

DRY NEEDLING VERSUS INTEGRATED NEUROMUSCULAR INHIBITION TECHNIQUE ON UPPER TRAPEZIUS MYOFASCIAL TRIGGER POINTS

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ABSTRACT

Background: Active myofascial trigger points (MTrPs) are major pain generators in myofascial pain syndrome and have a significant impact on the quality of life, pain and functional disability in the neck. dry needling and integrated neuromuscular inhibition technique are two effective technique used in the treatment of active MTrPs. **Objective:** to compare between the effect of dry needling and integrated neuromuscular inhibition technique on upper trapezius active MTrPs . **Subjects and Methods:** Thirty patients participated in the study and were assigned randomly into two equal groups; group (A) received dry needling and passive stretching exercise while group (B) received integrated neuromuscular inhibition technique and passive stretching exercise .Measurement outcome included pressure pain threshold (PPT) which measured by digital electronic pressure algometer and neck functiona was measured by neck function disability index (NDI) and pain intensity was measured by visual analogue scale (VAS) that were taken at the beginning of the treatment period as pre- test measurement and at the end of the treatment period (3weeks) as a post-test measurement. **Results:** Both groups showed significant improvement in PPT, NDI and VAS post treatment compared with that pre treatment ($P < 0.001$); however there was significant increase in PPT and significant decrease in NDI and VAS of group A compared with that of group B post treatment ($p < 0.001$). **Conclusion:** According to the findings of the study dry needling was more effective than integrated neuromuscular inhibition technique on the management of upper trapezius active myofascial trigger points. **Key Words:** Active myofascial trigger point, dry needling, integrated neuromuscular inhibition technique, pressure pain threshold and neck function disability

INTRODUCTION

Myofascial pain syndrome (MPS) is the most common complain between subjects. It is a musculoskeletal pain condition characterized by local referred pain perceived as deep aching pain and by the presence of myofascial trigger points (MTrPs) in any part of the body (**Simons, 2004**).

Myofascial trigger points (TrPs) develop as a result of injury, overuse, sustained contractions, eccentric and maximal concentric contractions of muscles, which result in shortening of muscles and local ischemia. Any factor that puts over load on a muscles such as prolonged posture , poor ergonomics , occupational demands, sports or recreational activities can form a muscle trigger points because muscle used goes beyond the boundary of muscle capacity and limits the normal recovery (**Bron and Dommerholt, 2012**)

Dry needling (DN) is one of physical therapy treatment for MTrPs which is safe and settled by several studies (**Liamas et al., 2014**). The effect of DN on MTrPs of the upper trapezius muscle have demonstrated reduced pain intensity and pain pressure threshold (PPT). It can disrupt the neuromuscular activity dysfunctional in the muscles, decrease muscle tone and normalize the neurochemical pathways of muscles, increased local blood flow, restored range of motion at the neck, and improved quality of life (**Liu et al.,2015 and Vulfsons et al., 2012**)

Integrated neuromuscular inhibition technique(INIT) is a manual therapy technique consisted of muscle energy techniques (MET), ischemic compression (IC) and strain-counterstrain (SCS)(**Nagrале et al., 2010**). It was settled and found to be effective in treatment of MTrPs and more beneficial in relieving pain , reducing stiffness, and improving functional ability (**Jyothirmai et al., 2015, Nagrale et al., 2010 and Sibby et al., 2009**).

Santos et al., (2014) compares between dry needling and ischemic pressure with passive stretch in the treatment of trigger points of upper trapezius. The study found that both treatments relief pain and improve patient's activity but patients treated with dry needling with passive stretching showed the best results .So, this study is going to find if adding muscle energy technique and strain-counter strain and myofascial release to ischemic compression (integrated neuro muscular inhibition technique) would be more effective than dry needling in treatment of trigger points of upper trapezius or using dry needling will still show the superiority in the results? Aim of study: The study was conducted to answer the following research question: Which is significantly more effective dry needling or integrated neuromuscular inhibition technique in treatment of active MTrPs of upper trapezius muscle.?

MATERIAL AND METHODS:

This study was conducted in the out patients clinic of the faculty of physical therapy, Cairo University. The study was approved by research ethical committee of faculty of physical therapy (NO:P.T.REC/012/002474) and The patients were assigned randomly into two groups by using block randomization according to a computer generated randomization list and kept in numbered envelopes for allocation concealment

Subjects:

Thirty subjects from both genders with active myofascial trigger points in upper trapezius muscle were participate in the study .Their age were ranged from 18-35 years old (**Tali et al., 2014**) The patients were assigned randomly into two groups:

1-Experimental group (A): 15 subjects were received Dry needling and passive stretching exercise on the upper trapezius muscle; two times per week;for 3 weeks.

2-Experimental group (B): 15 subjects were received integrated neuromuscular inhibition technique and passive stretching exercise on the upper trapezius muscle; two times per week;for 3 weeks

Inclusion criterion

- All patients had active trigger myofascial trigger points (MTrPs) in upper trapezius muscle in the dominant side.
- The patients age ranged from 18-35years
- The patients had been chosen from both sexes .
- patient agrees not to receive additional treatment for their painful condition during the trial (apart from NSAIDs and pain killers
- The patients body mass index < 30 kg/m²

Exclusion criteria:

- History of whiplash injury
- History of cervical spine surgery
- Cervical radiculopathy or myelopathy
- Having undergone physical therapy within the past 3 months before the study.
- Non –rheumatologic diseases as multiple sclerosis ,thyroid dysfunction and chronic infection.
- Rheumatologic condition as mild systemic lupus erythematosus , poly articular osteoarthritis ,rheumatoid arthritis and advanced cervical spine degenerative diseases.
- **Procedures:**

Evaluation procedures

Patients were assessed before and after the treatment program . The assessment procedures included the following items :

- **Pressure pain threshold (PPT):**

Digital Electronic pressure Algometer ;“force one gauge- model FDI” was used to measure active Myofascial trigger point (MTrPs) tenderness by determining the pressure pain threshold (PPT) using a pressure transducer probe, that was placed on the Myofascial trigger point (Fischer, 1996).

- **Functional Disability Index:**

- Functional disability of each patient was assessed by Disability Index (NDI) . It is valid and reliable tool (It is consists of 10 multiple choice questions for neck pain , where the patient select one sentence out of six that best describe their function , higher score 5 indicate great loss of function and lower score 0 indicate no disability.(Macdermid et al., 2009).
- **Visual analogue scale:** was used to assess the intensity of pain (Jensen et al., 1999). The VAS is a 10 cm line anchored with a (0) a tone representing (no pain) and (10) at the other end representing (the worst pain imaginable) it has been shown to be reliable and valid for assessing pain intensity (Bijur et al., 2001)

Procedure:

Dry needling for upper trapezius trigger points : it was applied to group (A)

Patient was placed in a comfortable prone position and encouraged to maintain complete relaxation. The selected active MTrPs was prepared by wiping the area with alcohol pad, and a gauge needle with its plastic guide tube in place was palced over the active MTrPs .a tapping motion was used to advance the needle to a depth of 5 to 10 mm for 30 seconds (Baldry, 1995).

INIT for upper trapezius trigger point: it was applied to group(B)

The patients were in supine to reduce tension in the upper trapezius muscle .The arm in affected side was positioned in slight shoulder abduction withe elbow bent and their hand resting on their stomach . Using a pincer grasp , the physiotherapist moved throughout the fibres of the upper trapezius and maked note of any active TrP .once TrP was identified treatment begins . The first technique applied was ischemic compression . The therapist again utilized a pincer grasp , placing the thumb and index finger over the active TrP. Slowly , increasing levels of pressure was applied to the trigger point, but not sustained Rather an on - and-off pressure application was suggested , 5 seconds of pressure , 2-3 seconds release , following by a further 5 seconds of pressure , and so on , repeated until a perceptible change was palpated

Ischemic compression was followed by the application of positional release technique. The position of release was often produced through positioning the muscle in a shortened / relaxed position . Ease

was defined as the point where reduction in pain of a least 70% was produced . The patient had been in supine lying with the head side bent towards the involved side while the therapist positioned the ipsilateral arm in flexion , abduction and external rotation to reduce the reported TrP pain . Once the position of ease was identified .it was held for 20-30 sec and repeated for three to five repetitions Lastly, the subjects receive Muscle energy technique directed towards the involved upper trapezius . Each isometric contraction for shoulder elevation (autogenic inhibition) was held for 7-10 sec. Then isometric contraction for shoulder depression (reciprocal inhibition) then followed by further contralateral side bending , flexion , and ipsilateral rotation to maintain the soft tissue stretch. Each stretch was held for 30 sec and was repeated three to five times per treatment session and was repeated three to five times per treatment session (**Chaitow, 2003**)

Passive stretch exercise : was received to group (A)and (B)

The patient was placed in a comfortable and relaxed sitting position with his back supported ; one hand was placed on the side of the head applying the stretching force, while the other hand was placed on the patients shoulder applying shoulder stabilization . The direction of stretched force was in flexion , side bending to the opposite side and rotation to the same side . The stretched position was sustained for 30 seconds , then a relaxation period of 30 seconds . This procedure was repeated 3 times .

DATA ANALYSIS

Sample size:

Sample size calculation was performed prior to the study based on data of pilot study using PPT as the primary outcome using G*POWER statistical software (version 3.1.9.2; Franz Faul, Universitat Kiel, Germany) [F tests- MANOVA: Repeated measures, within-between interaction, $\alpha=0.05$, power = 80%, effect size= 0.27] and revealed that the appropriate sample size for this study was N=30.

Subject characteristics were compared between groups using unpaired t-test. Chi- squared test was used for comparison of sex and affected side distribution between groups. Normal distribution of data was checked using the Shapiro-Wilk test for all variables. Levene's test for homogeneity of variances was conducted to test the homogeneity between groups. Mixed MANOVA was performed to compare the effects of treatment on PPT and NDI between the group A and B as between group comparison and between pre and post treatment in each group as within group comparison. Post-hoc tests using the Bonferroni correction were carried out for subsequent multiple comparison. VAS was compared between groups by Mann-Whitney U test and between pre and post treatment in each group by Wilcoxon Signed Ranks The level of

significance for all statistical tests was set at $p < 0.05$. All statistical analysis was conducted through the statistical package for social studies (SPSS) version 25 for windows (IBM SPSS, Chicago, IL, USA).

RESULT

- Subject characteristics:

Table 1 showed the subject characteristics of both groups. There was no significant difference between both groups in the mean age, weight, height and BMI. ($p < 0.05$). Also there was no significant difference in sex and affected side distribution between groups ($p < 0.05$).

Table 1. Comparison of subject characteristics between group A and B.

	Group A		Group B		p- value
	$\bar{x} \pm SD$		$\bar{x} \pm SD$		
Age (years)	25.33 \pm 2.7		26.73 \pm 3.76		0.25
Weight (kg)	67.53 \pm 10.17		64.87 \pm 8.14		0.43
Height (cm)	165.06 \pm 9.51		163.8 \pm 6.4		0.67
BMI (kg/m ²)	24.76 \pm 2.97		24.2 \pm 2.95		0.61
Males/females	5/10		12/3		0.4
Right/left affected side	9/6		10/5		0.7

\bar{x} , Mean; SD, Standard deviation; p value, Probability value

Effect of treatment on PPT, NDI and VAS:

Mixed MANOVA for PPT and NDI revealed that there was a significant interaction of treatment and time ($F = 19.11$, $p = 0.001$). There was a significant main effect of time ($F = 441.04$, $p = 0.001$). There was a significant main effect of treatment ($F = 4.53$, $p = 0.02$).

Within group comparison

Both groups showed significant increase in PPT post treatment compared with that pre treatment ($p < 0.001$). There was a significant decrease in NDI and VAS in both groups post treatment compared with that pre treatment ($p < 0.001$). (table 2).

Between group comparison

There was no significant difference between group A and B in all variables pre-treatment ($p > 0.05$). There was a significant increase in PPT of group A compared with that of group B post treatment ($p > 0.001$); also, there was a significant decrease in NDI and VAS of group A compared with that of group B post treatment ($p > 0.001$). (table 2).

Table 2. Mean PPT and NDI pre and post treatment in group A and B.

	Pre treatment			Post treatment			Pre vs post (group A)	Pre vs post (group B)
	Group A	Group B	P value	Group A	Group B	p value		
	$\bar{x} \pm SD$	$\bar{x} \pm SD$		$\bar{x} \pm SD$	$\bar{x} \pm SD$	p value		
PPT (kg/cm ²)	1.55 \pm 0.42	1.58 \pm 0.43	0.86	3.68 \pm 0.47	2.84 \pm 0.35	0.001	0.001	0.001
NDI (%)	16.26 \pm 4.83	15.13 \pm 3.73	0.47	2.4 \pm 0.98	4.26 \pm 0.96	0.001	0.001	0.001

\bar{x} , mean; SD, standard deviation; p-value, level of significance

Table 3. Median values of VAS pre and post treatment of group A and B:

VAS	Group A	Group B	U- value	p-value
	Median	Median		
Pre treatment	7 (8-6)	8 (9-7)	82.2	0.2
Post treatment	1 (1-1)	2 (2-1)	38	0.001
Z- value	-3.44	-3.45		
	<i>p = 0.0001</i>	<i>p = 0.0001</i>		

IQR, Interquartile range; U- value, Mann-Whitney test value; Z- value, Wilcoxon signed ranks test value; p-value, level of significance

DISCUSSION

This study was conducted to compare between the effect of both dry needling and integrated neuromuscular inhibition technique on active myofascial trigger points of upper trapezius muscle. An underlying premise of this study was that both these technique would be effective in improving pain pressure threshold, neck disability index and visual analogue scale . According to the data analysis of the current study, there were a significant improvement of PPT, NDI and VAS of dry needling group. Also, neuromuscular inhibition technique group showed significant increase of PPT and significant decrease in NDI and VAS. The percent of improvement in PPT of group A was 137% while that of group B was 80%. The percent of decrease in NDI of group A was 85% while that of group B was 70%. In comparison between groups post treatment revealed significant increase in PPT and significant decrease in NDI and VAS of group (A) compared with that of group(B).

The effect of DN on sensory component was significant decrease in pain intensity and increase in PPT. Many studies and recent systematic reviews on the management of MTrPs showed that DN was effective in relieving pain and improving PPT (Kietrys et al., 2014; Tekin et al., 2013; Tough et al., 2009, Edwards and Knowles, 2003 and Cummings and White, 2001) It is possible that rapidly moving a needle into a MTrP might stimulate the large diameter-sensory afferent fibers, which could lead to an inhibition in the dorsal horn of spinal cord by blocking the pain information generated in the MTrP's nociceptors through a "gate control" mechanism (Cagnie et al., 2013). Inserting a needle into the MTrP and stimulating it by rotation is thought to decrease pain due to the rapid depolarization of the involved muscle fibers which manifests as local twitches. After the muscle has finished twitching, the spontaneous electrical activity subsides and the pain and dysfunction decrease dramatically.

The effect of DN on motor component Similar to previous reports that dry needling 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 (Dommerholt, 2004). For the

chemical effect of DN, some studies have demonstrated that the increased levels of bradykinin, substance P, and other chemicals at TrP are directly corrected by eliciting local twitch response following DN (**Shah, 2008**). And also may influence the circulation. Several investigators demonstrated that needle insertion in the muscles increased both skin and muscle blood flow in the stimulated region (**Cagnie et al., 2012**).

The effect of DN on autonomic component was the therapeutic effects of needling can act through the sympathetic system regulation following needle insertion. Inhibition or blockade of the sympathetic nervous system might be explanatory mechanism for the reduction of sympathetic response following DN. Sympathetic system regulation is a polysynaptic reflex with spinal and supraspinal control (**Vetrugno et al., 2003**). Different parts of brain cortex, thalamus, hypothalamus, limbic system have been shown to be involved in facilitation or inhibition of pain and the autonomic system (**Sakai et al., 2007**).

Another explanation may include DN is more local and specific because of the smaller contact point and possibility of accessing deeper muscles and provoking LTRs more easily compared with progressive pressure technique (**Kayleigh et al., 2017**).

Furthermore, our results were supported with the study investigated the effect of DN on pain intensity and PPT in patients with myofascial pain in the upper trapezius muscle. They observed similar improvements in pain intensity and PPT in patients with myofascial pain in the upper trapezius muscle. They observed similar improvements in pain intensity and PPT after 1 session of DN compared with 10 physiotherapy sessions.

In contrast to our results (**De Meulemeester et al., 2017**) who investigated short term and long term treatment effect of dry needling and myofascial pain release in treating myofascial neck and shoulder pain in women. They found that both treatment techniques lead to short term and long term effects, but dry needling was found to be no more effective than Myofascial pain release in treatment of myofascial neck-shoulder pain.

Regarding the effect of integrated neuro muscular inhibition technique directly deal with muscle trigger point that aids in its deactivation (**Chaitow, 1996**). Ischemic compression aims to slow down blood supply then produce reactive hyperemia that aids in relieve pain and muscle tension (muscle spasm) by decreasing the sensitivity of painful nodules and normalizing length of sarcomeres in the affected TrP (**Nagrале et al., 2010**). Strain counter strain improve tissue relaxation created by maintaining a position release of TrP by mechanism of facilitating unopposed arterial filling that decrease muscle tone which aids in modification of neural reporting, improvement of local circulation and decreasing of pain (**Nagrале et al., 2010**). MET' inhibit muscle tone by isometric contraction to the involved muscle producing post-isometric relaxation through stimulation of

Golgi tendon organs (autogenic inhibition) and to the antagonistic muscle group producing reciprocal inhibition in affected agonistic muscle (**Nagrle et al., 2010**).

Our findings were in agreement with the study (**Nagrle et al., 2010**) that INIT was directed toward deactivation of TrP and inhibition of muscle tone before stretching affected upper trapezius that aim. To equalize shortened sarcomere so increase ROM .NDI is sensitive to change and correlates significantly with VAS (**Vernon and Mior, 1991**).

Other study proved that INIT along with specific strength training is proved to be more effective than INIT alone in reducing pain, decreasing disability and improving range of motion in individuals with upper trapezius trigger points (**Jyothirmai et al., 2015**).

CONCLUSIONS

According to our findings dry needling was more effective than integrated neuromuscular inhibition technique in improving patients with active myofascial trigger points on upper trapezius.

Recommendations

- 1- Replicate this study with greater sample size.
- 2- Replicate this study with greater number of sessions.
- 3- Follow up to know long lasting effect of dry needling and integrated neuromuscular inhibition technique and recurrence of symptoms
- 4- Including less physically active , older or more progressive patients
- 5- Further study to be conducted to investigation the effect of dry needling and integrated neuromuscular inhibition technique on EMG activity

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مقارنه بين تاثير الابر الجافه و تقنيه التثبيط العصبى العضلى المتكامل على

الجزء العلوى من العضله الشبه منحرفه فى حالات

متلازمه الالم الليفى العضلى

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**مدرس العلاج الطبيعى بقسم العلوم الاساسيه.جامعه القاهره

***استاذ دكتور العلاج الطبيعى بقسم العلوم الاساسيه .جامعه القاهره

خلفيه: يعتبر متلازمه الالم الليفى العضلى واحد من اكثر مسببات الالام الذى يتعرض له المريض حيث انه يؤثر على اعماله اليوميه ويتسبب فى الاحساس باللام الرقبه على مدار اليوم **الهدف:** مقارنه بين تاثير الابر الجافه و تقنيه التثبيط العصبى العضلى المتكامل على الجزء العلوى من العضله الشبه منحرفه فى حالات متلازمه الالم الليفى العضلى **النتائج:** تحسن ف النتائج لكل من المجموعتين فى تحمل الالم و فى شده الالم و كفاءه الرقبه ولكن يوجد زياده فى تحمل الالم ونقص فى شده الالم ف المجموعه الاولى (ا) مقارنه بالمجموعه الثانيه (ب) **الخلاصه:** الابر الجافه تاثيرها اعلى من تقنيه التثبيط العصبى العضلى المتكامل على الجزء العلوى من العضله الشبه منحرفه فى حالات متلازمه الالم الليفى العضلى.

الكلمات الداله: الابر الجافه -تقنيه التثبيط العصبى العضلى المتكامل- متلازمه الالم الليفى العضلى