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"Effect of Iontophoresis And Muscle Energy Technique on Visual Analogue Sacle, Pressure Pian Thershould And Cervical Contral-Lateral Side Flexion Rom In Subjects With Upper Trepezius Trigger Point".

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Abstract: *Myofascial pain is considered one of the most frequent causes of pain.* ***Simons*** *reviewed the literature and indicated that in practice of internal medicine about 30% of patients suffer from myofascial pain. Regardless of the underlying mechanism of trigger point origination, the treatment of MPS is usually directed to the trigger point in the palpable taut band aiming at reducing its sensitivity. Iontophoresis is non invasive, economical, less irritable and comfort to the patient than invasive method. Many authors stated that Lidocaine Iontophoresis is effective in decreasing musculoskeletal pain. It is well documented that direct current is also effective in reducing musculoskeletal pain and MTP, but how for the Lidocaine Iontophoresis is effective with respect to other treatment modalities on Myofascial trigger point is not known. So this study aimed to know the relative efficacy of 4% Lidocaine Iontophoretic treatment in patients having myofascial pain syndrome & to compare it to manual therapy treatment like Muscle energy techniques. 30 patients were selected and divided into two groups (n=15), namely Experiemntal Group (Iontophoresis + MET) & Control Group (only MET). The 2 × 3 ANOVA revealed that there was a main effect for time and group, also the main effect qualified to the interaction of time × group Post Hoc analysis revealed that the Experimental group had a significant improvement in VAS score , PPT and increased Contralateral side flexion ROM as compared to Control Group. So that it can be concluded that Iontophoresis with 4% Lidocaine to upper trepezius had an added effect in reducing Pain and improving PPT & ROM of cervical spine in Myofascial Pain syndrome, then when the condition was treated with MET alone.*

Keywords*: Myofascial Pain syndrome, trigger point, Iontophoresis, Lidocaine.*

I. Introduction:

Myofascial Pain Syndrome – This term has acquired both a general and a specific meaning, which need to be distinguished. [1] The general meaning includes a regional muscle pain syndrome of any soft tissue origin that is associated with muscle tenderness [2] and it is commonly used in this sense by dentists. [3] The other meaning is specifically a Myofascial Pain Syndrome (MPS) caused by Trigger points, this is a focal hyperirritability in muscle that can strongly modulate CNS functions and also giving rise to referred pain. The prevalence of Myofascial Pain Syndrome (MPS) has been increasing dramatically in recent years. Myofascial pain is considered one of the most frequent causes of pain. Simons reviewed the literature and indicated that in practice of internal medicine about 30% of patients suffer from myofascial pain. Alvarez JD, Rockwell GP defined as the; Myofacial pain syndrome are main cause of disability in working age population and are leading cause of disability in other age group. [4, 5] Myofascial pain syndrome due to MTrps is very common in general population and its incidence can be as high as 54% in women and 45% in men, suggestive of its higher prevalence in female population. [6]

Rachlin ES et al. defined its incidence is higher in women than me & most common site for MTP in human body is upper trapezius. [7 – 9] Among the neck muscles, TrPs were identified in 35% of the right splenius capitis muscles and in 33% of the right upper trapezius muscles. The insertion of the right upper trapezius to the clavicle was also tender in 42% of those muscles with TrPs. Enthesopathy of this muscle was common. [10]

Mechanical neck pain individual has been found to develop Trigger point (TrPs) frequently compared to their age matched controls. [11, 12] Recent studies have hypothesized that the pathogenesis results from the overloading and injury of muscle tissue, leading to involuntary shortening of localized fiber. [12, 13] The areas of stressed soft tissue receive less oxygen, glucose, and nutrient delivery, and subsequently accumulate high levels of metabolic waste products. The most credible etiological explanation of muscle TrPs is the so called

Intergrated hypothesis. The end result of this cascade of events is the creation of altered tissue status, pain, and the development of TrPs. [14] Ge et al. have provided recent evidence of sympathetic facilitation of mechanical sensitization and facilitation of the local and referred pain reactions in muscle TrPs. [15]

Regardless of the underlying mechanism of trigger point origination, the treatment of MPS is usually directed to the trigger point in the palpable taut band aiming at reducing its sensitivity. Currently, a large variety of manual interventions exist for the deactivation of TrPs. Manual approaches may include muscle energy techniques (METs), strain–counter strain (SCS), myofascial release, and ischemic compression and also electrotherapeutic modality like electrical muscle stimulation, TENS, LASER, ultrasound has been proven effective for treating MTP. [16, 17] Iontophoresis is a very less used treatment method in treatment of MPS.

Iontophoresis is used as a means of delivering drugs across the skin for the management of variety of medical conditions, most often we believe, for localized inflammation and pain. With this modality, we can administer medication to target tissues up to a depth of 1 cm to 3 cm. [18] Iontophoresis introduces a topically applied, physiologically active ion into the epidermis and mucous membrane of the body using continuous, low voltage, direct current. [19] Lidocaine is applied iontophoretically under the anode. Lidocaine produces dilatation of blood vessels and a rather profound topical anaesthesia of skin, to depths of several millimeters. Because of amount of drug administered in this manner are rather small, the systemic effects of Lidocaine are not seen. [20] Lidocaine local anesthetic has been used frequently used during Iontophoresis. These drugs produce an anesthetic effect by blocking the transmission of impulses along peripheral nerve axons. Lidocaine and similar drug binds to sodium channels in the nerve membrane and prevent sodium from entering the axon. The affected portion of the axon is not able to initiate an action potential, the anesthesia occurs in the tissue innervated by that neuron because afferent impulses cannot reach the CNS. [7, 21]

The aims of the study was

- To know the relative efficacy of 4% Lidocaine Iontophoretic treatment in patients having myofascial pain syndrome.
- To compare it to manual therapy treatment like Muscle energy techniques.

Methods: Experimental Pre Test and Post Test Study Design ; Which includes 30 patient from physiotherapy department of Swami Vivekananda Institute Of Rehabilitation Training And Research Centre (SVNIRTAR), Oltapur, fulfilling the following inclusion and exclusion criteria with mean age 27.36 (S.D -2.69; Ranging from 22-30). Inclusion criteria used which was given by Simons D et al. (A taut palpable band in the affected muscle, Exquisite focal tenderness to digital pressure in the taut band of the muscle, A local twitch response elicited through snapping palpation or needling of the tender spot, Reproduction of typical referred pain pattern of TP in response to compression) and also Clinical presentation of unilateral upper trapezius shortness and the ROM of the side contra lateral to presence of TP should be decreased than ipsilateral side. [22] Exclusion criteria were any contraindication to manual therapy, Diagnosis of fibromyalgia syndrome according to American college of Rheumatology, History of any surgery in cranio-cervical region, History of chronic neck pain, History of whiplash injury.

The subjects assessed and after fulfilled the inclusion criteria, informed consent taken. And randomly assigned into 2 groups. The entire procedure explained to them. Identification of the primary trigger point was done and measurement of baseline (pre intervention) –Pressure pain threshold (PPT), Contra lateral cervical side flexion range of motion (ROM) and pain score on Visual Analog Scale (VAS) were carried out. Syringe algometer used to determine pressure pain threshold of myofascical trigger point. The syringe algometer is easy to construct and performs reliably within a limit of 10% accuracy over the approximate range for clinical use. Calibration of the device can be assumed to be constant as the physical principle on which it relies (compression of air) will vary only slightly with small changes in atmospheric pressure. Direct current stimulator used for iontophoresis treatment to the myofascial trigger point. And measuring tape used to measure the contra lateral cervical side flexion ROM. It consisting of reading from 1 to 150 centimeter with an accuracy of 1mm was used for measuring the range of contra lateral neck side flexion.

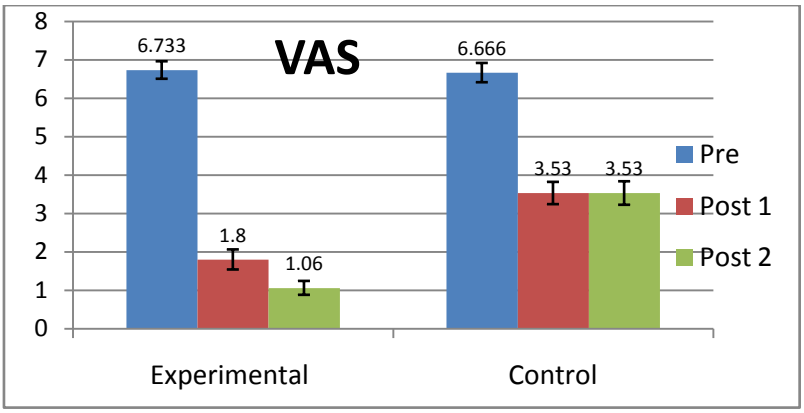
Procedure: Subjects in group A received Iontophoresis and muscle energy technique (MET) in this specifically post isometric relaxation technique used & subjects in group B received only muscle energy technique (MET) i.e. post isometric relaxation technique. Then immediate recording of changes in PPT and pain on VAS measure (post treatment) were taken. Outcome measures (PPT and Pain on VAS) were taken pre – post1 (5th day) & Post 2 (10^{th} day). All the participants received the selected treatment for 5 sessions within period of 1 week. Contra lateral range of motion (ROM) measurement were taken for analysis, prior to beginning of treatment (pre-test) and were repeated after completion of 1^{st} week (5 days) Post 1. Then again after 2^{nd} week (next 5 days) follow up reading has taken which is Post 2.

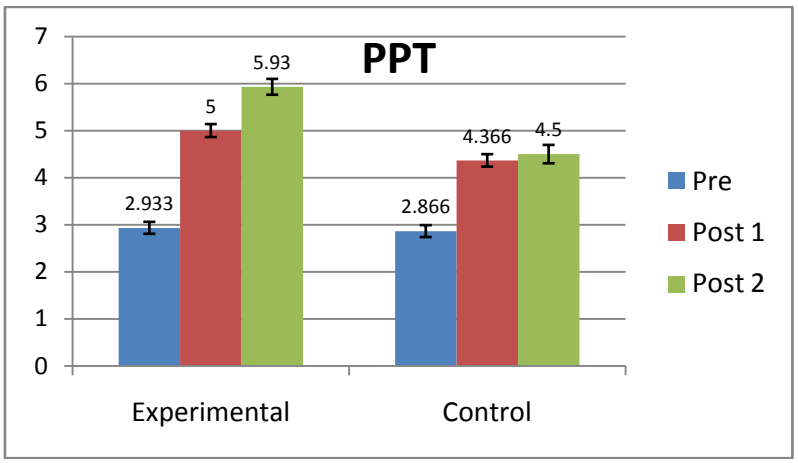
Data analysis: The dependent variables were analyzed using a 2 × 3 ANOVA, repeated measures on second factor. There was on between factor (Group) with two levels (Group: Iontophoresis, Manual therapy) and on

within factor (Time) with three levels (Time: Pre, Post 1, Post 2). All pair wise Post- Hoc comparisons were analyzed using a 0.05 level of significance.

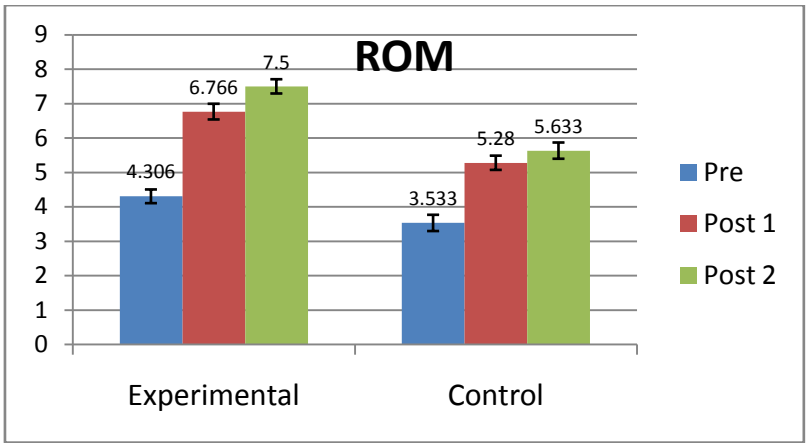
Result: The 2 × 3 ANOVA revealed that there was a main effect for time and group, also the main effect qualified to the interaction of time × group in VAS {time (F=771.949 , p=0.00), group (612.938 , P=0.00), time ×group (F=63.975, p=0.00}), PPT {time (F=261.600, p=0.00), group (22.76, P=0.00), time ×group (F=22.760, p=0.00} & ROM {time (F=14.536, p=0.00), group (26.236, P=0.00), time ×group (F=14.536, p=0.00}).

S.No	Demographic characteristics	Group A	Group B
1	No of subjects	15	15
2	Age range (years)	22- 30	21- 30
3	Mean age	27.13 ± 2.92	27.6 ± 2.52
4	Gender (M/F)	8/7	8/7





Graph 1: VAS (Mean ± SEM) Graph 2: PPT (Mean ± SEM)



Graph 3: ROM (Mean ± SEM)

The mean age of the subjects included in the study was 27.36 (S.D -2.69; Ranging from 22-30). The overall results in both Experimental (Iontophoresis and MET) group and Control (MET) group showed the significant differences from Pre to Post1 measurements in all the parameters (VAS, PPT& ROM) after one week of intervention in subjects with myofascial trigger point in upper trepezius muscle. Even after follow up period, next one week (at 2nd week) when no intervention was given both Experimental (Iontophoresis and MET) and Control (MET) group were found significantly different from Post1 to Post2 measurements in VAS and PPT, But in case of contra-lateral neck side flexion ROM in both experimental & control group were showed no significant difference at the end of 2nd Week. However experimental group showed more significant difference in comparison to control group in all the parameters.

VAS	Source	F	Sig.
Within Subjects Effect	Time	771.949	.000
	Time × Group	63.975	.000
Between Subjects Effect	Group	612.938	.000

Table 1: Anova For Vas

PPT	Source	F	Sig.
Within Subjects Effect	Time	261.600	.000
	Time × Group	22.760	.000
Between Subjects Effect	Group	22.760	.000

Table 2: Anova Fro Ppt

ROM	Source	F	Sig.
Within Subjects Effect	Time	14.536	.000
	Time × Group	14.536	.001
Between Subjects Effect	Group	26.236	.000

Table 3: Anova For Rom

II. Discussion

The purpose of this study was to know the relative efficacy of Iontophoresis in myofascial trigger point pain and its comparison with the manual therapy like MET (post isometric relaxation). Study design was to know the changes in Visual Analogue Scale (VAS), Pressure Pain Threshold (PPT), and Contra lateral Neck Side Flexion ROM as outcome measures. The overall results of this present study shows that there was significant reduction in perception of pain in terms of VAS , increase in pressure pain threshold & increase in contra lateral neck side flexion ROM in both the experimental (Iontophoresis and MET) group & control (MET) group in subjects with myofascial trigger point in upper trepezius muscle. However Iontophoresis group shows statistically more significant improvement in all the parameters with treatment for one week as compared to control group. After cessation of treatment the improvement in outcomes continued in both the groups in next one week with supervised exercises only. At the end of 2nd week the groups were significantly different in Pain, PPT& contra-lateral cervical side flexion ROM from Post1 to Post2 measurements. However Experimental group showed more significant as compared to control group.

Reduction in VAS through Muscle Energy Technique in both the Experimental and Control groups may be attributed to the improvement in blood circulation in the area of pain and increased extensibility soft tissues. Travel & Simons hypothesized that decreasing trigger point pain utilizing spray and stretch is due to elongation of the muscle to its full normal length. [22] Lewit & Simons (1984) demonstrated that muscle lengthening utilizing post isometric relaxation appears to be successful in relieving pain due to myofascial trigger point without the use of vapocoolent spray. Their study supports the idea that muscle lengthening in the processes that provides pain relief. [23] Lewit K, discussing MET methods states that medullary inhibition is not capable of explaining their effectiveness. He considers that the predictable results obtained may relate to the following facts: i) during resistance using minimal force (isometric contraction) only a few fibers are active, the others being inhibited. ii) During relaxation (in which the shortened musculature is taken gently to its new limit without stretching) the stretch reflex is avoided – a reflex which may be brought about even by passive and non painful stretch. He concludes that this method demonstrates the close connection between tension and pain, and between relaxation and analgesia. [23, 24]

The increase in PPT through MET in both the Experimental and Control groups may be explained by the fact that PIR (Post Isometric Relaxation) lengthens the shortened muscle fibers. Travell and Simons have shown that whatever initial treatment is offered to inhibit the neurological over activity of the trigger point, the muscle in which it lies has to be made capable of reaching its normal resting length following such treatment or else the trigger point will rapidly reactivate.(Chaitow). In the MET a physiologically induced Post isometric relaxation or reciprocal inhibition response is created. [22]

Travel and simons mistakenly credited Lewit with developing MET, the technique involves taking the muscle to a length just of short pain, the patient contracting the muscle for 5-10 sec with an inhalation, the therapist preventing the shortening of the muscle followed by the patients relaxing the muscle with an exhalation. Jaeger and reeves quantified the changes in MTrP sensitivity with a pressure algometer after passive stretch and spray of the involved muscle. They found that TrP sensitivity decreased in response to passive stretch. [25] Improvement in Neck Side Flexion ROM through MET in both Experimental and Control groups may be attributed to neurophysiologic principle that account for neuromuscular inhabitation that occurs during application of these techniques which states that after a muscle is contracted , it is automatically relaxed state for a brief latent period. Improvement in NROM in stretching group may be attributed to neurophysiologic principle that account for neuromuscular inhabitation that occurs during application of these techniques which states that after a muscle is contracted; it is automatically relaxed state for a brief latent period. [26]

The reduction in VAS score, improvement in PPT & Contra lateral ROM in iontophoresis group may be attributed to the decreases in sensitivity of myofascial trigger point caused by Lidocaine Iontophorsis. Mechanism by which Lidocaine Iontophoresis produce the effect of local anesthesia is by blocking of transmission impulse s along the axon. Lidocaine binds with sodium channels in nerve membrane and prevents sodium from entering the axon hence inhibiting nociceptive action potential. [27] Lidocaine also producess dilatation of blood vessels resulting an increase in local blood flow which helps to decrease the local ischemia and removal of substances that sensitize nociceptive which are because of sustain sarcomere contraction. [28 – 30]

This sustains sarcomere contraction increase the release of acetylcholine at motor end plate due to mechanical trauma or chemical stimulation of nerve terminals as per integrated hypothesis of pathophysiology of myofascial trigger point. So by removing nociceptors sensitizing substances and decreasing local ischemia breaks the sustained Ach cycle. [31 – 33] Another mechanism contributing to Lidocaine Iontophoresis analgesia may be contributing to acid / alkaline reaction underneath the electrodes. The anode produces an acidic reaction, where as cathode produces a strong alkaline reaction, sodium hydroxide. The anode anode is sclerotic and tends to produce hardening of tissue, possibly due to release of oxygen, aiding vitality of the tissue. Lidocaine iontophoresis causing blocking of sodium channel resulting blocking of central perception of nociception, hardening of skin underneath due to sclerotic action of anode and breaking of abnormally maintained Ach cycle at motor end plate. Effect may be maintained for long period.

III. Conclusion

The study demonstrated that, Iontophoresis with 4% Lidocaine to upper trepezius had an added effect in reducing Pain and improving PPT & ROM of cervical spine in Myofascial Pain syndrome, then when the condition was treated with MET alone. After cessation of Iontophoresis the improvement continued whereas treatment with MET improved was plateau.

Limitations:

- Small sample size.
- Lack of consideration of perpetuating factors like posture, psychological factors.
- No functional outcomes were taken.
- Electronic pressure algometre could have been used.

Recommendation:

It has been shown that psychological emotional factors contribute to muscle pain so further study can be done to consider these factors by including psychotherapeutic and behavioral approaches in the treatment of myofascial pain syndrome.

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