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MYOFASCIAL PAIN AND TREATMENT: EDITORIAL

A critical overview of the current myofascial pain literature — November 2018

Keywords:
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Manual therapy

A B S T R A C T

This is the first issue of this review column since the passing of Dr. Leon Chaitow. We would like to take a brief moment to acknowledge how much his mentorship, friendship, and confidence have meant to us. Leon was a force in osteopathic and naturopathic medicine and his influence reaches to all corners of the musculoskeletal realm crossing over many disciplines through his lectures, workshops, and of course, his many books, editorials, and articles. In the foreword to one of his books, Jan Dommerholt wrote that "Leon Chaitow […] continued the work of Travell and Simons, but also of many others, whose contributions he has skillfully woven into an intricate tapestry of clinical pearls, practical tips, and solid evidence-informed research." Dr. Chaitow was a synthesizer, who always considered what different clinicians and researchers could possibly contribute to a better understanding of pain and dysfunction and provide real solutions to real problems. Even when he would not necessarily agree with all suggested remedies, he maintained an open mind and was able to take a step back and consider the bigger picture. For example, Leon was not a big fan of dry needling, yet, he valued the importance of this approach and encouraged the inclusion of dry needling papers in this review article and in his journal. The Journal of Bodywork and Movement Therapies became his baby and, considering the growth of the journal, there is no question that Leon's intense focus and efforts are appreciated by many around the globe. We wish to extend our condolences to Leon's wife Alkmini and daughter Sasha. He will surely be missed, but we can find peace in knowing that his legacy will stay with us forever.

In this issue, we have included several basic myofascial pain research articles. As usual, dry needling (DN) studies and case reports are the most commonly referenced papers, but we also included neuroscience and electromyography studies, sleep studies, interrater reliability studies, and case reports of adverse events.

1. Basic research

Cheatham SW, Kolber MJ, Mokha M, Hanney WJ. 2018. Concurrent validity of pain scales in individuals with myofascial pain and fibromyalgia. 2018. Journal of Bodywork and Movement Therapies, 22(2):355-360

Investigators from the USA compared the concurrent validity of the Numeric Pain Rating Scale (NPRS) and the Visual Analog Scale (VAS) in patients with myofascial pain syndrome (MPS) and fibromyalgia (FM). A total of 60 patients were recruited. Thirty had FM based on the 1990 American College of Rheumatology criteria (Wolfe et al., 1990), and 30 had MPS and did not meet the FM criteria. Each patient was tested with a pressure algometer at 18 pre-determined tender points for fibromyalgia. After each point was tested with the algometer with up to 4 kg/cm^2, or until maximum pressure was reported, patients recorded their level of tenderness with the NPRS and VAS. Prior to testing each patient was familiarized with the process by having two control points tested to ensure each patient understood what to do. Prior to the study, the authors performed a pilot study with 10 separate subjects to determine the intrarater reliability of the testing used in the main study. Results of the pilot study demonstrated good intrarater reliability. Results of the primary study demonstrated that there was an excellent relationship for the NPRS and VAS for both the MPS and FM groups. This study was well organized and easy to follow. The authors did a good job organizing the content should anyone chose to perform a similar study. Because this was the first of its kind for these populations it is good to know that both the NPRS and the VAS can be utilized with these populations. One thing of note, however, is the authors did not report if the patients reported on the NPRS or the VAS first when reporting pain. It could be possible that reporting on the NPRS first versus the VAS could alter results. Also, the 1990 ACR criteria have been replaced with several other more recent criteria dating back to 2010 and it is somewhat surprising that the authors opted to use outdated criteria to diagnose FM (Wolfe et al 2010, 2011; Bennett et al., 2014).

Dibai-Filho AV, de Jesus Guirro RR, Ferreira VTK, de Oliveira AK, de Oliveira Guirro EC. 2018. Analysis of chronic myofascial pain in the

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1360-8592/

upper trapezius muscle of breast cancer survivors and women with neck pain. Journal of Bodywork and Movement Therapies, 22(2):237–241.

Researchers from Brazil conducted a cross-sectional study to compare the intensity of myofascial pain, catastrophizing, and the pressure pain threshold (PPT) at upper trapezius TrPs between breast cancer survivors and women with neck pain. The authors hypothesized that myofascial pain in breast cancer survivors produces greater symptoms than in women with neck pain as a result of a greater severity of disease and extent of injury from surgical and adjuvant treatment breast cancer survivors have endured. Thirty female subjects over the age of 18 were recruited with complaints of myofascial cervical pain for more than 90 days, and a Neck Disability Index (NDI) score ≥ 5. Thirty breast cancer survivors greater than 18 years of age with complaints of myofascial pain in the upper trapezius muscle region for more than 90 days, who had previously undergone treatment for breast cancer (surgery, chemotherapy, and/or radiation therapy) at least six months prior to the study, were included in this study. Subjects in both groups had the presence of a bilateral, active, and centrally located TrP in the upper trapezius muscle. Each subject was measured for pain intensity (Numeric Rating Scale), catastrophizing (Pain-Related Self-Statement Scale), and PPT using an algometer at the bilateral upper trapezius muscle TrPs.

The authors reported a significant difference when comparing pain intensity ($p < 0.001$) between the breast cancer survivors (median score 8) and women with neck pain (median score 2.50). No significant difference was noted in catastrophizing and PPT. The authors concluded that the breast cancer survivors have a higher intensity of myofascial pain in the upper trapezius as compared to patients with neck pain. It is important to note that the breast cancer survivors had a significantly higher age (54 years vs. 22 years) and body mass index (29.69 kg/m2 vs 21.22 kg/m2) than the neck pain group. The authors included the utilization of NDI in the comparison group but did not utilize this in the breast cancer group. The incorporation of this outcome tool could have allowed a further comparison of dysfunction for both groups. As a result of the outcomes of this study, the authors report the need for evaluation and intervention for potential myofascial dysfunction for breast cancer survivors as a result of central sensitization.

Girasol CE, Dibai-Filho AV, de Oliveira AK1 de Jesus Guirro RR. 2018. Correlation between skin temperature over myofascial trigger points in the upper trapezius muscle and range of motion, electromyographic activity, and pain in chronic neck pain patients. Journal of Manipulative and Physiological Therapeutics, 41(4):350–357.

Researchers from Brazil conducted a single-blinded cross-sectional study to evaluate the correlation between skin temperature measured using infrared thermography over a TrP in the upper trapezius muscle, cervical range of motion (ROM), electromyographic activity (EMG), and pain in subjects with chronic neck pain. Forty subjects (38 females, 2 males) with a mean age of 24.31 (range 18–45) years and mean chronic cervical pain duration of 55.09 months participated in this study.

The authors reported a positive association between the right upper trapezius muscle skin temperature with cervical flexion ROM, median frequency of right shoulder elevation isometrics, and the resting median frequency of the left upper trapezius muscle. A negative association was noted between skin temperature of the right upper trapezius TrP and the resting median frequency of the right upper trapezius muscle and a positive correlation between skin temperature to the left and median frequency of right shoulder elevation isometrics and the median frequency of left side resting EMG activity.

Of clinical significance, the authors noted that the higher the resting EMG activity, the lower the skin temperature. This reported observation could be the result of higher EMG muscle activity at rest, which would result in increased intramuscular pressure creating compression upon the vascular structures within the muscle causing local ischemia (Barão et al., 2011; Rodrigues-Bigaton et al., 2014). In addition, as a result of the increased muscular activity, a higher sympathetic response can result in a reduction of peripheral flow with consequent reduction of temperature (Prato and Yucha, 2013).

This article demonstrates a change in muscle physiology as measured by a change in skin temperature in patients with chronic neck pain. Clinical interventions to promote muscle relaxation and treating local TrPs can help restore normal muscle tone and flexibility in this patient population.

Jafari M, Bahrpeyma F, Mokhtari-Dizaji M, Nasiri A. 2018. Novel method to measure active myofascial trigger point stiffness using ultrasound imaging. Journal of Bodywork and Movement Therapies, 22 (2): 374-378

Myofascial trigger points are an important aspect of the pathophysiology of MPS. Current assessment is commonly based on palpation techniques and clinical experience. Diagnostic ultrasound has been widely used in real-time for non-invasive imaging and can provide an objective assessment of TrPs. There is growing elastography evidence that TrPs have a different level of stiffness compared to normal adjacent tissues, but elastography is not commonly available due to a lack of familiarity and high cost of the equipment. Jafari and his colleagues from Iran developed a low-cost and simple method to distinguish TrPs from normal adjacent tissues through quantitative measurement of elastic modulus based on ultrasound imaging.

Twenty-nine female subjects were included in this study based on their history and physical findings of the sternocleidomastoid (SCM) muscle. The subjects underwent an ultrasound examination using a clinical ultrasound system targeted at the active TrPs in the SCM muscle. TrPs in ultrasound images were usually considered as hypoechoic focal points with heterogeneous echotexture. To gain elastic modulus in both TrPs and normal part of the muscle, images of with and without stress states were recorded and measured.

The authors presented a new objective method for the quantitative measurement of TrPs elastic modulus and distinguished it from normal adjacent muscular tissue. This non-invasive method can provide informative data after treating TrPs, and it is possible to study the effect of the proposed therapeutic modalities on TrP stiffness and to investigate the relation between the biomechanical properties of TrP and its signs and symptoms.

Lin WC, Shen CC, Tsai SJ, Yang AC. 2017. Increased risk of myofascial pain syndrome among patients with insomnia. Pain Medicine, 18(8):1557-1565

Sleep disturbance may induce pain symptoms, especially in chronic pain disorders such as MPS. Poor sleep and pain are closely related (Mathias et al., 2018), and further research into their relationship is important from a clinical perspective. Researchers from Taiwan conducted a population-based cohort study of the Taiwan National Health Insurance Research Database (NHIRD) based on the hypothesis that prolonged or frequent nocturnal sleep disturbances lead to more subsequent suffering and pain.

This study showed that patients with insomnia were 1.93 times more likely to develop MPS than control patients after adjusting for age, sex, monthly income, urbanization, and comorbidities. There were differences depending upon whether patients lived in urban settings or in rural areas, with an increased risk of developing MPS for those patients living in urban settings independent of monthly income level. The prevalence of MPS in urban vs rural populations has been reported with inconsistent results. The authors suggested that elevated cytokine levels in both insomnia and MPS might explain why patients with insomnia are at risk of developing MPS.

Lin Y–C, Yu N–Y, Jiang C–F, Chang S–H. 2018. Characterizing the SEMG patterns with myofascial pain using a multi-scale wavelet model through machine learning approaches. Journal of Electromyography and Kinesiology, 41:147-153

Surface electromyography (SEMG) is a common non-invasive measure used to examine neuromuscular function. A new SEMG model, named multi-scale wavelet energy variation (MSWEV) graphs, was developed to circumvent the difficulties of handling between-patient comparisons due to individual-dependent variations. Uncertainty in human decision making and insufficiency in classification in different stages of MPS have contributed to the low accuracy in the visual-determined classification process. Researchers from Taiwan conducted a study to employ machine learning technology to reduce human bias and see if the low accuracy problem can be resolved.

First, a template matching method was adopted to replace the previous visually-determined classification process and to minimize rater-dependent bias. Classification accuracy of the SEMG model to differentiate MPS patients from normal subjects was 77% using template matching and 60% using K-means clustering. Second, an auto-clustering process was adopted to automatically classify the interference pattern (IP) data into a normal and an MPS group. The results were compared to evaluate the efficacy of using the MSWEV graphs to detect MPS. Classification consistency between the two machine learning methods was 87% in the normal group and 93% in the MPS group. The 2D feature graphs, MSWEV, reveal distinct patterns between normal subjects and MPS patients. The high consistency of classification results between the two methods, template matching and K-means clustering, suggests the potential of using the MSWEV graph to characterize SEMG signal changes associated with MPS.

Morikawa Y, Takamoto K, Nishimaru H, Taguchi T, Urakawa S, Sakai S, Ono T, Nishijo H. 2017. Compression at myofascial trigger point on chronic neck pain provides pain relief through the prefrontal cortex and autonomic nervous system: a pilot study. Frontiers in Neuroscience, 11:186

The prefrontal cortex is involved in the experience of chronic pain through abnormal activation of the autonomic nervous system. Morikawa and his colleagues in Japan hypothesized that ischemic compression of TrPs might affect the medial prefrontal cortex (PFC) involved in autonomic regulation, which in turn would induce pain relief. Through a pilot study of 21 subjects, they analyzed the relationships between prefrontal hemodynamic activity, activity of the autonomic nervous system, and subjective pain in patients with chronic neck pain, with and without TrP compression. Prefrontal hemodynamic activity includes changes in Oxy-hemoglobin (Hb), Deoxy-Hb, and total-Hb concentrations. The researchers found that a low frequency (LF) component of HRV was decreased, but a high frequency (HF) component was increased during TrP compression based on spectral frequency-domain analyses of heart rate variability (HRV). The LF/HF ratio was decreased. Besides, prefrontal hemodynamic activity was significantly decreased during TrP compression compared with non-TrP compression. As the Oxy-Hb concentration was significantly decreased in the PFC during compression at TrPs, the authors suggested that Oxy-Hb concentration may be the most consistent parameter for cortical activity. Furthermore, changes in Oxy-Hb concentration were significantly correlated with changes in HRV parameters during compression. These findings suggest that unbalanced activity within the PFC might be associated with chronic pain and hyperactivity in the medial PFC might be involved in altered autonomic activity in chronic pain states and that compression at TrPs might suppress sympathetic activity via the medial PFC.

This is a very interesting study of cortical changes following compression of TrPs and as such, the first such study. Given the prelimary results of this pilot study, further studies with greater numbers of subjects are warranted. The authors clearly identified significant precortical differences between compression of TrPs and non-TrPs, which is more proof that skeptics who keep insisting that TrPs do not exist may need to reconsider their belief system.

Poveda-Pagán EJ, Catalán García I, Catalán García A, Segura Heras JV, Lozano-Quijada C. 2018. Fiabilidad interexaminador de la exploración de puntos gatillo miofasciales en la musculatura de las regiones cervical y lumbar (in Spanish: Inter-examiner reliability of the examination of trigger points in the cervical and lumbar spine regions. Fisioterapia. 40(2):79-87

During the past few years, several intra- and interrater studies of the identification of TrPs have been published (Rathbone et al., 2017; Rivers et al., 2015; Bron et al., 2007; Grosman-Rimon et al., 2017; Mora-Relucio et al., 2016; Zuil-Escobar et al., 2015; Sanz et al., 2016; Sales do Nascimento et al., 2018; Rozenfeld et al., 2017; Licht et al., 2007; Mayoral del Moral et al., 2018; De Groef et al., 2018). Most studies report acceptable degrees of agreement including several excellent ratings. In this prospective observational interrater reliability study from Spain, two non-expert physiotherapists and one expert therapist examined the sternocleidomastoid, upper trapezius, levator scapula, infraspinatus, quadratus lumborum, gluteus medius, and piriformis muscles in 30 subjects. They examined the subjects for the presence of a taut band and a sensitive spot, referred pain, familiar pain provocation, and a local twitch response.

The degree of agreement was nearly perfect except for the local twitch response and referred pain in some muscles, such as the infraspinatus muscle. The intraclass correlation was good or very good for all muscles, except for the levator scapula muscle. This study is yet another study that demonstrates that TrPs can be reliably identified.

Rozenfeld, E, Finestone, AS, Moran, U, Damri, E & Kalichman, L, 2017. Test-retest reliability of myofascial trigger point detection in hip and thigh areas. Journal of Bodywork and Movement Therapies, 21, 914–919.

This Israeli study examined the intra- and interrater reliability of the TrP identification in the lower extremities. The authors claimed that this was the first such study of the lower extremity, but there are several other lower limb interrater reliability studies such as Sanz et al. and Zuil-Escobar et al. (Sanz et al., 2016; Zuil-Escobar et al., 2015). Twenty-one subjects with various pain locations were examined four times by two experienced physical therapists in a random order for the presence of a taut band, tenderness,

referred pain, and relevance of referred pain to the patient's complaint. The rectus femoris (proximal), vastus medialis (middle and distal), vastus lateralis (middle and distal), and gluteus medius (anterior, posterior and distal) muscles were included for a total of 16 locations. The authors concluded that the inter- and intra-tester reliability of active and latent TrP evaluation was moderate to substantial with Cohen's kappa values ranging from −0.25 to 0.77. There were individual differences between muscles; the examination of the distal vastus medialis was the most reliable for latent and active TrP's. Palpation of TrPs in the lower extremity is a moderately reliable diagnostic tool, which can be used in the clinic and in research studies.

2. Reviews

Adah F, Huang M. 2018. The effectiveness of dry needling on the reduction of proximal upper quadrant pain using Cohen's d: a systematic review. Journal of the Mississippi Academy of Sciences, 63(2) Supplemental:194-201

This systematic review was conducted to determine if DN to the trapezius muscle in patients with proximal upper quadrant pain reduced pain intensity compared to controls and other interventions using Cohen's d to measure outcomes. Cohen's d was used to describe the standardized mean difference of an effect (Cohen, 1988). The authors maintain using Cohen d for magnitude of effects of intervention may be clinically more useful as a difference between statistical significance and outcomes measures like Cohen's d that provide a magnitude of the difference and whether that difference is significant or not looking at the Confidence Interval (CI).

This article contends that the effectiveness of DN may be dependent on which statistical analysis is used, either p-value or effect size. Eleven randomized clinical trials were assessed in this systematic review. Using Cohen's d to measure the efficacy, the authors reported DN had a large effect and was more superior for pain control in five studies compared to controls/interventions (Effect Size [ES] range 0.81–17.46; CI: 0.08–1.50 and 15.19–19.50 respectively), moderate effect in one study which was not significant (ES 0.52; CI: −0.15–1.8), and a small effect which was not significant in two studies (ES 0.07 to 0.23; CI -0.86–1.00 and −0.18–0.63). In three studies, DN appeared to be less effective but insignificant when compared to either control or other interventions (ES range −0.32 to −0.14; CI 0.18–0.63 and −0.89–0.60 respectively).

This article outlines varying methods to examine outcomes in a study. The authors compared the findings using p-value to that of Cohen's d to determine effect size. The authors utilized eleven articles in this systematic review whose sample sizes ranged from 17 to 128. Although Cohen's d can be utilized to calculate effect size, when sample sizes are small the effect size can be biased and overstated. Therefore, to correct for this bias, Hedge's g may be used for small sample sizes. It can easily be calculated and may have been warranted in this study. This article does examine the varying means of interpreting outcomes as both statistically and clinically relevant.

3. Dry needling, acupuncture, and injections

Calamita SAP, Biasotto-Gonzalez DA, De Melo NC, Fumagalli MA, Amorim CF, de Paula Gomes CAF, Politti F. 2018. Immediate effect of acupuncture on electromyographic activity of the upper trapezius muscle and pain in patients with nonspecific neck pain: a randomized, single-blinded, sham-controlled, crossover study. Journal of Manipulative and Physiological Therapeutics, 41(3):208–217.

Neck pain is a common musculoskeletal condition presenting with varying degrees of disability. Frequently, there is no identifiable underlying disease or abnormal anatomic structure leading to the use of the term “nonspecific neck pain.” Chou et al. reported on the effects of acupuncture on the electromyographic (EMG) activity of the upper trapezius (UT) muscle in individuals with TrPs following ACP of acupoints known as triple energizer 5 (TE-5; "Wai-guan") and large intestine 11 (LI-11; "Qu-chi") (Chou et al., 2009). There are no studies that have examined this treatment in patients with nonspecific neck pain. The authors of this study conducted a randomized, single-blinded, sham-controlled crossover study to assess changes in UT EMG activity and pain in patients with nonspecific neck pain following a single session of acupuncture. Fifteen patients with nonspecific neck pain and 15 healthy participants that served as a control group (CG) were enrolled in this study. Inclusion criteria for the nonspecific neck pain group were: neck pain for a minimum of 3 months, restricted neck movement in at least 1 direction, a score on the Neck Disability Index (NDI) between 15 and 24 (out of 50), and a score on the Numeric Rating Scale (NRS) for perceived pain intensity between 3 and 7 on an 11-point scale (range 0–10). Subjects were included in the CG if they were physically active with no self-reported history or positive signs of cervical spine or scapular dysfunction with physical examination. Prior to any testing, a baseline NRS was collected. EMG of the UT was assessed as each subject performed shoulder elevation at 5 force levels (15%, 20%, 25%, 30%, and again at 20%) to examine possible manifestations of fatigue. Following one minute of rest, NRS scores were recorded again and the acupuncture needles were inserted and left in-situ for 30 minutes in both groups. Each subject received a single session of acupuncture and sham acupuncture. Acupuncture was performed using a 0.25 × 13 mm needle that was inserted in LI-11 in the direction of the lateral epicondyle and in at TE-5 to a depth where participants reported a sensation of de-qi. The LI-11 point is located at the outermost point of the skinfold of elbow flexion. The TE-5 point is located 3 cm above the joint line of the wrist, at the dorsal face of the forearm between the radius and ulna. Participants in the CG received needles that were inserted superficially 1 cm to the side of each acupuncture point. In both groups, the needles were rotated in both the clockwise and counterclockwise directions for 10 seconds every 3 minutes, at an approximate frequency of 60 times per minute. After 30 minutes, the needles were removed and the NRS was recorded again, followed by a second EMG examination that was performed in the same manner as previously described. This was followed by a final NRS evaluation following rest for 2 minutes.

The authors reported significant effects for the nonspecific neck pain group following treatment in both the acupuncture and sham acupuncture for NRS scores. EMG amplitude was significantly decreased in both groups following acupuncture treatment. In addition, the authors reported no significant differences between the acupuncture and sham acupuncture treatment for the NRS or EMG amplitude. The authors concluded that the effects of both acupuncture at acupoints TE-5 and LI-11 or in close proximity contribute to pain relief in patients with nonspecific neck pain and muscle fatigue and decreased EMG activity of the upper trapezius muscle activity in both healthy individuals and patients with nonspecific neck pain. Limitations of this study include the use of sham acupuncture points approximate to the target acupoint as well as using the same needle insertion depth that may have not allowed for a true control group. Further studies using another form of sham acupuncture are warranted to examine the use of acupoints or peripheral acupuncture for patients presenting with nonspecific neck pain.

Gascon-Garcia J, Bagur-Calafat C, Girabent-Farrés M, Balius R. 2018. Validation of the range of dry needling with the fascial winding technique in the carpal tunnel using ultrasound. Journal of Bodywork and Movement Therapies, 22(2):348-353

Spanish investigators performed an interesting validation study showing how solid filament needles placed in the region of the carpal tunnel can reach the transverse carpal ligament (TCL) and cause a traction-stretching of the ligament when the needles are rotated. The authors used sonography to perform the assessment. Additionally, they determined the possible risks associated with the technique. A total of 9 healthy subjects who met the inclusion and exclusion criteria where included. Both wrists were utilized for a total of 18 assessments. The authors did determine the sample size needed prior to initiating the study for better interpretation of results. The clinician, who inserted the needles and conducted the ultrasound had 12 and 25 years of experience respectively. Four 0.30 × 25 mm needles were inserted in an oblique, dorsal midline direction at a 45-degree angle at the scaphoid, pisiform, trapezium, and hamate bones until a firm elastic resistance was felt. This resistance was believed to be the TCL. The needle placement was confirmed with the ultrasound once for each of the four locations. The needles were rotated unidirectionally. Data collected with the ultrasound included the distance of the needle tip to the TCL and/or contact with the ligament, the distance of the needle tip to the median nerve, the distance of the needle tip to the ulnar artery, and traction stretching of the TCL. They also tracked whether there was any surface bleeding or bruising and the pain intensity with needling measured on the Visual Analog Scale (VAS).

Results showed that 93.1% of the needles came into direct contact with the TCL, with 81.9% of them being in contact and 11.1% going through the TCL. No contact with the TCL was found in 6.9% of the needle insertions with an average distance of 1.41 mm. The distance of the tip of the needle to the median nerve ranged from 2.55 mm to 5.81 mm depending on the location of the needle being inserted. The distance of the tip of the needle to the ulnar artery ranged from 3.82 mm to 11.22 depending on the location of where the needle was inserted. Visualization of stretching of the TCL was observed in 80.6% of the needles. Pain was experienced with 98.5% of needle withdrawals, with the average VAS score being 1.52. After 10 minutes, 16.67% continued to experience pain that averaged 0.74 on the VAS, but a week later no pain was reported. There was minimal and superficial bleeding only from the proximal needle insertions in 8.3%. This was an interesting study highlighting how the TCL can be accessed safely with needles and be stretched in a majority of cases. The impact on this technique on patients with carpal tunnel syndrome is not known, but it does offer an interesting approach to treat patients.

Hall ML, Mackie AC, Ribeiro DC. 2018. Effects of dry needling trigger point therapy in the shoulder region on patients with upper extremity pain and dysfunction: a systematic review with meta-analysis. Physiotherapy, 104(2):167-177

Hall and coworkers conducted a systematic review with meta-analysis on trigger point dry needling (TDN) to determine its effectiveness of the shoulder region for management of upper extremity pain or dysfunction and to examine the reports of adverse effects during the treatment. Randomized controlled trials comparing the effects of TDN of at least one TrP in the shoulder region for shoulder or upper extremity pain or dysfunction were included. Cohort and case-controlled studies were included if they assessed the adverse effects of TDN in the study. Studies were excluded if they combined TDN with other forms of needling such as superficial needling, needling of non-trigger points, or injection treatment.

Eleven randomized trials involving 496 subjects were included in this review that compared TDN to a control or sham needling, no intervention, other interventions, including acupuncture, wet needling, medication, exercises, or manual therapy, such as soft tissue mobilizations, joint mobilizations and manipulations, or exercise training. Primary outcomes of pain and dysfunction were evaluated as well as other secondary outcome measures including pain pressure threshold and self-rated recovery. In addition, the frequency and severity of adverse effects were assessed.

The authors reported very low evidence to support the use of TDN in the shoulder region for treating patients with upper extremity pain or dysfunction. Two studies reported adverse effects from TDN, with post-needling soreness being the most common. The meta-analysis was limited to two studies that were conducted by the same principal authors, which therefore limit generalization of its findings. The findings of this review agree with those by Kietrys et al., (2013) and demonstrate the need for well-designed clinical trials that can likely impact treatment effects.

Nystrom NA, Freeman MD. 2018. Central sensitization is modulated following trigger point anesthetization in patients with chronic pain from whiplash trauma. a double-blind, placebo-controlled, crossover study. Pain Medicine, 19(1):124-129

The relationship between central sensitization (CS) and TrPs is a topic of debate within the literature. TrPs may be expressions of CS and CS may be a promoter of TrPs (Fernández-de-las-Peñas and Dommerholt, 2014; Srbely, 2010). Others have purported that TrPs do not play a role in CS (Curatolo et al., 2001). This study was conducted to investigate the immediate response of CS to alterations in nociceptive input. Thirty-one subjects with chronic pain (trapezius myalgia) and CS after whiplash were included in this study. One TrP or “tender point” was identified with a permanent marker on the upper trapezius muscle of the affected side for each subject. Subjects were then randomized into two treatment groups: Group A (N = 15) and Group B (N = 16). Group A received a subfascial injection of 2mL bupivacaine 0.25mg/mL using a 25 g needle at the upper trapezius skin mark. Group B received a sham injection of 0.5 ML local anesthetic solution (bupivacaine 0.25 mg/mL) given intra-dermally at the upper trapezius skin mark. Repeat measurements for pressure pain thresholds (PPT), grip strength, jaw opening, and resting pain (Visual analog scale) were recorded beginning after 2 min following the injection and completed within 5 min.

The authors reported significantly higher PPT and maximum voluntary jaw opening observed in Group A but not in Group B. VAS scores were significantly lower in both groups. Following 30 minutes of the injection subjects in Group B were informed of the randomization and a TrP injection was then performed as previously described for Group A followed by repeated measurements. Significant improvements were noted for all variables following this second injection in Group B. As a result of this study the authors discuss surgical ablation of TrPs as a potential treatment for CS.

This study has several shortcomings that should be noted prior to recommending surgical intervention including a small sample size, no long-term follow-up, cervical range of motion was not observed, and the authors did not offer a description of the inclusion criteria of “prior failed conservative treatment.” Furthermore, although the authors concluded that since subjects in Group B described the first injection as no less painful or uncomfortable than subjects in Group A, the authors consider phase II free from expectation bias; however, as it should be noted since the authors

informed the subjects in Group B prior to their second injection that the initial injection was a "sham injection," it is possible that subjects within this group were indeed biased as a result of this information.

Sánchez-Mila Z, Salom-Moreno J, Fernández-de-las-Peñas C Effects of dry needling on post-stroke spasticity, motor function and stability limits: a randomised clinical trial Acupuncture in Medicine Published Online First: 09 July 2018

Dry needling is used increasingly with patients suffering from neurological problems, such as CVA, Parkinson, and multiple sclerosis, among others. Initially, clinicians focused primarily on pain reduction, but more recently researchers are exploring whether DN can reduce the degree of spasticity (Ansari et al., 2015; Calvo et al., 2016; Mendigutia-Gomez et al., 2016; Salom-Moreno et al., 2014). In the current study from Spain, 26 CVA patients were randomly assigned to one of two groups. Subjects in group 1 were treated with the Bobath method only, while subjects in group 2 also received a single session of ultrasound-guided DN of the tibialis posterior muscle. Subjects in both groups participated in strengthening, stretching and reconditioning exercises. Outcome measures included the Modified Ashworth Scale for spasticity, the Fugl-Meyer Scale for function, and stability limits including movement velocity, maximum excursion, end-point excursion, and directional control using computerized dynamic posturography with the SMART EquiTest System. A blinded examiner collected the data. The researchers found a significantly greater decrease in spasticity in the subjects in the DN group and improved balance, range of motion, and accuracy of maintaining stability. This study supports the use of DN to decrease spasticity and suggests that DN should possibly be considered before resorting to injections with botulinum toxin. Dry needling also improved balance and stability, which is not all that easy to achieve with other treatment approaches. When considering DN for spasticity, it is important to realize that the target of the needling procedure is a spastic muscle and not a particular TrP or acupuncture point. The mechanisms underlying DN for spasticity remain somewhat speculative and more research is certainly needed.

Shariat A, Noormohammadpour P, Memari AH, Ansari NN, Cleland JA, Kordi R. 2018. Acute effects of one session dry needling on a chronic golfer's elbow disability. Journal of Exercise Rehabilitation 14(1):138-142

Investigators from Iran and the US published a case report on a single session of dry needling on a retired elite athlete with medial epicondylalgia that started 2 years ago after training with theraband and elastic ropes. The patient had seen 3 different providers in the past year and also had an MRI that did not yield any significant findings. The patient's shoulder, elbow, and hand were examined following a standardized method for assessment by the American Shoulder and Elbow surgeons committee in 1999. The elbow was also examined with sonography. The patient received dry needling with 10 needles left in situ for 20 minutes in the wrist flexor region at the medial epicondyle. After the needles were removed the patient had an ice pack to the area. The time frame was not specified.

Immediately after the treatment range of motion or pain did not change. Two days later, however, the patient reported decreased pain and increased tolerance to functional activities, and seven days later he was able to start using exercise bands pain-free. Although this article reports positive effects of dry needling, there are several issues with the paper. First, the objective examination was very weak at best. It did not include extensive palpation of the tissues in the upper extremity to determine possible referral of pain from proximal muscles to the medial epicondyle region. As a result, there is no justification for the use of needles. The authors did not include any clinical reasoning considerations for the location of needle insertions or why the needles were left in situ versus manipulated in the tissue. They did not use any outcome forms to assess disability or function. The authors relied solely on the patient's self-report. Additionally, they reported that "subjective measures of this study were based on observing localized tenderness just below the medial epicondyle with pain and having a limitation in forceful wrist flexion and a limitation in forearm pronation against resistance." While this appears to be an objective examination, the authors suggested that the patient was reporting the findings. Additionally, it is not clear how localized tenderness can be observed without palpation. Due to the many issues with this paper, the paper does not really contribute much to our understanding of dry needling. Clearly, the athlete benefitted from the intervention, but other recovery mechanisms cannot be excluded.

Sheikhhoseini, R., Massoud Arab, AM. 2018. Dry Needling in myofascial tracks in Non-Relaxing Pelvic Floor Dysfunction: A case study. Journal of Bodywork & Movement Therapies 22:337-340

Clinicians from Iran described the case of a 42-year old man with a 20-year history of frequent urination. He had to urinate every 30 minutes, described difficulty initiating urination and had a sense of incomplete evacuation. He was diagnosed with Non-Relaxing Pelvic Floor Dysfunction (NRPFD), for which there is no gold treatment standard. The authors emphasized the need to appreciate the pelvic anatomy and especially the connections of the endopelvic fascia with the visceral and abdominal fascia, the pelvic floor muscles, and hip and core muscles. The patient denied a history of low back and pelvic pain, sexual dysfunction and other related symptoms. He did acknowledge that the symptoms worsened with occupational and general stress. Previous physical therapy, including interferential therapy, biofeedback, and massage, was unsuccessful. Upon physical examination, he presented with tenderness in the hip adductors, piriformis and obturator internus muscles. The patient was treated with DN of the adductor longus, magnus, and brevis, obturator internus, piriformis, gluteus maximus and medius, and rectus abdominis muscles as described by Dommerholt and Fernández-de-las-Peñas (Dommerholt and Fernández-de-las-Peñas, 2013). The patient had 10 sessions of DN, 2 or 3 times per week. The patient's home exercise program included stretches of the hip adductor and flexor, piriformis and hamstrings muscles.

During the treatment period, the patient's symptoms slowly improved. By the 7th session, he was able to go walking and jogging. Three months after discharge, he reported no urinary frequency or any adverse events. This is a nice case report of the successful treatment of a patient with severe urinary frequency that resolved with DN.

Silva de Camargo P, Lima CR, de Andrade E Rezende ML, Silva Santos AT, Rodrigues Hernandez JW, Silva AM. 2018. The effect of auricular and systemic acupuncture on the electromyographic activity of the trapezius muscle with trigger points—a pilot study. Journal of Acupuncture and Meridian Studies, 11(1):18-24

Researchers from Brazil conducted a study to analyze and compare the intra and intergroup comparisons of the immediate effect of the auricular and systemic acupuncture LR8 (QuQuan) on the surface electromyographic (EMG) activity of the trapezius

muscle with the TrPs. Forty volunteers were randomly assigned to of four groups: GI (mustard seed applicated in the auricular point); GII (bilateral needling in the LR8 acupoint); GIII (the combination of GI and GII); and GIV (mustard seed applicated to an acupoint not linked to the muscle tendon as a control group). Finally, they found that 5 min of systemic and auricular acupuncture did not promote changes in the EMG activity of the muscle during maximum voluntary contraction (MVC).

The authors' hypothesis that either auricular acupoint or systemic acupoint may act on the EMG activity of TrPs in the upper trapezius muscle was rejected as neither technique changed the EMG activity. The authors suggested that possibly there were no changes because of the small sample size and the short treatment duration. Based on the current study, auricular and systemic acupoints stimulation cannot be recommended unless more studies demonstrate relaxation of muscles and tendons.

Uzar T, Turkmen I, Menekse EB, Dirican A, Ekaterina P, Ozkaya S. 2018. A case with iatrogenic pneumothorax due to deep dry needling. Radiology Case Reports 13:1246-1248

As an invasive intervention, dry needling is prone to significant adverse events (Cummings et al., 2014; Mccutcheon and Yelland, 2011; Karavis et al., 2015; Norheim, 1996; Yamashita et al., 2000). Although the risk of significant adverse events was less than 0.04% in a prospective Irish study (Brady et al., 2014), the authors of this paper present a case of a 36-year old male who was admitted to the emergency room of a Turkish hospital with complaints of right chest pain following a dry needling treatment 2 h earlier for pain in his back muscles. X-rays appeared to be normal initially, but on further examination, a minimal pneumothorax was seen as a thin line on the right hemithorax. The patient was scanned with high-resolution computed tomography, which did reveal a pneumothorax. The entrance areas of the needles to lung parenchyma was visible on the scan. Fortunately, the patient recovered in three days without further intervention. This report reminds clinicians that proper technique based on a solid anatomical understanding remain important to avoid such serious adverse events.

In general, dry needling by physical therapists is a safe procedure. During the past 5 years, the major malpractice insurance company for physical therapists in the USA has processed 34 liability cases related to DN, which made up only 1% of the total number of liability cases. We estimate that during the 5-year period at least 125 million DN treatments were administered by physical therapists in the US.

Yaghoubi Z, Pardehshenas H, Takamjani IE. 2018. The effect of upper trapezius muscle dry needling treatment on sleep quality: A case report. Journal of Bodywork & Movement Therapies, 22(2): 333-336

Poor sleep quality is significantly associated with MPS (Lin et al., 2017). The relationship between the presence of active TrPs, the intensity of pain, disability, and sleep quality in individuals with neck pain has been studied and should be addressed in a patient with MPS. The authors from Iran reported a case of a 34-year old, female hairstylist, who complained of increasing chronic pain and early fatigue in both shoulder and upper back during working hours. Besides, she had difficulty falling asleep, and could only stay asleep for an average 3 or 4 hours. Previous physical therapy and medications only provided temporary improvements over the past three years. After she received six weekly sessions of DN of active TrPs in the upper trapezius (UT) muscle, she reported a significant decrease in pain and muscle relaxation in the shoulder region with increased neck and shoulder ROM. Interestingly, she also noted a considerable improvement in her sleep quality. At a 1-year follow up, she had maintained good quality sleep for 7–8 hours without any residual problems.

Although DN is commonly indicated for reducing pain, it may also help with sleep disorders. Perhaps DN contributes to stress reduction through an effect on the limbic system. Several acupuncture studies have shown that acupuncture can also regulate various neurotransmitters and hormonal factors, which can play major roles in sleep regulation.

4. Manual therapy

Ginszt M, Berger M, Gawda P, Bożyk A, Gawda J, Szkutnik J, Suwała M, Majcher P, Kapelan M. 2017. The immediate effect of masseter trigger points compression on masticatory muscle activity. Orthodontic Forum; 13: 79-88

Investigators from Turkey examined the immediate effect of TrP compression to latent masseter TrPs on pressure pain threshold (PTT) and muscle activity in healthy individuals. Fifteen subjects, 10 women and 5 men, with unilateral latent TrPs in the masseter muscle were included in the study. The researchers used Simons et al.'s criteria (Simons et al., 1999). Muscle activity of the bilateral masseter, anterior temporalis, and anterior digastric muscles was recorded with surface electrodes under three different conditions: rest, maximum voluntary clenching, and maximum voluntary clenching with cotton rolls. Each clenching activity was performed three times for 3 s each with a 2 s rest in between each repetition. The PPT of the masseter muscle was assessed with a digital algometer. The average of three measurements was taken. Both the muscle activity and PPT were measured before and after the masseter muscle compression treatment, which was performed for 90 seconds with a constant pressure of 2 kg/cm^2. Results of the study showed that there was no significant difference between the mean muscle activity of the masseter, anterior temporalis, and masseter muscles on either side during any of the three positions tested. The PPT of the masseter muscle was decreased on the TrP side compared to the non-treated/non-TrP side. There was a significant difference in the mean muscle activity at rest after the TrP compression versus before in the masseter muscle with the TrP and both sides of the digastric muscles.

Although it is interesting to see that manual TrP treatment can influence the PPT and some muscle activity, the value of this research is somewhat limited. First, the number of participants in the study is very small. Second, healthy subjects were utilized instead of patients with a diagnosis of temporomandibular dysfunction. The experience of the clinicians identifying TrPs and treating the TrPs was not discussed, nor the experience of the person using the surface electromyography. This can have an impact on outcomes and also results. Furthermore, the authors did not offer a plausible explanation for why the anterior digastric muscles bilaterally had reduced muscle activity at rest after masseter TrP compression. Finally, this study only looked at the immediate effect of TrP compression of the masseter, there was no short-term or long-term follow-up. With that, caution should be taken with interpreting these results.

Maistrello LF, Geri T, Gianola S, Zaninetti M, Testa M. 2018. Effectiveness of trigger point manual treatment on the frequency, intensity, and duration of attacks in primary headaches: a systematic review and meta-analysis of randomized controlled trials. Frontiers in Neurology, 9:254

Investigators from Italy and Austria performed a systematic review and meta-analysis to explore the effectiveness of manual treatment of TrPs and its effectiveness in reducing the frequency, intensity, and duration of primary headaches in patients. Primary headaches included tension-type headache (TTH), migraine headache (MH), and cluster headache (CH). They also examined whether a particular manual technique or dosage would be superior to another. A total of 7 studies met the inclusion and exclusion criteria. Treatments had to target TrPs and be either direct or indirect techniques. The manual treatment had to be compared to some type of intervention such as placebo, sham, routine medications, or waitlist with routine medications. Primary outcomes included the frequency, duration, and intensity of headache attacks. Secondary outcomes included quality of life (QOL), medication consumption, effects on TrPs, and adverse events. The Cochrane Risk of Bias (RoB) tool was used to assess internal validity. The Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach was used to evaluate the overall quality of evidence.

The frequency, intensity, and duration of headache attacks showed a significant improvement when comparing manual TrP treatment to other interventions for TTH and MH, however, several studies had a high RoB. Similarly, when examining the manual TrP treatment specifically of TTH or MH, the results suggest similar findings as the combined analysis. Improvements were also seen in the number of TrPs present, pressure pain threshold testing and TrP sensitivity, consumption of medication, and headache disability. No change was found in QOL. Overall, the authors reported that there is low to very low evidence in favor of manual TrP treatment and very low evidence for a greater reduction in the duration of MH attacks and frequency of TTH attacks. This paper is very well written and organized. The authors highlighted that there is some evidence to show the efficacy of manual TrP treatment in patients with TTH or MH, but the biggest issue with many of the papers is that researchers are not controlling for bias well enough to allow for more meaningful interpretation of their results.

Rangon FB, Koga Ferreira VT, Rezende MS, Apolinário A, Ferro AP, Guirro ECO. 2018. Ischemic compression and kinesiotherapy on chronic myofascial pain in breast cancer survivors. Journal of Bodywork & Movement Therapies, 22(1);69-75

Myofascial pain is a common finding after surgery in breast cancer survivors, with a high prevalence of chronic pain. Trigger points are commonly observed in the pectoralis major, levator scapulae, and upper trapezius muscles. Ischemic compression is a commonly used technique in the treatment of TrPs has been shown to reduce pain intensity and increase movement amplitude of flexion and extension cervical individuals with trigger points in the upper trapezius.

Researchers from Brazil conducted a blinded randomized clinical trial to evaluate the effects of ischemic compression and therapeutic exercise in the rehabilitation of breast cancer survivors with chronic myofascial pain. Twenty patients were randomized into two groups: Group 1 (ischemic compression + kinesiotherapy) and Group 2 (kinesiotherapy). Patients were submitted to a total of 10 treatment sessions conducted twice a week for 5 weeks. In Brazil, kinesiotherapy is a different term for physical therapy, which in this study consisted of walking, stretching, active mobilizations, and relaxation exercises. The authors used pressure pain threshold as the main outcome measure, but also considered the Numeric Rating Scale, the Pain Related Self-Statement Scale, the Functional Assessment of Cancer Therapy-Breast, and infrared thermography. They demonstrated that ischemic compression combined with kinesiotherapy increases the pressure pain threshold of TrPs in the upper trapezius muscle and reduces the intensity of pain in breast cancer survivors with myofascial pain.

The authors explained that the objective of ischemic compression is to inhibit TrPs, by improving blood flow and tissue nutrition, which would facilitate increased perfusion and increased oxygen supply to the skeletal muscle, even there is no evidence that this actually happens. Travell and Simons discontinued the use of the term “ischemic compression” when it became clear that TrPs are hypoxic already, but clinicians and researchers continue to use the term even when ischemia most likely does not even occur with pressures of just 2.5 kg/cm^2, which is what the authors used in this study.

5. Statement of interest

Jan Dommerholt, Michelle Finnegan, and Todd Hooks are affiliated with Myopain Seminars, LLC, Bethesda, MD, USA, an organization that promotes the recognition and treatment of individuals with myofascial pain.

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Jan Dommerholt*
Bethesda Physiocare, Bethesda, MD, USA

Myopain Seminars, Bethesda, MD, USA

Todd Hooks
New Orleans Pelicans, New Orleans, LA, USA

Myopain Seminars, Bethesda, MD, USA
E-mail address: trhooks@hotmail.com.

Li-Wei Chou
China Medical University, Taichung, Taiwan
E-mail address: chouliwe@gmail.com.

Michelle Finnegan
Myopain Seminars, Bethesda, MD, USA

ProMove PT Pain Specialists, Bethesda, MD, USA
E-mail address: mbfpt77@gmail.com.

* Corresponding author. Bethesda Physiocare, 4405 East West Highway, Suite 403, Bethesda, MD, 20814-4535, USA.
E-mail address: jan@bpcemail.com (J. Dommerholt).

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