International Journal of ChemTech Research
CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.9, No.12 pp 943-952, 2016

Dry Needling Versus Trigger Point Release In Treatment Of Myofascial Low Back Pain

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Abstract : The aim of our study is to compare between the effects of dry needling and ischemic compression in treatment of myofascial low back pain. **Material and Methods:** Thirty patients participated in our study and divided into two equal groups suffering from myofascial low back pain with the presence of trigger points of quadratus lumborum, iliocostalis lumborum, piriformis and gluteus medius muscles. The first group (A) consist of 15 patients receiving trigger point release over trigger points followed by stretching exercise, the second group (B) consist of 15 patients receiving dry acupuncture point stimulation therapy over the same trigger points followed by stretching exercise. Their age ranged from 18 - 43 years. Pain severity and functional disability were measured by visual analogue scale and Oswestry disability questionnaire respectivly. **Results:** Regarding within group's comparison, statistical analysis using Wilcoxon Signed Rank tests revealed that there was a significant reduction in pain intensity scale and function disability at post treatment in compare to pre treatment at both groups with ($p < 0.05$). Considering the effect of the tested group (first independent variable) on pain level and function disability, " Mann-Whitney U test " revealed that there was no significant difference between both groups at pre and post treatment ($p>0.05$). **Conclusions**: The results showed a significant improvement in functional disability and a significant decrease in the visual analogue scores within each group. No differences were found between the improvement in both groups. Trigger point release and TrP DN were equally effective in reducing pain level and improvement of functional disability in treatment of patients with myofascial back pain.

Key words : myofascial pain, trigger points, ischemic compression, dry needling.

Introduction

Myofascial Pain Syndrome (MPS) is a condition characterized by chronic and severe pain that is related to the affected area which associated with trigger points (TrPs) that aggravated by activities of daily living (ADL)[1]. Myofascial pain has a high prevalence among individuals with regional pain complaints. The prevalence varies from 21% of patients seen in a general orthopedic clinic, to 30% of general medical clinic patients with regional pain, to as high as 85% to 93% of patients presenting to specialty pain management centers[2].

TrPs are hyperirritable spots within a taut band of skeletal muscle which is painful when compressed and can give rise to characteristics referred pain, tenderness and muscle tightness[3]. TrPs are classified as being active or latent, depending on their clinical characteristics[4]. An active trigger point causes pain at rest. It is tender to palpation with a referred pain pattern that is similar to the patient's pain complaint[4]. This referred pain is felt not at the site of the trigger-point origin, but remote from it. The pain is often described as spreading or radiating[5]. Referred pain is an important characteristic of a trigger point. It differentiates a trigger point from a tender point, which is associated with pain at the site of palpation only[6]. A latent trigger point does not cause spontaneous pain, but may restrict movement or cause muscle weakness[7]. The patient presenting with muscle restrictions or weakness may become aware of pain originating from a latent trigger point only when pressure is applied directly over the point[8].

TrPs restricts motion of the muscles and decreases circulation, depriving the muscle of nutrients and oxygen and resulting in a collection of metabolic waste that cannot filtered away. These wastes excite pain nerve endings and can also damge them. The decrease of nutrients to the muscle increase spasm and inflammation[9].

Myofascial TrPs can be eliminated through one of several modalities, including trigger-point injection, stretch and spray, dry needling (acupuncture), massage, trigger point pressure release, exercise, and pharmacologic agents[10]. The TrPs pressure release is based on the technique of ischemic compression and can provide effective pain relief. The clinician applies direct digital pressure on each myofascial TrP, until a state of tension relief is reached and, thus, inactivates the TrP[11]. This technique is safe and effective for successfully reducing tenderness of myofascial Trps[12]. Stretching is complementary to myofascial trigger points pressure release as Holey and Cook (1997)[13] demonstrated that, a myofascial trigger point is effectively deactivated if the muscle in which it lies is restored to its normal resting length.

Needle-based interventions have also been used for MTrPs. These include acupuncture point stimulation, and trigger points injection. Interestingly, direct needling has been found to exhibit a direct effect that is independent from the injected substance of TrPs[14]. The advantages of dry needling include an immediate reduction in local, referred, and widespread pain, restoration of range of motion and muscle activation patterns[15].

TrPs in iliocostalis lumborum, quadratus lumborum, gluteus medius and piriformis are implicated in Myofascial back Pain Syndrome[16]. There is no study, until now, compare the effects of ischemic compression to the effects of dry needling of Trps in iliocostalis lumborum, quadratus lumborum, gluteus medius and piriformis muscles in treatment of Myofascial back Pain Syndrome. Therefore, this study will be conducted in order to determine which of the two treatment protocols is more effective in treatment.

Material and methods

Participants

Thirty patients (male & female) with age between 18-43 years participated in the study. Group (A): consisted of 15 patients receiving trigger point release (ischemic compression) over trigger points of iliocostalis lumborum, quadraus lumborum, gluteus medius and piriformis muscles followed by stretching exercise. Group (B): consisted of 15 patients receiving dry needling over trigger points of iliocostalis lumborum, quadraus lumborum, gluteus medius and piriformis muscles followed by stretching exercise.

Inclusion criteria:

Age ranges from 18 to 45 years old, pain of at least 30 mm to 70 mm on a visual analogue scale (VAS) from 0 mm (no pain) to 100 mm (worst imaginable pain), presence of MTrPs at least in 4 muscles on both sides and patients had myofascial back Pain syndrome for at least 3 months ago. The presence of MTrPs was determined using the diagnostic criteria described by Simons et al.[17]: 1. Presence of a palpable taut band in a skeletal muscle. 2. Presence of a hypersensitive tender spot in the taut band. 3. Local twitch response provoked by the snapping palpation of the taut band. 4. Reproduction of the typical referred pain pattern of the MTrP in response to compression. 5. Spontaneous presence of the typical referred pain pattern and/or patient recognition of the referred pain as familiar[18].

Exclusion Criteria:

History of previous back surgery, neurologic deficit, current lower extremity symptoms, cardiopulmonary disease with decreased activity tolerance, rheumatologic conditions such as mild systemic lupus erythematosus, polyarticular osteoarthritis, rheumatoid arthritis and advanced lumbar degenerative disease, participants receiving other treatment, in the form of physical therapy or medication, for the duration of the study that may interfere with the results of this study, bleeding disorders, renal disorders and disc lesion.

Randomization and allocation concealment:

The study was conducted in the out-patient clinic, Faculty of Physical Therapy, Cairo University; between June 2015 and November 2016. After all baseline criteria have been met, participants were randomized using the random permuted block method to ensure that the treatment groups are balanced at the end of every block. Participants were enrolled in blocks using random number generator software. All patients were asked to sign a consent form for ethical issue.

Instrumentations

A- Instrumentations used for evaluations:

Patients were assessed before and after the treatment sessions. The assessment procedures will include the following:

1- Pain assessment:

Pain was assessed by visual analog scale (VAS). This scale allows continuous data analysis and uses a 10cm line with 0 (no pain) and 10 (killing pain). The patient places a mark along the line to denote his level of pain[19].

2-Functional disability:

Functional disability of each patient was assessed by Oswestery disability questionnaire. It is a valid and reliable tool. It consists of 10 multiple choice questions for back pain, patients select one sentence out of six that best describes his pain, higher scores indicate greater pain. Scores (0-20%) indicate minimal disability, scores (20%-40%) indicate moderate disability, scores (40%-60%) indicate severe disability, scores (60%-80%) indicate crippled patient and scores (80%-100%) indicate patients are confined to bed[20].

B-Instrumentations used for treatment:

Acupuncture like needle (Long somatic needle):

Long Somatic Needles 0.30mm in diameter and 50 and 70mm long was used as a treatment tool (Wujiang City, Shenlong medical health products Co, Ltd, jiangsur.P.R., China).

Treatment procedures:

Treatment procedure for group A (trigger point release and stretching exercise):

First of all, detect the trigger points by palpating a taut band within the muscle belly in the lumbar region. which will be tender and will refere pain to characteristic regions. The muscles which will be treated iliocostalis lumborum, quadratus lumborum, gluteus medius and piriformis muscles. The patients received 2 sessions per week for 2 weeks.

Trigger point release (Ischemic compression):

Use the thumb or four fingers and apply sustained gentle pressure for 90 Sec. to 120 Sec. moving inward toward the center of the (TrP) once tissue resistance is felt, stop and wait until resistance dissipates (melting away). A 90-second rest was given between compressions to allow blood reperfusion into the treatment site. This cycle was repeated 3 times. At the end, either further relaxation of the tissue will be felt or no new gains will be achieved[21].

Stretching exercise:

For effective trigger point therapy, it must always be followed by stretching exercises to maintain the degree of relaxation and bring the muscle to an ergonomically correct state. The stretch should be very slow in rate and at least for 30 seconds and was repeated for 3 times[21].

Home exercise program:

Stretching exercise was given to the patient as a home exercise program and was repeated 3 times daily.

Muscles that released: 1-Iliocostalis lumborum:

Stretching position: long sitting, trunk flexion, reaches with the arm to the opposite side. Ischemic compression was applied from side lying position.

2-Quadraus lumborum:

During trigger point therapy and while the patient is in side lying position, the patient's arm was placed in extension to elevate the rib cage; upper leg is in extension and adduction to drop the iliac crest lower, and use a pillow or bolster under the non-treated side to open up a wider space where trigger points can be easier identified and pressure is applied perpendicular. Stretching position: the patient is in a semi prone position with the leg in extension and adduction. The therapist supports the area of the lower thoracic cage and iliac crest with his hands while spreading the hands apart or in semi supine with the leg in flexion and adduction, the therapist supports the area of the lower thoracic cage and iliac crest with his hands while spreading the hands apart.

3-Gluteus medius:

Stretching position: the patient is in a supine position. The involved side is in hip flexion and adduction. The patient facilitates movement using one hand to assist hip flexion and the other to assist hip adduction. Ischemic compression was applied from side lying position.

4-Piriformis:

Stretching position: the patient is in supine position. The involved side is in hip flexion above 90 degrees, adduction, and external rotation. Emphasis is on external rotation. The patient facilitates movement using both hands and the other leg to assist hip flexion, adduction and external rotation. Ischemic compression was applied from side lying position.

Treatment procedure for group B (dry needling and stretching exercise):

First of all, detect the trigger points by palpating a taut band within the muscle belly in the lumbar region. which will be tender and will refere pain to characteristic regions. The muscles which will be treated iliocostalis lumborum, quadratus lumborum, gluteus medius and piriformis muscles. The patients received 2 sessions per week for 2 weeks.

Myofascial dry needling technique:

An explanation of the procedure to the patient should be performed prior to the application of dry needling (DN). The patient should be educated on DN rationale and theory, what to expect during and after the treatment, the type of needle used, precautions, possible side effects, and expected outcomes. Possible fear of needling and pain associated with DN must be addressed. When using DN techniques for the treatment of TrPs, the therapist should palpate the target muscle for a taut band and identify a hyperirritable spot within the taut band confirming TrPs to be treated. After locating TrPs, the overlying skin is cleaned with alcohol, dry needling is usually performed with a solid filiform needle in a tube. The filiform needle in its tube is fixed with the non-needling hand against the suspected area by using a pincer grip or flat palpation depending on the muscle orientation, location, and direction of needle penetration. With the needling hand, the needle is gently loosened from the tube. The top of the needle is tapped or flicked allowing the needle to penetrate the skin. With deep DN, the needle is guided toward the TrP until resistance is felt and a LTR is elicited. The elicitation of a LTR is considered essential in obtaining a desirable therapeutic effect. The needle is inserted deep enough to fully penetrate the taut band region and then pulled back to the subcutaneous tissue layer, but not out of the skin (fast in and fast out technique) and repeated several times then the needle is left in the TrP for seven to ten minutes. Generally, numerous LTRs can be elicited. Cessation of a given DN procedure may occur as a result of notable decreased frequency or eradication of LTRs, decreased resistance to palpation of the underlying tissue, or patient intolerance of continued needling at that particular site. Once the needle has been withdrawn completely from the skin, pressure (hemostasis) can be applied directly to the skin over the needle insertion site with an alcohol swab to aid in the prevention of possible swelling or post needling soreness. The muscle is then palpated again to reassess for taut bands and TrPs.

Stretching exercise:

For effective trigger point therapy, it must always be followed by stretching exercises to maintain the degree of relaxation and bring the muscle to an ergonomically correct state. The stretch should be very slow in rate and at least for 30 seconds and was repeated for 3 times[21].

Home exercise program:

Stretching exercise was given to the patient as a home exercise program and was repeated 3 times daily.

1-Quadraus lumborum:

While the patient is in a side lying position, place the patient's arm in extension to elevate the rib cage; leg is in extension and adduction to drop the iliac crest lower, and use a pillow or bolster under the non-treated side to open up a wider space where trigger points can be easier identified. The needle is inserted just caudal to the 12th rib and anterior to the paraspinal muscle mass; it is directed parallel to the plane of the back (in the frontal plane) toward the L2 and L3 transverse processes. Stretching position: was the same stretching position as in group A.

2-Iliocostalis lumborum:

From side lying position identify the TrP via flat palpation. Insert the needle slightly superior to the TrP, perpendicular to the skin, and angle it inferomedially for about 30^0. Precautions: Avoid penetration of the lung. Stretching position: was the same stretching position as in group A.

3-Gluteus medius:

The patient is in side lying psition. The muscle is needled with flat palpation perpendicular to the muscle along the contour of the iliac crest. Strong depression of the subcutaneous tissue is required to reduce the distance from the skin to the muscle. Needle contact at the periosteum is common. Precautions: Avoid needling the sciatic nerve. There are also deep branches of the superior gluteal vessels and nerve between the medius and minimus which should be not needled. Depth of penetration is dependent on the amount of adipose tissue. Stretching position: was the same stretching position as in group A.

4-Piriformis:

The patient is in side lying position. Identify the bony landmarks of the greater trochanter and the sacrum at S2, S3 and S4. The needle can be inserted perpendicular to the muscle surface at the trochanter or just medial to the sacrum from the sciatic notch toward the pubic symphysis directly into the TrP taut band identified by palpation. Precautions: Avoid needling the sciatic nerve. Stretching position: was the same stretching position as in group A.

Statistical Analysis:

Statistical analysis was conducted using SPSS for windows, version 20 (SPSS, Inc., Chicago, IL). Prior to final analysis, data were screened for normality assumption, and presence of extreme scores. This exploration was done as a pre-requisite for parametric calculation of the analysis of difference and analysis of relationship measures. Descriptive analysis using histograms with the normal distribution curve showed that the data were not normally distributed and violates the parametric assumption for the pain level and functional disability. Also, normality test of data using Shapiro-Wilk test was used, that reflect the data was not normally distributed for pain level and functional disability, so non parametric statistical tests in the form of (Wilcoxon Signed Rank tests) was used to compare between "pre" and "post" treatment for each group and "Mann-Whitney tests" was conducted to compare pain level and functional disability between both groups in the "pre" and "post" treatment. The alpha level was set at 0.05.

Results

Baseline and demographic data

There were no statistically significant differences (P>0.05) between subjects in both groups concerning age (Table 1).

Table (1): Physical characteristics of patients in both groups (A&B)

Items	Group A	Group B	Comparison		S
	Mean ± SD	Mean ± SD	t-value	P-value	
Age (years)	25.26±6.30	29±6.17	-1.638	0.113	NS

*SD: standard deviation, P: probability, S: significance, NS: non-significant.

Pain level and function disability

Regarding within group's comparison, statistical analysis using Wilcoxon Signed Rank tests revealed that there was a significant reduction in pain intensity scale and function disability at post treatment in compare to pre treatment at both groups with ($p < 0.05$). Table (2) present descriptive statistic (median) of all detective variables. While, table (3) represents comparison tests (within and between groups) for the all dependent variables. Considering the effect of the tested group (first independent variable) on pain level and function disability, " Mann-Whitney U test " revealed that there was no significant difference between both groups at pre and post treatment (p>0.05).

Table: 2. Descriptive statistics (median) of the all dependent variables in patients with myofascial back pain at both groups.

Dependent variables	Group A		Group B	
	Pre treatment	Post treatment	Pre treatment	Post treatment
Pain level`	**6**	**4**	**6**	**3**
Function disability	**20**	**11**	**25.5**	**8**

Table: 3. Comparison tests (within and between groups) for the all dependent variables in patients with myofascial back pain.

Within groups (Pre Vs. Post)				
	Group A		Group B	
	Pain level	Function disability	Pain level	Function disability
Z-value	-3.218	-3.241	-3.207	-3.297
p-value	0.001*	0.001*	0.001*	0.001*
Between groups (Group A Vs. Group B)				
	Pre treatment		Post treatment	
	Pain level	Function disability	Pain level	Function disability
U-value	104	76.5	91.5	104.5
Z-value	-0.045	-1.248	-0.599	-0.022
p-value	0.964	0.212	0.549	0.982

***Significant at the alpha level (p < 0.05).**

Discussion

The results of this study revealed that 4 sessions of TrP DN followed by stretching exercise result in similar outcomes as 4 sessions of trigger point release followed by stretching exercise in patients with myofascial back pain syndrome after treatment. Because physical therapists generally use a multimodal treatment approach, it would be interesting to see if TrP DN or trigger point release would add any additional benefit to an approach including mobilization/manipulation and exercise for the management of myofascial back pain. The current study found that 4 sessions of either trigger point release or TrP DN were similarly effective for decreasing pain and improving function in patients with myofascial back pain syndrome. This study showed a significant improvement in pain level and functional disability compared with pre-treatment scores in both groups. This finding is in accordance with other studies showing the effects of DN in patients with myofascial pain syndrome. Edwards hypothesized that DN followed by active stretching is more effective than stretching alone, or no treatment, in the management of myofascial pain and PPT[22] . Ga[23] revealed that DN of TrPs in elderly patients resulted in a slight reduction of pain especially when the DN was combined with paraspinal needling.

In a systematic review focused on DN in athletes. Teasdale[24] investigated four comparisons: 1) DN vs. placebo or no treatment; 2) DN vs. standard care; 3) DN vs. standard acupuncture; and 4) DN vs. wet needling. She concluded that DN in athletes was more beneficial than sham acupuncture or no treatment, and that no safety problems were reported. She also noted no statistically significant benefit with dry needling compared to standard care. However, when comparing dry needling to standard acupuncture, she found a statistically significant benefit to dry needling, and noted that dry needling has been shown to reduce pain, increase quality of life, and increase range of motion beyond that produced with standard acupuncture. She concluded, “For athletes, this treatment has the ability to have a positive impact on pain, performance, and quality of life,” especially if used in conjunction with stretching, exercise therapy, and other non-invasive treatments. Most recently, Rainey[25] described the case of a 30-year female on active military duty who injured her low back while weight lifting. She was diagnosed with a lumbar segmental instability along with right hip stability dysfunction. She was treated for two sessions with DN and IES to the gluteus maximus and medius, as well as the bilateral L3 and L5 multifidus muscles. After two sessions, the patient reported no existing pain or disability on the Numerical Pain Rating Scale or the Oswestry Disability Questionnaire, and a large improvement on the Global Rating of Change.

Investigators have attributed the therapeutic effects of DN to various mechanisms, such as mechanical, neurophysiologic and chemical effects[26]. It is thought that DN provides a mechanical localized stretch to the shortened sarcomers and contracted cytoskeletal structures within the TrP. This would allow the sarcomere to resume its resting length by reducing the degree of overlap between actin and myosin filaments [26,27] . From a neurophysiological perspective DN may stimulate A-delta nerve fibers, which in turn, may activate the enkephalinergic inhibitory dorsal horn interneurons, resulting in opioid mediated pain suppression and pain relief [26]. For the chemical effect of DN, some studies have demonstrated that the increased levels of bradykinin, CGRP, substance P, and other chemicals at TrP are directly corrected by eliciting LTR following DN [28]. DN may influence the microcirculation. Several investigators have demonstrated that needle insertion in the muscles increased both skin and muscle blood flow in the stimulated region[29]. Also, this finding come in agreement with other studies showing the effects of trigger point release in patients with myofascial pain syndrome. Kostopoulos et al.[30]compared efficacy of ischemic compression, passive stretching, and the combination of ischemic compression and passive stretching for the first time and reported that the combination was significantly more effective for pain reliefs than the others. Lake et al.[31] evaluated the efficacy of ischemic compression on 13 patients with 40 myofascial trigger points and reported that ischemic compression was significantly efficient for treatment in comparison with control group, but did not define the optimal level of ischemic compression. Hanten et al.[32] studied the efficacy for the combination of ischemic compression and stretching for patients with MPS on neck and upper back. Patients underwent the combination therapy for 5 days and then the duration of pain sensations in 24 hours, PPT and VAS measured 3 days after the treatment were compared with those measured before treatment. Results revealed that a home program, consisting of ischemic pressure and sustained stretching, was shown to be effective in reducing TP sensitivity and pain intensity in individuals with neck and upper back pain. Hou et al. [33] investigated various combinations of physical therapeutic modalities for active upper trapezius trigger points and found IC with quantified pressure and duration provided immediate pain relief and reduction of trigger point sensitivity. The improvement in group A could be attributed to the following mechanisms: The shortened sarcomeres are the main cause of myofascial trigger points formation and the local ischemia at site of trigger points. Thus, by the use of the ischemic compression and stretching, the shortened sarcomeres will flatten and be lengthened. This local stretch reduces actin and myosin overlap, and also causes flush of blood at site of compression once the pressure is removed from the trigger point. This improves the local circulation and thus reduces release of noxious painful substances, all of this tends to inhibit the trigger points activity and decrease the sensitivity of myofascial trigger points[34,9]. The deactivation of trigger points and reduction of muscle spasm by removing myofacial restrictions can restore normal activation and function of muscles, hence improve functional disability [35,36], Stretching and exercises of the trunk muscles following myofascial therapy induce muscular relaxation and pain relief[37], This explanation come in agreement with Simons (2004)[38] when he proposed an integrated hypothesis of the aetiology of MTrPs, where acute or chronic muscle overload results in trauma to the motor endplate and subsequent release of acetylcholine. Excessive amounts of acetylcholine result in the formation of contraction knots (areas of localized sarcomere shortening), which are in a state of continued contraction and result in local ischaemia and hypoxia. The combination of increased energy demand in the face of loss of energy supply causes the release of sensitizing noxious substances, which are proposed to be responsible for the pain associated with MTrPs, so treatment of TrPs should be focused on equalizing the length of sarcomeres in the involved MTrP and improving circulation in the affected area.

There are limitations in the current study that should be considered. We only collected data after 2 weeks without short-term or long-term follow-up after the treatment. We used TrP DN and trigger point release in isolation, which does not reflect actual clinical practice, where physical therapists usually take a multimodal approach. There was not a control group in the current study. Further, we also did not assess changes in other potential variables related to back pain, such as depression, anxiety, mood, or sleep disorders. Finally, our treatment interventions were only applied over 4 sessions for practical reasons and based on the authors' clinical experience. We do not know if a greater number of sessions would have revealed greater changes in outcomes or differences between the interventions. Future studies should continue to examine the effectiveness of TrP DN and trigger point release alone and in conjunction with other used physical therapy interventions for the management of myofascial back pain. We also suggest that it would be useful for future trials to include a control or placebo group and collect data at a long-term follow-up period and at last The management of MTrPs is not restricted to MTrP inactivation, but it requires correction of perpetuating factors that lead to the activation of TrPs. As summary, the results of the current study showed a significant improvement in functional disability and a significant decrease in pain intensity within each group. No differences were found between the improvement in both groups. Trigger point release and TrP DN were equally effective in reducing pain level and improvement of functional disability in treatment of patients with myofascial back pain.

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