review question. The exclusion criteria consisted in articles that were published before the year of 2010 and articles whose main theme or comorbidities do not correspond to the main question of this review.

Data processing
After the identification of the articles, the titles and abstracts were evaluated, in order to sort them according to relevance. The articles were them listed, according to type of publication, database origin, language, year of publication, objectives, results and conclusion theme.
Data in the body of the text from each article selected were then evaluated, covering the main characteristics of the articles used in the research. If necessary, thematic categories were identified.

Data analysis
A qualitative analysis was performed determining the level of evidence for DN treatment for the treatment of MTPs, shoulder dysfunctions and pain.

RESULTS

A total of 45 citations were found through the screening. 22 articles were automatically excluded since they did not meet the criteria of this review: 11 were excluded because they focused on the applicability of DN in disorders and/or pathologies of the lumbar spine; nine were excluded since the study reviewed the DN technique in hip pathologies, and two were excluded because there was no correlation between the DN technique and shoulder diseases.
The other 23 remaining citations were examined for titles and abstracts, then duplicate studies were removed, leaving 10 articles left for full text evaluation. No articles were excluded after full-text screening. Finally, 10 articles[1-10] met the selection criteria and were included in this review.

Study characteristics
A total of 10 studies which met the eligibility criteria were identified for further and detailed analysis. The selected studies include the analysis of the DN technique for the treatment of MTPs, shoulder dysfunctions and the associated pain.

Effects of Dry Needling for myofascial trigger points
In one systematic review and meta-analysis[5], the main conclusion was that there is no significant difference between DN and lidocaine treatment in the management of MTPs in the shoulder region. However, it must be recognized that these analyzes were made with a relatively small number of participants. The authors also concluded that there is limited evidence of no significant difference between DN and placebo for pain intensity and activity outcomes immediately after treatment and at 6-month follow-up. There is also limited evidence of no significant difference between dry needling and lidocaine in activity levels immediately after treatment and at 1 month. As DN is as effective as lidocaine injection, it may be more favorable and more feasible to use in the clinical physical therapy because it is a minimally invasive technique, less costly, and has fewer adverse effects than a local anesthetic injection[5].

Efficacy of Dry Needling in shoulder dysfunctions
A randomized controlled clinical trial[9] evaluated two DN techniques, namely, the Deep Dry Needling (DDN) and The Hong Technique. Research has shown that there was a reduction in pain and disability in all groups treated with different techniques, therefore each of the treatments has a positive effect on intensity of pain and disability. This superiority in pain reduction remained the same for four weeks after treatment. In addition, pain and disabilities did not show a significant difference between the Hong group and the control group. The findings of this study demonstrated that the application of the DN technique together with routine physical therapy can reduce pain more effectively than the Hong technique or routine physical therapy alone, and this result also has more stability to improve the shoulder dysfunction and its impacts.
In a systematic review[10], the researchers identified that there is a positive benefit of DN for tendinosis treatment according to the responses reported by the patient. Despite these results, more high-quality evidence is needed to better assess the DN use in tendinopathy cases. In this case, the focus of the review was DN as an intervention for tendinopathy. However, the studies in this review showed a suggested bias to patient's improvement when using blood products in combination to DN. Differences related to the blood products used, subject evaluations and characteristics of the tendons made it difficult to conclude which technique is superior. It is also not known whether DN increases the use of injected blood products. Ultimately, research is needed not only on the treatment of tendinopathy, but also on the epidemiology and risk factors that contribute to tendinopathy to better understand diagnosis, management, prevention and applicability of adjuvant techniques such as DN.
Pain analgesia in shoulder dysfunctions after Dry Needling treatment Another systematic review[1] showed the effects of DN on trigger points in the shoulder region of patients with upper limb pain and dysfunction. The authors found that there is very low evidence that DN applied directly to trigger points in the shoulder region is more effective to reduce pain symptoms than placebo or when used in combination to a physical therapy rehabilitation program, after a short-term treatment. In this citation, however, there are high risks of bias, with low strength and quality of evidence from the analyzed data, which discourages supporting the use of DN in the shoulder region

for the treatment of patients with pain or dysfunction in the upper limbs[1].

Similarly, a randomized clinical trial[3], the first publication of this type evaluating the effectiveness of DN when used as a personalized treatment for shoulder pain, did not bring additional data about benefits in terms of analgesia, and patients reported only general response to recover of functions, range of motion and reduction of active MTPs[3].

After performing a systematic review and meta-analysis using the Pubmed, Scopus, SportDiscus, and Web of Science databases, a group of authors[6] found 1771 articles in a first sort, in which 42 were eligible to be included in the meta-analysis for pain measurement. In their publication, there was low-quality evidence in the included studies suggesting that DN performed by physical therapists was more effective than no treatment for pain reduction. Although the results of this review concluded that the effectiveness of DN in analgesic treatments benefits is higher compared to other physical therapist interventions during the follow-up period, this effect still diminishes as time passes after the intervention, suggesting that DN treatment may require a prolonged follow up to achieve better and sustained results.

The study[7] presented a more complete and detailed evaluation of the theme in their systematic review and meta-analysis, including randomized controlled trials in which at least 1 group received some type of DN therapeutics to relieve MTPs in subjects with non-traumatic shoulder pain of musculoskeletal origin. The article considered as example of diagnosis of non-traumatic shoulder pain of musculoskeletal origin a subacromial pain syndrome, the rotator cuff disorder, the subacromial impingement syndrome, or nonspecific shoulder pain. Meta-analysis was performed using the Review Manager Statistical Software (RevMan version 5.3). Data synthesis was categorized by groups according to short-term, medium-term and long-term follow-up period, if data were available.

Electronic searches identified 551 potential studies for that review. After removing the duplicates, 319 studies remained. Then, 308 studies were excluded based on the examination of their titles/abstracts, leaving 11 articles for full-text analysis. Another five were excluded for the following reasons: pilot study of a large randomized clinical trial, inadequate comparison group or lack of a randomized clinical trial adjuvant DN intervention with lidocaine injection, and no diagnosis of non-traumatic shoulder pain. Finally, a total of six trials were included in the main analyses. Results found moderate-quality evidence of DN in MTPs for a small effect in reducing shoulder pain intensity and low-quality evidence for a large effect in reducing pain-related disability in subjects with non-traumatic shoulder pain of musculoskeletal origin.

The authors[8], in their systematic review and meta-analysis, again, showed the effectiveness of DN to reduce pain in MTPs in the neck and shoulder, aiming to determine the short, medium, and long-term effectiveness of DN. They found the effect of DN in pain reduction among patients with neck and shoulder MTPs compared to placebo/sham DN, Wet Needling and other treatments. Based on the analysis performed in that study, it can be cautiously recommended that DN compared to control group can significantly relieve pain in neck and shoulder TPs in the short to medium term, while Wet Needling is more effective than only DN in reducing medium-term pain (nine to 28 days) originated by MTPs in the neck and shoulders.

As the authors[8] suggested that other treatments, and not DN, would be better to treat medium-term pain from MTPs, more research should also be carried out with a larger sample to provide better scientific evidence and encourages DN use in clinical practice.

DISCUSSION

The analysis of the selected previous published works still showed poor advances and knowledge regarding the application of DN for the treatment of pain, painful and general shoulder dysfunctions and MTPs, with few evidence regarding treatment effectiveness, patients' pain scores data, mechanisms of action and statistical analysis.

Despite that, in shoulder disorders, the DN technique proved to be of average effectiveness, and low to medium effectiveness in the treatment of shoulder pain, setting a standard to a very innovative and still little used treatment among physiotherapists[8]. In the treatment of MTPs, especially located in the shoulder, data suggested that DN has a better efficacy, reducing TPs and contributing to patients' analgesia, which reinforces the positive aspect of the technique, its easy applicability and low costs and application risks. DN can be performed by trained personal in hospitals, outpatient clinics, clinics and in home care. One of the disadvantages of the procedure is the patient's hypersensitivity to the needle due to severe painful conditions, which is already accentuated by muscle dysfunction. Another point is the phobia of needles, which makes it difficult to perform the procedure.

DN has provided some clinical benefits for treating painful shoulder dysfunctions[8], however still no clearly scientific proved evidence supports its use singularly to solve the patient's condition as well as other common therapies such as anti-inflammatories, local anesthesia application, intra-articular injection, physiotherapy, irradiation therapy or surgery intervention, which do not have a profound improvement effect on painful shoulder dysfuction[4] by themselves, suggesting that a combined strategy may work better while inducing tissue regeneration, promoting analgesia and rescuing quality of life.

The study[9] supports this idea showing that DDN associated with constant physical therapy assistance would be a greater analgesic for patients compared to only physical therapy or the Hong technique for needling. Besides that, it is still important to refer that a study with defined acute and chronic follow up period and outcome is still required to understand if DN treatment does have an acute effect which needs an undetermined number of reapplications for a sustained and prolonged analgesia as the authors[6] suggested, something that directly impacts its logistics for use in day-to-day clinical practice.

Although the literature suggests that the DN procedure is an innovative and promising technique, there is still a lack of con-

crete scientific evidence to assess its effectiveness in modulating pain in patients with TPs in the shoulder and which supports its mechanisms of action. It is worth mentioning that in this review the majority of clinical trials, systematic reviews and meta-analysis presented complete evidence for DN application, however always concluding that so far the advances in how DN may have a better benefit to a chronic pain patient with MTPs are unsatisfactory or do not overcome classical pharmacological applications. The present narrative review showed that two main published meta-analysis[5,7] concluded that the scientific clinical evidence indicating an analgesic effect of DN to treat MTPs and bring quality of life improvement is poor. This shows that there is still much more to be uncovered about DN as an antalgic approach and DN needs to be used with attention so that its higher potential in each condition is achieved.

CONCLUSION

In this narrative review, data suggested that there is still a lack of clear scientific knowledge about the effectiveness and mechanisms of DN in modulating pain in patients with TPs in the shoulder. Further systematic reviews, meta-analyses and more detailed research on DN will make easier to better understand the outcomes of treated patients and indicate a better application for MTPs and painful shoulder dysfunctions, as well as when used combined with multiple therapies. Notwithstanding, DN may be a potential technique to treat painful shoulder dysfunctions, especially when triggered by MTPs, also being useful when implemented as adjuvant to other pharmacological and non-pharmacological therapies, becoming of urgent relevance for the improvement of patients' analgesia and quality of life. Further research to fill the gaps regarding DN will certainly guarantee its clinical use and spread its benefits.

ACKNOWLEDGMENTS

This research was supported by the Albert Einstein Israeli Institute of Education and Research, São Paulo, SP, Brazil.

AUTHORS' CONTRIBUTIONS

Jhonatan Zimmermann Antônio
Statistical Analysis, Data Collection, Conceptualization, Research, Writing - Preparation of the original
Heloísa Alonso Matielo
Data Collection, Conceptualization, Writing – Preparation of the original, Writing - Review and Editing, Visualization
Fabíola Minson
Supervision
Camila Squarzoni Dale
Funding Acquisition, Conceptualization, Resource Management, Project Management, Supervision, Validation

REFERENCES

1. Hall ML, Mackie AC, Ribeiro DC. Effects of dry needling trigger point therapy in the shoulder region on patients with upper extremity pain and dysfunction: a systematic review with meta-analysis. Physiotherapy. 2018;104(2):167-77.
2. Feitosa AIGVS, Albano RS, Soares JPC, Vieira CEN, Melo MM, Oliveira Junior PRM, Rosa BV, Cunha FV. Incidência de lesões no ombro em praticantes de musculação. RBPFEX – Revista Brasileira de Prescrição e Fisiologia do Exercício. 2021;15(96):137-45.
3. Pérez-Palomares S, Oliván-Blázquez B, Pérez-Palomares A, Gaspar-Calvo E, Pérez-Benito M, López-Lapeña E, de la Torre-Beldarraín ML, Magallón-Botaya R. Contribution of dry needling to individualized physical therapy treatment of shoulder pain: a randomized clinical trial. J Orthop Sports Phys Ther. 2017;47(1):11-20.
4. Hains G, Descarreaux M, Hains F. Chronic shoulder pain of myofascial origin: a randomized clinical trial using ischemic compression therapy. J Manipulative Physiol Ther. 2010;33(5):362-9.
5. Ong J, Claydon LS. The effect of dry needling for myofascial trigger points in the neck and shoulders: a systematic review and meta-analysis. J Bodyw Mov Ther. 2014;18(3):390-8.
6. Sánchez-Infante J, Navarro-Santana MJ, Bravo-Sánchez A, Jiménez-Diaz F, Abián-Vicén J. Is dry needling applied by physical therapists effective for pain in musculoskeletal conditions? A systematic review and meta-analysis. Phys Ther. 2021;101(3):pzab070.
7. Navarro-Santana MJ, Gómez-Chiguano GF, Cleland JA, Arias-Buría JL, Fernández-de-Las-Peñas C, Plaza-Manzano G. Effects of trigger point dry needling for nontraumatic shoulder pain of musculoskeletal origin: a systematic review and meta-analysis. Phys Ther. 2020;101(2):pzaa216.
8. Liu L, Huang QM, Liu QG, Ye G, Bo CZ, Chen MJ, Li P. Effectiveness of dry needling for myofascial trigger points associated with neck and shoulder pain: a systematic review and meta-analysis. Arch Phys Med Rehabil. 2015;96(5):944-55.
9. Imani M, Abbasi L, Taghizadeh S, Amiri M. Comparison of the effect of two different types of dry-needling techniques on subacromial impingement syndrome. J Bodyw Mov Ther. 2021;25:35-40.
10. Krey D, Borchers J, McCamey K. Tendon needling for treatment of tendinopathy: a systematic review. Phys Sportsmed. 2015;43(1):80-6.