Year: 2014; Volume: 1; Issue: 1
Article ID: MD14 27; Pages: 1-7

International Journal of Medicine & Health Research

Research Article

Efficacy of intramuscular electrical stimulation with dry needle over classical trigger point dry needling in non-traumatic shoulder pain and dysfunction–a randomized controlled pilot study

Sukumar S[1*] and Lawrence J. Mathias[2]
[1]Nitte Institute of Physiotherapy, Mangalore
[2] Dept of Orthopedics, K.S. Hedge Medical Academy, Deralakatte, Mangalore

Correspondence should be addressed to G Sukumar S

Received 1 October 2014; Accepted 23 October 2014; Published 14 November 2014

Abstract

Background: Myofascial Pain Syndrome (MPS) is a common condition in most of the painful shoulder conditions and it is effectively treated with trigger point dry needling of shoulder muscles. Very few studies on Intra muscular electrical stimulation were documented the effects of IMES with dry needle in treating MPS. This study was conducted to establish the clinical importance of IMES with dry needle in Myofascial pain syndrome of non traumatic shoulder disorders. **Methods:** 30 subjects with unilateral non-traumatic shoulder pain and dysfunction were selected and divided into two groups, 15 subjects in each group. Experimental group (7 male and 8 female subjects) treated with IMES with dry needle and control group (7 male and 8 female subjects) treated with classical trigger point dry needling twice in a week for consecutive 3 weeks. Pain, range of motion, and shoulder disability were assessed with VAS, Goniometry, and DASH-Questionnaire respectively at the end of 1st, 2nd, 3rd week, and end of 3rd month. **Results:** Descriptive characteristics of pre and post intervention VAS and DASH-Q, score and shoulder range of movements suggesting improvement in intramuscular electrical stimulation with dry needle. Within group comparison of VAS score and DASH-Q score in both groups in all observations shown the p value=.001 and between group comparison VAS score shown the mean 5.70 ± 1.02 standard deviation in the 1st week post intervention and DASH-Q score shown the mean 49.66 ± 9.69 standard deviation in the 1st week, mean 61.76 ± 7.30 standard deviation in the 2nd week intervention. Shoulder range of motion within group comparison was shown the p=.000 in both groups and between group comparison of shoulder abduction was shown the mean difference of 13.7 (p=.033) and 20.4 (p=.028) in the 1st and 2nd week and for shoulder external rotation shown the mean difference of 8.40 (p value= .01), and 9.60 (p=.01) in the 1st and 2nd week post intervention. **Conclusion:** This pilot study result suggests that both IMES with dry needle and classical trigger point dry needling are effective in treating pain and dysfunction. And subjects treated with IMES with dry Needle more effective in producing early recovery from pain and dysfunction of shoulder compared to the Classical Trigger Point Dry Needling in myofascial pain syndrome due to Non-Traumatic Shoulder pain and dysfunction.

Key words: dry needling, intra muscular electrical stimulation, shoulder pain and dysfunction, adhesive capsulitis, myofascial trigger points, dry needling physiotherapy.

Introduction

Myofascial Pain Syndrome (MPS) is described as the sensory, motor, and autonomic symptoms caused by Myofascial trigger points (TrPs). TrPs are defined as tender spots in discrete taut bands of hardened muscle that produce local and referred pain, among other symptoms[1]. Based on the clinical manifestation Myofascial trigger points can be can be active or latent and may cause dysfunction, but only active MTrPs produce spontaneous referred pain. It prevents full lengthening of the muscle, weakens the muscle, and mediates a local twitch response of muscle fibers when adequately stimulated. When compressed within the patient's pain tolerance, it produces referred motor and often autonomic phenomena, generally in its pain reference zone [2]. A latent TrP is "clinically quiescent with respect to spontaneous pain; it is painful only when palpated. A latent TrP may have all the other clinical characteristics of an active TrP and always has a taut band that increases muscle tension and restricts range of motion [3]. MTrPs in shoulder girdle muscles is a common cause for the Myofascial pain syndrome in shoulder. And MTrPs most frequently located in the infraspinatus and upper trapezius muscles, in agreement with results from Skootsky [4] and Simons [5], who found that infraspinatus muscles were frequently associated with Myofascial trigger points. At present days Myofascial trigger points are effectively treated by trigger point dry needling by Physical therapists and other healthcare providers in many countries. Dry needling is a minimally invasive treatment technique mainly used for deactivation of trigger points and causes immediate relief from pain and other clinical manifestations. The advantages of dry needling are increasingly documented and it is helpful in immediate reduction of local, referred, and widespread pain,[6,7,8,9,10] restoration of range of motion and muscle activation patterns[4,7,11]. Deep Dry Needling has been shown to inactivate TrPs by eliciting local twitch responses [10,12] which are modulated by the central nervous system[13,14]. A Local Twitch Response is a spinal cord reflex that is characterized by an involuntary contraction of the contractured taut band [14] which can be elicited by a snapping palpation or penetration with a needle [15]. Intramuscular electrical stimulation with dry needle on Myofascial trigger points may have positive effects on Myofascial Pain Syndrome by increasing the microcirculation in the respective muscle [16]. So, this study was conducted to demonstrate the effects of intramuscular electrical stimulation with dry needle in decreasing clinical manifestations of Myofascial trigger points in shoulder musculatures.

Materials and methods

After ethical approval from the scientific research committee of Nitte University, Mangalore, there are 30 subjects diagnosed as unilateral shoulder pain and dysfunction with signs and symptoms of Myofascial trigger points in shoulder muscles were selected during the period between February 2014 and June 2014 from the Department of physiotherapy, Justice K.S. Hedge Charitable Hospital, Mangalore, India. After fulfilling the inclusion and exclusion criteria, all 30 subjects were given consent form for their willingness to participate in the study and they were randomly divided into two groups, 15 subjects in each group. Subjects in experimental group (7 male and 8 female) were treated with intramuscular electrical stimulation with dry needle and subjects in control group (7 male and 8 female) were treated with classical trigger point dry needling. Subjects in the both groups were treated weekly two days for three consecutive weeks. Pre intervention assessment for pain, disability, and shoulder range of motion were taken on day one and post intervention assessment

were taken at end of 1st, 2nd, 3rd week and One follow-up assessment was taken at the 3rd month.

Procedure of Intra Muscular Electrical Stimulation: Subjects in the experimental group initially examined for the Myofascial trigger points using pincer or snapping palpation in the muscles of shoulder joints. Active trigger points were identified based on its clinical characteristics and solid acupuncture needle were inserted into the skin and placed adjacent to trigger points in the different muscles of shoulder. Needles are connected with low frequency multi- channel electrical stimulator with current source of 6 Volt. The stimulation frequency ranges from 5-100 Hz was used with tolerable intensity. The patients were positioned in supine and/or prone lying and stimulation was carried out for 10 - 15 minutes with the tolerable intensity. Minimum 2 and maximum 3 muscles were treated to avoid excessive muscle soreness. Common muscles treated with intramuscular electrical stimulation are upper trapezius, deltoid (anterior, middle, posterior), infraspinatus, pectorallis, and supraspinatus muscles. Post needling examination was done to check adverse effects of needling but, we did not find bleeding and severe pain in all subjects. Intramuscular electrical Stimulation with dry needle was given twice in week for three consecutive weeks.

Classical Trigger Point Dry Needling: Myofascial Trigger Points in shoulder muscles were identified using Pincer/ snapping palpation and the skin surface over Myofascial trigger point's area was cleaned by warm water. Sterilized solid thin solid acupuncture needle was inserted through the appropriate points with precaution and the needle was approached towards the MTrPs of respective muscles. MTrPs were manipulated with needle 2 to 3 times to elicit local twitch response from trigger points without removing needle completely out of the skin. And the dry needle were kept remain intact in the muscles till the complete relaxation of the triggers points. Maximum 2 to 3 shoulder muscles were treated in single sitting. Remaining muscles were treated in the 2nd sitting at gap of 48-72 hours to allow the muscle soreness to subside and. In the second and third week dry needling procedure were performed to deactivate the existing MTrPs in different muscles of shoulder joint. Subjects in this group were treated with classical trigger point dry needling twice in week. The post intervention assessment was taken at the end of each week for three consecutive weeks. All the outcome measures were taken again after the three months of post intervention.

Data Analysis:

The data are expressed as the mean and standard deviation for the shoulder range of motion. Median and Interquartiles was used to describe the visual analog scale score and Disability of Arm Shoulder Hand - Questionnaire score. Wilcoxon Sign Rank Test and Mann-Whitney U- test were used for within group and between group comparison respectively for VAS score and DASH questionnaire score. Paired't' test was used for within group comparison of shoulder range of movement and independent't' test was used for between group comparisons for shoulder range of motion.

Results

A clinical characteristic of subjects in both the groups are shown in the table 1. The mean age in group 1 was 46.73 ± 7.45, and 51.6 ± 8.11 in the group 2. There are 7 male and 8 female subjects in each group was participated, among 30 subjects 20 subjects were diagnosed Myofascial pain syndrome in the right side, and 10 were Diagnosed MPS in left side shoulder. Post intervention VAS Score and DASH-Q score in group 1 and 2 suggesting both interventions are very effective in all three weeks and follow up it was compared with pre intervention score.

Descriptive characteristic of all movements of shoulder joints was described in mean ± standard deviation, and mean difference. The mean of post

intervention goniometric measurements were higher than pre intervention range of motion for both the groups and this is indicating the effectiveness of both the interventions in improving shoulder joint range of motion. (Table 2)

The mean difference of VAS score and DASH-Q score between the group 1 and group 2 in the 1st, 2nd, 3rd post intervention and 3rd month follow up showing the Mann-Whitney U values respectively (table 3). Intramuscular electrical stimulation with dry needle is more effective than classical trigger point dry needling in the 1st week of intervention on reducing pain (p=.001), and in reducing shoulder disability (p=.000) and the 2nd week as well (p=.016). But in the 3rd week post intervention and 3rd month follow up assessment did not show any statistical significance for pain score in between group comparison. (Table 3)

Intramuscular electrical stimulation with dry needle was effective in improving shoulder abduction (p=.033 in 1st week and in 2nd p=.028) and external rotation (p=.01 in 1st week, and p=.01 in 3rd month follow up) movements within the short period than classical trigger point dry needling. But there was no statistical significance for other shoulder movements throughout the intervention period. Statistical results of within group comparisons were shown that both intramuscular electrical stimulation and classical trigger point dry needling were effective (p= .000) in treating Myofascial pain syndrome in unilateral non-traumatic shoulder pain and dysfunction.

Table 1: characteristics of subjects treated with intramuscular electrical stimulation with dry needle (group 1) and classical trigger point dry needling (group 2).

variable	Intramuscular electrical stimulation with dry needle	Classical trigger point dry needling
Age(Years)	46.73 ± 7.45	51.6 ± 8.11
Gender Male Female	 7(46.7%) 8(53.3%)	 7(46.7%) 8(53.3%)
Side affected Right Left	 11(73.3%) 4(26.7%)	 9(60%) 6(40%)
VAS-PRE	8.76±1.09	8.20±.86
VAS score-1ST WEEK	1.93±.45	3.13±.63
VAS score-2ND WEEK	.00±.00	.40±.50
VAS score-3RD WEEK	.06±.25	.26±.45
VAS score FOLLOW-UP-3RD Month	.00±.00	.33±.61

DASH-Q. score-PRE	69.66±5.60	72.86±5.84
DASH-Q.-1ST WEEK	14.53±4.86	29.66±6.67
DASH-Q-2ND WEEK	4.86±3.67	14.33±4.93
DASH-Q-3RD WEEK	1.20±1.26	3.06±3.76
DASH-Q- FOLLOW-UP-3RD MONTH	.53±1.59	3.66±3.92

Table 2: Descriptive statistics of shoulder range of movement of subjects treated with intramuscular electrical stimulation with dry needle (group 1) and classical trigger point dry needling (group 2).

n=30	Intramuscular electrical stimulation with dry needle (N = 15)					Classical trigger point dry needling (N = 15)				
variable	Flex.	Ext.	Abd.	Ext.Rt.	Int.Rt.	Flex.	Ext.	Abd.	Ext.Rt.	Int.Rt.
ROM-Pre	65.33 ± 19.95	38.33 ± 6.45	69.26 ±27.28	36.13 ±12.07	45.46± 11.4	71.00 ±26.67	39.66 ±5.27	69.33 ±25.02	38.73 ±9.05	43.40 ±10.3
ROM 1st wk	146.6 ± 20.23	50.00 ± 4.92	131.6 ±24.02	57.06 ± 7.19	61.06 ± 6.55	148.0 ± 11.87	48.06 ± 3.75	48.00 ±22.74	51.26 ± 7.73	57.33 ± 6.51
ROM 2ndwk	159.0 ±12.84	56.60 ±2.26	170.00 ±8.67	75.00 ±7.37	86.06 ±4.63	164.66± 5.16	54.40 ±2.50	149.66 ±13.29	68.00 ±5.60	79.6±20.91
ROM 3rd wk	171.00 ±6.60	58.93 ±1.66	177.06 ±2.49	84.40 ±4.65	89.33 ±1.75	173.30 ±6.45	56.06 ±1.43	167.00 ±4.92	82.66 ±4.15	83.40 ±4.03
Follow - Up	176.00 ±4.80	59.60±0.73	176.48 ±2.79	88.73 ±2.65	90.00 ±.000	173.66 ±6.11	58.40 ±2.29	169.00 ±5.36	79.73 ±4.19	87.46 ±2.23

Table 3: Between group comparison for Visual Analog Scale score and Disability of Arm Shoulder and Hand - Questionnaire score using Mann-Whitney U test.

ASSESMENT	VISUAL ANALOG SCALE SCORE			DASH- QUESTIONNAIRE SCORE		
	MEAN ± S.D.	U-VALUE	SIG.	MEAN ± S.D.	U-VALUE	SIG.
1ST WEEK	5.70 ± 1.02	33.50	.001	49.66 ± 9.69	25.50	.000
2ND WEEK	8.03 ± 1.09	85.00	.267	61.76± 7.30	54.50	.016
3RD WEEK	8.06± 1.04	94.00	.461	69.13± 5.77	88.50	.317
FOLLOWUP	8.06± 1.08	87.00	.305	69.16± 5.94	106.50	.802

S.D- Standard deviation, U- Mann Whitney U Test, Sig.- Significance

Table 4: Inferential statistics of between group comparison of shoulder range of movement in between the experimental (intramuscular electrical stimulation with dry needle) and control group (classical trigger point try needling) using Independent t test:

Shoulder ROM		M.D. in EXP.GP	M.D. in CON.GP	DIFF. in MEAN	Std. Error. Diff.	t-Value	Sig.
Flex.	1st w	81.33	77.66	3.36	10.15	.361	.721
	2nd w	93.66	93.66	.00	8.42	1.00	1.00
	3rd w	105.66	102.33	3.33	9.49	.351	.728
	3rd m	111.00	102.66	8.33	9.51	.876	.388
Ext.	1st w	11.66	8.40	3.26	1.93	1.688	.103
	2nd w	18.26	14.73	5.53	2.31	1.525	.139
	3rd w	20.60	16.40	4.20	2.09	2.001	.055
	3rd m	21.26	18.73	2.53	2.14	1.184	.246
Abd.	1st w	62.40	48.66	13.7	6.11	2.246	.033
	2nd w	100.80	80.33	20.4	8.81	2.321	.028
	3rd w	107.80	97.66	10.1	9.06	1.118	.273
	3rd m	107.20	99.73	7.46	8.86	.842	.467
Ext. rot.	1st w	20.93	12.53	8.40	2.42	3.461	.002
	2nd w	38.86	29.26	9.60	3.47	2.759	.01
	3rd w	48.26	43.93	4.33	3.79	1.141	.264
	3rd m	52.60	41.00	11.6	4.19	2.764	.01
Int. rot.	1st w	15.60	13.93	1.66	2.35	.707	.485
	2nd w	40.60	36.26	4.33	5.98	.727	.475
	3rd w	43.86	40.00	3.86	3.79	1.020	.317
	3rd m	44.53	44.06	.46	3.98	.117	.908

Flex- flexion, Ext- Extension, Abd- Abduction, Int. Rot- Internal Rotation, Ext. Rot- External Rotation, M.D. - Mean Difference, EXP.GP.- Experimental Group, CON.GP- Control Group, ROM- Range of Movement

Discussion

The statistical results of this present study suggesting that classical trigger point dry needling and intramuscular electrical stimulation with dry needle are effective in treating the non-traumatic unilateral shoulder pain and dysfunction with sign and symptoms of Myofascial pain syndrome. Both interventions are equally effective in reducing shoulder pain due to Myofascial trigger points in shoulder muscles. But, intra muscular electrical stimulation with dry needle may be more effective in improving shoulder functions and regaining full range motion[16] and especially shoulder abduction and external rotation range of movements are improved faster with intramuscular electrical stimulation than classical dry needling. There is more statistical significance on functional outcome and shoulder disability for the intramuscular electrical stimulation than classical trigger point dry needling approach. Subjects those who are underwent intra muscular electrical stimulation with dry needle were shown consistent follow up outcomes compared to classical trigger point dry needling.

Conclusion: Intra muscular electrical stimulation with dry needle is more effective and may produce faster pain relief and early functional recovery compared to classical trigger point dry needling in Myofascial pain syndrome due to non-traumatic shoulder disorders.

Acknowledgement:

We extend our thanks to Dr. Dhanesh Kumar, Principal, Nitte Institute of Physiotherapy for his encouragement to complete this study and we are very grateful to Mr. Purusotham Chippala (Assistant Professor) and Mr. Ajay Thakur (Assistant Professor), Nitte Institute of Physiotherapy who read and corrected this manuscript. We would like to convey our gratitude to Dr. Sanal, Assistant Professor, Department of Biostatistics, K.S. Hedge Medical Academy, Mangalore who guided us for statistical analysis for this research pilot study.

References:

1. Simons D. Review of enigmatic MTrPs as a common cause of enigmatic musculoskeletal pain and dysfunction. J Electromyogr Kinesiol.2004; 14:95-107.
2. Kuijpers T, van Tulder MW, van der Heijden GJ, Bouter LM, van der Windt DA. Costs of shoulder pain in primary care consulters: a prospective cohort study in The Netherlands. BMC Musculoskelet Disord. 2006; 7:83.
3. Simons D, Travell JG, Simons LS. Myofascial pain and dysfunction. The trigger point manual. Upper half of body. Baltimore: Lippincott, Williams and Wilkins; 1999
4. Skootsky SA, Jaeger B, Oye RK. Prevalence of Myofascial pain in general internal medicine practice. West J Med. 1989; 151(2):157-160.
5. Simons DG, Travell JG, Simons LS. Myofascial Pain and Dysfunction. The trigger point manual. Upper half of body, second. I. Baltimore, MD: Lippincott, Williams and Wilkins; 1999.
6. Gerwin R. Myofascial Pain Syndrome: Here we are, where must we go? J Musculoskeletal pain. 2010; 18(4):18.
7. Affaitati G, Costantini R, Fabrizio A, Lapenna D, Tafuri E, Giamberardino MA. Effects of treatment of peripheral pain generators in fibromyalgia patients. Eur J Pain 2011; 15:61-64.
8. Fernandez-Carnero J, La Touche R, Ortega-Santiago R, Galan-del-Rio F, Pesquera J, Ge HY. Short-term effects of dry needling of active Myofascial trigger points in the masseter muscle in patients with temporomandibular disorders. J Orofac Pain 2010:24:106-12.
9. Hsieh Y L, Kao MJ, Kuan TS, Chen SM, Chen JT, Hong CZ. Dry needling to a key Myofascial trigger point may reduce the irritability of satellite MTrPs. Am J Phys Med Rehabil 2007:86:397-403
10. Lewit K. The needle effect in the relief of Myofascial pain. Pain 1979:6:83-90.
11. Lucas KR, Polus Bl, Rich PS. Latent Myofascial trigger points: their effects on muscle activation and movement efficiency. J Bodyw Mov Ther2004; 8:160-6.
12. Shah JP, Danoff JV, Desai MJ, Parikh S, Nakamura LY, Phillips TM, et al. Biochemicals associated with pain and inflammation are elevated insites near to and remote from active myofascial trigger points. Arch Phys Med Rehabil 2008:89:16-23.
13. Affaitati G, Costantini R, Fabrizio A, Lapenna D, Tafuri E. Giamberardino MA. Effects of treatment of peripheral pain generators in fibromyalgia patients. Eur J Pain. Jan 2011; 15(l):61-69.
14. Majlesi J, Unalan H. Effect of treatment on trigger points. Curr Pain Headache Rep. Oct 2010; 14(5):353-360.
15. Shah J, Phillips T, Danoff JV, Gerber LH. A novel micro analytical technique for assaying soft tissue demonstrates significant quantitative biomechanical differences in 3 clinically distinct groups: normal, latent and active. Arch Phys Med Rehab. 2003; 84.
16 Lee SH, Chen CC, Lee CS, Lin TC, Chan RC. Effects of needle electrical intramuscular stimulation on shoulder and cervical Myofascial pain syndrome and microcirculation J.ChinMedAssoc.2008Apr;71(4):200-6