



Efficacy of trigger point injection for non-malignant persistent musculoskeletal pain: a narrative review

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ABSTRACT

Myofascial pain is a commonly occurring reason for pain complaints and can affect patients' daily activities, work commitments and well-being. Several non-invasive approaches practised for myofascial trigger point relief are stretching, massage therapy, ischemic compression, and heat-therapy. Invasive treatment for trigger points commonly refers to the injection of fluid directly into the trigger points using a variety of substances, such as sterile water, saline, local anaesthetics, long-acting corticosteroids, or botulinum toxin. This review evaluates the efficacy of trigger point injections (TrPI) for patients with myofascial pain syndrome compared with non-invasive management options through published studies. In accordance with SANRA guidelines, 35 studies that focused on comparing TrPI and other therapeutic interventions managing myofascial pain syndrome, were included. Results indicate that a combination of TrPI, ultrasound therapy and myofascial stretches was found to be more effective than a stand-alone trigger point intervention. Tro-pisetron showed a 50% decrease in pain, botulinum toxin type A (BTX-A), and lidocaine injection also demonstrated improvement, although short-term, of up to 4 weeks. Physiotherapy in conjunction with BTX-A increased the efficacy of TrPI. Ultimately, both TrPI and ESWT demonstrated comparable results in managing myofascial pain syndrome. A clear limitation was a lack of objective clinical imaging testing while identifying trigger points or tender points. Current practice in treating myofascial pain syndrome remains empirical without established clinical standards. Although, TrPI have demonstrated its value in treating myofascial pain syndrome, future research is warranted addressing its effectiveness within a multidisciplinary approach instead of a stand-alone treatment. Pain perception, culture and genetics should also be taken into consideration in future studies as other risk factors.

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Introduction

Persistent pain, including musculoskeletal (MSK) conditions like myofascial pain, is a major global cause of disability.¹ These conditions, irrespective of age, race, or culture, can significantly disrupt patients' daily lives, work, and overall well-being despite not being life-threatening.² MSK conditions are so broad and can impact individuals in various ways, therefore, a tailored shared decision-making approach is required to provide patient-centred care.³ Ultimately, patients' education in understanding their conditions is key to enhance treatment outcomes.⁴ The American Pain Society also recommended a shared decision-making approach, which is fundamental when delivering pharmacological and nonpharmacological treatments for MSK conditions.⁵

Myofascial pain syndrome has a strong association with trigger points. Current aetiology of trigger point causation is likely induced by overusing or trauma, which leads to excessive acetylcholine release as a result.^{6,7} Thus, Gerwin⁸ suggested that the contraction of the muscles compress the surrounding blood vessels, causing ischemia to the anatomical area of the trigger points. Studies concluded the pH of trigger points is lower than their surrounding muscle tissues, hence leading to pain.^{9,10} Direct compression onto the trigger points can cause discomfort, as well as referred peripheral pain.⁸ It is common to have a reduction of muscle strength with or without a reduction of joints range of movement due to muscular stiffness and spasms.¹

On the contrary, a fibromyalgia tender point is different from a trigger point. However, patients with a diagnosis of fibromyalgia would have co-morbidities of other pain, such as hyperalgesia and stiffness.¹¹ Central sensitisation is evident in patients with fibromyalgia, may be driven by peripheral and central pain mechanisms.¹² It is the aforementioned reasons that influence clinicians to treat tender points just like trigger points in clinical practice. A study by Staud *et al.*¹³ argued that both lidocaine and saline injections directly onto the tender points in fibromyalgia patients, did not demonstrate improvement in pain levels. Therefore, an understanding of the mechanisms of fibromyalgia is fundamental in selecting the most appropriate treatment. Furthermore, it is acknowledged that localised pain enhances pain sensitivity, thus, a crucial factor that clinicians should consider when injecting onto a single tender point.¹³

In order to provide a diagnosis of myofascial pain syndrome, an assessment by a clinician or a musculoskeletal specialist is required.¹ Diagnostic tool for trigger points remains limited today, although three studies have shown that magnetic resonance elastography (MRE), ultrasonography (US) and ultra-sonoelastography (UE) can objectively detect trigger points, which facilitate the validity of trigger points and improve treatment success rate.¹³⁻¹⁵ However, none of these studies specified the primary areas of trigger points, other potential injuries such as muscle sprains were not taken into consideration. Pressure algometry is a commonly utilised device to diagnose widespread musculoskeletal pain, including myofascial pain syndrome.¹⁶ A more advanced device known as a digital algometer may also be incorporated to assess trigger points, whereby the higher the value indicates the higher pain threshold.¹⁶ Ultimately, there are still inconsistencies in the classification and the diagnosis of trigger points due to the lack of objective diagnostic measures. Therefore, direct firm pressure onto the muscle, reproducing local twitch and referred pain is the current practice in confirming the diagnosis of trigger points.¹⁷

Non-invasive, non-pharmacological approaches such as stretching, massage therapy, ischemic compression, and heat therapy are currently being practised for trigger point management despite the paucity of evidence for their efficacy in pain relief.^{18,19} Trigger point injections (TrPI) are a commonly used treatment to manage myofascial pain syndrome; an injectable fluid administered directly onto the trigger points using water, saline, local anaesthetics, long-acting corticosteroids or botulinum toxin to reduce pain.²⁰⁻²² Notably, this technique is also being used as a diagnostic tool and a way to facilitate physiotherapy aimed at identifying the cause of the pain.²³

Currently, a variety of injectables for myofascial pain syndrome is used with local anaesthetics being the most common.²⁴ Studies have shown the improvement of the range of motion with local anaesthetic injections such as bupivacaine, prilocaine, lidocaine and triamcinolone acetone.²⁵⁻²⁷ Botulinum toxin A (BTX-A) is another injectable widely used by clinicians in practice.²⁸ It has been shown that BTX-A releases acetylcholine leading to pain reduction as a result.²⁹ Additionally, infusions of hypertonic saline or ketamine have been shown to also reduce the trigger points tenderness, muscular hyperalgesia and pain.^{30,31}

The purpose of this narrative review is to decipher the efficacy of trigger point injections in patients with myofascial pain syndrome compared to other available invasive and noninvasive treatment options in current practice. Despite being a long-es-

tablished technique, trigger point therapy has faced ongoing scrutiny and criticism over the years. This narrative review endeavours to elucidate its efficacy according to the available literature, addressing these concerns comprehensively.

Methods

Review rationale

Invasive treatments for trigger point release have shown positive results.³² Scott *et al.*³³ found that TrPI alone reduced pain in patients with various conditions, but they concluded that non-invasive treatments like ultrasound and laser had similar outcomes. They also noted that clinical outcomes vary depending on the injectables used. Many patients with myofascial pain syndrome rely on injectable agents to enhance their physiotherapy treatment. This narrative review aims to identify and analyse published studies assessing the effectiveness of TrPI in myofascial pain syndrome patients and compare different injectables to justify current practices.

Data sources and searches

Following SANRA criteria, we conducted an extensive literature search using databases like PubMed, UCL Library, Cochrane, and Web of Science. Our search terms included myofascial pain syndrome, trigger point, muscle pain, and various treatment approaches such as injection therapy, ultrasound-guided injection, Extracorporeal Shock Wave Therapy, stretching and physiotherapy. We also explored complementary treatments like acupuncture and alternative approaches in relation to myofascial trigger points.

Inclusion criteria

To ensure the reliability of our information on trigger point injections for myofascial pain syndrome, we assessed various types of studies individually. Systematic reviews with meta-analyses are considered strong evidence as they provide evidence-based clinical solutions by consolidating multiple primary studies and addressing limitations.^{34,35} Randomised control trials (RCTs) are valuable for evaluating new interventions with reduced bias.³⁶ Therefore, we included meta-analyses, systematic reviews, and RCTs in this narrative review.

Our included studies compared trigger point injections to therapies like dry needling, Extracorporeal Shock Wave Therapy (ESWT), and trigger point injections using various injectable substances. We looked at sterile water, saline, local anaesthetics, long-acting corticosteroids, and botulinum toxin as injectable modalities. Both male and female adult participants with myofascial pain were considered to minimise gender bias. We also explored relevant studies listed in our selected studies' references. Our primary focus was on assessing how trigger point injections improve pain and quality of life.

Study selection

Out of 122 initially identified studies, 20 duplicates were removed. After screening the remaining 102 studies using our inclusion criteria, 60 were excluded. From the remaining 42, only 35 were included in this narrative review based on their reliability, validity, and relevance (Figure 1).

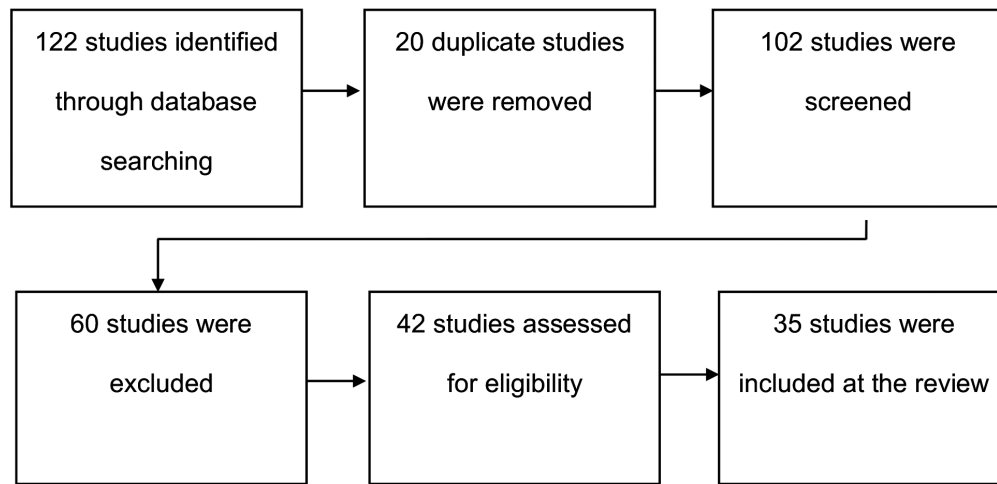


Figure 1. Flow diagram of study selection.

Results

Trigger point injection with different injectables

Tropisetron trigger point injections

A study by Ettlin³⁷ investigated the efficacy of tropisetron, a 5-HT₃ receptor antagonist, in trigger point injections for individuals with whiplash syndrome. Tropisetron, known for its immunoinflammatory properties, promotes analgesic effects on trigger points, tendinopathies, fibromyalgia, and systemic inflammatory rheumatic disorders.^{38,39} 5 tropisetron injections (0.5 to 1.0 mL per trigger point) were administered to 20 participants, targeting approximately 15 areas in the neck, shoulders, and thoracic paravertebral muscles during each treatment session.³⁷ Patients received repeated injections every 4 weeks, resulting in a 50% reduction in pain post-treatment. Tropisetron was well-tolerated without adverse effects. However, the study had limitations, including the lack of sufficient objective measurements to validate trigger points, despite involving experienced therapists.⁴⁰

Lidocaine trigger point injections

Esenyel and Caglar⁴¹ conducted a randomised study to assess the effectiveness of lidocaine trigger point injections (TrPI) combined with stretches and ultrasound therapy. Participants were divided into three groups: one receiving ultrasound therapy with neck exercises, another receiving lidocaine trigger point injections with neck stretches, and the third group undergoing neck exercises alone. The groups that received trigger point injections, ultrasound therapy, and stretches exhibited more significant pain relief, though the exact number of sessions required for this outcome remains unspecified.

Granisetron vs lidocaine trigger point injections

In a recent double-blind randomised-controlled trial (RCT), Rezasoltani *et al.*⁴² compared granisetron and lidocaine injections on myofascial trigger points. This study involved 40 participants with acute myofascial pain. Each group received a 1 ml dose of lidocaine 2% and 1 mL of granisetron administered to the upper fibers of the trapezius muscle. All participants were

physically active and received guidance on neck stretches and individual trapezius massage. Both groups experienced reduced neck pain scores and pain disability scale improvements, with the lidocaine injection group demonstrating superior result. Table 1 provides an overview of the selected studies.

Lidocaine trigger point injections and adjunct physiotherapy

In a 10-year single-blind randomised-controlled trial conducted by Lugo *et al.*,³² 127 participants with non-specific shoulder girdle myalgia pain were divided into three intervention groups. The first group received lidocaine injections, the second group received physiotherapy, and the third group received a combination of lidocaine injections and physiotherapy. The study aimed to assess the effectiveness of these treatments in terms of function, well-being, and the reduction of depressive symptoms. The physiotherapy intervention comprised 12 sessions, including ultrasound therapy, 10 min of heat therapy, direct pressure-trigger point deactivation, and manual therapy on trigger points. After one month, only the group receiving both physiotherapy and lidocaine injections showed a statistically significant improvement in quality of life compared to the other two groups. However, there were no significant differences in pain scores and depressive symptoms among the three groups even after three months. Nonetheless, the results hinted at a trend favouring better functional outcomes in the physiotherapy groups compared to the lidocaine injection alone group.

BTX-A vs dry needling vs lidocaine trigger point injections

In a single-blinded study, Kamanli and colleagues⁴³ compared TrPI using BTX-A, dry needling, and lidocaine injection for cervicothoracic myofascial pain syndrome. The study assessed cervical range of motion, pain pressure threshold, pain scores, work disability, and measures of depression and anxiety. The findings indicated that all groups experienced notable improvements in pain pressure threshold and pain scores. However, only the BTX-A and lidocaine groups showed enhanced quality of life, with the BTX-A group demonstrating significant progress in depression and anxiety measures.

BTX-A vs saline trigger point injections

Contrarily, a randomised-double-blind, placebo-controlled study by Ferrante *et al.*⁴⁴ found that BTX-A was not effective for cervicothoracic myofascial pain. They compared saline injections with BTX-A in treating cervical and shoulder myofascial pain syndrome. All participants received oral painkillers four times daily, along with physiotherapy incorporating myofascial treatment techniques and exercises. Trigger points were identified through palpation and replication of participants' usual symptoms. The study did not reveal a statistically significant difference in pain relief between the placebo and BTX-A injection groups. However, Borodic *et al.*⁴⁵ discovered that multiple injections into different sites of the same muscle yielded better results than a single injection.

In another study, Wheeler *et al.*⁴⁶ randomly assigned thirty-three participants to two groups, one receiving BTX-A and the

other saline for cervicothoracic myofascial pain. The researchers were unable to establish a statistically significant difference between the controlled groups. These inconsistencies in results may be attributed to the variable mechanisms of action of BTX-A in managing chronic myofascial pain.⁴⁷

BTX-A vs methylprednisolone trigger point injections

Porta⁴⁸ compared BTX-A and methylprednisolone for the treatment of myofascial pain syndrome, in which they concluded that BTX-A treatment is more effective compared with injection steroid therapy. The results of BTX-A treatment can last up to 4 weeks and its combination with physiotherapy treatment can maximise the benefits.⁴⁸ The visual analogue scale (VAS) pain scores at baselines and four weeks post-treatment of the different injectables are demonstrated in a graph (Figure 2). Table 2 highlights a detailed summary of the results of the studies included.

Table 1. Details of included studies for trigger point injection of lidocaine alone or combined with other treatments.

Study	Participants	Study design	Type of intervention	Outcome	Risk of bias	Country of origin research
Lugo <i>et al.</i> ³²	127 adults	Single-blind randomised control clinical trial	3 intervention groups, one group received only lidocaine injection, the second group only physiotherapy and the third group received a combination of both	After one month of treatment only the combined group of physiotherapy and lidocaine injection had statistically significant difference on quality-of-life comparison the other two groups	Some concerns	South America-Colombia
Rezasoltani <i>et al.</i> ⁴²	40 adults	Double-blind randomised clinical trial	One group received 1 ml Lidocaine 2% and the other group 1 ml of granisetron at the upper fibers of trapezius muscle.	All the patients from both groups had reduced score at neck and pain disability scale but the group who received lidocaine injection responded better, reported reduction of pain and disability	Some concerns	Scandinavian

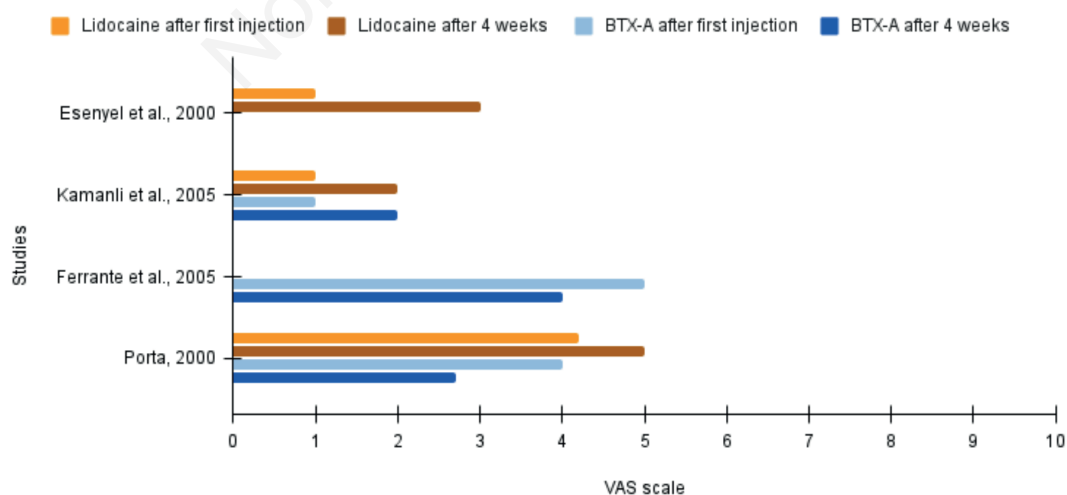


Figure 2. Visual analogue scale (VAS) pain scores at baseline and four weeks post-treatment for different injectables. We can see that there are no obvious patterns from the results collected from these studies and therefore it is unclear which injectable modality has the greater efficacy.^{41,43,44,48}



Trigger point injection vs other techniques

Trigger point injection vs extracorporeal shock wave therapy

Extracorporeal shock wave therapy (ESWT) has been utilised since the 1990s for musculoskeletal pain disorders, although is being considered an adjunct, studies showed that ESWT significantly decreased the level of myofascial pain.^{22,49} The efficacy of ESWT and corticosteroid injection in myofascial low back pain was studied in 54 participants and were allocated into two groups.⁵⁰ The group that received ESWT had 5 treatments sessions per week of 1500 pulses/session with an energy flux density of 0.1 mJ/mm²/min and a frequency of 10-16. The corticosteroid injection group received an injection containing 40 mg triamcinolone + 2 mL of lidocaine 2% directly onto the trigger point. After two weeks of treatment, the group treated with corticosteroid trigger point injection, scored greater improvements in the pain and disability score compared to the ESWT group. However, after 4 weeks of treatment the ESWT group had statistically significant improvements in pain threshold. Overall, Eftekharsadat *et al.*⁵⁰ concluded that corticosteroid TrPI had significantly higher

improvement on disability and pain threshold compared to ESWT in myofascial low back pain management.

Another study investigated the efficacy of ESWT on myofascial pain. They allocated 30 participants into two groups, the first group received ESWT treatment, whilst the second group received trigger point injections of glucocorticoids and local anaesthetics as well as transcutaneous electrical nerve stimulation (TENS).⁵¹ The researchers conducted a physical examination of a taut band and checked for peripheral referred pain in order to determine the trigger points. The total treatment durations for both groups were three weeks. The ESWT group received 1,500 shock waves for each treatment with energy flux of 0.10 mJ/mm² per minute. The other group received three TrPI treatments, and after a week they were given five TENS treatments in a week for twenty minutes each. Jeon and colleagues⁵¹ concluded that both interventions demonstrated improvements in the cervicothoracic range of movement and reduction of the pain scale. Ultimately, both studies by Eftekharsadat *et al.*⁵⁰ and Jeon *et al.*⁵¹ suggested that ESWT is a noninvasive method which directly targets trigger points, however, although TrPI is also direct, there is a potential risk of side effects such as allergic reactions towards the drugs. Table 3 reports the overview of the above-selected studies.

Table 2. Details of included studies for trigger point injection with different injectables.

Study	Participants	Study design	Type of intervention	Outcome	Risk of bias	Country of origin research
Ettlin ³⁷	20 adults	Case control study	5 injections of tropisetron 0.5 mL to 1.0 mL per trigger point	50% of pain relief	Some concerns	Scandinavian
Esenyel <i>et al.</i> ⁴¹	102 adults	Randomised control study	Lidocaine TrPI combined with stretches and ultrasound therapy	The groups with the trigger point injection and ultrasound therapy combined with stretches were more effective	Low	USA
Kamanli <i>et al.</i> ⁴³	29 adults	Prospective, single-blind study	They compared the efficacy of botulinum toxin type A (BTX-A) TrPI to dry needling and lidocaine injection to patients with cervicothoracic myofascial pain syndrome	All three groups saw increased pain threshold. Quality of life improved only at the BTX-A group and the lidocaine group. BTX-A was the only group that had significantly better scores in depression and anxiety questionnaires	High	Turkey
Ferrante <i>et al.</i> ⁴⁴	132 adults	Randomised double-blind, placebo-controlled study	They compared saline injection and BTX-A into a trigger point in patients with cervical and shoulder myofascial pain syndrome	The study didn't find any significant difference in pain relief between the placebo and BTX-A injection group	High	USA
Wheeler <i>et al.</i> ⁴⁶	33 adults	Randomised, double-blind study	They compared BTX-A and saline for cervicothoracic myofascial pain	Unable to demonstrate a statically significant difference between the two groups	Low	USA
Porta ⁴⁸	40 adults	Single-centre, randomised trial	They compared botulinum toxin type A and methylprednisolone for the treatment of myofascial pain syndrome	BTX-A treatment is effective comparison steroid therapy. BTX-A combined with physiotherapy treatment can maximise the efficacy of the injection	Low	USA

Trigger point injection vs dry needling

Six studies examined the management of active trigger points through dry needling and TrPI.^{41,43,52-55} Among these, four studies concentrated on the upper trapezius fibres,^{41,43,54,55} while Eroglu *et al.*⁵² targeted all neck muscles and Raeissadat *et al.*⁵³ focused on the most painful area for participants. Trigger points were identified in all studies using palpation and the elicitation of local twitches with needles. The control group in each study received dry needling, while the second group received lidocaine injections. Additionally, Kamanli *et al.*⁴³ included a third group receiving BTX-A injections. Treatment consisted of a single intervention in all studies, except for Eroglu and colleagues,⁵² which provided three treatments for each group. The primary outcome measure across all studies was pain reduction. The primary methodological bias across all studies was the challenge of blinding assessors. Notably, Eroglu *et al.*⁵² acknowledged this limitation, while its impact on treatment bias remains unclear. Statistically significant differences favouring trigger point injections (TrPI) over dry needling were observed in two studies,^{54,55} but the most recent study by Raeissadat *et al.*⁵³ found no significant difference. The majority of studies reported superior effectiveness of wet needling on trigger points compared to dry needling, a finding corroborated by meta-analyses conducted.^{56,57} However, most of the studies consider improvement

in symptoms after 10 days of intervention. Therefore, short-term follow-up results were only focused on these studies.^{41,43,52-55} The most common trigger points examined and treated are located on the neck. There is a lack of studies focusing on other myofascial trigger points such as managing masticatory with either a wet or dry needling approach.⁵⁸ Figure 3 demonstrates in a graph the results of trigger point injections effectiveness.

Trigger point injection vs ultrasound-guided injection and acupuncture

Imaging modalities are being used to measure the stiffness of skeletal muscle through a shear wave.⁵⁹ A study compared ultrasound-guided myofascial trigger point injection with blinded injection for the treatment of trapezius myofascial pain followed by shear wave elastography.⁶⁰ Overall, 41 participants were divided into two groups; participants' pain scores, cervicothoracic range of movement and pain disability scores were collected as outcome measurements. After four weeks of treatment, both groups reached statistical significance, although the group with ultrasound-guided injection had better results in pain scores within the neck and shoulder disability index. The most painful anatomical landmark during palpation is being considered as an active trigger point in this study. Palpation is the most common identification of the trigger points and is used as a landmark of

Table 3. Details of included studies for trigger point injection of lidocaine alone or combined with other treatments.

Study	Participants	Study design	Type of intervention	Outcome	Risk of bias	Country of origin research
Eftekharsadat <i>et al.</i> ⁵⁰	54 adults	Randomised control trial	Compared ESWT and corticosteroid injection for myofascial low back	Concluded that the corticosteroid trigger point injection intervention had significantly higher effectiveness pain threshold and reduced disability	Some concerns	Iran
Jeon <i>et al.</i> ⁵¹	30 adults	Prospective randomised experimental and control group research	One group received ESWT treatment, and the second group received TrPI and TENS	Both groups saw a reduction on the pain scale	Some concerns	Korea

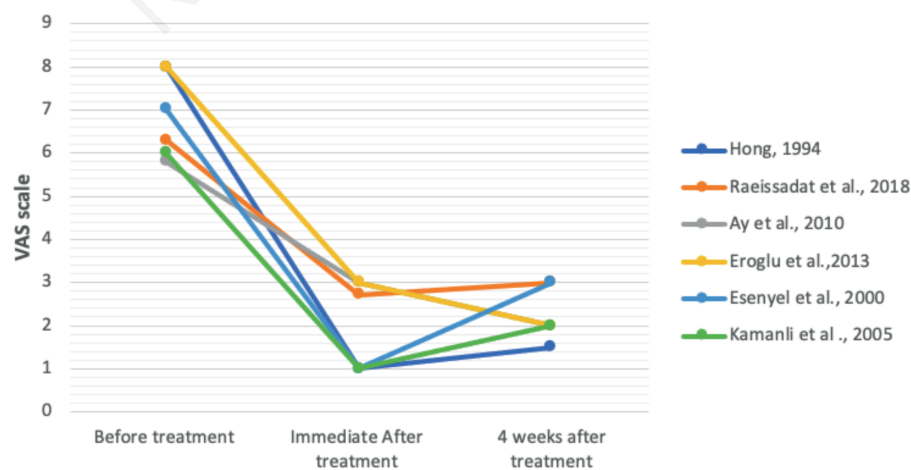


Figure 3. Results of trigger point injections effectiveness. This graph shows a trend of improvement in pain reduction against the VAS scale after trigger point injection in the six studies that were included.^{41,43,52-55}



blind injections, although the appropriateness of needle placements is still uncertain.⁶¹ Ultrasound-guided injections, on the other hand, are indicated to be 100% accurate, it can reduce the number of complications because of their ability to identify nerves and vessels. Therefore, the placement of the needle is less challenging.^{62,63}

Limited controlled trials compare acupuncture and trigger point treatments. Gazi *et al.*⁶⁴ conducted one such study involving 30 participants with myofascial pain, selected based on criteria such as local tenderness, taut bands, referred pain, and limited range of motion. The treatment included biweekly trigger point injections (0.25% bupivacaine combined with 10 mg cyclobenzaprine chlorhydrate at night) and 500 mg oral sodium dipyrone every 8 hours for four weeks.⁶⁴ The injection group also received high-frequency electrical stimulation below pain levels for 15 mins on pressure points in the hands and feet. Both groups were advised to perform stretching exercises four times daily. The results showed reduced pain levels and improved well-being in both groups after four weeks of interventions. Detailed study summaries are provided in Table 4.

Discussion

This review compared trigger point injections with other invasive and non-invasive interventions for the treatment of musculoskeletal pain associated with trigger points.

Efficacy of trigger point injection and future research

In this narrative review, the efficacy of trigger point management between different injectables were compared. The intent of the TrPI is to deactivate the trigger point by reducing the level of the pain in order to help restore function and improve quality of life.⁶⁵ Most of the included studies practiced TrPI as a stand-alone treatment rather than a multimodal approach, predominantly in clinics. For that reason, there is a possibility that the effectiveness of the trigger point injections is underrated.

The combination of trigger point injections with stretching exercises in individuals with myofascial shoulder, neck and back pain improved treatment outcomes.^{41,43} However, the fact that studies didn't include, an "only" "stretching" control group restricts the ability to analyse the level of effectiveness of trigger point injections in pain relief. Patients with cervicothoracic myofascial pain, regardless of the injectant utilised, showed relief in their symptoms when used as a stand-alone treatment.^{41,43,52-55} Many parts of this study make it difficult to deduce conclusive outcomes due to inconsistencies regarding the range of variables used. For example, the efficacy of ESWT for myofascial pain syndrome remains unclear as most of the studies investigated short-term relief outcomes, whilst long term follow ups were excluded.⁵⁸ Furthermore, it is noteworthy that most of the studies only explored the upper fibers of trapezius and excluded other myofascial pain which can also respond to trigger point injections on administration.

Of all the injectables, 5-HT3 receptor antagonist was superior to lidocaine, but BTX-A, is neither a cost-effective option nor superior to lidocaine.⁴³ A future topic of research could explore and compare the cost-effectiveness in conjunction with the efficacy of all the available injectables for trigger point pain used in current practice.

There is limited evidence supporting the superiority of trigger point injections over ESWT for myofascial pain treatment. Both interventions equally had improvements in pain threshold and at the disability score, however, the researchers argued that TrPI can cause allergic reactions due to the drugs.^{50,51} Common side effects associated with steroid injections are hyperglycaemia, skin pigmentation and, on rare occasions, tissue atrophy, facial flushing and anaphylaxis.⁶⁶ By taking a full medical history, using aseptic techniques and avoiding the frequent administration of steroids, these complications can be avoided (⁶⁷). Facial flushing, nausea and dizziness have been found to be induced by vasovagal reactions rather than a form of allergic reactions.⁶⁸⁻⁷⁰ Ultimately, an allergic reaction is inevitable, however this does not determine the efficacy of TrPI.

There were limited controlled trials comparing acupuncture and trigger point treatment. The study by Gazi *et al.*⁶⁴ concluded that both groups experienced reduced levels of pain and in-

Table 4. Details of included studies were compared ultrasound guided injection and acupuncture to injection for trigger points.

Study	Participants	Study design	Type of intervention	Outcome	Risk of bias	Country of origin research
Kang <i>et al.</i> ⁶⁰	41 adults	Randomised control study	They compared ultrasound guided myofascial trigger point injection with blinded injection for the treatment of trapezius myofascial pain	The two groups reached statistical significance after 4 weeks of the treatment, where the group with ultrasound guided injection had better results on pain scores neck and shoulder disability index	High	Korea
Gazi <i>et al.</i> ⁶⁴	30 adults	Randomised control study	They compared acupuncture and TrPI of 0.25% bupivacaine combined with 10mg cyclobenzaprine chlorhydrate. For the injection group they also added a high frequency electrical stimulation and physiotherapy	Both groups experienced reduction of pain and improvement of quality of life after 4 weeks of interventions. However, the researchers have the inability to effectively blind the groups- there is risk of bias	Some concerns	South America- Brazil

Table 5. Summary of trigger point injection effectiveness.

Category	Intervention	Outcome	Insights
Injectables	Tropisetron	50% pain reduction, good tolerability.	Lack of objective validation of trigger points. ³⁷
	Lidocaine	Consistently effective for pain relief and quality of life, especially combined with physiotherapy.	Superior to granisetron in neck pain and disability reduction. ^{32,41}
	Botulinum toxin type A (BTX-A)	Improvements in pain and quality of life but inconsistent results; not cost-effective.	Effective when combined with physiotherapy but inferior to corticosteroid injections in some studies. ^{43,48}
	Granisetron	Reduced neck pain and disability scores but less effective than lidocaine.	Limited studies for broader application. ⁴²
	Corticosteroids	Effective for pain relief in lower back myofascial pain.	Superior in short-term disability reduction compared to ESWT. ⁵⁰
Techniques	Extracorporeal shock wave therapy	Comparable results to TrPI for pain and disability.	Fewer risks of allergic reactions compared to injectable therapies. ^{50,51}
	Ultrasound-guided injection	Higher accuracy, fewer complications, and better pain and disability outcomes than blind injections.	Recommended for minimising risks and improving precision. ⁶⁰
	Dry needling	Less effective than wet needling (e.g., lidocaine injection) for pain relief.	Better outcomes when combined with physiotherapy. ^{41,54}
	Physiotherapy	Enhanced outcomes when combined with lidocaine or BTX-A.	Multimodal approach showed improved quality of life and function. ^{41,32}
	Acupuncture	Comparable pain relief and quality of life improvements as trigger point injections.	Limited evidence; potential influence from additional therapies (e.g., physiotherapy and medications in studies). ⁶⁴

creased well-being after four weeks of intervention. However, the researchers did not have the capacity to effectively blind the groups and a placebo intervention is absent in this study. Therefore, the improvements reported in both groups could be influenced by either the oral medication or physiotherapy input. According to Kang *et al.*⁶⁰ ultrasound-guided trigger point injections can reduce complications due to their accuracy. This study showed better results on pain scores of the neck and shoulder disability index. However, the selected participants were from one rehabilitation centre, therefore, it cannot be excluded that the study was not biased.

Identifying trigger points or tender points and implementing appropriate treatment is important for myofascial pain treatment for both the patient and the practitioner. To date, there is no guidelines for diagnosing and differentiating the trigger and tender points and therefore, there is no conventional treatment since no standards have been established.⁷¹ There is a clear need for standardised teaching methods in the education sector to allow accurate identification and safe implementation of evidenced based treatment in trigger and tender points.

To synthesize the key insights from the results section and facilitate interpretation within a broader clinical context, Table 5 provides a summary of the effectiveness of different injectables and techniques for managing myofascial pain.

Strength and limitations

One notable strength of this review lies in its thorough literature search. However, it's worth noting that the quantity of included studies might be perceived as relatively limited. Trigger point injections and the other interventions included in this narrative review are the most common treatment options that are being used in current practice. However, there is a paucity of current literature that explored the efficacy of TrPI as most trials were undertaken in the early 2000s, and the recent systematic reviews were reviewing these studies.

Furthermore, the efficacy of the therapeutic effect of each injectable administered needs to be clarified by taking into consideration the genetic variations and the pain culture of the patient. These confounding factors can ultimately impact the outcome of a treatment; however, it was not examined in this review. Future studies should explore the efficacy of trigger point injection and other invasive and noninvasive treatment options. The main bias of this narrative review is the literature search, whereby the selection of studies and data were extracted and performed by a sole investigator. Despite the limitations mentioned, our goal is to provide the readers an overview of the current evidence of the efficacy of the trigger point management.

Conclusions

Trigger point injections are an effective therapeutic treatment for myofascial trigger points. TrPI should however be analysed within a multidisciplinary approach and not as a stand-alone treatment for greater therapeutic efficiency. Trigger point injections along with interventions like ESWT, TrPI with 5-HT₃ receptor antagonists, and physiotherapy modalities, have shown beneficial results in managing persistent myofascial pain. More RCTs are needed to address the effectiveness of the injection therapies with a wider range of clinical questions.

Lastly, other influential factors that can influence the efficacy of trigger point injections such as patients' pain perception, culture and genetics, should be taken into consideration in future studies.

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