

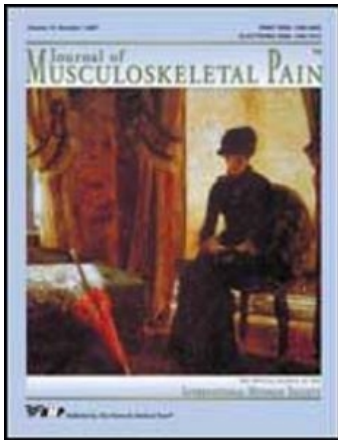
This article was downloaded by:

On: 30 December 2008

Access details: *Access Details: Free Access*

Publisher

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Journal Of Musculoskeletal Pain

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t792304019>

Myofascial Pain Syndrome—Trigger Points

Jan Dommerholt ^a; David G. Simons ^{bc}

^a Bethesda Physiocare, Bethesda, MD ^b Department of Rehabilitation Medicine, Emory University, Atlanta, GA ^c Department of Physical Therapy, Georgia State University, Atlanta, GA

Online Publication Date: 01 January 2008

To cite this Article Dommerholt, Jan and Simons, David G.(2008)'Myofascial Pain Syndrome—Trigger Points',Journal Of Musculoskeletal Pain,16:4,333 — 338

To link to this Article: DOI: 10.1080/10582450802479677

URL: <http://dx.doi.org/10.1080/10582450802479677>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

LITERATURE REVIEW

Myofascial Pain Syndrome—Trigger Points

Jan Dommerholt, PT, MPS
David G. Simons, MD, MS, DSc [Hon x 2]

INTRODUCTION

In 1993, Dr. David Simons welcomed this literature review column with great enthusiasm (1). During the following 14 years, he has introduced the readers of this journal to numerous new studies, reviews, and case reports in the field of myofascial pain with ever growing enthusiasm. The number of high quality papers increased dramatically, offering further substantiation of the myofascial concepts he helped pioneer with Dr. Janet Travell after meeting her during the early 1960s. Even a quick glance at the previous reviews illustrates how much progress has been made during the past decade.

At this point in time, Dr. Simons has decided to step down as a featured reviewer of the myofascial pain literature. On behalf of the subscribers of the journal, we would like to offer our sincere gratitude to Dr. Simons for all his contributions to the *Journal of Musculoskeletal Pain* and to the field of myofascial pain in general. His pointed commentaries and insights will be missed from these pages!

The current review includes papers from four different countries, including Spain, Taiwan, the United Kingdom, and the United States. A new study by Shah et al. confirmed and expanded the results of their previous study of the chemical milieu of myofascial trigger points [TrPs]. A first in this report is the successful imaging of a taut band using magnetic resonance elastography. Another is the review by McPartland of the endocannabinoid system using a bioinformatics approach. The use of functional magnetic resonance imaging to image TrP pain is a major step forward in our understanding of the effect of TrPs on the brain.

A consequence of the ever-increasing number of new publications is that at times we receive more papers than we can review and still stay within the JMP's allowable number of pages. To review as many papers as possible, some reviews will be shorter than the reader may be accustomed to. For the last time, each article review indicates whether it is prepared by Dommerholt [JD] or by Simons. [DGS]

Jan Dommerholt, PT, MPS, Bethesda Physiocare, Bethesda, MD.

David G. Simons, MD, MS, DSc [Hon x 2], Clinical Professor [voluntary], Department of Rehabilitation Medicine, Emory University, Atlanta, GA and Adjunct Professor, Department of Physical Therapy, Georgia State University, Atlanta GA.

Or, David G. Simons, MD, 3176 Monticello St., Covington, GA 30014-3535. E-mail: loisanddavesi-simons@earthlink.net

Address correspondence to: Jan Dommerholt, PT, MPS, Bethesda Physiocare, 7830 Old Georgetown Road, Suite C-15, Bethesda, MD 20814-2440. E-mail: dommerholt@bethesdaphysiocare.com

RESEARCH STUDIES

Shah JP, Danoff JV, Desai MJ, Parikh S, Nakamura LY, Phillips TM, et al.: Biochemicals associated with pain and inflammation are elevated in sites near, to, and remote from active myofascial trigger points. Arch Phys Med Rehabil 89: 16–23, 2008.

Summary

Four investigators with MD, PhD and BA degrees of the United States investigated the biochemical milieu of upper trapezius muscles with active, latent, or absent TrPs including interleukin [IL] 6 and IL-8 and of an uninvolved gastrocnemius muscle. This study replicated the results of a previously described study, which also used a special needle and micro-analytic technique to measure pH, bradykinin, substance P, calcitonin gene-related peptide, tumor necrosis factor alpha, IL-1 β , serotonin, and norepinephrine using immunocapillary electrophoresis and capillary electrochromatography (2). A local twitch response [diagnostic of a TrP] was tested and elicited from active and latent TrPs. Microdialysis needle insertions were at the acupuncture test sites GB-21 in the upper trapezius and LV-7 in the gastrocnemius muscles of the nine healthy volunteer subjects. Trigger points are characterized by finding a hyperirritable nodule in a palpable taut band that produced a muscle twitch and referred pain. Active TrPs produced spontaneous pain, latent TrPs did not. Normal muscle contained no taut bands or spot tenderness. Analyte concentrations in the gastrocnemius showed less marked differences in all three subject groups compared to trapezius results, but in the same direction. However, two analytes, TNF-alpha and norepinephrine analytes, showed no differences from previous TrP-free subjects and no gastrocnemius analytes responded to trapezius local twitch responses. Most analyte abnormalities may not be limited to the muscle with the TrPs, but may be somewhat increased throughout the body and that this effect of TrPs has a long response time to change the milieu of another TrP.

Comments

This is an outstanding pioneering study by Shah and his colleagues, and addresses the

concerns of the skeptics who questioned the validity of the first study because of the few subjects. It is very unlikely that a biochemical study would get such consistent low P values by chance, making the agnosticism even more untenable. The sophisticated discussion of the physiological influences and interactions among analytes is most enlightening. This study provides a reliable beacon for guiding future TrP research. [DGS]

Chen Q, Bensamoun S, Basford JR, Thompson JM, An K-N: Identification and quantification of myofascial taut bands with magnetic resonance elastography. Arch Phys Med Rehabil 88: 1658–1661, 2007.

Summary

Four coauthors from the Mayo Clinic in the United States, with one MS degree, two MD degrees, and three PhD degrees introduce the use of magnetic resonance elastography [MRE] to image the taut band of TrP. The authors added specific computer analysis to standard magnetic resonance imaging [MRI] that analyzes shear waves to detect differences in tissue stiffness between tense fibers of a taut band and unaffected surrounding muscle. Vibration of a frequency known to the computer must be applied to the muscle to analyze the shear waves. The authors pretested the validity of the new technique with two studies using phantom targets. The audio speaker used to vibrate the muscle had the advantage over previous vibration devices as it stimulated a larger region of the muscle.

Comments

These results on one subject are promising, but need considerable refinement to be routinely clinically useful for confirming the presence of TrPs. Since the resonant frequency of muscle is a function of its tension, the taut band should have a significantly different resonant frequency than the surrounding unaffected muscle. This audio stimulation system should provide the frequency control that might significantly increase the resolution of the image. The absence of a system for imaging TrPs to date has been a major block to widespread TRP acceptance, especially among

those without the skill to palpate a taut band. This development might fill that void. [DGS]

In a subsequent publication by the same research group, they expanded the number of human subjects and included four subjects with and four subjects without myofascial pain (3). The authors suggested that with refinement of the elastography techniques, it may be feasible to visualize TrPs in the future, which would be a major step forward. [JD]

Niddam DM, Chan R-C, Lee S-H, Yeh T-C, Hsieh J-C: Central representation of hyperalgesia from myofascial trigger point. *Neuroimage* 39(3): 1299–1306, 2008.

Summary

Five investigators in the National Yang Ming University and the Taipei Veterans General Hospital in Taiwan examined 16 patients with TrPs in the left trapezius muscle and 14 healthy volunteers using functional magnetic resonance imaging [fMRI]. They analyzed brain responses to electrical intramuscular stimuli at the location of a TrP at medium pain intensity for patients. They stimulated control sites with both a duplicate stimulus level for control subjects and also at a stimulus level that matched the pain response of patients. A TrP was identified by a palpable band or a hardened nodule in the upper left trapezius, by referred pain emanating from that spot, and by a local twitch evoked when manipulating the stimulus electrode in the TrP. Brain responses showed significantly enhanced somatosensory [SI, SII, inferior parietal, mid-insula] and limbic [anterior insula] activity and suppressed right dorsal hippocampal activity in patients compared with controls. At matched pain intensity, enhanced activity was found in the same somatosensory areas but not in limbic areas. The hyperalgesic state observed in myofascial pain syndrome patients was associated with abnormal hyperactivity in regions processing stimulus intensity and negative affect.

Comments

This well-designed, up-to-date, and controlled study makes it clear that the brain processes pain from TrPs in much the same areas

as pain from other sources, but not completely the same. We have now advanced from studying just the spinal cord to the effects of TrPs on brain activity. [DGS]

Fernández de las Peñas C, Cuadrado ML, Arendt-Nielsen L, Ge HY, Pareja JA, (2008) Association of cross-sectional area of the rectus capitis posterior minor muscle with active trigger points in chronic tension-type headache: A pilot study. *Am J Phys Med Rehabil* 87(3): 197–203, 2008.

Summary

Eleven female patients with chronic tension-type headaches were included in this Spanish study of the cross-sectional area [CSA] of the rectus capitis posterior minor and major muscles and the presence of TrPs in these muscles. The CSA was determined with conventional T1-weighted magnetic resonance imaging. Two experienced radiologists determined the CSA. An experienced assessor determined whether subjects had active TrPs in the muscles using the criteria described by Simons et al. (4). Because the muscles are not directly palpable, the TrP diagnosis was made when there was tenderness in the suboccipital region, referred pain by maintaining pressure for 10 seconds, and increased pain upon muscle contraction.

All patients had referred pain elicited by manual palpation. Six subjects [55 percent] had active TrPs and five [45 percent] had latent TrPs. Patients with active TrPs had smaller CSAs of the rectus capitis posterior minor muscles, but not of the rectus capitis posterior major muscles. The authors reviewed possible mechanisms for the observed atrophy.

Comments

This is yet another interesting TrP study from the laboratory of Dr. Fernández de las Peñas and colleagues. Although this study has several acknowledged limitations, as a pilot study it illustrates that TrPs of the cervical muscles may cause or at least contribute to chronic tension-type headaches. Whether atrophy is primary or secondary to the TrPs needs to be seen. [JD]

TREATMENT STUDIES

Gemmell H, Miller P, Nordstrom H: *Immediate effect of ischaemic compression and trigger point pressure release on neck pain and upper trapezius trigger points: A randomized controlled trial. Clin Chiropractic 11: 30–36, 2008.*

Summary

Forty-five students of the student body of the Anglo-European College of Chiropractic in Bournemouth, England were included in this randomized single-blind placebo-controlled study of the immediate effects of ischemic compression and TrP pressure. Subjects had mechanical neck pain for less than three months and an active TrP in the upper trapezius muscle. The subjects were randomly assigned to an “ischemic compression” group, a “trigger point pressure release” group, or a control group. Ischemic compression was defined as “sustained deep pressure with the thumb to the upper trapezius TrP for 30 s–1 min.” Pressure was maintained until there was no more tension or tenderness in the TrP, or after one minute. Trigger point pressure release was defined as “non-painful slowly increasing pressure with the thumb over the TrP until a tissue resistance barrier was felt, at which point the pressure was maintained until release of tension was felt.” Pressure was increased until a new barrier was reached. Pressure was maintained until there was no more tension or tenderness in the TrP, or after 90 seconds. Subjects assigned to the control group received sham ultrasound over the region of the TrP for two minutes using a detuned ultrasound machine.

Using clinical improvement as the primary short-term outcome measure, the authors found that nine out of 15 subjects in the ischemic compression group, seven out of 15 in the TrP release group, and four in the control group improved. The results did not reach statistical significance, but did reach clinical significance.

Comments

The authors justified the use of clinical significance because “statistical significance does not necessarily equate to clinical importance and non-significance does not necessarily mean no effect.” Research findings frequently do not

support clinical practice especially in meta-reviews. In this study, the only conclusion the authors could reach is that for one patient to improve with a single treatment with ischemic compression, three patients would have to be treated compared to the control group, and a patient treated with ischemic compression is five times more likely to improve than a patient treated with sham ultrasound. The study did not show that ischemic compression was superior to TrP release pressure. [JD]

Blikstad A, Gemmell H: *Immediate effect of activator trigger point therapy and myofascial band therapy on non-specific neck pain in patients with upper trapezius trigger points compared to sham ultrasound: A randomized controlled trial. Clin Chiropractic 11: 23–29, 2008.*

Summary

This study is similar to the previously described study. A similar subject population was randomly assigned to one to three groups: an activator group, a myofascial band therapy group, and a sham ultrasound control group. An activator is a tool used in chiropractic for joint manipulations. In this study, the applicator was placed over a TrP and a force of 170 N was applied using 10 thrusts at a rate of one thrust per second. Myofascial band therapy was defined as “firm thumb pressure in a slow stroking motion along the muscles and through the active TrP for one minute.” As outcome measures, the authors used pain pressure thresholds, an increase of at least 1 kg/cm² as clinical improvement, and cervical range of motion to determine clinically significant improvement. An odds ratio was calculated indicating the number of patients that must be treated for one patient to improve. Subjects treated with the applicator were seven times more likely to improve than subjects treated with myofascial band therapy or sham ultrasound. However, there were no differences in between the groups for the range of motion.

Comments

To the best of my knowledge, this is the first study exploring the use of an applicator, which,

on the basis of this paper, appears to be a useful tool in the treatment of patients with TrPs. [JD]

Fernández de las Peñas C, Ge HY, Arendt-Nielsen L, Cuadrado ML, Pareja JA: *The local and referred pain from myofascial trigger points in the temporalis muscle contributes to pain profile in chronic tension-type headache. Clin J Pain 23(9): 786–792, 2007.*

Summary

Five PhDs investigators from Spain or Denmark, who were also MDs, DMSc, and a PT, reported examination of the temporalis muscle bilaterally in 30 patients with chronic tension-type headache [CTTH] and 30 matched controls for active and latent myofascial TrPs. The experienced blinded assessor identified TrPs by the presence of a hyperirritable spot in a palpable taut band that responded to snapping palpation with a local twitch response and referred pain. Active TrPs reproduced the clinical head pain, latent TrPs did not.

Patients reported significantly more pain [visual analog scale 1–10] than controls: patients 5.5 and controls 0.75 [$P < 0.001$], and significantly more referred pain 4.1 than controls 0.35 [$P < 0.001$], mostly to the temple and supra-auricular area and commonly ipsilaterally deep within the head or behind the eye. Only 10 percent of controls reported any referred pain from their latent TrPs and referred pain area was significantly larger among patients than controls [$P < 0.001$]. Twenty-three of 30 patients [77 percent] had active TrPs in the temporalis muscle corresponding to their CTTH. Active TrPs in the temporalis muscles may contribute to CTTH.

Comments

This unusually well-designed and a well-reported study of myofascial TrPs is the first to address specifically the role of the temporalis muscle in TTH. The temporalis muscle *should* always be examined in patients with CTTH. Pain behind the eye is noteworthy. The pressure-pain threshold [PPT] of active TrPs in patients was much lower than PPT of latent TrPs in controls. Pressure-pain threshold is a sensitive measure of progressive change from an active to a latent

TrP with treatment. It is fervently hoped that this competent group will progress to a treatment study of TrPs in this and other CTTH muscles in order to identify a cause-effect relationship between headaches and TrPs. [DGS]

Ruiz-Saez M, Fernandez-de-las-Penas C, Blanco CR, Martinez-Segura R, Garcia-Leon R: *Changes in pressure pain sensitivity in latent myofascial trigger points in the upper trapezius muscle after a cervical spine manipulation in pain-free subjects. J Manipulative Physiol Ther 30(8): 578–583, 2007.*

Summary

Seventy-two pain-free subjects [27 males and 46 females] participated in this study from Spain examining the immediate effects of a single cervical spinal manipulation [high-velocity, low-amplitude thrust] on the PPT of a latent TrP in the upper trapezius muscle. Subjects in the experimental group demonstrated a trend toward an increase in PPT after the manipulation, whereas subjects in the control group displayed a trend toward a decrease.

Comments

This elegant study illustrates that joint dysfunction and latent TrPs are correlated without differentiating how the two entities may be related. The authors suggested several possible mechanisms worthy of further study. The study does not clarify whether it makes any difference to inactivate TrPs before addressing joint dysfunction or vice versa. There may not be a preferred order. It would be interesting to reverse the study and examine the effect of inactivating TrPs on joint dysfunction. [JD]

Lew HL, Lee EH, Castaneda A, Klima R, Date E: *Therapeutic use of botulinum toxin type A in treating neck and upper-back pain of myofascial origin: A pilot study. Arch Phys Med Rehabil 89: 75–80, 2008.*

Summary

In this study, 29 patients with cervical or upper back pain and TrPs were randomly assigned

to either a group receiving an injection with botulinum toxin type A or to a control receiving an injection with normal saline solution. The TrPs in the trapezius, levator scapulae, splenius capitis, and other posterior neck muscles were injected. Outcome measurements were taken at baseline, two weeks, and one, two, three, four, and six months. The authors did not observe significant differences between the two groups except for the bodily pain and mental health scales of the SF-36. They had limited the dosage of botulinum toxin to 200U in four or fewer muscles.

Comments

The effectiveness of botulinum toxin injections into TrPs continues to be variable with some studies reporting excellent results (5), although others, including this study, did not find any benefits compared to saline injections or dry needling (6). The researchers included several muscles in their intervention, which may have diluted the results. Also, they did not mention what their criteria were for the identification of TrPs and whether they elicited local twitch responses. [JD]

REVIEWS AND COMMENTS

McPartland JM: Expression of the endocannabinoid system in fibroblasts and myofascial tissues. *J Bodywork Mov Ther* 12: 169–182, 2008.

Summary

An osteopathic physician from Vermont, USA reviewed the endocannabinoid [eCB] system that is analogous to the better-known endorphin system using a bioinformatics approach because of this system's potential for helping to clarify myofascial pain due to trigger points [TrPs] and fibromyalgia syndrome. The eCB system consists of cell membrane receptors, endogenous ligands, and ligand metabolizing enzymes.

The two cannabinoid receptors are CB₁ that is principally located in the nervous system, and CB₂, which is primarily associated with the immune system. Two eCB ligands, anandamide and 2-arachidonoylglycerol [2-AG], are mimicked by cannabis plant compounds. The eCB system may help resolve TrPs and relieve symptoms of fibromyalgia syndrome. To investigate the eCB

system in fibroblasts and other fascia-related cells, a bioinformatics approach provided microarray data via the Gene Expression Omnibus [GEO] database [www.ncbi.nlm.nih.gov/geo/]. GEO data mining revealed that fibroblasts, myofibroblasts, chondrocytes, and synoviocytes expressed CB₁, CB₂, and eCB ligand-metabolizing enzymes. The eCB system remodels fibroblasts through lipid rafts associated with focal adhesions and dampens cartilage destruction by decreasing fibroblast-secreted metalloproteinase enzymes. The eCB system helps shape biodynamic embryological development, diminishes nociception and pain, reduces inflammation in myofascial tissues, and plays a role in fascial reorganization. Practitioners have tools to upregulate eCB activity that includes myofascial manipulation, diet, lifestyle modifications, and pharmaceutical approaches.

Comments

This an impressive introduction to a relatively unfamiliar potential contributor to myofascial pain caused by TrPs. The bioinformatics approach is an innovative way to make effective use of the silos of information now accumulating. [DGS]

REFERENCES

1. Simons DG: Myofascial pain and dysfunction syndrome. *J Musculoske Pain* 1(2): 123–132, 1993.
2. Shah JP, Phillips TM, Danoff JV, Gerber LH: An in-vivo microanalytic technique for measuring the local biochemical milieu of human skeletal muscle. *J Appl Physiol* 99: 1977–1984, 2005.
3. Chen Q, Basford J, An KN: Ability of magnetic resonance elastography to assess taut bands. *Clin Biomech (Bristol, Avon)* 23(5): 623–629, 2008.
4. Simons DG, Travell JG, Simons LS: *Travell and Simons' Myofascial Pain and Dysfunction: The Trigger Point Manual*. Vol. 1. 2nd ed. Williams & Wilkins, Baltimore, 1999.
5. Göbel H, Heinze A, Reichel G, Hefter H, Benecke R: Efficacy and safety of a single botulinum type A toxin complex treatment (Dysport) for the relief of upper back myofascial pain syndrome: Results from a randomized double-blind placebo-controlled multicentre study. *Pain* 125(1–2): 82–88, 2006.
6. Kamanli A, Kaya A, Ardicoglu O, Ozgocmen S, Zengin FO, Bayik Y: Comparison of lidocaine injection, botulinum toxin injection, and dry needling to trigger points in myofascial pain syndrome. *Rheumatol Int* 25(8): 604–611, 2005.