Myofascial Pain Syndromes–
Trigger Points

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INTRODUCTION

Several articles reviewed in this issue were published in the *Journal of Manual and Manipulative Therapy*, which marks the first time a prominent physical therapy journal from the United States devoted an entire issue to the topic of myofascial pain and myofascial trigger points. Many of the articles are available free of charge at the journal's website [www.jmmtonline.com]. Although both reviewers were involved in generating several of these articles, we have attempted to provide an objective review of these articles without consideration of authorship. One of the articles in the manual therapy journal, which we will not review here, is a compilation of several issues of this review column (1). We would like to express our appreciation to the editor-in-chief and publisher of the *Journal of Musculoskeletal Pain* for granting us permission to prepare and publish this compilation article. The issue of the *Journal of Manual and Manipulative Therapy* is an important introduction of the myofascial pain literature and indirectly of the *Journal of Musculoskeletal Pain* to manual physical therapists worldwide.

Other articles include two review papers of the efficacy of non-invasive therapies for the treatment of myofascial pain and an interesting report of the treatment of asthma using a myofascial trigger point in the cutaneous temporoparietalis muscle. As usual, each article review indicates whether it is prepared by Dommerholt [JD] or Simons [DGS].

RESEARCH STUDIES

Rickard LD: The effectiveness of non-invasive treatments for active myofascial trigger point pain: A systematic review of the literature. Int J Osteopathic Med 9(4): 120-136, 2006.

Summary

This article reviews the evidence for the effectiveness of non-invasive treatments in the treatment of patients with myofascial pain due to myofascial trigger points [TrPs]. The article starts off with a comprehensive review of the myofascial pain literature with many up-to-date references. The author searched several databases from their inception to May 2006, including Medline, Pubmed, CINAHL, EMBASE, PEDro, and CENTRAL/CCTR. A total of 23 randomized controlled trials and quasi-randomized controlled studies with clear and acceptable criteria for the diagnosis of active

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TrPs were considered. Only English-language publications were included. The studies represented five different types of interventions, including laser, electrotherapies, ultrasound, magnet therapies, and physical/manual therapies. All studies were scored for methodological quality and the data were standardized.

The author commented that many studies had limitations possibly limiting the interpretation of the results. The quality of studies assessing laser treatment was high. Laser was found to be significantly more effective than placebo in five out of six studies. However, there were few studies supporting long-term effectiveness. Studies of electrotherapy included transcutaneous electrical nerve stimulation compared to other forms of electrotherapy. transcutaneous electrical nerve stimulation was found to have an immediate effect on pain intensity of TrPs, without any evidence from the literature for any long-term effects. There was no evidence of the effectiveness of ultrasound, although one study showed some evidence that high power pain threshold ultrasound may be more effective than standard ultrasound. Three high-quality studies of magnet therapies were shown to be effective. Several manual therapy studies demonstrated positive effects, but again there was no evidence of any long-term effect. Of the latter, effectiveness beyond placebo was not supported nor refuted. While the author listed many other non-invasive therapies for the treatment of TrPs, there were no studies that supported their use.

Rickards noted that most outcome studies were limited to treatment of the upper trapezius and other muscles in the cervical spine region. Only three studies considered the typical characteristics of TrPs and known etiologic factors in the assessment of efficacy. Most studies focused on pain reduction. The etiology and management of TrPs are multifactorial and may include peripheral and central sensitization, metabolic factors, social issues, posture, etc. He also addressed some of the limitations of this study. The study was conducted by only one reviewer, who was not blinded. In conclusion, Rickards recommends that high quality trials are needed with good control of contributing and perpetuating factors. The evidence for effectiveness of non-invasive therapies for TrPs is limited to only a handful of studies. Two appendices with information about the methodology and an extensive list of references conclude this paper.

Comments

Where a previous paper focused on the effectiveness of invasive procedures for the treatment of TrPs, Rickards has completed an excellent inventory of the effectiveness of non-invasive procedures (2). The paper reflects the author's mastery of the TrP literature and is a much needed methodological review. In an era of evidence-based or evidence-informed medicine, such reviews are not only essential to determine which interventions have proven efficacy, they also assist researchers in developing new outcome studies. Many interventions used in clinical practice have not been subjected to outcome studies, which does not necessarily mean that they would not be effective, but points to the need for high quality trials. This reviewer wholeheartedly agrees with Rickards that future studies must consider the multi-factorial nature of TrPs [JD].

TREATMENT STUDIES

Crow T, Kasper D: A myofascial trigger point on the skull: Treatment improves peak flow values in acute asthma patients. AAO J 16(1): 23-25, 2006.

Summary

This is a retrospective study of nine patients with a history of recurrent attacks of asthma not satisfactorily controlled by the usual home-use medications. It reports the effectiveness of treating their acute asthmatic attacks by manual treatment of a myofascial trigger point [TrP] on the left parietal eminence of the skull. The patients were classified as having a mild, moderate, or severe attack based on the percentage reduction from expected normal of the measured rate of peak expiratory flow. There were three patients with mild, five with moderate, and one with severe symptoms. The authors implied that they diagnosed the TrP by finding a tender spot in a taut band that responded to cross-fiber stimulation with a local twitch response and

that the patients reported pain on deep palpation and evidenced autonomic dysfunction.

The left parietal TrP was treated by folding skin around the point and applying deep pressure for about 45 seconds. The TrP treatment restored five patients to flow rates between 96 and 108 percent of normal. The other four reached between 66 and 88 percent of expected normal based on body size. This improvement was statistically significant [$P < 0.0003$] and clinically significant because most patients experienced improved breathing. The authors speculated that the treatment had impacted the parasympathetic nervous system.

Comments

The authors do not indicate how many times this treatment was used, but imply that these were the only patients on whom the TrP was found, but out of how many other patients without the TrP? Were all of the patients right-handed? Were all of them free of a pain complaint that could be attributed to that muscle so this would be comparable to the motor effects that can occur without associated clinical pain complaint? The description fits the cutaneous temporoparietalis muscle and is the first published report indicating TrP influence on the parasympathetic nervous system. Numerous sympathetic effects are described for the sternocleidomastioid muscle. One hopes to see a prospective study that presents more hard data, especially concerning the examination technique and the prevalence of this TrP effect. More extensive examination of these patients may reveal that other muscles have similar effects [DGS].

REVIEWS

Dommerholt J, Bron C, Franssen JLM: Myofascial trigger points; an evidence-informed review. J Manual Manipulative Ther 14(4): 203-221, 2006.

Summary

The practice of evidence-informed manual therapy integrates the best available scientific evidence with the individual clinicians judgments, expertise, and clinical decision-making. After a brief historical review of noteworthy milestones, the authors review clinical aspects of myofascial trigger points [TrPs], interrater reliability of identifying them, and discuss character features including: a taut band, local twitch response, and referred pain patterns. Discussion of the etiology of TrPs incorporates a detailed and comprehensive review of mechanisms that includes: sustained low-level muscle contractions [Cinderella syndrome], unaccustomed eccentric contractions, unaccustomed concentric contractions, and overload concentric contractions. The summary of frequently encountered precipitating and perpetuating factors such as mechanical [structural] stress-inducing deviations that are the province of physical therapists plus nutritional, metabolic, and psychological factors that are relevant to physical therapy practice and need to be effectively addressed. The authors note that many scientific studies provide strong support for therapists to seriously considering TrPs routinely in the clinical decision-making process when dealing with musculoskeletal problems.

Comments

This is a masterful, erudite, and comprehensive review [including a treasure-chest of recent literature] of TrPs tailored to the needs of physical therapists that is head and shoulders above anything else in recent literature. The section on intramuscular pressure distribution reminds us that oxygenation of muscle depends on capillary perfusion that is terminated during sustained, relatively minor contractions. This is why sustained contraction in a fixed position causes the muscles so much trouble. However, this is a problem that is effectively avoided by frequent periods of relaxation while performing an activity [DGS].

Fernandez-de-las-Penas CF, Arendt-Nielsen L, Simons DG: Contributions of myofascial trigger points to chronic tension type headache. J Manual Manipulative Ther 14(4): 222-231, 2006.

Summary

This article explores the hypothesis that myofascial trigger points [TrP] are involved in

the etiology of tension-type headaches. The anatomical basis for referred pain from neck and shoulder muscles is found in the convergence of cervical and trigeminal afferents in the trigeminal nerve nucleus caudalis, which provides a mechanism for the referred pain patterns of TrPs and the upper cervical spine joints. The authors review TrP referred pain patterns according to the *Trigger Point Manual* and several studies by Fernandez et al. (3-7). In addition, they included muscle referred pain patterns from several other sources. They emphasized that referred pain patterns can vary between subjects and that more studies of referred pain are needed with greater sample sizes. The primary author and his research colleagues have published many articles demonstrating the association between tension-type headaches, migraine and TrPs in the temporalis, trapezius, sternocleidomastoid, suboccipital, and extra-ocular muscles (3-5,8,9).

The question remains whether there is a cause-and-effect relationship between TrPs and headaches. The authors propose that based on the available evidence it is likely that active TrPs may be a causative factor of central sensitization, which in turn is thought to be responsible for the conversion of episodic into chronic tension-type headaches. Persistent nociceptive input from TrPs in neck and shoulder muscles may trigger sensitization of nociceptive second order neurons of the cervical spine and trigeminal nucleus and contribute to tension-type headaches. The authors emphasize that even in the presence of TrPs, other physical and psychological factors should not be negated. They concluded that future studies should explore therapeutic options for patients with tension-type and migraine headaches.

Comments

With this article the authors have succeeded in synthesizing the TrP literature, relevant pain sciences literature, and headache literature into a comprehensive and clear manuscript that offers substantial scientific support for the role of TrP in the etiology and maintenance of chronic tension-type and migraine headaches. Considering the target audience of this publication, this article may inspire manual physical therapists to consider TrPs in the management of persons suffering from persistent headaches. Traditionally, TrPs have played a relatively minor role in the manual therapy world. However, the implications of this article reach far beyond manual therapy and physical therapy and this information should be required reading for any clinician examining and treating patients suffering from headaches. The authors are commended for this excellent contribution [JD].

McPartland JM, Simons DG: Myofascial trigger points: Translating molecular theory into manual therapy. J Manual Manipulative Ther 14(4): 232-239, 2006.

Summary

This article expands the current integrated trigger point [TrP] hypothesis which suggests that TrPs develop as a result of an excessive release of acetylcholine from the motor endplate. After reviewing the concept of the integrated TrP hypothesis in some detail, the authors provide a detailed description of the role of pre- and postsynaptic voltage-sensitive calcium channels, nicotinic acetylcholine receptors at the muscle cell membrane, and ryanodine receptors at the sarcoplasmic reticulum. Several mechanisms that may result in a deficiency of acetylcholinesterase with a subsequent maintenance of muscle contractures and TrPs are reviewed such as genetic factors, drugs and other chemicals, and exposure to organophosphate pesticides.

Some attention is paid to the motor, sensory and autonomic aspects of TrPs. The motor deficits seem with TrPs are mostly triggered by the so-called ATP energy crisis, which is involved in the excessive release of acetylcholine from the motor endplate, the dysfunction of the calcium pump, and impaired motor function. From a sensory perspective, the authors suggest that an ongoing barrage of nociceptive signals from TrPs may result in central sensitization, allodynia, and hyperalgesia. The autonomic aspects of TrPs are seen as pilo-erection, vasodilation or vasoconstriction, etc, which may be related to the release of norepinephrine and viscerosomatic reflex activity.

In clinical practice, the authors recommend treating TrPs and articular dysfunctions in ad-

dition to providing postural training and behavioral advice. They recommend against excess coffee, caffeine, and nicotine, which can upregulate the ryanodine receptors, voltage-sensitive channels, and acetylcholine receptors, respectively. McPartland and Simons emphasize the need for adequate nutritional intake, especially vitamins and minerals, based on theoretical considerations and empirical evidence, realizing there have been no controlled studies of the effects of vitamin supplementation on TrPs. A section on herbal remedies reveals that many herbs patients may take contain linalool, which inhibits the nicotinic receptors and release of acetylcholine.

Based on the various mechanisms involved in the formation of TrPs, the authors provide a theoretical rationale for the injection of pre- and postsynaptic calcium blockers, including omega-conotoxin, verapamil, quinidine, and diltiazem. The authors revisit previous recommendations of using lidocaine patches, topical dimethisoquin, which inhibits voltage-gated sodium channels, and capsaicin, based on its ability to desensitize vanilloid receptors. The expanded integrated trigger point hypothesis opens the doors to many new treatment approaches.

Comments

The integrated TrP hypothesis is the most credible explanation of the formation of TrPs. In a previous article, McPartland developed an expansion of the trigger point hypothesis from an osteopathic perspective(10). The current article, co-authored by Simons, is targeted directly toward manual physical therapists and provides in a scholarly and authoritative manner further support for the TrP hypothesis. The authors acknowledged which areas need further research and how the developing hypothesis has changed clinical practice. They illustrated the importance of a theoretical framework and how such thinking can assist in developing a body of evidence-based interventions. As part of the series of articles featured in the special issue of the *Journal of Manual and Manipulative Therapy*, this article complements and expands other articles in the series. McPartland and Simons have succeeded in preparing an excellent, in-depth, and focused article with much new theoretical and practical information for physical therapists. As with the other articles in this series, other clinicians and researchers are encouraged to download this prominent article [JD].

Dommerholt J, Mayoral O, Gröbli C: Trigger point dry needling. J Manual Manipulative Ther 14(4): E70-E87, 2006.

Summary

Trigger point dry needling [TrP-DN] usually involves inserting an acupuncture needle into the TrP within a muscle. It is approved for physical therapists in many countries and in eight states in the United States. The procedure requires training and competence. It is practiced on the basis of three models of needling technique: radiculopathy, myofascial trigger points [TrPs], and spinal segmental sensitization, of which the first two are fully described in detail. In addition, the authors summarize the origin and distinguishing characteristics of neural acupuncture, and fully describe electrical twitch-obtaining intramuscular stimulation as a radiculopathy technique. The others depend on injections, which are beyond the scope of practice for most physical therapists in this country.

The differences and relative effectiveness of superficial and deep dry needling are covered in detail. Superficial [subcutaneous] dry needling [DN] is effective, but deep dry needling of the TrPs that elicits local twitch responses is more effective. The authors speculated on possible mechanisms for the effectiveness of deep DN that included normalization of the TrP milieu as demonstrated by Shah et al. (11), by producing reparable small focal lesions temporarily terminating endplate function, localized stretch of sarcomeres that interrupts the feedback cycle sustaining endplate dysfunction, and possibly depolarization of the TrP tissue due to mechanical disturbance by the needle. For superficial DN, they suggest the possibility that the reduction of pain may contribute to central release of oxytocine, but were less enthusiastic about Baldry's conviction that it is due to stimulation of Aδ nerve fibers. Finally they considered the effects on loose connective

tissue evidenced by acupuncture "needle grasp." The authors seriously questioned if the addition of an injectable to DN is of any benefit.

When one compares TrP-DN to acupuncture, the authors emphasize that TrP-DN is not a form of acupuncture in the *classical Chinese* sense and effectively discredit the pertinent literature that claims that it is. However, they note that when acupuncture is defined as those sites that qualify as "Ah Shi" points, it looks like a credible story. Later, they question whether referred pain patterns are characteristic of entire muscles or of specific TrP locations in a muscle and concluded that it is characteristic of a muscle not of an individual TrP.

Comments

This is a comprehensive, authoritative, scholarly, and clinically relevant review of DN of all kinds. The question of whether referred pain is characteristic of the muscle as a whole or just of a TrP misses the point, apparently because the *Trigger Point Manual* did not make it sufficiently clear that the reported pain patterns are only guidelines as to what has commonly been found at that location in the muscle. The manual does include an extended pattern that has been observed in some subjects for each TrP. Experimental literature reported pain patterns produced by injecting the same amounts of several algogenic substances into the same anterior deltoid muscle location in 10 different subjects illustrated referred patterns that were sometimes completely non-overlapping (12). This clearly demonstrates the inherent variability of this phenomenon from one subject to the next.

Two recent reports of referred pain patterns from muscles with TrPs of many subjects, when compared to previous publications, make it abundantly clear that there is marked individual variation in the pain patterns observed from one muscle and for good neurophysiological reasons (13,14). The Wright study (14) presents much more extensive pain patterns than other authors. This may happen when strong pressure is exerted on a very active TrP and induces another phenomenon: recruitment and superimposition of the referred pain pattern of a satellite TrP of the TrP being examined. Masticatory muscles may be especially prone to this phenomenon, but it has been observed in muscles throughout the body. What has not been clearly published is that injection of hypertonic salt solution in different parts of the same muscle can elicit different components of the total pain pattern observed from TrPs in that muscle. Therefore the answer is a bit of both. Referred pain patterns are specific to a muscle, but variable in location and in extent from one site to another in that muscle among subjects, more so with more intense pain. The size of the referred pain pattern depends on the activity level of the TrP and intensity of stimulation [DGS].

Orlando B, Manfredini D, Bosco M: Efficacy of physical therapy in the treatment of masticatory myofascial pain: A literature review. Minerva Stomatol 55(6): 355-361, 2006. [Simultaneously published as: Efficacia della terapia fisica nel trattamento del dolore miofasciale dei muscoli masticatori: revisione della letteratura. Minerva Stomatol. 55(6): 361-366, 2006].

Summary

This review article from Italy is published in both English and Italian. After a brief introduction to myofascial pain and myofascial trigger points [TrP], the authors aimed to critically review the literature on conservative therapeutic approaches to myofascial pain of the masticatory muscles. Two studies suggested that ultrasound is an effective treatment for myofascial pain. One study on transcutaneous electrical stimulation was included that showed a decrease in pain without reaching statistical significance compared to the control group. The authors quoted a few studies on muscle stretching and one massage therapy study. Finally, they discussed TrP compression without referencing any specific research.

Comments

Any review article of the literature is at risk for missing pertinent articles. Although the objective of the paper was to critically discuss the available studies, several pertinent articles were not included such as the 1997 study by

Lee et al. (15) published in this journal and a 2004 study by Majlesi and Unalan (16). One of the quoted ultrasound studies did not consider TrPs, but used the more generic criteria commonly used in the dental literature (17,18). Several electro-therapy papers were missing from this review (15,19-22). Trigger point compression was recently studied by Fernandez et al. (23).The authors did not indicate which databases they used to locate articles about masticatory pain and physical therapies. They did not include whether they used specific criteria for their analysis. In summary, it seems that the studies reviewed in this study were chosen rather arbitrarily. Compared to Rickard's study reviewed above, this paper does not have the methodological rigor and accuracy.

The title of this article suggests that the authors were looking at the efficacy of physical therapy. The use of the term "physical therapy" suggests that they were considering the discipline of physical therapy, while in reality they reviewed papers dealing with non-invasive or conservative interventions, which may be used by physical therapists as well as other disciplines [JD].

CASE STUDY

Issa TS, Huijbregts PA: Physical therapy diagnosis and management of a patient with chronic daily headache: A case report. J Manual Manipulative Ther 14(4): E88-E123.

Summary

Issa and Huijbregts describe in much detail the physical therapy diagnosis and treatment of a 48-year old female with medical diagnoses of common migraine headache, chronic tension-type headache, and temporomandibular dysfunction. The patient suffered from chronic migraine headaches for several years. During the preceding eight months, she experienced daily headaches with bilateral headache, neck pain, left facial pain, and tinnitus. The initial physical therapy assessment included a detailed history, a comprehensive physical examination, and the Henry Ford Hospital Headache Disability Inventory and the Neck Disability Index. The Headache Disability Inventory indicated severe and frequent headaches intensity. The Neck Disability Index revealed moderate disability. Magnetic resonance imaging studies ruled out any brain abnormality. The physical examination showed forward head posture and significant active range of motion deficits in the cervical and thoracic spine leading to the conclusion she had segmental mobility dysfunction. Shoulder range of motion was within normal limits. Active myofascial trigger points [TrP] were identified in the bilateral upper trapezius, sternocleidomastoid, splenius capitis, suboccipital, left masseter and temporalis muscles using the criteria by Simons, Travell, and Simons (6). Trigger points in the trapezius muscle produced referred pain into the upper neck, and palpation of the sternocleidomastoid caused referred pain into the forehead. The authors concluded that the patient met the criteria for chronic tension-type headache, probable migraine headaches with aura, and probably cervicogenic headache. When the patient mentioned the onset of jaw pain, she was also examined for temporomandibular dysfunction using the criteria of the American Academy of Orofacial Pain (24).

In addition, the authors described the patient's diagnosis, current functioning, and level of disability with the International Classification of Functioning, Disability, and Health disablement model, as well as the criteria contained in the Guide to Physical Therapy Practice, which is the model promoted by the American Physical Therapy Association (25). The prognosis of the patient featured several poor indicators, such as the likely presence of longstanding central sensitization, emotional stress, depression, persistent lack of progress, and increased medication use. On the other hand, the patient presented with several musculoskeletal findings within the realm of orthopedic manual therapy, such as spine dysfunction, TrPs, poor posture, etc. Once the therapy program was initiated, the patient presented with significant within-session improvements, which have been shown to be positive prognostic indicators.

The patient was treated twice weekly for six weeks with two more subsequent treatment periods up to a total of 21 visits. The initial focus of physical therapy was to decrease pain and to initiate a home exercise program. The primary

author, who was the treating clinician, addressed the myofascial and upper cervical spine restrictions with a combination of TrP dry needling, education, and soft tissue and spinal and temporomandibular mobilizations. As the result of the interventions, the frequency of the patient's headaches reduced from more than once per week to no headaches at all. Outcome measures showed significant improvements on all scales. The authors concluded that the physical therapy management was at least contributory to the many positive changes, realizing that a case report does not allow to infer any cause-and-effect relationship between intervention and outcome. The article is illustrated with as many as 23 illuminating figures and photographs.

Comments

This case report must be one of the most comprehensive case reports in the myofascial pain literature. The authors provided not only an extensive review of pertinent headache literature, but included extremely detailed literature references to all diagnostic and outcome tests and classifications and treatment options. Every step of the process is described in much detail without ever becoming a mere listing of tests and procedures. The article is easy to follow in spite of its wealth of information, which speaks highly to the accomplishments of the authors. This case reports reflects accurately the many considerations and complexities of physical therapy intervention for a patient with a multifactorial case scenario and provides support for considering manual physical therapy in the management of complex pain patients [JD].

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