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Myofascial Pain and Treatment

A critical overview of the current myofascial pain literature – January 2020

Keywords:
Myofascial pain syndrome
Trigger points
Dry needling
Manual therapy

A B S T R A C T

We are starting 2020 with 6 basic research studies, 9 review articles, 14 dry needling/injection studies, and one manual therapy paper for a total of 30 new papers. Topics range from studies on mechanisms, inflammatory mediators in myofascial pain, fascia, screening, Platelet-rich plasma intramuscular injections, and temporal summation to clinical studies on patients with tension-type headache, chronic pelvic pain, knee osteoarthritis, plantar fasciitis, generalized musculoskeletal pain, neck pain, breast cancer, tendinopathies, thoracic outlet syndrome, and canine dry needling, among others.

1. Basic research

Chatchawan U, Thongbuang S, Yamauchi J. 2019. Characteristics and distributions of myofascial trigger points in individuals with chronic tension-type headaches. Journal of Physical Therapy Science, 31(4):306–309. https://doi.org/10.1589/jpts.31.306.

Tension-type headaches (TTH) are among the most common complaints in adults and can lead to functional, emotional, and social activities impairments. Myofascial tenderness and muscle hardness are often observed in chronic tension-type headaches (CTTH), which commonly are associated with TrPs in the head and neck muscles. However, the original source of CTTH pain from the myofascial tissues or from the brain is still unknown.

Chatchawan and colleagues from Thailand conducted a study to investigate the characteristics and distributions of active TrPs and their pressure pain threshold (PPT) in individuals with CTTH compared with healthy individuals. Fifty-three CTTH patients with a headache for at least the last 3 months and 53 age and gender-matched individuals without CTTH were recruited. TrPs and tenderness points were first identified by manual palpation, after which their PPTs were determined using a manual algometer. An active TrP was recorded when the participant exhibited spontaneous pain, tenderness in a taut band and referred pain after pressure was applied to the TrP. A latent TrP exhibited characteristics similar to those of an active TrP, except there was no pain unless compressed. Based on the TrP criteria, the other tender point was described as “tenderness” and it did not refer pain anywhere.

The total numbers of active TrPs, latent TrPs and tenderness point totals per person in the head, neck, shoulder (HNS) and upper back (UB) in CTTH were 4.3 ± 2.1, 0.6 ± 1.0 and 1.9 ± 1.8, respectively, while those in the control group were 0, 0.7 ± 1.5 and 1.9 ± 1.8, respectively. The PPT levels of the active TrPs were 0.7 ± 0.2 to 1.2 ± 0.6 kg/cm2 in the muscles of the HNS and UB. A larger number of active TrPs and lower PPT levels of the active TrPs were found in the HNS regions than in the UB region.

The authors concluded that active TrPs were found in the HNS and UB muscles of individuals with CTTH and the PPTs of the active TrPs were found to be very low in the individuals with CTTH. They suggested that the low PPTs of the active TrPs in the HNS region could influence the headaches in individuals with CTTH. Furthermore, the study provides scientific evidence for TrPs in the HNS and UB muscles as well as a guideline for the diagnosis of pain and tension in individuals with CTTH.

Fuentes-Márquez P, Valenza MC, Cabrera-Martos I, Ríos-Sánchez A, Ocón-Hernández O. 2019. Trigger points, pressure pain hyperalgesia, and mechanosensitivity of neural tissue in women with chronic pelvic pain. Pain Medicine, 1;20(1):5–13. https://doi.org/10.1093/pm/pnx206.

The etiology of chronic pelvic pain (CPP) has been proposed as multifactorial. Fuentes-Márquez and colleagues from Spain conducted a case-control study to evaluate the presence of TrPs, widespread pressure pain sensitivity, and mechanosensitivity of neural tissue in women with chronic pelvic pain. Trigger points were explored bilaterally in muscles described to refer pain to the lumbopelvic area, including the gluteus maximus, gluteus medius, gluteus minimus, quadratus lumborum, and adductor magnus muscles. Pressure pain thresholds (PPTs) were also assessed bilaterally over one local point - the Pfannenstiel incision point on the abdominal wall, and three distant pain-free points – the C5–C6 zygapophyseal joint, the second metacarpal, and the tibialis anterior muscle to determine widespread pressure sensitivity. Mechanosensitivity of neural tissue was assessed with the neurodynamics tests of slump and the straight-leg raising.

Forty CPP women having noncyclic pelvic pain for more than six months and 40 matched healthy controls were included in their

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1360-8592/

study. The authors found a significant number of active TrPs in CPP patients compared with the control group. CPP women presented with pressure pain hyperalgesia that was extended to the pelvic region with a non-segmental significant decrease in pain pressure threshold. They also found significant differences in neurodynamic tests between women with CPP and controls.

The authors suggested that central sensitization should be considered in assessing regional chronic pain with the presence of tender and/or TrPs in the absence of structural pathology.

Sánchez-Romero EA, Pecos-Martín D, Calvo-Lobo C, García-Jiménez D, Ochoa-Sáez V, Burgos-Caballero V, Fernández-Carnero J. 2019. Clinical features and myofascial pain syndrome in older adults with knee osteoarthritis by sex and age distribution: A cross-sectional study. Knee, 26(1):165–173. https://doi.org/10.1016/j.knee.2018.09.011.

Recently, Dor and Kalichman confirmed that TrPs may play a critical role as a source of pain and impairment in knee osteoarthritis (OA) (Dor and Kalichman, 2017). Researchers from Spain conducted a study to describe and compare the demographic, clinical and myofascial pain syndrome characteristics in older adults with knee OA by age and sex distribution. In March 2016, a total of 114 participants were recruited from older-adults care centers for this cross-sectional study. The inclusion criteria were participants aged 62 years or older with knee pain and unilateral or bilateral dysfunction, and primary knee OA fulfilling the American College of Rheumatology criteria for clinical and radiographic diagnostics. The diagnosis of active and latent TrPs followed the essential and confirmatory criteria described by Simons, Travell and Simons (Simons et al., 1999).

Outcome measurements including the Numerical Pain Rating scale, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), the Barthel Index, the Timed Up and Go Test (TUG), the Mini-Mental State Examination, the EuroQol Group 5-Dimension Self-Report Questionnaire, chronicity, number of falls, and medication use. All data were compared by sex (male or female) and age (<70, 70–80, or > 80 years) distributions.

The authors found that the most prevalent muscles with active and latent TrPs were the vastus medialis (75.43%) and vastus lateralis (65.78%) muscles. The clinical characteristics showed significant differences for chronicity, WOMAC functionality and total scores, TUG, falls rate and medication between males and females, as well as for chronicity, Barthel index and TUG between age distributions. Besides, there were not any significant differences by sex or age distribution according to the number and presence of active and latent TrPs. Finally, the authors concluded that the demographic and clinical features of older adults with knee OA may be influenced by sex and age distribution, but the finding of myofascial pain syndrome associated with knee OA did not seem to be related to sex or age distribution.

This is a well-conducted and clinically useful study that provides insights in a very common pathological condition of knee OA. Clinicians should always evaluate the muscles around the knee with OA and focus especially on the vastus lateralis and medialis muscles.

Schleip R, Gabbiani G, Wilke J, Naylor I, Hinz B, Zorn A, Jäger H, Breul R, Schreiner S, Klingler W. 2019. Fascia is able to actively contract and may thereby influence musculoskeletal dynamics: a histochemical and mechanographic investigation. Frontiers in Physiology, 2;10:336. https://doi.org/10.3389/fphys.2019.00336.

Compared to muscles, bones, discs, and ligaments, fascia has received little attention within musculoskeletal research. Fascia is often considered as a relatively inert tissue, but it plays a major role as an essential force transmitter in muscular dynamics (Huijing, 2009). Also, fascia has an inherent ability to contract actively. The ability of fascial tissues to shorten over several days or more in certain pathologies with tissue shortening and stiffening is driven by myofibroblasts (MFBs). Fascial contractures feature an incremental combination of cellular contraction, collagen cross-linking, and matrix remodeling in a slip and ratchet-like manner. The active tissue contractions have been successfully recorded in vitro with several of these pathologic tissues in response to pharmacological stimulation.

An international research team from Germany, Switzerland, the UK, Canada, and Australia, conducted a serial of studies in vitro to further investigate the presence of MFBs in different fascial tissues, evaluate their potential active responsiveness to pharmacological stimulation, and estimate the impact of the resulting forces on musculoskeletal dynamics. In the studies, human and rat fascial specimens from different body sites were investigated using immunohistochemical staining for a-smooth muscle actin. Mechanographic force registrations were performed on isolated rat fascial tissues, which had been exposed to pharmacological stimulants. Mechanographic force measurements revealed contractions in response to stimulation by fetal bovine serum, the thromboxane A2 analog U46619, TGF-b1, and mepyramine, while challenged by botulinum toxin type C3—used as a Rho kinase inhibitor— provoked relaxation. The authors found that fascial tissues were insensitive to angiotensin II and caffeine. A positive correlation between MFBs density and contractile response was found.

Fascial tissues form a ubiquitous network throughout the whole body, which is usually regarded as a passive contributor to biomechanical behavior. In this study, the results do not support a significant immediate contribution of active fascial contractility within a matter of seconds. The authors observed the presence of the fascial contractions and they suggested that active changes of fascial stiffness might play contributory roles to the motoneuronal coordination aspect of low back stability. The hypothetical application of the registered forces to human lumbar tissues predicts a potential impact below the threshold for mechanical spinal stability, but strong enough to possibly alter motoneuronal coordination in the lumbar region. The authors concluded that tension of myofascial tissue is actively regulated by MFBs with the potential to impact active musculoskeletal dynamics.

Wen GJ, Liu H, Chen J, Zhang SF, Li YK, Zhou SG. 2019. 温针对肌筋膜痛扳机点模型大鼠病理形态及致痛性炎性介质的影响 (In Chinese: Effect of warm acupuncture on the pathological morphology and pain-induced inflammatory mediators in rats with myofascial trigger point pain). Zhongguo Gu Shang, 25;32(3):260–264. https://doi.org/10.3969/j.issn.1003-0034.2019.03.013.

Wen and colleagues from China established a new rodent model of myofascial TrPs. First they developed an exercise injury model resulting in disordered and damaged muscle fibers verified by histopathology. They observed the development of local fibrotic muscle fibers and contractures and contracture nodules, which were invaded by macrophages and other inflammatory cells. Next, the authors conducted an intervention study with “warm acupuncture” to evaluate the effect on the pathological morphology and pain-induced inflammation of the rat model assessed by microscopic pathology and microdialysis. The warm acupuncture intervention consisted of the insertion of an acupuncture needle into the skin about 2 mm above TrPs or A-Shi points combined with 0.5 g moxibustion on the acupuncture handle, for a total of 30 min per day for

1 or 2 weeks.

Sixty-four SD rats were randomly divided into group A (blank control), group B (model control) and group C (model and intervention control). The TrP model was established in both groups B and C; the warm acupuncture intervention was administered to the C1 group for 7 days and the C2 group for 15 days. TrPs were locally sampled and stained with hematoxylin-eosin after the rats were sacrificed and the pathological changes were observed under light microscopy. The morphology and arrangement of muscle fibers were improved after 7 days of the warming needle intervention (group C1) compared with the model group (group B1). A large number of newly immature and obviously smaller blood vessels could be seen locally. The number of local micro-vessels decreased while the diameter of vessels increased until they had developed into mature capillaries on the 15th day after the intervention of the warming needle (group C2).

Local microdialysis confirmed the presence of interleukin-1β (IL-1β) and prostaglandin E2 (PGE2) using a technique similar to the approach reported by Shah and colleagues (Shah et al., 2008). After successful modeling, the amount of IL-1β and PGE2 in group B0 was significantly higher than that in group A0 before the warm needle intervention. After the warming acupuncture intervention for 7 days, there was no significant difference in the amount of IL-1β and PGE2 between group C1 and group B1. Group C1 and B1 were significantly higher than group A1; in the warm needle intervention group (C2), the concentrations of IL-1β and PGE2 were lower than in group B2, but those in group C2 and B2 were significantly higher than group A2, and the amount of IL-1β and PGE2 in group C2 was lower than group C1. The authors concluded that an acupuncture intervention with moxibustion can improve the pathological and inflammatory state of local muscle fiber in TrPs of a rat, promote local microvascular formation and maturation, and facilitate local muscle fiber repair near TrPs.

Zhou P, Li Y, Zhang J, Chen Y, Wang K, Svensson P. 2019. Temporal summation of painful heat stimulation is facilitated in trigeminal and extratrigeminal regions in painful myofascial temporomandibular disorders: evidence from a case-control study. Journal of Oral & Facial Pain and Headache, 33(2):174–182. https://doi.org/10.11607/ofph.2248.

Researchers from China conducted this case-controlled study to examine if patients with painful myofascial temporomandibular disorders (TMD) exhibit facilitated temporal summation (TS) responses to thermal stimuli applied to the painful trigeminal and extra-trigeminal regions and whether there is a bilateral difference in the trigeminal region for TMD patients as compared to healthy controls. Twenty female patients with myofascial TMD pain and 20 age-matched healthy female subjects were included in this study to serve as a control. Thermal detection thresholds, thermal pain thresholds and TS of 20 repetitive noxious thermal stimuli were measured on the skin located above the masseter muscle on both sides and the nonpainful or less painful side of the thenar eminence of the hand for the myofascial TMD group and the dominant side for the control group. Thermal quantitative sensory testing (QST) was performed using a thermode to detect cold and warm detection thresholds followed by cold and heat pain thresholds. The temperature of the thermode started at a baseline of 32 °C and cooled down or heated up at a rate of 1 °C/second. Subjects were instructed to press a button when they perceived the thermal sensation of cold, warm, cold pain, or heat pain. Numeric rating scale (NRS) scores were recorded after the 1st, 5th, 10th, 15th, and 20th stimuli, and TS was calculated as the highest NRS score minus the first NRS score in each test.

The authors reported evidence of TS in both the trigeminal and extra-trigeminal regions in both groups, but with facilitated TS responses in the myofascial TMD group ($P < 0.001$). The authors also noted that, independent of the side being more or less painful, there was no side-to-side difference within the myofasiclal TMD pain patients. In addition, there were no significant associations between the intensity of the mean TMD pain and TS scores.

Temporal summation indicates an increase in the magnitude and frequency of the responses of the central nervous system nociceptive neurons to repetitive noxious stimuli as wide dynamic-range neurons show increasing responses to unchanging or diminishing afferent inputs (Price et al., 1977). The authors have presented evidence suggesting that TS of painful heat stimulation is facilitated in myofascial TMD pain patients. Although this study was well conducted, it does have a few limitations including a small sample size, and the inclusion of patients in the TMD group reporting bilateral pain thus not allowing a “clean” comparison of non-painful and painful sides.

2. Reviews

Al-Boloushi Z, López-Royo MP, Arian M, Gómez-Trullén EM, Herrero P. 2019. Minimally invasive non-surgical management of plantar fasciitis: A systematic review. Journal of Bodywork and Movement Therapies, 23(1):122–137. https://doi.org/10.1016/j.jbmt.2018.05.002.

Al-Boloushi and colleagues from Kuwait and Spain prepared a systematic review of the scientific evidence and the effectiveness of minimally invasive non-surgical techniques for the treatment of plantar fasciitis following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The researchers included randomized controlled trials (RCTs) of adult patients and intervention studies with at least 20 subjects. The methodological quality of all included studies was assessed with the Physiotherapy Evidence Database (PEDro) scale. Although the authors concluded that there was sufficient evidence that minimally invasive (non-surgical) treatments including shock wave therapy, botulinum toxin type-A injections, platelet-rich plasma injections and intratissue percutaneous electrolysis dry needling showed similar and sometimes better results when compared to corticosteroid injections, there are still no definitive treatment guideline for plantar fasciitis. We agree with the authors that non-invasive therapies should be considered. It was a bit surprising that platelet-rich plasma injections had reasonable good outcomes, as other studies have not always shown clinically meaningful results (Tsikopoulos et al., 2016). For US readers, percutaneous electrolysis has nothing in common with local hair removal as the term electrolysis could imply. Percutaneous electrolysis uses a galvanic direct current usually administered with a special needle placed within a tendon (Lopez-Martos et al., 2018).

Barbero M, Schneebeli A, Koetsier E, Maino P. 2019. Myofascial pain syndrome and trigger points: evaluation and treatment in patients with musculoskeletal pain. Current Opinion in Supportive and Palliative Care. 13(3):270–276. https://doi.org/10.1097/SPC.0000000000000445.

Swiss researchers synthesized the literature on the assessment and treatment of TrPs in people with MPS. Current evidence suggests medical providers need to seek out active and latent

hyperirritable palpable nodules, known as TrPs, in skeletal muscle fibers. Latent trigger points only cause pain with palpation whereas active TrPs reproduce the patient's symptoms both at the site of palpation and referred elsewhere. Both active and latent TrPs can cause limited motion but the clinician must be judicious to determine it is muscle and not the joint that is the culprit of the pain. The authors incorporated the original work of Travell and Simons to outline three basic interview questions as well as a physical examination to attempt to standardize the screening for TrPs. According to this literature review, clinicians should ask patients the following questions while examining TrPs: "Which of the following spots is the most painful?", "Is this pain part of your usual complaint?", and "Does the pain refer anywhere from the spot that I am compressing?" An affirmative answer corresponds with hypersensitivity, pain recognition, and presence of referred pain, respectively. The article also suggested the use of a daily or weekly VAS for pain intensity and body diagram to be used as a comparison for treatment effectiveness.

Effective medical interventions consist of both invasive and non-invasive options. Dry needling is considered invasive when compared with manual therapy and modalities all of which are classified as non-invasive. Several systematic literature reviews reported positive immediate and short-term improvements with dry needling (Kietrys et al., 2013; Ong and Claydon, 2014), however, these studies concluded that more randomized-controlled trials with larger sample sizes and longer follow-ups are needed. Manual therapy may include TrP compression, pressure release, passive stretching, and muscle energy techniques. A review by Fernández-de-Las-Peñas and colleagues included seven trials comparing various manual therapy interventions and did not identify significant differences in outcomes (Fernandez-de-Las-Penas et al., 2005). Additionally, they neither supported nor refuted the use of manual therapy beyond a placebo to treat TrPs even though some of the significant outcomes included decrease pain pressure threshold and VAS score.

Callejas-Marcos I, Torrijos-Bravo A, Torres-Chica B, Ortiz-Gutiérrez RM. 2019. Eficacia de la punción seca en la cervicalgia en comparación con otras técnicas de fisioterapia: una revisión sistemática [in Spanish: Efficacy of dry needling in neck pain compared with other physiotherapy techniques: A systematic review]. Rehabilitación, 53(3):189–197. https://doi.org/10.1016/j.rh.2018.11.004.

In this systematic review from Spain, the researchers examined the evidence of DN by searching the MEDLINE Complete (EBSCO), Pubmed, PEDro, and Scopus databases. To determine the quality of the included studies, the authors used the standard of biases of the Cochrane Collaboration. A total of 11 studies met the inclusion criteria out of an initial 356 studies. The efficacy of dry needling was compared with kinesio tape, ultrasound, TENS, and various manual therapy techniques. The authors concluded that DN was an effective technique for the treatment of neck pain, but the results were similar to other approaches. In a recent study, Ziaeifar and colleagues came more or less to the same conclusion (Ziaeifar et al., 2019) as did Gattie, Cleland and Snodgrass in their 2017 systematic review (Gattie et al., 2017). On the other hand, several other studies and reviews found that DN was superior to other interventions (Braithwaite et al., 2018; Vier et al., 2019; Hall et al., 2018; Hu et al., 2018). The differences are likely due to methodological issues, definitions of DN, and time of the outcome measures, among others. Very few DN studies use a pragmatic approach approximating clinical practice.

Falsiroli Maistrello L, Rafanelli M, Turolla A. 2019. Manual therapy and quality of life in people with headache: systematic review and meta-analysis of randomized controlled trials. Current Pain and Headache Reports, 10;23(10):78. https://doi.org/10.1007/s11916-019-0815-8.

This systematic review and meta-analysis from Italy was conducted to evaluate the effectiveness of manual therapy on health-related quality of life (HRQoL) in patients with tension-type headache (TTH), migraine (MH), and cervicogenic headaches (CGH). The authors conducted a literature search on MEDLINE, COCHRANE library and PEDro databases for randomized controlled trials (RCTs) in Italian, English and Spanish for articles comparing manual therapy treatment in adult subjects with TTH, MH, or CGH compared to pharmacological usual care or placebo. The authors identified a total of 10 RCTs, 7 of which were included into the meta-analysis. Outcome measure included the HRQoL measured by the Headache Impact Test (HIT-6), the Headache Disability Inventory (HDI), the Migraine Disability Assessment Questionnaire (MIDAS) and the Short Form Health Survey 12/36 (SF-12/36).

The studies included used a variety of treatments including articular mobilizations, manual trigger point release, sub-occipital inhibitory pressures and upper cervical manipulation, soft tissue techniques, and neuro-dynamic techniques. The meta-analysis for both the HIT- 6 and HDI scales showed statistically significant differences in support of manual therapy both after treatment and at follow-up. Studies utilizing the MIDAS and SF-12/36 provided inconclusive results due to high risk of bias and the presence of only one study for the MIDAS and SF-12 scales. The authors concluded that manual therapy should be considered as an effective treatment approach in improving the quality of life (HRQoL) in patients with TTH and MH.

This review has several limitations including the authors' attempt at examining various manual therapy treatment approaches and techniques for 3 sub-groups of headaches. In addition, the number of treatment sessions varied from 4 sessions in 4 weeks–14 sessions in 6 months with treatment durations ranging from 15 to 50 minutes. Post-treatment follow-up periods ranged from 2 weeks to 9 months following treatment. With a wide range of sub-groups, treatment techniques utilized, and follow-up periods, it is difficult to quantify the effects of treatments in analyzing the effects of manual therapy on HRQoL. Nevertheless, the study does highlight the use of manual treatment and its ability to improve HRQoL in these patients. As always, there is a need for future studies using valid and reliable disease-specific outcome measures when studying subjects with a diagnosis of headache.

Fernández-de-Las-Peñas C, Nijs J. 2019. Trigger point dry needling for the treatment of myofascial pain syndrome: current perspectives within a pain neuroscience paradigm. Journal of Pain Research. 12:1899–1911. https://doi.org/10.2147/JPR.S154728.

Two highly respected researchers and pain scientists from Spain and Belgium prepared this comprehensive narrative review of TrP DN within a pain neuroscience context. After briefly reviewing the current state of affairs of myofascial pain and TrP DN from different perspectives, including controversies about whether local twitch responses are essential, adverse events, post-needling soreness, the effectiveness of DN, and the mechanisms underlying DN, they proposed integrating contemporary pain science and TrP DN. Dommerholt et al. made a similar argument in the first chapter of the third edition of the 2018 edition of the Trigger Point Manual (Dommerholt et al., 2019). Current experimental evidence supports

that TrPs are linked to the excitability of the central nervous system (Fernández-de-las-Peñas and Dommerholt, 2014). The authors recommend integrating TrP DN into a broader pain science paradigm with exercise, pain education and manual therapy. This will not only benefit clinical practice, but also offers opportunities for future research.

Griswold D, Wilhelm M, Donaldson M, Learman K, Cleland, J. 2019.The effectiveness of superficial versus deep dry needling or acupuncture for reducing pain and disability in individuals with spine-related painful conditions: a systematic review with meta-analysis, Journal of Manual & Manipulative Therapy, 27(3):128–140. https://doi.org/10.1080/10669817.2019.1589030.

Dry needling and acupuncture are commonly used treatment approaches for the management of spine-related painful dysfunctions. Although both treatments involve puncturing of the skin using a filiform needle, DN targets trigger points of symptomatic soft tissue while usually acupuncture targets acupoints or 'Ashi' (tender points) based on Traditional Chinese Medicine. Researchers from the United States performed this systematic review with meta-analysis to evaluate the effects of deep versus superficial DN or acupuncture on pain and disability for spine-related painful conditions. Differences in needling performed local, local and remote, and remote to the painful site were also examined.

Only randomized controlled trials were included directly comparing deep to superficial dry needling or acupuncture for the treatment of spine-related painful conditions. All included studies were required to include a measure of pain and/or disability. Superficial needling was defined as needling to a depth of <10 mm or described as superficial in the study methods. Deep needling was defined as needling at a depth of >10 mm or described as deep needle insertion in the study methods. Twelve manuscripts were included in this systemic review and ten were utilized in the meta-analysis.

The authors reported a consistent effect supporting deep needling over superficial needling with a Standard Mean Difference (SMD) of 0.585, $p < 0.001$ from 10 studies for pain, but a non-significant effect of 0.197, $p = 0.14$ on disability from 2 studies. A temporal examination on pain was similar for results with a SMD of 0.450 immediately, 0.7111 short-term (1–11 weeks), and 0.470 for greater than 12 weeks. The authors reported a greater effect on pain with needling performed locally (SMD = 0.754) as compared to remotely (SMD = 0.501). The analysis of mixed local and remote needling treatment on disability was small and not significant SMD of 0.197. The authors reported that nine studies had an unclear risk of bias and three studies had a high risk of bias. The high risk of bias was most notably in performance or detection bias for lack of blinding. This systematic review highlights varying treatment strategies and approaches, however, as noted by the authors an unclear or high risk of bias is prevalent in the articles used in this review. Therefore, more high-quality trials are needed to better understand the effects of these treatment techniques. Standardization of superficial versus deep needling is also needed to allow for future comparative studies.

Kearns G, Fernández-De-Las-Peñas C, Brismée J-M, Gan J, Doidge J. 2019. New perspectives on dry needling following a medical model: are we screening our patients sufficiently? Journal of Manual & Manipulative Therapy, 27:3, 172–179. https://doi.org/10.1080/10669817.2019.1567011.

In 2013, 2015, respectively, the American Physical Therapy Association (APTA) and the US Federation of State Boards of Physical Therapy (FSBPT) provided screening guidelines when considering the use of DN. This United States based clinical commentary provided further details and supporting rationale what practitioners should assess to prevent unnecessary adverse responses to the treatment. The authors identified that while there is no protocol on dosage of DN, identifying certain co-morbidities should encourage a less aggressive approach. For example, utilizing an appropriate biopsychosocial questionnaire to screen for anxiety, depression, and fear avoidance could reduce the risk of DN overdosage and subsequent pain exacerbations. Additionally, other pathologies including cancer and issues affecting the cardiovascular, hematologic, and GI systems could present as or exacerbate TrP findings. If these diseases are suspected, the patient should be referred for further medical work-up prior to receiving DN to establish a baseline and help patients track their symptoms. The authors cautioned, that while DN may not be contraindicated in these cases, delayed healing, excessive bruising, and increased risk of infection could result. The authors concluded that a thorough patient history, and subsequent physician referral, if indicated, is mandatory when deciding to incorporate DN into the plan of care. They reported that DN may be an alternative to polypharmacy to avoid the side effects of the pain medications. Clinicians should consider appropriate interview questions to rule out or differentially diagnosis musculoskeletal problems and avoid unnecessary exacerbation of symptoms.

Yoon S–H, Kwon C–Y, Leem J. 2019. Adverse events of miniscalpel-needle treatment in Korea: A systematic review. European Journal of Integrative Medicine, 27:7–17. https://doi.org/10.1016/j.eujim.2019.02.002.

This systematic review from Korea detailed the characteristics of adverse events (AEs) that were associated with miniscalpel-needle (MSN) treatments. MSN is a popular form of treatment that combines acupuncture and microinvasive surgery to treat chronic pain syndromes. This intervention is common in Korea and China and has been reported to save $8.7 billion dollars in surgery costs. The acupuncture needle, which features a flat knife on the end, is considered more invasive than treatments involving a common needle and thus may be correlated with additional AEs.

The authors identified a total of 15 studies (304 patients) that reported AEs during the search time period. The search criteria from the inception of electronic databases through July 2017 did not exclude any pathologies, age, or sex of participants. The characteristics of AEs were ranked according to the 5-point Common Terminology Criteria for AEs scale with 1 defined as mild symptoms or observation and 5 as "death related to AE." The range of treatments was 12–24 with a mode of six. The most common mild AEs were pain, erythema, and ecchymosis and two studies reported moderate to severe symptoms of headache, dizziness, and tiredness. No grade 4 or 5 AEs were reported and all AEs resolved from 12 hours to 2 weeks. This is contrasted with AEs associated with acupuncture, which range from 0.14% to 15%. The authors reported AEs could be decreased with knowledge of anatomy and appropriate position of the blade in relation to other tissues. Additionally, infection prevention should include disinfection before and after treatment, wearing of gloves, and use of sterile gauze after treatment. The authors concluded that despite an incidence of AEs ranging from 0% to 100%, the heterogeneity and overall quality of the publications should be considered when interpreting the safety associated with MSN. The authors did provide strategies and concepts to decrease the risk of infection and other AEs associated with this intervention.

Zhang XF, Liu L, Wang BB, Liu X, Li P. 2019. Evidence for kinesio taping in management of myofascial pain syndrome: a systematic review and meta-analysis. Clinical Rehabilitation, 33(5):865–874. https://doi.org/10.1177/0269215519826267.

As a non-invasive treatment for myofascial pain syndrome (MPS) and TrPs, kinesio taping has been used increasingly by physiotherapists and pain clinicians as a clinical support treatment. However, no consensus has been reached about the benefits of kinesio taping, and no medical evidence is available to support the advantageous effect of kinesio taping on MFPS over other treatments at post-intervention and follow-up. Zhang and colleagues from China conducted a systematic review and meta-analysis to determine the effect of kinesio taping on patients with MPS in terms of improvement in pain intensity, pressure pain threshold, range of motion, muscle strength and functional disability at post-intervention and follow-up. PubMed, EBSCO, ScienceDirect, Web of Science, Cochrane Library and Physiotherapy Evidence Databases were searched from database inception to November 2018. A total of 660 articles were identified from the eight electronic databases, twenty randomized controlled trials involving 959 patients that used kinesio taping as the main treatment protocol for participants diagnosed with MPS were included.

In this systematic review and meta-analysis study, the authors found that kinesio taping results in significant improvement in pain intensity (mean difference (MD) = 1.06 cm, 95% confidence interval (CI): −1.66 to −0.46 cm, P = 0.006) and range of motion (standardized mean difference (SMD) = 0.26, 95% CI: 0.09 to 0.43, P = 0.003) at post-intervention compared with other treatments. Kinesio taping is also statistically superior to other non-invasive techniques in relieving pain intensity at follow-up (MD = −0.68 cm, 95% CI: −1.22 to −0.13 cm, P = 0.02). However, the scientific evidence remains insufficient for drawing conclusions regarding the post-intervention effects of kinesio taping on MPS in terms of pressure pain threshold, muscle strength and disability and the follow-up effects of kinesio taping for MPS in terms of all measurements compared with other treatments.

3. Dry needling, acupuncture, and injections

Bell L, Stout NL, Geiser MB. 2019. Dry needling for chronic breast/chest wall pain after breast cancer treatment. Rehabilitation Oncology, 37(3):E14-E16. https://doi.org/10.1097/01.REO.0000000000000176.

The physical therapist incorporated DN to the treatment to address the patient's persistent pain and soft tissue restrictions. The patient was treated for 3 sessions approximately 3 weeks apart. The authors reported treating the pectoralis major and minor muscles, drain scar, areas around the breast capsule, lateral chest wall, and trigger points within the latissumus dorsi muscle. The clinician used a combination of a pistoning technique and low-pulse electrical stimulation as the needles were left in situ for 5 minutes. The patient reported a 70% improvement in symptoms following one treatment, 80% improvement following the second treatment, and a 90% resolution of pain following her third visit. Furthermore, the patient reported a self-improvement in function, as she was able to shovel snow for 3 hours following her last visit.

This case study demonstrates the utilization of DN in the treatment of chronic pain and dysfunction following breast implant surgery. Clinicians should be cautious when performing DN in close vicinity of breast implants. The authors did report taking specific care to insert and piston the needles away from the implant as needling into the breast capsule is not without risk of implant puncture. The authors also reported that the patient was still happy to date with her results, however, they did not record the length of time from the last treatment until the patient's experience was recorded.

Ceballos-Laita L, Jiménez-del-Barrio S, Marín-Zurdo J, Moreno-Calvo A, Estébanez-de-Miguel EW. 2019. Effects of dry needling in hip muscles in patients with hip osteoarthritis: A randomized controlled trial. Musculoskeletal Science and Practice, 43: 76–82. https://doi.org/10.1016/j.msksp.2019.07.006.

This randomized double blinded placebo study from Spain assessed short-term outcomes of TrP DN on participants with unilateral hip OA. The study categorized 30 participants into a DN and sham needling group and tracked strength, ROM, and function after three sessions. The authors hypothesized that since the common complaint of hip OA is not related to radiographic findings, improving muscle function would also decrease pain. All participants aged 50–70 with a diagnosis of unilateral hip OA according to the American College of Rheumatology and at least one active TrP were included in the study. Each week, a maximum of three TrPs were treated with either a fast-in and fast-out or a blunt needle approach. The muscles assessed including the iliopsoas, rectus femoris, tensor fascia latae, glut medius and minimus. No additional exercises or instructions were issued as part of this study.

After the third session, a significant Group by Time interaction was observed in pain rating ($p = 0.004$), all hip motions ($p = 0.001$), and the functional tests of chair-stand and 20-m walk ($p < 0.002$ and $p < 0.001$, respectively). These results showed a large effect size ($d > 0.8$) and exceeded the minimum clinically important difference (MCID). Interestingly, after the study the sham group was identified to have less ROM (except hip adduction) and increased pain. Dieppe and colleagues hypothesized that sham treatments for OA result in CNS changes including alterations in pain perception (Dieppe et al., 2016). Future studies could include longer follow-up duration and additional interventions such as exercise and education.

Cruz-Torres de la B, Barrera-García-Martín I, Albornoz-Cabello M. 2019. Immediate effects of ultrasound-guided percutaneous neuromodulation versus physical exercise on performance of the flexor hallucis longus muscle in professional dancers: a randomised clinical trial. Acupuncture in Medicine, 37(2):91–97. https://doi.org/10.1177/0964528419826103.

Tendinopathy of the flexor hallucis longus (FHL) is a common condition in dancers due to high demand on this muscle in positions of extreme ankle plantarflexion and metatarsophalangeal (MTP) flexion and extension. Percutaneous electrical stimulation (PES) is used to relieve chronic pain and neuropathic pain with the aim of improving muscular activity in sports. When PES is applied via an acupuncture needle-like electrode that is placed in close proximity to the nerve or motor point of the target muscle under ultrasound guidance, it is known as ultrasound-guided percutaneous neuromodulation (US-guided PNM).

Researchers from Spain conducted a randomized clinical trial to examine the immediate effects of various different physical procedures, a stretching exercise, and an eccentric exercise and US-guided PNM (n = 15 each) on the performance of the FHL muscle in professional dancers. All participants were female in order to eliminate gender differences in dance technique and training. Measurements, including range of movement (ROM) of the first MTP joint, balance test and endurance test of the FHL muscle, were taken on each participant's stance limb before and just after the interventions, and performed barefoot. The researchers found that an isolated PES

intervention provided a greater immediate increase in balance and muscular strength than static stretching exercise and eccentric exercise of the FHL muscle in ballet dancers. They concluded that the beneficial effect of the PES technique on FHL muscle performance may potentially increase dance performance. PES treatment for the FHL muscle–tendon unit seem to enhance mobility of the first MTP joint, which may improve dance performance and/or help prevent FHL tendinopathy. The mechanisms of pain relief from PES are hypothesized as (1) the mechanism of segmental pain relief, mediated by Aβ fibers traverse the dorsal columns with similar pathways as utilized in spinal cord stimulation; (2) affected local concentrations of biochemical mediators, such as neurotransmitters and endorphins, lead to increased local blood flow that enhance the pain response; and (3) directly inhibit pain neurotransmission through alteration of local inflammatory mediators, and elevated pain thresholds.

Ferrer-Peña R, Calvo-Lobo C, Gómez M, Muñoz-García D. 2019. Prediction model for choosing needle length to minimize risk of median nerve puncture with dry needling of the pronator teres. Journal of Manipulative and Physiological Therapeutics, 42(5):366–371. https://doi.org/10.1016/j.jmpt.2018.11.020.

Pronator syndrome (PS) is an entrapment of the median nerve (MN) between the two heads of the pronator teres muscle. Dry needling and acupuncture are treatment approaches that can be performed to treat this condition, however, MN neuropathies have been reported during the use of deep DN and acupuncture in the forearm muscles (Southworth and Hartwig, 1990; Lee et al., 2008). Therefore, researchers from Spain conducted a study to correlate anthropometric measures of the forearm in healthy subjects and ultrasound to measure the depth of the pronator teres to better determine needle length to prevent median nerve injury during pronator teres DN.

Sixty-five healthy subjects participated in this study. The authors recorded the sex, age, and BMI for each subject. In addition, anthropometric data (forearm length and circumference) were collected. The forearm length was measured from the elbow to the wrist skin folds, while forearm circumference was measured at the largest perimeter located in the upper third of the forearm. An ultrasound was used to measure the total length of the pronator teres and a mark was then placed on the skin at the longitudinal center of the pronator teres. Muscle thickness and MN depth were measured between the pronator teres fascia and MN epineurium. Two needle lengths (13 mm and 25 mm) were utilized in this study.

The authors reported that for forearm circumferences smaller or equal to 27.5 cm; the predictive value for the 13-mm was 92%. For forearm circumferences greater than 27.5 cm and forearm lengths less than 26.75 cm, the predictive value for the 25-mm needle was 100%. This study provides useful clinical means of identifying MN depth for treatment aimed at the pronator teres, however, it does have several limitations including the use of healthy subjects only as the thickness of the pronator teres or MN cross-sectional area may differ in individuals with PS. In addition, measurements were taken at the midpoint of the pronator teres; the authors did not analyze the depth of the MN at other points within the forearm, which potentially could alter needle selection.

Gokcek O, Huzmeli I. 2019. The effects of dry needling on respiratory parameters in a patient with medium severity. Annals of Medical Research, https://doi.org/10.5455/annalsmedres.2019.03.148.

The World Health Organization forecasts that by 2030, Chronic Obstructive Pulmonary Disease (COPD) will be the third leading cause of death. While traditional Chinese acupuncture has been proposed as a treatment option for this pathology, no studies were identified that used DN. The Turkish authors of this paper hypothesized that if DN can improve muscle activity and decrease pain, it may also improve lung function. The case study involved a 49 year old male with COPD, who was treated every two days for a total of 10 visits with DN and exercise. Pre- and post-test assessments including respiratory and several other functional tests. The authors did not define how DN was performed but stated the following areas were needled at each visit: pectoralis, SCM, upper trap, and the “seventh region” of the spine related to the phrenic nerve.

While the patient improved both subjectively and objectively, following the sessions, these results should be interpreted with caution. This case study included multiple other interventions that may have been successful, including postural and respiratory exercises, stretching, postural drainage, and taping. It is impossible to determine if a single or combination of several interventions were the reason for this patient's success. Additionally, no needling protocol was described in the methods section. This makes the study impossible to duplicate and validate the findings. Dry needling for COPD is an innovative approach that warrants further investigation including randomized controlled studies.

Griswold D, Gargano F, Learman KE. 2019 A randomized clinical trial comparing non-thrust manipulation with segmental and distal dry needling on pain, disability, and rate of recovery for patients with non-specific low back pain. Journal of Manual & Manipulative Therapy, 27(3):141–151. https://doi.org/10.1080/10669817.2019.1574389.

The aim of this randomized clinical trial was to compare DN and non-thrust manipulation in the short-term management of non-specific LBP. This United States based study divided 30 participants into non-thrust joint manipulation or integrated DN groups. Both groups were treated twice a week for three weeks and all participants were instructed to complete a daily home exercise program. The non-thrust group received three bouts of graded mobilizations targeted at the most painful lumbar segment with a 45 second rest between. Each person in the DN group received 22 needles for a total time of 5–7 minutes per session. Two needles were placed bilaterally in the paraspinal muscles at the most painful lumbar segment as well as the area above and below the pain. In addition, needles were place in the bilateral peripheral nerve distributions.

All outcomes, including the Oswestry Disability Index (ODI), the Numeric Pain Rating Scale (NPRS), Pain Pressure Thresholds (PPT), and the Patient Specific Functional Scale (PSFS) were assessed at baseline, visit 2, visit 4, and visit 6. Additionally, the Single Assessment Numeric Evaluation (SANE) was performed during the last visit. No statistical difference was identified for Group by Time for any of the variables at any of the assessment periods. There was also no between group difference for the SANE ($p = 0.91$). However, the two-way mixed model ANOVA identified significant improvement in both groups in all outcome variables.

The investigators followed the approach taught by Dr. Ma which does not involve needle manipulation. This resulted in no palpation for TrPs as the authors reported that manual TrP palpation lacked reliability according to some authors (Rathbone et al., 2017; Lucas et al., 2009). However, this opposes evidence that reports active TrPs can reproduce both local and referred pain patterns (Gerwin, 2014; Alonso-Blanco et al., 2012; Poveda-Pagan et al., 2017). While research favors TrP DN, more gentle DN approaches may be better tolerated in people with trypanophobia or other associated fears of

invasive treatment options. On the other hand, fear of needles does not necessarily reduce the positive effects of DN (Joseph et al., 2013).

Kolb C, Kolb, W. 2019 Myofascial trigger point dry needling and manual therapy in a Yorkshire Terrier: a case report. Orthopaedic Practice, 31(3):189–191.

This United States based case study involved a Yorkshire Terrier, Sadie, diagnosed with left elbow arthritis which resulted in a 1-year left front leg (LFL) lameness. During the evaluation, the dog was observed to be walking on three legs when on slick surfaces. According to the owner, Sadie used all four legs on the carpet, 80% of the time. The owner also reported the animal had an increased frequency of chewing on her LFL, which could be indicative of nerve issues. According to Travell and Simon, the referral pattern for the latissimus corresponds to the human hand. Physical examination identified trigger points in the Sadie's latissimus dorsi, teres major, and tricepital muscles.

Sadie received a total of four sessions of Canine Rehabilitation by a certified therapist. Due to lack of medical orders, the first two sessions only included muscle stretching and ice were utilized. Mobilizations were added to the second visit. The owner reported significant improvement after the mobilizations but felt more improvement was necessary. The last two visits incorporated DN and Sadie was reported to be fully functioning and no longer chewing her LFL. Due to out of country responsibilities, the owner did not return to therapy although the therapist unsuccessfully attempted to contact the owner 2 and 5 months later. This study provides evidence for successful outcomes associated with DN on canines as dogs are unable to determine placebo interventions.

Moon YE, Kim SH, Seok H, Lee SY. 2019. Efficacy of topical vibratory stimulation for reducing pain during trigger point injection to the gastrocnemius: a randomized controlled trial. Archives of Physical Medicine and Rehabilitation, 100(9):1607–1613 https://doi.org/10.1016/j.apmr.2019.02.010.

Injections (TPI) with local anesthetic agents, steroids, or botulinum toxin, are among the most frequently used therapeutic approaches for treating TrPs. Occasionally pain may be induced during the procedure from puncturing the skin, inserting the needle into fascia and muscle, withdrawal and reinsertion, and infiltration of the injectant. Recently, topical vibratory stimulation has been introduced in dental applications to reduce injection pain effectively. For example, topical vibratory stimulation may reduce pain during intralesional steroid injections for keloid treatment, digital blocks of the hand, and various other procedures including injections, staple and suture removals.

Moon and colleagues from Korea conducted a randomized control trial to determine whether topical vibratory stimulation affects the pain experienced during TPI to the gastrocnemius. A total of 60 participants were enrolled, and randomly assigned to the vibration group or control group. TPIs were performed with 0.5% lidocaine using a 25- gauge needle. A vibrator was applied to the popliteal fossa for 3–5 seconds prior to and during the TPI; 100-Hz vibration was turned on for the vibration group and turned off for the control group. Pain intensity during TPI was assessed using a 100-mm Visual Analog Scale (VAS), and participant satisfaction and preference for repeated use were measured using 5-point Likert scales as the outcome measurement. These parameters were evaluated immediately after TPI. They found the VAS during TPI were significantly lower in the vibration group compared with the control group and the participant satisfaction and preference for repeated use were significantly higher in the vibration group than in the control group. The authors concluded that the topical vibratory stimulation significantly decreased pain during TPIs of the gastrocnemius.

Other modalities used for reducing pain during minor invasive procedures, such as ice packs, vapocoolant sprays, and lidocaine 2.5% plus prilocaine 2.5% cream (EMLA) may also effectively reduce pain during TPI, however, these modalities have some limitations. Ice packs and vapocoolant sprays may induce frostbite and cannot be applied when patients have peripheral vascular disease or cold hypersensitivity. EMLA cream may cause transient local skin blanching or erythema in some patients.

This analgesic capability of topical vibration stimulation can be explained by Melzack's gate control theory via activating mechanoreceptors, Meissner and Pacinian corpuscles to stimulate large diameter type A-beta fibers, activate inhibitory interneurons in the spinal cord, close the neural gate, and block nociceptive transmission through type A-delta and C fibers respectively to the brain via the spinothalamic tract. Topical vibratory stimulation has the advantages of ease of application, rapid onset of action, and safety. No participants in this trial reported any adverse effects associated with the vibration. Although the use of topical vibration generally does not eliminate pain completely, it can make TPIs more tolerable.

Morgan BC, Deyle GD, Petersen EJ, Allen CS, Koppenhaver SL. 2019. Dry needling in the management of patients meeting clinical diagnostic criteria for subacromial pain syndrome: a case series. International Journal of Sports Physical Therapy, 14(4):637–654. PMCID: PMC6670052; PMID: 31440414

The aim of this case series was to describe the use of DN and exercise for patients with subacromial pain syndrome (SAPS). Twenty-five patients were treated with DN for two sessions before exercises were added to the treatment regimen. The main outcome measure was the Quick Disabilities of the Arm, Shoulder, and Hand survey (Q-DASH). Measurements were taken at the 3rd visit, and after 2 weeks and 3 months. Secondary outcome measures included the Numeric Pain Rating Scale (NPRS), shoulder abduction active range of motion (AROM), and the Global Rating of Change (GROC) scale.

The authors defined primary TrPs in taut bands that were more pronounced or in muscles which most closely produced the patients' familiar symptoms upon palpation. Secondary TrPs were classified by the presence of taut bands or symptom production with a lesser degree of correlation to the patients' familiar symptoms. Dry needling was performed with 0.30 × 50 mm or 0.30 × 60 mm sterile, disposable, solid filament needles. At the time of the 3rd visit, 21 of 24 patients demonstrated improvement in Q-DASH scores ranging from 4.5 to 38.6 points lower than their baseline scores, with 8 of 24 (33%) exceeding the minimal clinically important difference (MCID) of 16 points. At the 3-month measurement point, 19 of 22 patients continued to show improvements in the Q-DASH ranging from 0.1 to 54.5 points lower than their baseline scores, with 11 of 22 (50%) exceeding the MCID. With regard to the NPRS, at the 3rd visit 22 of 24 patients reported reduced pain on the NPRS ranging from 0.7 to 6.7 points less compared to baseline with 8 of 24 (33%) meeting the MCID. At the 3-month measurement point, 20 of the 22 patients reported improvement ranging from 0.4 to 6.3 points on the 11-point scale with 13 of 22 (59%) meeting the MCID. At the 3rd visit, active abduction improved from 10° to 120° compared to baseline, with 10 of the 18 (56%) exceeding the MCID. At the 3-month mark, 14 of 16 (88%) patients with AROM impairments at baseline demonstrated improvements in abduction that

exceeded the MCID. GROC scores of +3 ("somewhat better") or greater were determined to represent clinically meaningful improvement. At the 3rd visit, 15 of 24 (63%) patients reported scores of +3 or greater which increased to 19 of 22 (86%) at the 3-month follow up.

As the authors mentioned, this is a rare pragmatic study of DN and exercise in a patient population. More commonly used randomized controlled clinical trials of DN fail to resemble real life situations and have the inherent risk of overestimating benefits and underreporting risks (Dommerholt, 2020). The study design allows to assess the immediate effects of DN, including improvements in pain, function, and shoulder motion. Although the case series design precludes drawing any cause and effect conclusions, the results of this study are encouraging. As a side note, the authors mentioned that the patient information would be protected in accordance with the U.S. HIPPA provisions, which of course should have been the US HIPAA provision, where the acronym stands for the Health Insurance Portability and Accountability Act of 1996.

Nasr AJ, Zafereo J. 2019. The effects of dry needling and neurodynamic exercise on idiopathic peripheral neuropathy: A case report. Journal of Bodywork and Movement Therapies, 23(2):306–310. https://doi.org/10.1016/j.jbmt.2018.02.006.

Changes to nerve homeostasis can alter neurodynamics causing pain and functional limitations Neurodynamic treatment techniques are directed at the neural structures through patient positioning and movements of the nerve within the neural tube. While these neurodynamic treatment techniques appear to be useful in the treatment of patients with CTS, evidence is lacking for patients with varying forms of peripheral neuropathy. Ballestero-Pérez et al. reported in a systematic review that subjects receiving neural mobilization for carpal tunnel syndrome (CTS) had greater and faster pain relief, decreased sensitive distal latency and time summation, and increased pinch grip strength (Ballestero-Perez et al., 2017).

Clinicians from the United States described a case of a 67-year old male with a medical diagnosis of idiopathic peripheral neuropathy. The patient presented with a 6-9-month history of gradual complaints of symptoms, that had progressed to constant symptoms of pain ranging from a 2/10 at best and 7/10 at worst on a Numerical Pain Scale. The patient had complaints of numbness and tingling in bilateral feet, along with warm and occasional burning sensations that began in his toes and progressed to the mid-tibia region. Neurological examination revealed diminished bilateral sharp/dull sensation in the L4 and S1 dermatomes. Neural tension testing in the slump position did not reveal overt symptom reproduction but did result in reports of altered burning sensation. Manual muscle testing and reflex testing were reported as normal.

The patient received four 30-min treatments over a five-week period. Treatment consisted of both DN with and without electrical stimulation along the pathway of the superficial peroneal, intermediate dorsal cutaneous, deep peroneal, sural, and lateral dorsal cutaneous nerves. Eight needles were inserted into each limb. Thirty-millimeter (mm) needles were inserted in the lower leg and 15 mm were used for the foot. Electrical stimulation was applied at the most proximal and most distal point of three neural pathways (deep peroneal nerve, superficial peroneal nerve, and the lateral dorsal cutaneous nerve) as identified by greatest sensation complaints. Electrical stimulation was set at a frequency of 2 Hz, intensity was described as strong but comfortable (average range 7–9 miliamps) for 10 minutes per leg. The patient received a HEP to be performed once daily for 3 sets of 10 to extend the knee until the lower leg and foot symptoms appeared and immediately returned to the resting position.

The patient reported that after the 4th visit, functional self-report scores were not improved, however the NPRS decreased to 2 from a baseline rating of 4. The Rhomberg balance test improved with the eyes closed from 5 seconds to 15 seconds on the right limb, and from 8 seconds to 20 seconds on the left limb. The sharp/dull sensation testing improved at both the L4 and S1 dermatome. Additionally, the patient's Global Rating of Change was rated as quite a bit better (+5). Idiopathic peripheral neuropathy is a complex disease process with many uncertainties, and as a result conventional treatment approaches may not always resolve the patient's symptoms. This report highlights the use of a multimodal approach for patient care. A thorough evaluation and the utilization of varying treatment may be warranted in the treatment of neuropathies.

Nitecka-Buchta A, Walczynska-Dragon K, Kempa WM, Baron S. 2019. Platelet-rich plasma intramuscular injections - antinociceptive therapy in myofascial pain within masseter muscles in temporomandibular disorders patients: a pilot study. Frontiers in Physiology, 19;10:250. https://doi.org/10.3389/fneur.2019.00250.

Myofascial pain of masseter muscles is a difficult issue for differential diagnosis in temporomandibular disorders (TMD) patients. The longer the muscle pain persists, the harder it is to overcome it. An intramuscular platelet-rich plasma (PRP) injection, as a minimally invasive treatment, is being used more frequently for skeletal muscle injuries in athletes and may be a suitable therapy in selected patients with myofascial pain, when other conservative methods do not bring relief. PRP is a concentrate of many growth factors such as vascular endothelial growth factor, platelet-derived growth factor, and transforming growth factor-b1, which is very important for angiogenesis, extracellular matrix changes, and cell production. The goal of PRP in promoting muscle healing after intramuscular injection in painful muscles is to concentrate the main growth factors from native blood and to reintroduce them in the injured muscle.

Nitecka-Buchta and colleagues from Poland conducted a randomized, controlled, double-blind, two-arm trial to explore the nociceptive effect of PRP intramuscular injections in selected patients with myofascial pain of masseter muscles. Out of a total of 80 patients, 59 subjects (38 female and 21 male, mean age 29.35 ± 6.61) met the inclusion criteria and they were randomized into the two groups: Group I (injections with PRP, $n = 29$) and Group II (injections with isotonic saline 0.9% NaCl, $n = 29$). Approximately 40mL of venous blood was harvested from the cubital vein and about 6mL of pure-PRP was obtained. There were no leucocytes or low-density fibrine network in the produced PRP. Group I PRP and in Group II isotonic saline were injected bilaterally into the right and left masseter muscles at 3 painful points at each site (6 Å~ 0.5mL = 3mL) near the origin, under the zygomatic arch. Injections were deposited 0.5–1.0 cm under the skin surface. The Visual Analog Scale (VAS) was used to determine the pain intensity changes during follow-up visits (Day 0, Day 5 and Day 14) in each group.

The authors found that there was a 58% reduction in pain intensity 5 days after the PRP injection in masseter muscles in Group I, and 10.24% reduction after isotonic saline injection in the control group II. Furthermore, immediately after the PRP application, 50% of patients experienced pain at the level of 5 or higher; after 5 days, 50% of patients experienced pain at the level of at least 2 and 50% greater than 2. They concluded that the use of intramuscular PRP in masticatory muscles is an innovative method. It carried almost no risk of complications and high effectiveness of action for masseter muscle myofascial pain.

Although the authors acknowledged that the small study group and a short follow-up observation were the main limitations of the study, there were several other limitations. First, many different techniques are available for PRP preparation, injection protocols and technical intervention. Second, for TrP injections, a concern is that the injected target must be the actual TrP, and not just intramuscular. Eliciting a local twitch response is preferred as well. Third, the VAS is not a strong enough outcome measure to be used exclusively. Further subjective and objective measurements are needed.

Rogge J, Krause DA. 2019. Use of trigger point dry needling as a component of a rehabilitation program for a patient with nonspecific chronic low back pain and a history of a lumbar discectomy. Orthopaedic Practice, 31(3):136–142.

Drs. Rogge and Krause, from the United States, submitted outcomes on a patient that received 20 PT visits who had nonspecific LBP, bilateral LE radiculopathy, and a prior history of microdiscectomy. The case study involved standard PT and 12 sessions of trigger point DN. The subject reported his job required physical activity 10–20 hours a day. Current pain levels ranged from 5 to 7 on a Visual Analog Scale (VAS). At the initial evaluation, the participant was screened for red flags, including neurologic involvement. A thorough history had been previously reported to be clinically relevant to determine appropriateness in patient selection (Kearns et al., 2019).

The participant reported 50% improvement in pain immediately following the first visit. At the final PT visit, the subject met all his goals including no pain and able to work without limitations. Additionally, he had full lumbar and hip ROM and no neurologic signs or symptoms. The results of this study provide insight into the possible effects of DN despite prior history of surgery. However, despite immediate improvement after the first visit, it is not possible to determine whether the DN, traditional PT, or a combination was the reason for the clinical success. Griswold and associates (2019) identified similar successful outcomes for both groups who received dry needling or non-thrust mobilizations with a diagnosis of with nonspecific LBP (Griswold et al., 2019). Future studies should include randomized controlled trials with comparative interventions to determine the benefits of DN on patients after surgery.

Snyder DD. (2019) Acupuncture gone awry: a case report of a patient who required surgical removal of two single-use filament needles following acupuncture treatment. Journal of Manual & Manipulative Therapy, 27(3):180–184, https://doi.org/10.1080/10669817.2019.1608010.

Acupuncture is a treatment technique that has existed for over 2000 years. The safety of this treatment technique has been reported (Lao et al., 2003). The most common adverse events (AE) include localized pain, slight bleeding, and hematoma, however, more serious AE have been reported with an incident rate of 0.5 serious AE per 10,000 treatments (White, 2004). Both DN and acupuncture involves the insertion of filiform needles for treatment, therefore AE resulting of the use of single-use disposable filiform needles should be of interest to both acupuncturists and health-care providers practicing DN.

This case report describes a 52-year-old male who had been receiving ongoing physical therapy (PT) treatment as part of a multi-disciplinary approach to chronic neck pain and decreased cervical range of motion. The patient presented to PT following surgery to excise two equal length fragments of two different single-use disposable filiform acupuncture needles from his neck. The patient received two acupuncture treatments while on an international business trip from a licensed acupuncturist that had provided prior acupuncture treatment with “good success” during prior visits. During treatment, one of the acupuncture needles fractured in the patient's neck in the right paraspinal region near the C1–C2 junction. The acupuncturist immediately attempted to retrieve the needle with a pair of tweezers but was unable as the needle was too deep to retrieve. The subject was sent to the hospital for radiographs. Radiographs revealed that not just one, but two needles had fractured in the patient's neck. The known needle was discovered near the C1–C2 junction, while a previously unknown second needle was abutting the left facet joint of C6–C7. The subject reported an unfamiliar pain during a treatment he received four days previously in which he experienced unfamiliar pain following an acupuncture treatment near the location where the needle appeared on radiographs. Images revealed that neither of the needles posed an immediate threat to the patient and he was allowed to fly to the United States where he would have the needles removed.

The patient reported that when he boarded his flight less than 3 h later he noted a palpable lump in his neck at the site of the C1–C2 needle. However, less than 2 h later the palpable lump had disappeared. Upon returning to the US, it was revealed that the C1–C2 needled had migrated 3 cm and settled 2 mm from the right vertebral artery. The second needle was vertically oriented abutting the left C6–C7 facet. The patient underwent successful surgery to remove both needles.

Acupuncture needles were originally manufactured for reuse, however, following an outbreak of hepatitis B in the United Kingdom in 1977, single-use disposable filiform needles were brought to the market to mitigate this risk (Hayhoe et al., 2002). Researches have begun to investigate the quality of single-use filiform needles that are used in both acupuncture and DN treatment. Xie et al. examined the relationship between buckling of single-use filament needles and handle type, and reported plastic handled needles had an almost 50% greater average buckling force that needles with a copper coil handle (Xie et al., 2014). Leow et al. investigated static compression forces applied to a filiform needle and reported that needles bent but did not break with a compression rate of 10mm/min (Leow et al., 2017). The World Health Organization noted that breaks in acupuncture needles may arise from poor quality manufacturing, erosion between the shaft and handle, strong muscle spasm, sudden movement from the patient, incorrect withdrawal of a stuck or bent needle, or prolonged galvanic current use (World Health Organization, 1999). A few recommendations are noteworthy to minimize the risk of needle fracture, including leaving more than just the needle handle exposed above the skin, which is relevant for needles where the needle has been inserted into the handle. Clinicians should also “count in” and “count out” the needles used during treatment to confirm all needles are accounted for, and finally clinicians should be aware of the manufacturing process to assure they are selecting the highest quality needles for patient care. Needles with a high nickel content are more likely to break.

Ziaeifar M, Arab AM, Mosallanezhad Z, Nourbakhsh MR. 2019. Dry needling versus trigger point compression of the upper trapezius: a randomized clinical trial with two-week and three-month follow-up, Journal of Manual & Manipulative Therapy, 27(3):152–161, https://doi.org/10.1080/10669817.2018.1530421.

A collaborative study involving researchers from Iran and the United States examined the effects of DN versus trigger point

compression (TPC) of the upper trapezius in a group of 33 subjects with an active TrP in the upper trapezius muscle. Individuals were randomly assigned to either the TrP compression group (N = 17) or DN (N = 16). Pain intensity, neck disability using the Northwick Park Neck Pain Questionnaire (NPQ), and Disability of the Arm, Hand, and Shoulder (DASH) were assessed before treatment, after treatment sessions, and at two-week and three-month follow-ups.

Subjects in each group received three treatment sessions over one week (every other day). TPC was performed as the therapist manually applied increasing pressure to the TrP gradually until onset of pain. Pressure was maintained until the patient reported the discomfort or pain was decreased by 50%, at which time the pressure was increased until discomfort was reported again. Pressure was maintained for 90 seconds and repeated until tenderness and tension of the TrP was released. DN was performed using a 0.30 mm × 50 mm solid filiform needle aimed at eliciting a local twitch response at the TrP. Upon eliciting a local twitch response (LTR) needling was stopped.

The authors reported a significant group-measurement interaction effect for the Visual Analog Scale (VAS) ($p = 0.02$). No significant interaction was found for the NPQ and DASH ($p > 0.05$). Significant changes in VAS, NPQ, and DASH disability were noted after three treatment sessions, two-week and three-month follow-ups as compared to before treatment in both groups. However, changes in the VAS, NPQ, and DASH after two weeks or three months were not significantly different between groups when compared with pretreatment scores. The VAS obtained immediately after three treatment sessions was significantly different between the two groups ($p = 0.02$).

This study does highlight the use of two commonly used treatment strategies in the treatment of TrPs in the upper trapezius muscle, however, it does have several limitations that are worth noting. The authors have data missing at follow-up, that although these were excluded from analysis, it may have affected the outcome reporting. DN treatment was performed until a single LTR was elicited, it is feasible that a treatment approach including multiple LTRs may have a different response. Further studies examining varying DN treatment approaches as compared to TPC are warranted.

4. Manual therapy

Muoñz de Baena Albarracín A. 2019. Tratamiento del syndrome de dolor myofascial asociado a syndrome del desfiladero torácico. A propósito de un caso [in Spanish: Treatment of myofascial pain syndrome associated with thoracic outlet syndrome: presentation of a case]. Fisioterapia, 41(4):237–241. https://doi.org/10.1016/j.ft.2019.04.004.

In this case report from Spain, the authors presented a 32-year old female patient with a history of thoracic outlet syndrome. She presented with normal cervical range of motion in spite of radiographic evidence of the presence of a cervical rib. The physical therapy examination revealed myofascial trigger points in multiple cervical muscles, including the bilateral upper trapezius, the levator scapulae, the scalenes, and the sternocleidomastoid muscles. She was treated conservatively with a combination of manual trigger point therapy, massage therapy, an application of a cervical hot pack, and TENS for a total of 12 sessions over 6 weeks. Pain levels reduced 5/10 to 0/10. The authors concluded that a conservative treatment may be a viable option for the management of thoracic outlet syndrome.

Disclosure statement

No potential conflict of interest was reported by the authors. Drs. Dommerholt and Thorpe and Mr. Hooks are affiliated with Myopain Seminars, LLC, Bethesda, MD, USA, an organization that promotes the recognition and treatment of individuals with myofascial pain. Dr. Dommerholt receives royalties from published books.

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