



TRIGGER POINTS IN MEDICAL PRACTICE - CURRENT THERAPEUTIC DIRECTIONS

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Abstract

Recent scientific evidence suggests that one of the causes of myofascial pain syndromes responsible for the occurrence of chronic headaches, among other things, may be increased or impaired with trigger point therapy.

This paper presents the results of a non-systematic literature review on trigger point therapy.

The analysis shows a clear increase in scientific interest in invasive trigger point pain treatment techniques. Invasive therapy consists primarily of the use of injections and dry needling. Injections of anesthetics or botulinum toxin are methods that, in addition to their possible therapeutic effect, may carry side effects. In contrast, dry needling does not have a fully scientifically-proven effect. Recent scientific data also indicates that the aforementioned method may have a limited clinical effect.

The performed analysis did not demonstrate a significant advantage in invasive techniques over typical non-invasive techniques. It is therefore necessary to design randomized multi-center clinical trials to definitively verify the efficacy of these techniques in the treatment of tension-type trigger point-dependent myofascial pain.

Running title: Trigger points in medical practice

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Introduction

Pain is a factor that significantly reduces the quality of life of those affected. One of the causes of pain can be tension and spasm in the muscle tissue. A small, tender point in the muscle, where pressure causes localized pain or pain that spreads along adjacent tissues, is called a trigger point (MTrP) [1]. At this point, pressure is exerted by the swollen tissues on nearby blood vessels, leading to a regional state of ischemia [2].

The causes of painful MTrPs include a number of factors that are considered to be harmful to health but remain a permanent feature in many people's daily lives. These include stress, fatigue, and insufficient sleep. Other factors that may cause fascio-muscular trigger points are trauma, degenerative arthritis, systemic disorders, or various types of dysfunctions e.g., related to the nervous system [2].

The mechanism of the pathophysiological formation of myofascial trigger points (MTrPs) is not fully understood due to the still imprecise knowledge of anatomical details regarding the human body. Several different factors are likely to be involved in the pathogenesis of MTrPs, including the release of substances with vasoactive activities (IL-1, bradykinin, substance P, prostaglandins). It is likely that acetylcholine, and, more specifically, the induced release of calcium from the cells and the subsequent contraction of the muscle, is also involved in the formation of trigger points. Other theories claim that MTrPs are the result of the presence of spinal abnormalities or impaired spinal nerve function [3].

The problem is very common, as it is estimated that approximately 75% of the population suffers from myofascial pain [4]. A significant fraction of this high statistic can be attributed to the pain resulting from trigger point tension. Due to the magnitude of the problem, MTrP therapy needs to be refined and certain treatment guidelines need to be established. Therapy based on trigger point relaxation is currently gaining importance in myofascial pain syndromes (MPS) and tension headaches (TTH) [5].

There are many types of therapies for MTrP, ranging from manual therapies to invasive therapies based on the injection of chemicals, such as botulinum toxin or steroids into the MTrP. Some of these require follow-up with real-time imaging studies [6].

Although this topic is highly controversial, everyone agrees that the use of therapies to reduce a patient's pain, despite the lack of evidence for their effect, is an important aspect of therapeutic success and leads to improved patient outcomes. We concur, as clinical trials consistently support the added benefit of initiating therapies despite the lack of evidence for their effectiveness.

Given the prevalence of trigger point syndromes in the population, the topic of their elimination warrants special attention from those authorized

to treat and rehabilitate patients - physicians and physiotherapists.

There is a lack of conclusive data in global literature on the efficacy of invasive processes in the treatment of MTrPs, including dry needling or the injection of therapeutic substances such as botulinum toxin or compounds with anesthetic effects (e.g., lidocaine).

Although many physiotherapeutic techniques are used in the manual therapy of painful trigger points, there is a lack of critical evaluation of these techniques in literature.

Not all therapeutic procedures can be carried out by a physiotherapist, as different qualifications and medical certifications are needed for some of them. The aim of this review is to evaluate invasive methods of fascial-muscular trigger point therapy that can be applied in everyday medical practice.

Definition and general characteristics

Myofascial pain is a clinical problem that has been the cause of very frequent visits to medical and physiotherapy practices (especially GP surgeries) for many decades. The described pain is caused by the formation of trigger points (MTrPs), which are tender foci resulting from the hyperactivity of points located on the tense skeletal muscle band. The formation of trigger points is not a fully understood process. However, there are some theories in research about the origin of MTrPs in areas of sensory nerve passage (deep sensation). These nerves are responsible for the release of acetylcholine on the motor plates, causing contraction of the innervated muscle. Understanding the topography of nerve branch entry may contribute to a better understanding of the pathophysiology of MTrP formation, improving treatment and avoiding iatrogenic complications [7,8].

Another theory is that frequent microtrauma, as well as severe trauma or arthritis, may contribute to muscle fiber strain and the subsequent appearance of MTrP [9].

Simons, in the Trigger Point Manual, described the 'Cinderella' hypothesis, which presents theoretical principles for the formation of painful myofascial points. This theory assumes that people doing light to moderate work (for example, office workers, dentists) primarily use smaller type I muscle fibers (hereafter referred to as the eponymous 'Cinderella fibers') in their movements [10].

These fibers are recruited first and relaxed last, causing them to be constantly activated in contrast to other, larger muscle fibers. The phenomenon results in the 'Cinderella' fibers showing an increased susceptibility to muscle injury and increased sensitivity to disruption of intramuscular calcium metabolism, which is key in the formation of MTrP [11].

Initially, the theory was confirmed on an animal model - rabbits were examined [12]. In the next sta-

ge, human studies were conducted [11]. For example, the hypothesis was confirmed by a study done by an international group of researchers, which showed that even short periods of computer use (about 30 minutes) result in the appearance of trigger points in the employees, especially in the area of Trapezius [13].

In addition, current data suggest a link between the formation of active trigger points and psychosocial disorders, chronic stress, or a failure to engage in proper and regular physical activity [11].

Physiotherapists identify several types of MTrP. The most relevant are:

- latent points, which do not cause pain phenomena (except, for example, when they are irritated);
- active points, causing pain to the patient at rest and during movement [1].

Active MTrPs are associated with patient pain, although the patient may not be aware of the cause of the pain. We do not observe this phenomenon with latent trigger points. In other words, the MTrP is physically present, but the patient with a latent trigger point does not complain about any pain. Irritation of a latent trigger point may result in increased pain, a similar but dampened version of the pain perceived by the patients with active MTrPs. This means that the pain sensations in patients with active points are much more intense.

Both active and latent MTrPs contribute to dysfunction and muscle weakness, as well as a reduced range of motion in the area where painful myofascial tensions occur. This phenomenon occurs to a lesser extent in individuals with latent MTrP. The tense muscle bands that make up the MTrP are palpable, meaning no specialized medical equipment is required to locate them [1].

The MTrP is a highly irritable site; pressure results in muscle contraction and observed motion.

A physical examination is the “golden standard” in MTrP diagnosis. This includes three elements: palpation of the tension band, identification of an extremely tender point in the tension band, and restoration of the patient’s symptomatic pain with persistent pressure.

The presence of an MTrP lays the foundation for the diagnosis of myofascial pain. This disorder is characterized by a patient’s perception of pain in a highly specific location and a restriction of muscular mobility. Studies show that the presence of painful MTrPs associated with back pain is a common complaint, affecting up to 20% of the population [14].

MTrP diagnostic criteria

The standards for the diagnosis of MTrP are based on the presence of an active MTrP foci, diagnosed by:

- demonstration of the presence of a tense band of fibers within the skeletal muscles;
- the appearance of a hypersensitive point in the area of the band with increased tension;
- the appearance of projected pain during stimulation of the hypersensitive point.

The following additional assessments are recommended to confirm the diagnosis:

- the appearance of a localized tremor during palpation of a tense band;
- the evocation of sudden pain during palpation, stretching, or contraction;
- the identification of pain by the patient, based on the predicted pattern of projected pains;
- the detection of attenuated or increased tenderness of a strained muscle; or the simple detection of a strained band [15].

Directions for the treatment of sore trigger points

Compression techniques show that, when tight muscles are compressed, the flow of lymph and blood is facilitated through an effect on cell metabolism, resulting in a reduction in pain. There are several methods used today for the treatment of myofascial trigger point pain, including the continuous compression technique, pinch grip, spray and stretch technique, postural relaxation, passive or active muscle stretching, needle therapy, electro-magnetotherapy, electroacupuncture, acupuncture, as well as injections of lidocaine and procaine or botulinum toxin [16].

Injection therapy

Injection techniques begin by disinfecting the area where the injection will be performed, stretching a piece of skin between the fingers, and inserting the needle into the patient where he/she feels pain. This is a sign of injection in the right place [17].

In recent years, injection of MTrPs under ultrasound guidance has become a common technique. This allows for safer injections, reducing the risk of complications like pneumothorax, hematomas, and damage to structures such as vessels and nerves [18]. Moreover, ultrasound control allows the administration of a smaller amount of local anesthetic, reducing the risk of systemic anesthetic toxicity [19].

Injections with local anesthetics

Systematic injections with anesthetics, such as lidocaine, have been recognized as a treatment option for MTrPs. Anesthetics in the treatment of MTrPs block nerve conduction by inhibiting the transmission of depolarizing waves in nerve fibers and excitable cells. Sodium influx into the cell is reduced by blocking the channels for these ions. The

possibility of spontaneous discharge of excitable cells is inhibited. All this leads to a decreased sensation of pain for the patient [19].

The choice of anesthetic does not change the effect. Lidocaine together with mepivacaine are the most commonly used pharmaceuticals in the practice of MTrP injection with local anesthetics. Regardless of which of these agents the patient was given, they reported a significant reduction in pain following injection with local anesthetics. Mepivacaine showed a stronger pain reduction immediately after injection, however, in the long term, both substances show a similar effect [20].

However, in our opinion, larger-scale studies with longer follow-up times are needed. For the treatment of frequent episodic tension headaches, lidocaine injection can be considered an effective and welfare-improving method for the patient. Lidocaine, in appropriate concentrations, reduces the number of mediators that cause pain in the muscles and suppresses its long-term perception in peripheral tissues [19]. This method is not fully validated due to the short follow-up period and the small number of patients observed in scientific studies. Despite emerging doubts, this method is commonly used to treat MTrP-related pain in the head, neck, shoulder girdle, quadriceps, and other areas. However, it is necessary to plan multi-center studies to confirm the effectiveness of this method [21-23].

A number of studies are emerging that focus on comparing anesthetic injection with other invasive methods for the treatment of persistent pain associated with MTrP. Tantanatip et al. [21], in a double-blind, randomized controlled trial for the treatment of myofascial pain syndrome of the Trapezius muscle, evaluated the efficacy of saline injection with lidocaine insertion in MTrP using a visual analogue scale (VAS), in addition to a segmental mobility assessment study (ROM) measured using a goniometer in all directions. Eighty patients participated in the study. Patients were randomized into two study groups, where one group received ultrasound-guided injections of an anesthetic in MTrP, while the other group received injections of physiological saline administered subfascially.

In the lidocaine injection group, results were more satisfactory after just 10 minutes, but, two weeks after the injections, there were no significant differences. Regarding the secondary ROM study, no significant differences were observed between injection types. The study showed that the treatment of MTrP with lidocaine injections is effective, but the subcutaneous injection of saline has a statistically similar ef-

fect. It is possible that similar effects were observed, regardless of if the patients received an injection of NaCl or lidocaine, due to the mere fact that the mechanical insertion of the needle into the trigger point relaxed the tight muscle - similar to what occurs during the dry needling technique, rather than being the result of the therapeutic substance used [23].

Other researchers have also attempted comparative studies of lidocaine injections with other methods, including bicarbonate and hyaluronidase injections in MTrP.

Ghasemi et al. [22] conducted a single-blind, randomized trial. After meeting the criteria set by the investigators, 60 patients entered the study and were divided into 3 equal groups, which received the following injections: 1) with bicarbonates 2) with hyaluronidase 3) with lidocaine. Injections were made at two sites of the Trapezius muscle under ultrasound guidance. Measurements were taken immediately after, two weeks after, and four weeks after. The results appeared to favor hyaluronidase, as the rate of pain reduction was significantly faster following its application than in the bicarbonate and lidocaine group.

Anesthetic injections were also compared with other less invasive methods. Supittita et al. [24] performed a pilot comparison of 1% lidocaine injection with radial extracorporeal shock wave therapy (rESWT). The study was a single-blind, prospective, randomized trial of treating hypersensitive areas of MTrP with the aforementioned two methods. The primary validation of pain treatment was the VAS analogue scale. Muscle flexibility and compression pain threshold and neck disability index were also checked. The assessment was carried out four times: before the start of treatment, 15-30 min after the first treatment, just before the second treatment, and after the third attempt i.e., four weeks after the start of therapy. Initially, no significant differences were observed between the two groups. Later measurements of the rESWT versus anesthetic injections showed that anesthetic injections had a statistically lower mean VAS score and a lower score in the other assessments performed. The authors demonstrated that rESWT may become a more favorable method than lidocaine injection, as it does not cause potential microbial contamination and is not myotoxic. The study has many limitations, and it becomes necessary to further observe the use of rESWT, which has the potential to replace the administration of local anesthetics, an established procedure for the treatment of MTrP.

Lugo et al. [23] compared the efficacy of lidocaine injections alone, physiotherapy, and a simultaneous combination of both therapies in a single-blind, randomized, controlled clinical trial in people with shoulder rim MPS. After multistage qualification, only 135 patients were selected from 726 patients,

divided into equal groups of 45 patients. The researchers' conclusion is that the combination of both therapies is not more beneficial than the use of them separately.

It is evident from the cited studies on anesthetic injections that they are effective in the treatment of MTrP and are a relatively inexpensive method. The level of patient satisfaction is evident in every study cited above and represents the subjective opinion of patients.

However, compared to other methods, injectables may contribute to more complications due to their invasiveness. This raises the need for further research into both the efficacy of lidocaine and less invasive methods that provide similar benefits.

Botulinum toxin injections

Botulinum toxin injections are used, among others, in the treatment of migraine or tension headaches correlated with the presence of myofascial trigger points [1]. They are also used in other types of localized pain, including cervical dystonia, fibromyalgia, piriformis muscle syndrome, or spasticity [6].

Furthermore, some scholars use botulinum toxin injection for functional disorders of the temporomandibular disorder, as well as in cases of pelvic pain [25,26].

Botulinum toxin works by inhibiting the release of selected neurotransmitters - primarily acetylcholine. It is likely that its mechanism of action allows for a longer pain-free period in patients complaining about myofascial pain, compared to standard treatments. Botulinum toxin is thought to act both peripherally and centrally, reducing sensitivity within the injected muscle [27].

Ranoux et al. [27] conducted a study involving 63 patients who underwent therapy involving the injection of OnaA (a botulinum toxin drug) into one of the selected sites associated with the development of migraine pain (myofascial pain) - the trapezius muscle, temporalis muscle or corrugator supercilii. The efficacy of the injections was assessed on the basis of headache diaries that participants kept throughout the study. The frequency of headaches was compared.

The quadriceps muscle proved to be the preferred site for injection during the analysis, as improvements were observed in more than 92% of patients treated for myopathy. The overall response rate achieved by the researchers during the analysis was 65.1%. The effect of the injection of the therapeutic substance into the trigger points lasted for a period of several months (usually 3-4 months).

According to scientific reports, the procedure of injecting botulinum toxin into a specific muscle point is considered safe if the injection is performed according to current standards. Potential side effects associated with botulinum toxin injection include, for example, transient pain at the injection site [27].

A study on the use of botulinum toxin in 24 patients with headaches correlated with the presence of myofascial trigger points was also conducted by Janis et al. Patients were injected at a trigger point with an appropriate dose of botulinum toxin. When there were several trigger points, several injections were performed simultaneously - one in each of the identified trigger points. Ultimately, the researchers found that the vast majority of patients improved (by a minimum of 50%) by reducing the frequency and intensity of migraine pain after botulinum toxin injection [28].

Botulinum toxin and other therapeutic agents are also used in the treatment of fascial-muscular pain in the sacrum. In this case, the injection is administered into the lumbar minor and/or major muscle. Applied therapy and using the toxin gives patients partial or complete pain relief for a period of several weeks to as long as three months [14].

The analgesic effect of botulinum toxin in patients with pain associated with musculo-fascial trigger points was tested by Querama et al. through a randomized, double-blind study with a placebo group (isotonic saline was used). However, the study does not support the theory that botulinum toxin injections make therapeutic sense for the treatment of pain correlated with the presence of musculo-fascial trigger points [29].

Scientists, Dessie et al., in a study based on the administration of botulinum toxin injections to 59 patients struggling with pelvic myofascial pain also failed to demonstrate a statistically significant advantage of onabotulinumtoxin A therapy over the use of saline injections [26].

Patients who receive botulinum toxin treatment do gain from the therapy, as evidenced by the high percentage of patients who are satisfied with their treatment (and the results of this treatment) [29].

Given the lack of conclusive data on the outcome of botulinum toxin use in pain therapy, Ho et al. performed a systematic review to evaluate the efficacy of botulinum toxin type A (BTA) injections into musculo-fascial trigger points. Throughout the course of the analysis, the researchers found significantly more papers demonstrating the lack of analgesic activity of botulinum toxin than publications supporting the efficacy of BTA administration in patients with fasciocutaneous myofascial trigger points [30].

Potential side effects associated with the therapy: transient muscle pain (especially exacerbated at the injection site), muscle weakness, eyelid drooping, chewing disorders, and double vision [28].

However, there is still a lack of studies comparing the efficacy of botulinum toxin injection in a trial to a control, placebo-treated trial. This problem is pointed out by many authors of scientific publications [29].

The limited (small) size of the groups that have participated in the studies on the meaning and efficacy of botulinum toxin injection in trigger point

therapy weakens the reliability of the limited results that were found.

Given the medical training of physicians, which entitles them to perform the injections, there is a need for strong physician involvement in the research process of the treatment of pain resulting from fascial-muscular trigger points.

Dry needling

Studies suggest that dry needling (DN MTrPs) in TSM may have a positive effect on muscle stiffness and functional outcomes [31]. Current research on DN does not conclusively prove the effectiveness of this method. The evidence is of very low to moderate quality but suggests that DN performed by physical therapists shows greater efficacy compared to no treatment at all. However, when compared to other physical therapy methods, no significant differences in improved functional outcomes have been demonstrated. Currently, there is a lack of evidence for the long-term benefits of this method [32,33].

According to one of the most popular theories, DN involves irritation of the tender nerve fiber endings within the trigger point, causing an involuntary spinal reflex (LTR). The puncture and irritation produce a nerve impulse that reaches the fibers of the muscle in a hypertonic state, the muscle then contracts, reducing tension and relieving the pain associated with the trigger point [34].

In another model of the mechanism of action of DN, it has been shown that after the removal of the needle from the trigger point, blood flow and oxygen saturation at the treated point are increased compared to pre-treatment levels, which may be associated with a reduction in the pain response [34].

Navarro Santana et al. [35] compared DN with sham needling, no intervention, and manual therapy applied to trigger points (TrP) associated with neck pain symptoms. Their study suggests that DN may show efficacy in the short-term reduction of pain intensity and pain-related disability in people with TrP-related neck pain symptoms. No increase in cervical range of motion was observed after DN compared to other modalities.

Discussion

There is much controversy regarding trigger point therapy. Despite the existence of multiple techniques acting on trigger points for the treatment of pain [20-23], there are many opposing views on this topic. There are papers showcasing the serious side effects that come as a result of pain treatment on trigger points, suggesting the occurrence of ischemic stroke after needle therapy [36,37].

According to some authors, the precise execution of a dry needling procedure can produce a stronger analgesic effect than injecting an analgesic into a painful point. This is related to the mechanism of action of dry needling, which reduces the degree of muscle tension and lowers the pain threshold [38].

To achieve this effect, the needling procedure should be carried out with extreme precision, preferably under ultrasound guidance, so that the needle enters the target site perfectly. The eligibility of physiotherapists to perform dry needling procedures is not clear, and the operation of an ultrasound (US) machine is a procedure that only physicians have authorization for, in Poland.

Although not widely known, the performance of a specialized soft tissue ultrasound examination can also be performed by trained physiotherapists. Unlike doctors, however, they cannot issue official descriptions of the examination, as there are no legal regulations on this subject.

The eligibility of physiotherapists able to perform dry needling techniques (without the use of an injection of a therapeutic substance) is not clear-cut. In some countries, such as Ireland, the UK, Norway, or Montenegro, physiotherapists are allowed to use this therapeutic method with their patients.

In most of these countries, appropriate health and safety training is required for this purpose.

In Poland, both dry needling and injections can be carried out by physicians, nurses, and paramedics. Dry needling alone in our country can be used by physiotherapists after completing training in this field - as there are no more specific legal regulations in this area [39,40].

The list of potential complications of MTrP therapy with the use of needles (dry or combined with the injection of a therapeutic substance) is quite long, so it is extremely important that the procedure is performed by a qualified person. In addition, the use of the aforementioned methods also carries treatment risks, so it is highly justified to reflect on who (which professions) is authorized to carry out such procedures.

Intramuscular botulinum toxin injections, despite the beneficial therapeutic effects presented in some scientific studies, carry a risk of side effects [27,28].

Potential side effects are due to both the mode of action of the toxin itself and the process involved in performing the injection. According to scientific data, side effects after botulinum toxin type A injection are not common and are predominantly mild and short-term. Side effects following the toxin include localized, temporary pain at the injection site and slight muscle weakness. Other side effects include the formation of hemorrhages, malaise, swelling, or erythema of the injected area [41,42].

Botulinum toxin injections carry the risk of the toxin migrating outside the treated area. The area covered by the toxin depends primarily on the injection technique. This type of problem occurs in trigger point therapy, as well as in injections related to aesthetic medicine [43].

For this reason, the validity of the treatment method and the availability of studies describing not only the treatment procedure but also the comparison of the different types of substances (depending on the manufacturer), their dilutions, and volumes,

are extremely important. The availability of such data for practitioners would greatly facilitate the selection of the agent best suited to the particular problem of the individual patient.

The exact consequences of an inappropriate botulinum toxin injection depend, among other things, on the site of the injection and the structure of surrounding anatomical structures. After injection in the neck area, for example, one may experience dysphagia or difficulty in head movement [42].

The administration of any drug, including botulinum toxin, carries the risk of anaphylaxis or shock. Although such complications are rare, it is then necessary to implement appropriate life-saving procedures immediately. Few medical professionals are qualified to do this, which also is an argument in favor of physicians when regulating the eligibility of individual professions to perform toxin injections.

Anesthetics are used in many areas of medicine including the treatment of pain associated with MTrP. The drugs are administered locally, into a nodule formed from muscle tissue. When regional anesthetics are administered locally, the safety margin for achieving toxic levels of the substance in the blood is not large. The individuals that are more susceptible to the stronger, potentially dangerous effects of injected drugs are patients of extreme age and pregnant women [44].

The main side effects are post-traumatic nerve damage and dose-dependent toxic effects on muscles and nerves. It is thought that the toxicity may be due to the high concentrations of anesthetic and preservatives contained in the solution [44]. In the case of muscle puncture in the head and neck region, an overdose of the drug may cause neurological symptoms related to central nervous system damage.

Additionally, intramuscular administration may increase creatine phospholipase levels, which may mask the diagnosis of acute myocardial coronary syndrome. It is important to remember that lidocaine is a drug that can lead to severe hemodynamic disturbances, including cardiac and respiratory arrest. In addition, myopathy and muscle necrosis have been reported at the injection site in MTrP. This is caused by hypercontraction of the myofibrils, through which lytic degradation, oedema, and subsequent necrosis occur. Regeneration takes place in the area after a few weeks [44].

It is important to note that, despite the risks that trigger point needling techniques entail, complications are extremely rare. According to Boyce et al. [45], out of 20,494 procedures, only four episodes of fainting after DN occurred i.e., 0.02%.

Bleeding, bruising and pain during dry needling are the three most common adverse events. Unfortunately, during DN and any other trigger point needling, there is a risk of puncturing adjacent tissues and structures. For example, during DN of the m. piriformis, there is a risk of puncturing the ischiatic

nerve, the mm. inclined - the shoulder plexus, the m. dorsalis - the pleura [46].

When analyzing the beneficial effect of DN, in cases of needling performed with an injection, it is important to consider whether the therapeutic effect was brought about by the administration of the drug or the needling procedure itself.

Additionally, it is worth noting the lack of a record of adverse events following trigger point needling therapies. The development of procedures to deal with complications could be helpful to the profession and increase the safety of their patients.

There are many indications of pain relief through the use of injection or dry needling methods. Most studies are based on the subjective opinion of the patient regarding pain sensation before and after the application of the therapy, such an assessment of the results does not allow an evaluation of the effect of the phenomena, as it may be an apparent effect. However, this does not change the fact that it is essential to use therapies that reduce the patient's pain associated with trigger points. The studies cited in this paper, although sometimes showing promising results for the treatment of painful trigger points, were carried out on small groups of patients and their reliability is, therefore, questionable. On the other hand, meta-analyses present inconclusive findings, making it problematic to draw clear conclusions.

Further studies are needed to prove or negate the effectiveness of these trigger-point pain treatments.

Conclusions

Trigger point therapies using needles, in dry needling or injectable versions, offer sufferers the hope for pain relief. Therefore, their popularity continues to grow. So far, the beneficial effects of these methods in treating trigger point pain have not been directly proven, but there are many indications of a possible therapeutic effect. Due to the multitude of papers on this topic and the doubts that still arise, a future systematic review is necessary and several multi-center randomized clinical trials are advisable. Only via these methods can one definitively verify whether invasive treatments for MTrP-related pain are effective in the long term.

Ethical approval

The conducted research is not related to either human or animal use.

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Conflict of interest

All authors declare that they have no conflict of interest.

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