Efficacy of Non-invasive Myofascial Trigger Point Therapy on Cervical Myofascial Pain

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ABSTRACT

Background: *Myofascial Trigger Points (MTrPs) are a common cause of pain and dysfunction in persons with musculoskeletal injuries and diagnoses. Manual therapy is a specialization within physical therapy and provides comprehensive conservative management for pain and other symptoms of neuro-musculo-articular dysfunction in the spine and extremities.* ***Purpose:*** *to assess the effectiveness of Progressive Pressure Release (PPR) and Transcutanuous Electrical Nerve Stimulation (TENS) on cervical myofascial Pain.* ***Methods:*** *Thirty patients (male and female), their age range 25-35 years, with neck pain were assigned randomly to three equal groups. The control group A (CG) (n=15) underwent an eight weeks of specific physical therapy program (infra red (IR) and stretching exercises for neck muscles. The PPR group B (n=15) underwent an eight weeks PPR technique plus the same physical therapy program. The TENS group (C) underwent a 8-week TENS plus the same physical therapy program. Outcome measure in terms of objective Pain Pressure Threshold (PPT) level was measured before starting the study and after the end of the study (after 4 weeks) for all participants in both groups.* ***Results:*** *After intervention, the PPR techniques showed a statistically significant (P< 0.05) increase in pain threshold levels from 2.21±0.95 to 5.13±1.16.* ***Conclusion:*** *The findings of this trial support the view that PPR technique should be incorporated into the physical therapy program for reducing pain and functional disability in patients with cervical MTrPs.*
Key words: *Myofascial Trigger Points, Progressive Pressure release, Pain Pressure Threshold, outcome measures.*

INTRODUCTION

Myofascial trigger points (MTrPs) are associated with many other pain syndromes, including, post-herpetic neuralgia, complex Regional pain syndrome, nocturnal cramps, phantom pain, and other relatively uncommon diagnoses such as Barré-Liéou syndrome and neurogenic pruritus[8].

MFTrP contains a sensory component, a motor component, and an autonomic component. These components comprise a new "integrated hypothesis" regarding the etiology of MTrPs. This hypothesis involves local myofascial tissues, the central nervous system (CNS), and systemic biomechanical factors[9].

Persons with mechanical neck pain had significantly more clinically relevant MTrPs in the upper trapezius, sternocleidomastoid, levator scapulae, and suboccipital muscles as compared to healthy control[8].

MTrPs have a motor component. MTrPs have been biopsied and found to contain "…contraction knots…" described as "…large, rounded, darkly staining muscle fibers and a statistically significant increase in the average diameter of muscle fibers[12]. Muscle contraction compresses local sensory nerves and local blood vessels, reducing the local supply of oxygen. Reduced oxygen, combined with the metabolic demands generated by contracted muscles, results in a rapid depletion of local adenosine triphosphate (ATP)[9].

MTrPs are painful. Pain begins in peripheral tissues as nociception, transmitted by Aδ and C-fiber afferent sensory neurons (nocioceptors). This leads to peripheral sensitization and hypoalgesia. Sensitizing substances may also generate a focal demyelination of sensory nerves. Demyelination creates abnormal impulse-generating sites (AIGS), capable of generating ectopic nociceptive impulses[3].

Autonomic phenomena associated with MTrPs include localized sweating, vasoconstriction or vasodilatation, and pilomotor activity ("goosebumps"). MTrPs located in the head and neck may cause lacrimation, coryza (nasal discharge), and salivation[15]. Norepinephrine has been shown to augment the amplitude and duration of MEPPs in frog leg motor endplates[2]. Pentolamine, an antagonist of α1 -adrenergic receptors, decreases SEA in MTrPs. Similar effects have been seen with local intramuscular injections of phenoxybenzamine, another α1 –adrenergic antagonist[14]. Ephaptic crosstalk (cross-excitation) is the nonsynaptic interaction between two nerves that are parallel and relatively close together so that their action potentials influence each other[11]. Trigger points in the trapezius are typically caused by emotional stress, postures such as hunching shoulders, certain activities like using a telephone receiver without elbow support, or by wearing certain articles such as a heavy coat[10].

TENS is the most frequently used electrotherapy for producing pain relief. TENS effects are rapid in onset for most patients so benefit can be achieved almost immediately. TENS is delivered to selectively activate Aβ afferents leading to inhibition of nociceptive transmission in the spinal cord[1]. TENS is a drug-free pain management technique that applies small amounts of electricity to nerve endings beneath the skin. It is sometimes used to treat a wide range of conditions, including pelvic pain, neuropathy, arthritis, back pain, shoulder pain and other types of joint pain, muscle pain and post-surgical pain[10].

Simons (2004)[17] recommend applying gentle gradual increasing digital pressure to MTrPs. This fundamental change is anchored in Travel's ATP energy crisis model, which characterizes MTrPs as centers of tissue hypoxia. Thus, deep digital pressure that produces additional ischemia is not beneficial. Travell and Simons named their new technique "trigger point progressive pressure release." It is believed to restore abnormally contracted sarcomeres in the contraction knot to their normal resting length.

Progressive pressure release technique is a manual technique using the thumbs, knuckles or four fingers of one or both hands, steady pressure was applied, moving inward toward the center. Once tissue distance was felt, we stopped and waited until resistance dissipated, and then when a slow release or a "melting away" sensation of the tissue under treating fingers was felt, further steady pressure moving again inward toward the center was applied. Once new tissue resistance appeared, steady pressure was maintained against the tissue, repetition of this cycle was done several times. The muscle was placed in a position to maximize stretch, but in a relaxed one. where constant feedback was provided by the patient. It was applied for at least 30 seconds and up to two minutes at a time. The patient breathed deeply and slowly while we progressively increased the pressure[18].

SUBJECTS, MATERIALS AND METHODS

Subjects

Criteria for inclusion in the study were restricted to 30 patients of either gender between the ages of 25 and 35 years and suffer from active MTrPs in one side of the upper trapezius muscle. The patients were selected on the basis of their symptoms and clinical presentation being considered by their treating medical specialist. The diagnosis of an active MTrPs in the upper trapezius muscle will be based on criteria described by Travell and Simons[18]. The patients suffer from active MTrPs in the upper trapezius muscle, Tender spots in one or more palpable taut bands, a typical pattern of referred pain distributed in the ipsilateral posterolateral cervical Para spinal area, mastoid process or temporal area, palpable or visible local twitch responses on snapping palpation at the most sensitive spot in the taut band, restricted range of motion in lateral bending of the cervical spine to the opposite side. Patients were excluded from entry to the study if they patients have symptoms and signs meeting the 1990 American Collage Rheumatology (ACR) criteria for fibromyalgia; chronic pain in both sides of the body, at least 11 of 18 common tender points must be painful on palpation, having myofascial trigger point injection or receiving physical therapy modalities within one year before this study, exposure to acute trauma, having history of inflammatory joint or muscle disease, infection or malignancy, having an evidence of neurological deficit, exhibiting inadequate cooperation, having a diagnosis of cervical radiculopathy or myelopathy.

Instrumentations

The Wagner FPIX Digital Algometer provides objective pain diagnostic testing with digital clarity and computer interface for data logging. An algometer is essentially a very sensitive force gauge designed to measure forces applied to very specific locations on the patient. Its tip generally ranges between 0.5cm and 2cm and its results are typically reported in terms of pressure[4].

Pressure threshold is defined as the minimum pressure required to cause pain. Pressure threshold measurements are usually performed over areas of muscle tenderness. Many clinical applications of the algometer have been documented including evaluation of fibromyalgia, identification of trigger points and evaluation of pain sensitivity. Pressure measurements has also been shown effective for evaluating the results of pain relieving modalities so because of its reliability algometer -can be used for objective medico-legal documentation of pain intensity[13].

<u>For treatment:</u>

1. Progressive pressure release technique: 3x/ w/ 8wks.
2. Selected Physical therapy program: IR (15 min + stretching exercises for upper fiber of trapezius 15 min).
3. Electrical Modalities: TENS Conventional mode TENS, a Symmetric biphasic rectangular pulses with 100 msec. duration, a current frequency from 90 to150 Hz, and intensity up to the patient's perception of paresthesia, combined with stretches. Conventional TENS stimulate A-beta sensory afferents by passing a high frequency, low intensity current which releases gamma-aminobutyric acid and that this inhibitory neurotransmitter blocks the intra-dorsal transmission of noxious information generated in C fibers.

RESULTS

General characteristics of the patients:

Thirty patients with cervical pain were assigned randomly into to 3 treatment groups with 10 patients in each group. There was no significant difference between the 3 groups in their ages, weights, and heights where their F and P-values were (1.15, 0.33), (0.62, 0.54), and (0.02, 0.98) respectively.

Pain Threshold:

For group (A) the mean of pain threshold pre treatment was (2.21±0.95). There was an increase in pain threshold post treatment to (5.13±1.16). For group (B) the mean of pain threshold pre treatment was (2.01±0.89). There was an increase in pain threshold post treatment to (9.12±1.07). For group (C) the mean of pain threshold pre treatment was (2.65±1.03). There was an increase in pain threshold post traditional treatment to (2.94±0.81).

i) Within subjects: For group (A), Repeated measurement ANOVA revealed a significant difference within subjects as the F value was 226.94 and ($P< 0.0001$). There was a significant difference of Pain threshold between pre treatment and post treatment values as t-value was (18.41) and P-value was ($P<0.001$), and there was significant difference of Pain threshold between pre treatment and post traditional treatment values as t-value was (18.48) and P-value was ($P<0.001$), ($P>0.05$) as shown in table (1). For group (B) also there was a significant difference within subjects as the F value was 479.5 and ($P< 0.0001$). There was a significant difference of Pain threshold between pre treatment and post treatment values as t-value was (51.74) and P-value was ($P<0.001$), and there was significant difference of Pain threshold between pre treatment and post traditional treatment values as t-value was (52.03) and ($P>0.05$) as shown in table (1). For group (C): There was no significant difference in the paired t-test between pre treatment and post treatment pain threshold where the t-value was (1.81) and P-value was (0.1).

Table (1): Pain threshold pre treatment, post treatment group (A) and (B).

	Comparison	Mean Difference	t-value	P-value	S
Group (A)	Pre treatment vs. Post treatment	2.92	18.41	P<0.001	S
	Pre treatment vs. Post traditional treatment	2.93	18.48	P<0.001	S
Group(B)	Pre treatment vs. Post treatment	7.11	51.74	P<0.001	S
	Pre treatment vs. Post traditional treatment	7.15	52.03	P<0.001	S

P-value = Probability S = Significance

ii) Between Group: To determine the difference in the mean value of the Pain Threshold analysis of variance (ANOVA) was performed. It revealed that there was no significant difference among the three groups for the pre treatment value as F value was (1.15) and P value was (0.33) .While there was a significant difference for the post treatment values as F value was (92.23) and P value was (0.0001), and there was a significant difference for the post traditional treatment values as F value was (85.5) and P value was (0.0001) as shown in table (2).

Table (2): Results of ANOVA among the three groups for Pain Threshold pre treatment, post treatment, and post traditional treatment.

Pain Threshold		SS	MS	F	P value	S
Pre Treatment	Between Groups Within Groups Total	2.144 25.143 27.287	1.072 0.931	1.15	0.33	NS
Post treatment	Between Groups Within Groups Total	196.362 28.741 225.103	98.181 1.064	92.23	0.0001	S

P-value = Probability S = Significance SS = Sum of squares MS = Means squares NS = Non significance

DISCUSSION

Findings of the current trail indicated that non-invasive trigger point therapy is effective in management of myofascial trigger pain in upper trapezius muscle.

Stretching:

Stretching after the application of a vapocoolant spray is reported by Travell and Simons[18] to be the 'single most effective treatment' for trigger point pain. An attempt was made to clarify this, using pain scales and pressure threshold as outcome measures for response to spray and stretch techniques in patients with chronic neck and head pain[5]. Hanten et al. (2000)[6] compared the results of a home program of ischaemic pressure and stretching to a program of stretching alone in subjects with trigger points in the trapezius region. Ischaemic pressure combined with stretching resulted in a greater improvement in pain scores and pain pressure threshold. The pressure was applied prior to the stretching and, therefore, could well have been acting in a counter-stimulatory fashion. Importantly, this research shows a benefit of massage techniques above the effect of stretching alone.

Transcutanuous electrical nerve stimulation:

Graff-Redford et al. (1989)[5] investigated the use of 100 Hz, 2 Hz and control TENS on subjects with trigger point related chronic pain in the thoracic, neck, or head region. Low frequency and control TENS had no effect on pain, whereas the high frequency resulted in significant pain relief. None of the modalities resulted in any change in pain pressure threshold. Graff-Redford et al. (1989)[5] postulated the results to be due to modulation of central pain sensitivity. As group II fibers are stimulated, this TENS mode achieves analgesia primarily by spinal segmental mechanisms, as predicted in the gate control theory of pain. Therefore the analgesia is of relatively rapid onset because local neurophysiological mechanisms are responsible. Yet the analgesia tends to be comparatively short term, typically lasting only for up to a few hours post-treatment.

Progressive Pressure Release: Progressive pressure release is the most effective than the other modalities in increasing pain threshold and reducing the tenderness of the active MTrPs immediately after therapy. The possible mechanisms behind the effectiveness of progressive pressure release in increasing pain threshold is the restoration of uniform sarcomeres length in the effected muscle fibers. Gradual pressure applied downward on a MTrPs tends to lengthen sarcomeres and reduce muscle tension. Spasm in muscle cause impairment of muscle circulation accumulation of metabolites, which produces more pain and further disturbance of the microcirculation in a vicious cycle. Progressive pressure release has many benefits in treating MTrPs, where lengthening of sarcomeres reduce muscle tension thus reducing the energy consumption and in turn release of noxious substances, breaking the vicious cycle.

These findings are supported by Fryer et al. (2005) who investigated the effect of manual pressure release on MTrPs in the upper trapezius muscle, they found that with 60 seconds of pressure release produced significant immediate decrease in sensitivity of MTrPs and increase in pain threshold. The results suggested that progressive pressure release is an effective therapy for MTrPs in the upper trapezius.

Conclusion

Both TENS and PPR are effective in management of MTrPs of upper fiber of trapezius. However TENS is not effective like progressive pressure release which restore normal length of sarcomeres of MTrPs not relief pain only like TENS but treat the problem itself.

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الملخص العربي

تأثير تقنيات العلاج اليدوي غير الغزوي لنقاط الزناد في مرضى الألم الليفي العضلي العنقي

مقدمة : ينتشر الألم الليفي العضلي العنقي بين كثير من الأشخاص اللذين لا يهتمون بقوام الفقرات العنقية أثناء تأدية أعمالهم لفترات طويلة. تتعدد وسائل العلاج الطبيعي المستخدمة في علاج ألم الرقبة إلا أنه بدأ التركيز في الأونة الأخيرة على استخدام العلاج اليدوي في صورة كل من تقنية تحرير نقاط الزناد المؤلمة للتحكم والسيطرة على هذا النوع من الألم . الهدف : تهدف هذه الدراسة إلى تقييم فاعلية كل من تقنية تحرير نقاط الزناد المؤلمة والذبذبات الكهربائية في التحكم والسيطرة على هذا النوع من الألم . الطريقة : تم إجراء هذا البحث على ٣٠ مريضا (رجال – نساء) تتراوح أعمارهم بين ٢٥– ٣٥ عام ويعانون من آلام الرقبة . تم تقسيم المرضى عشوئيا إلى ثلاث مجموعات متساوية في العدد حيث تم علاج المجموعة الأولى بواسطة الأشعة تحت الحمراء وتمرينات الإطالة لعضلات الرقبة والثانية بطريقة الإنفراج العضلي الليفي لنقاط الزناد المؤلمة والثالثة بواسطة الذبذبات الكهربائية لمدة ٨ أسابيع لمدة ٢٤ جلسة. النتائج : أظهرت النتائج فروق ذات دلالة معنوية إحصائية في المجموعات الثلاثة بين المتغيرات موضع الدراسة وهي شدة الألم قبل وبعد العلاج . إلا أنها أظهرت تفوق العلاج اليدوي على العلاج الكهربائي . الخلاصة : التقنيات العلاجية اليدوية لها تأثير في التحكم والسيطرة على آلام الرقبة .

الكلمات الدالة : الذبذبات الكهربائية – تقنية الإنفراج العضلي الليفي – آلام الرقبة – نقاط الزناد المؤلمة .