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Comparison between four treatment modalities for inactivation of myofascial triggers points

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Abstract
Most treatment methods for myofascial pain are empirical and aimed at the painful trigger points with the purpose of ablating muscle spasm and restoring normal muscle length. The current study conducted on 72 patients suffering from pain and decreased mouth opening as result of temporo mandibular joint dysfunction. Patients divided into four groups and low level laser, dry needling, injection of local anesthetic agent and pulsed electromagnetic field were tried for treatment of myofascial trigger point's pain. Results showed that pulsed electromagnetic field is the most effective treatment modality regarding pain relief. In conclusion; pulsed electromagnetic field should be used as adjunctive treatment with other treatment modalities for better inactivation of myofascial trigger points.

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1. Introduction

1.1Etiology of myofascial pain

Myofascial pain dysfunction syndrome (MPDS) is the most common cause of facial pains. Patients with MPDS suffer from pain, restricted jaw movements and masticatory muscle tenderness (Hong and Hsueh, 1996) Psychological factors, occlusion imbalance and parafunctional habits are mentioned as its most important underlying causes (Lynch and Brightman, 1994)

1.2 Trigger points

MPDS is a regional muscular pain syndrome characterized by the presence of hypersensitive points called "trigger points" (TrPs) in one or more muscles and/or connective tissue. Masseter muscles are frequently involved and followed by the temporalis muscle (Kamanli et al., 2005).

It has been suggested that certain nerve endings in the muscle tissue may become sensitized by allogenic substances that create a localized zone of hypersensitivity (Mense and Meyer, 1981; Simons and Travel, 1981; Mcmillian and Blasberg, 1994).

Trigger points are discrete, focal, hyperirritable spots located in a taut band of skeletal muscle. The spots are painful on compression and can produce referred pain, referred tenderness, motor dysfunction, and autonomic phenomena (Simons et al., 1999).

Myofascial trigger points (MTrPs) are classified as being active or latent, depending on their clinical characteristics. An active trigger point causes pain at rest, while latent trigger point does not cause spontaneous pain, but may restrict movement or cause muscle weakness (Ling and Slocumb, 1993).

Thus, a classic trigger point is defined as the presence of discrete focal tenderness located

in a palpable taut band of skeletal muscle, which produces both referred regional pain and a local twitch response. Trigger points help define myofascial pain syndromes while tender points by comparison are associated with pain at the site of palpation only. Tender points are not associated with referred pain and occur in the insertion zone of muscles, not in taut bands in the muscle belly (Hopwood and Abram, 1994).

1.3 Etiology of trigger points

There are several proposed histopathologic mechanisms to account for the development of trigger points and subsequent pain patterns. Many researchers agree that acute trauma or repetitive microtrauma may lead to the development of a trigger point (Han and Harrison, 1997).

1.4 Diagnosis of trigger points

In the head and neck region, myofascial pain syndrome with trigger points can manifest as tension headache, tinnitus, temporomandibular joint pain, and eye symptoms (Sola and Bonica, 1990).

Palpation of a hypersensitive bundle or nodule of muscle fiber of harder than normal consistency is the physical finding most often associated with a trigger point. Localization of a trigger point is based on the physician's sense of feel, assisted by patient expressions of pain and by visual and palpable observations of local twitch response (Simons et al., 1999).

The diagnosis of TMD depends on the clinician's skills, training and experience in taking a patient's history, performing a comprehensive examination, and assessing patients for MTrPs. To make a diagnosis of TMD, the minimum essential features that need to be present are a taut band, and the patient's recognition of the pain complaint with pressure on the tender nodule (Gerwin and Dommerholt, 2002).

1.5 Treatment modalities

Most treatment methods for myofascial pain are empirical and aimed at the painful trigger points with the purpose of ablating muscle spasm and restoring normal muscle length, function and strength.

In order to eliminate the signs and symptoms of MPDS, both mental and physical treatments are necessary (Hong and Hsueh, 1996) Conservative treatments are generally useful to alleviate pain and dysfunction. Dentists employ different methods such as pharmacologic treatment which include analgesics, muscles relaxant, antidepressants, neuroleptics, or nonsteroidal anti-inflammatory drugs (Imamura et al., 1997).

Nonpharmacologic treatment modalities which include acupuncture, massage, acupressure, ultrasonography, application of heat or ice, diathermy, transcutaneous electrical nerve stimulation, ethyl chloride spray and stretch technique.

Other treatment modalities include dry needling, and trigger-point injections with local anesthetic, saline, or steroid, occlusal splints, biofeedback, and physiotherapy in the treatment of this condition (Lynch and Brightman, 1994).

Different treatment modalities have been used for inactivation of TrPs such as interruption of the pain cycle by penetrating the TrP with a needle, injection of a local anaesthetic or saline, cooled spray of the skin, followed by stretching the muscle (Sola and Bonica, 1990)

1.6 use of Low-level laser therapy

Low-level laser therapy, Ultrasound and electro galvanic stimulation have been tried also and can sometimes be useful in managing TrPs (Thorsen et al., 1992; Kamyszek et al., 2001).

Modern dentistry utilizes low-level lasers in tissue healing acceleration, pain alleviation, reducing inflammation and physiotherapy in the orofacial region. Low-level laser plays an important role in the treatment of most musculofacial disorders and facial pain alleviation (Hong, 1994; Venanciorde et al., 2005; Dundar et al., 2006; Nunez et al., 2006).

Laser light is energy which is obtained by means of stimulated emission of radiation. The laser light biostimulation of structural tissue can be lifted to an energy level which leads to chemical reactions. It stimulates protein synthesis, phagocytic activities and the aerobic energy to induce anti-inflammatory, analgesic and tissue repair effect (Kitchen and Partridge, 1991). The laser type is determined by the wavelength of the light based on the state aggregation of the energized material. Many types of lasers have been used e.g. Helium-Neon (He-Ne), Gallium Aluminium Arsenide (Ga-Al-As), Neodimium - YAG, Carbondioxide (Baxter, 1994).

Ga-Al-As (diode laser) is a type of laser with a wavelength of 780 nm. The effect of Ga-Al-As laser revealed positive effects (Loevshall, 1994; Mikhailov, 1996) including acceleration of wound healing and pain reduction, (Soriano., 1995; Soriano., 1998) despite a large number of studies with negative change (Bulow, 1994; Basford et al., 1998).

Laser photobiomodulation is a low-cost noninvasive type of treatment that has been widely used for controlling a diversity of conditions, among them muscle-joint conditions. It is frequently used in clinical physical therapy practice for pain relief and tissue regeneration, and has been certified as beneficial in treating temporomandibular dysfunctions. Among the therapeutic effects are anti-inflammatory, analgesic and cell activity modulating actions, which have been proven in various studies (Kato et al., 2006; Kulekcioglu et al., 2003; Fikackova et al., 2006).

1.7 Dry needling

Also, one of the non pharmacologic treatments of myofascial trigger pointes is dry needling. Dry Needling is the use of solid needle for the treatment of myofascial pain and dysfunction. The approach is based on Western anatomical and neurophysiological principles. Not to be confused with the Traditional Chinese Medicine (TCM) technique of acupuncture (Baldry, 1995).

Such use of a solid needle has been found to be as effective as injection of substances in such cases as relief of pain in muscles and connective tissue. In the treatment of trigger points for persons with myofascial pain syndrome, dry needling is a procedure in which an acupuncture needle is inserted into the skin and muscle directly at a myofascial trigger point (Baldry, 1995).

A myofascial trigger point consists of multiple contraction knots, which are related to the production and maintenance of the pain cycle. Proper dry needling of a myofascial trigger point will elicit a local twitch response (LTR), which is an involuntary spinal cord reflex in which the muscle fibers in the taut band of muscle contract. The LTR indicates the proper placement of the needle in a trigger point. Research has indicated that dry needling that elicits LTRs improves treatment outcomes. It has been suggested that as the needle pierces the skin, A-delta nerve fibers are activated, resulting in inhibition of muscular C-fibers conveying pain from the trigger point (Luben, 1991).

1.8 Local anaesthesia

Local anaesthesia injection is one of the most effective treatment options available and is cited repeatedly as a way to achieve the best results. The use of a local anesthetic is more comfortable for many patients and results in a longer lasting reduction in MTrP pain (Han and Harrison, 1997)

1.9 Pulsed Electromagnetic

Field (PEMF) Pulsed Electromagnetic Field (PEMF) is a form of alternative medicine which claims to treat disease by applying electromagnetic energy to the body. (34)Among the reported therapeutic methods, the use of biophysical interventions, such as PEMF therapy, has attracted the attention of clinicians in the past decades, because of their noninvasive characteristics. (Greenough, 1992; Shi et al., 2010). It was observed that PEMF may affect tissue healing through a primary effect on vascular growth therefore has a role in stimulation of the healing process (Roland et al., 2000; Cummings and White, 2001; Smith et al., 2004).

Although MTrPs are a widely recognized phenomenon in clinical practice, there remains much to be elucidated with regards to their pathophysiology, mechanisms of pain referral, and treatment of choice. Therefore, it is the purpose of the present study to study the effect of four most common treatment modalities that used for treatment of pain associated with MPDS through direct effect on MTrPs.

2. Objective of Research

A lot of non invasive modalities for treatment of myofascial pain dysfunction syndrome are available. Four treatment modalities that most commonly used for inactivation of trigger points were selected to be compared for extraction of the most valuable method.

3. Material and Methods

3.1 Patients

The present study involved 72 patients, were selected from those referred to the outpatient clinic of Oral and Maxillofacial Surgery Department, Faculty of Oral and Dental Medicine, Cairo University. They were 57 female and 15 male with their ages ranged from 18 to 42 years with an average of 30

years, with active myofascial trigger points of masseter muscle.

3.2 General inclusion criteria
Diagnosis of temporomandibular disorder, Adult subjects (>18 years of age), Musculoskeletal dysfunction, Pain impairment , Presence of a tender spot characterized by spontaneous pain of the right or left masseter muscle,Restricted range of mandibular motion. No previous surgery in the temporomandibular region, and no other morbid conditions in the region of TMJ as rheumatic disease, neurological disease.

The selected cases should fulfill the following Helkimo index (Helkimo, 1974) Slightly impaired movement = index 1, Moderate dysfunction = DiII, Muscle pain sensitivity to pressure in four places=severe disorder,Pain associated with two or more movements=severe disorder, and Sensitivity to posterior pressure=severe disorder. Patients were divided randomly into four groups each included 18 patients.

3.3 Study groups
Group I (Low Level Laser):
After localization of TrP it was exposed to Low Level Laser Therapy (LLLT) stimulation using its fiber probe over the TrP in a circular movement (laser of a wavelength 980 nanometers, power 0.2 watt, total energy 12 joule) with exposure time of 50 seconds. In this group, laser was applied in 3 sessions per week for 4 weeks.

Group II (Dry Needling):
The trigger point was marked clearly and then the skin was prepared and cleansed. The overlying skin was grasped between the thumb and index finger .The trigger points were punctured with dry needle. In this group, each trigger point received three sessions a week for 4 weeks; each session took 50 seconds.

Group III (anesthesia):
The trigger points were injected with 0.5 ml of plain mepivacaine 3% local anesthetic solution. In this group, each trigger point received three sessions a week for 4 weeks. Injections were performed using a standard dental syringe and 27-gauge needle.

Group IV (PEMF):
The masseter muscle trigger points exposed to pulsed electromagnetic field (PEMF) stimulation. Patients received three sessions a week for 4 weeks. Each session took 50 minutes.

3.4 Clinical examination:
Masseter muscle was palpated by flat palpation technique using index finger of one hand. The masseter muscle was examined by means of palpation to determine:
• Palpable taut band.
• A hypersensitive spot within the taut band.
• Patient recognition of the elicited pain (identifies an active trigger point).
• Reproduction of a referred pain sensation with stimulation of the spot.
• Presence of a local twitch response with snapping palpation of the taut band.

3.5 Pain measurement
Each patient pointed to the exact location of pain and rated the pain (VAS) of 0-10 with zero being no pain and ten correspond to the worst pain that the patient ever had and were recorded on the patient's chart. Pain evaluated with visual analogue scale (VAS) at pre-operative, after one month, two months and three months respectively from the start of treatment.

3.6 range of movement evaluation
Assessment of mandibular maximal painless mouth opening (MMO) which measured by the distance in mm between the incisal edges of the upper and lower central incisors using Vernier graduated caliper.

No other therapies were used. The patients were asked to stop other pain medications and therapies, Cetal (paracetmol 500 mg (micronized) tablets, Egyptian International Pharmaceutical Industries Co., Cairo, Egypt.) was prescribed as pain killer only when needed.

Evaluation of four groups was performed at six stages, in the following order:

Prior to the treatment, at the end of two weeks (mid-treatment), at the end of four weeks (end of treatment), and monthly thereafter for a three month follow-up.

3.7 Statistical analysis
Data were presented as mean and standard deviation (SD) values. Pain scores and percent changes in different variables data showed non-parametric distribution; so Mann-Whitney U test was used to compare between the two groups. This test is the non-parametric alternative to Student's t-test. Wilcoxon signed-rank test was used to study the

changes by time in mean pain scores. This test is the non-parametric alternative to paired t-test.

Maximum mouth opening (MMO) data showed parametric distribution; so Student's t-test was used to compare between the two groups. Paired t-test was also used to study the changes by time in MMO. The significance level was set at $p \leq 0.05$. Statistical analysis was performed with IBM® SPSS Statistics Version 20 (® IBM Corporation, NY, USA. SPSS, Inc., an IBM Company.)

4. Results and Discussion

4.1 Pain

Pre-operatively, there was no statistically significant difference between pain scores in Group III and Group IV; both showed the statistically significantly highest mean scores. There was no statistically significant difference between pain scores in Group I and Group II; both showed the statistically significantly lowest mean scores.

After 2 weeks, Group I showed the statistically significantly highest mean score. There was no statistically significant difference between pain scores in Group II and Group III; both showed lower mean scores. Group IV showed the statistically significantly lowest mean score. After 3 months, Group I showed the statistically significantly highest mean score. This was followed by Group II then Group III. Group IV showed the statistically significantly lowest mean score.

Table 1: The mean, standard deviation (SD) values and results of Kruskal-Wallis test for comparison between pain scores (at rest) in the four groups.

	Group I		Group II		Group III		Group IV		*p*-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Pre-operative	4.7 b	3.3	3.7 b	2.7	6.6 a	2.5	6.4 a	2.7	0.008*
2 weeks	4.4 a	1.7	3.4 b	3	2.8 b	2.8	1.8 c	2	0.034*
3 months	4.1 a	2.9	2.9 b	3.1	1.8 c	2.2	1 c	1.7	0.008*

*: Significant at $p \leq 0.05$, Different letters are statistically significantly different according to Mann-Whitney U test.

Table 2: The mean differences, standard deviation (SD) values and results of Wilcoxon signed-rank test for the changes by time in mean pain scores (at rest) of each group

Group	Period	Mean	SD	*p*-value
Group I	Pre-op– 2 weeks	-0.3	3.4	0.574
	Pre-op – 3 months	-0.6	3.9	0.607
Group II	Pre-op– 2 weeks	-0.3	2.4	0.623
	Pre-op – 3 months	-0.9	3.9	0.327
Group III	Pre-op – 2 weeks	-3.8	2.4	0.003*
	Pre-op– 3 months	-4.8	2.4	0.003*
Group IV	Pre-op – 2 weeks	-4.6	2.9	0.001*
	Pre-op – 3 months	-5.4	3.2	0.001*

*: Significant at $p \leq 0.05$

In Group I and Group II, there was non-statistically significant decrease in mean pain scores through all periods. In Group III and Group IV, there was a statistically significant decrease in mean pain scores through all periods (table 1, 2).

The percentage change was calculated as:

$$\frac{\text{Score(Pre-operative) - Score(Post-operative)}}{\text{Score (pre-operative)}} \times 100$$

After 2 weeks and after 3 months; there was no statistically significant difference between % decrease in pain scores of Group III and Group IV; both showed the statistically significantly highest mean % decrease in pain scores. There was no statistically significant difference between % decrease in pain scores of Group I and Group II; both showed the statistically significantly lowest mean % decrease in pain scores Table (3).

Through all periods, there was no statistically significant difference between pain scores in Group I and Group II; both showed the statistically significantly highest mean scores. There was no statistically significant difference between pain scores in Group III and Group IV; both showed the statistically significantly lowest mean scores. In Group I, there was non-statistically significant decrease in mean pain scores through all periods. In Group II, there was non-statistically significant decrease in mean pain scores after 2 weeks. After 3 months; there was a statistically significant decrease in mean pain scores.

In Group III and Group IV, there was a statistically significant decrease in mean pain scores through all periods Table (4, 5).

The percentage change was calculated as:

$$\frac{\text{Score(Pre-operative)} - \text{Score(Post-operative)}}{\text{Score (pre-operative)}} \times 100$$

After 2 weeks and after 3 months; there was no statistically significant difference between % decrease in pain scores of Group III and Group IV; both showed the statistically significantly highest mean % decrease in pain scores.

There was no statistically significant difference between % decrease in pain scores of Group I and Group II; both showed the statistically significantly lowest mean % decrease in pain scores. Table (6):

4.2 Maximum mouth opening (MMO)

Pre-operatively and after 2 weeks, there was no statistically significant difference between (MMO) in the four groups. After 3 months, Group IV showed the statistically significantly highest mean (MMO). There was no statistically significant difference between Group I, Group II and Group III; all showed the statistically significantly lowest mean values Table (7).

In Group I and Group II, there was no statistically significant change in mean (MMO) through all periods. In Group III and Group IV, there was a statistically significant increase in mean (MMO) through all periods. The percentage change was calculated as:

$$\frac{\text{MMO(Pre-operative)} - \text{MMO(Post-operative)}}{\text{MMO (pre-operative)}} \times 100$$

Through all periods, there was no statistically significant difference between the four groups Table (8, 9).

Table 3: The mean %, standard deviation (SD) values and results of Kruskal-Wallis test for comparison between % decrease in pain scores (at rest) in the four groups

	Group I		Group II		Group III		Group IV		*p*-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Pre-op– 2 weeks	-8.2 [b]	13.5	-7.3 [b]	5.9	-56.6 [a]	38.8	-62.2 [a]	37.8	0.001*
Pre-op – 3 months	-4.9 [b]	19.7	-5.8 [b]	13.4	-69.3 [a]	35.5	-72.8 [a]	40.2	0.004*

*: Significant at $p \leq 0.05$, Different letters are statistically significantly different according to Mann-Whitney U test

Table 4: The mean, standard deviation (SD) values and results of Kruskal-Wallis test for comparison between pain scores (PPT) in the four groups

	Group I		Group II		Group III		Group IV		*p*-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Pre-op–	9.1 a	0.9	8.9 a	1.3	7.8 b	1.2	7.9 b	1.2	0.008*
2 weeks	7.4 a	2.4	8.1 a	2	3.4 b	2.9	3.2 b	2.3	<0.001*
3 months	8 a	2.3	6.4 a	2.8	2.1 b	2.4	1.2 b	1.9	<0.001*

*: Significant at $p \leq 0.05$, Different letters are statistically significantly different according to Mann-Whitney U test

Table 5: The mean differences, standard deviation (SD) values and results of Wilcoxon signed-rank test for the changes by time in mean pain scores (PPT) of each group

Group	Period	Mean dif.	SD	*p*-value
Group I	Pre-op – 2 weeks	-1.6	2.6	0.055
	Pre-op – 3 months	-1.1	2.2	0.095
Group II	Pre-op – 2 weeks	-0.7	1.8	0.131
	Pre-op – 3 months	-2.4	2.5	0.008*
Group III	Pre-op – 2 weeks	-4.3	2.6	0.002*
	Pre-op – 3 months	-5.7	2.3	0.002*

Group IV	Pre-op – 2 weeks	-4.7	2.6	<0.001*
	Pre-op – 3 months	-6.7	2.4	<0.001*

*: Significant at $p \leq 0.05$

Table 6: The mean %, standard deviation (SD) values and results of Kruskal-Wallis test for comparison between % decrease in pain scores (PPT) in the four groups

	Group I		Group II		Group III		Group IV		*p*-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Pre-op – 2 weeks	-17[b]	27.7	-7.3[b]	14.1	-57.6[a]	35.1	-58.7[a]	30.9	<0.001*
Pre-op – 3 months	-11.6[b]	25.6	-27.8[b]	29.7	-74.1[a]	30.5	-83.3[a]	28.2	<0.001*

*: Significant at $p \leq 0.05$, Different letters are statistically significantly different according to Mann-Whitney U test

Table 7: The mean, standard deviation (SD) values and results of one-way ANOVA test for comparison between (MMO) in the four groups

	Group I		Group II		Group III		Group IV		*p*-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Pre-op	36.2	6.8	35.6	5.5	34.6	2.4	35.7	9.4	0.958
2 weeks	37.6	4.9	37.1	4.4	36.6	1.4	40	5.6	0.376
3 months	35 b	3.8	36 b	4.2	36.8 b	1.2	40.1 a	5.3	0.050*

*: Significant at $p \leq 0.05$, Different letters are statistically significantly different according to Tukey's test

Table 8: The mean differences, standard deviation (SD) values and results of paired t-test for the changes by time in mean (MMO) of each group

Group	Period	Mean dif.	SD	*p*-value
Group I	Pre-op– 2 weeks	1.3	4.6	0.413
	Pre-op – 3 months	-1.2	6.7	0.598
Group II	Pre-op – 2 weeks	1.6	6.9	0.518
	Pre-op – 3 months	0.4	7.1	0.857
Group III	Pre-op – 2 weeks	2	1.9	0.015*
	Pre-op – 3 months	2.2	1.8	0.007*
Group IV	Pre-op – 2 weeks	4.3	7	<0.001*
	Pre-op – 3 months	4.4	7.2	<0.001*

*: Significant at $p \leq 0.05$

Table 9: The mean %, standard deviation (SD) values and results of Kruskal-Wallis test for comparison between % changes in (MMO) in the four groups

	Group I		Group II		Group III		Group IV		*p*-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Pre-op – 2 weeks	5.7	15.7	7.1	11.7	6.1	6.1	18.1	32.4	0.736
Pre-op – 3 months	-0.3	3.4	4	5.2	6.7	5.9	18.7	33.6	0.132

*: Significant at $p \leq 0.05$

Discussion

Temporomandibular pain of myofascial origin is a condition often referred to outpatient clinic of Oral and Maxillofacial Surgery Department. In the present study the highest concentration of individuals with temporomandibular disorder is among women aged between 21 and 30

years. One possible explanation for the higher prevalence of pain in women lies in the fact that women have lower levels of muscle strength under fatigue than men.

The use of non invasive, with less morbidity, and costless methods for treatment is our goal. Usual treatment of temporomandibular myofascial pain in our working environment is a combination of pharmacological and splint therapy, which produces a temporary relief. However, pharmacological treatments soon reach the limit of therapeutic efficacy and they are also associated with side effects (gastrointestinal disorders, drug interactions, and adverse reactions), so that the current trend is the search for alternative treatments.

Active exercise, manual therapy, postural training, and relaxation techniques, may decrease pain and increase total vertical mouth opening. The characteristics of the syndrome, however, remain highly debated as its hallmark findings of taut bands (localized areas of increased muscle tone and tenderness) and trigger points (smaller areas of increased tenderness within the bands that produce referred pain on pressure) depend on the examiner's clinical skills for identification. The identification of taut bands and trigger points was not only important for diagnosis, but also potential treatment. In our opinion pain from TMPD is better to be expressed by the participant, so patients had to self-evaluate their pain as: nonexistent, mild, moderate, severe and very severe, by using a visual analogue scale.

Trigger points also appeared to have a positive effect on pain, releasing a trigger point through ischemic spots reduction, resulted in less pain. Active myofascial trigger points are one of the major peripheral pain generators for regional and generalized musculoskeletal pain conditions.

Masseter muscle was selected to be a model for testing of the therapeutic effects in our study, because masseter taut bands are more superficial making them easily distinguishable and subsequently more sensitive to external effect of PEMF activity.

Considering that hypertonic shortened mandible elevators (masseter) limit TMJ range of motion. Therefore, specific work to decrease tension in these muscles would hypothetically allow for greater range of motion.

Recent evidence in the understanding of the pathophysiology of myofascial trigger points supports Local pain and tenderness at myofascial trigger points may be part of the process of muscle ischemia associated with sustained focal muscle contraction and/or muscle cramps. The massage techniques seemed most effective to superficial muscles as masseter muscle.
In agreement with Thomas (Thomas, 2007) in their study, reported that reduction of muscular pain could be achieved using portable PEMF device. It is the author’s opinion that direct applications of PEMF led to masseter muscle massage (focal muscle fiber contraction) besides heating effect have had the biggest impact on maximal pain relief.

The results indicate that exposure to a specific low-frequency PEMF appears to have some beneficial analgesic properties, particularly in patients with TMD and should be adjunctive treatment used concomitantly with other lines of treatments. Laser therapy induced a reduction in pain symptoms after application and increased the patient’s mouth opening. The reduction of the muscle pain through the first to the last session in the current study; demonstrated difference between laser and PEMF, with PEMF efficient in pain control. The laser is a supportive therapy effective in treating patients with TMD, relieve pain symptoms without changes in the etiology or cause of the disorder, but etiologic factors should therefore be viewed and disposed so that the success of treatment in long term can be achieved.

For MTrP injection, is an effective technique in providing high pressure stimulation. High pressure stimulates mechanoceptors to modulate pain. One injection is often not sufficient and several may be required. A trigger-point muscle injection provide an immediate way to relieve pain at its source, but with short term effect, and in conjunction with supporting therapies, is considered to be good, cheap and easy treatment option.

In this study, technique for dry needling applied, using this technique of needling, the needle tip is quickly inserted into a certain site of the MTrP region and as a result of the rapid movement (force _ mass _ acceleration) of a needle with a tiny tip (pressure _ force/area) definitely can provide very high stimulation. Strong stimuli applied on the sensitive nociceptors can generate strong impulses, and these impulses transmit into the spinal cord. It is likely that these impulses subsequently

break the vicious cycle of the neural circuit responsible for MTrP (the hypothetical “MTrP circuit”) (Hong, 2004; Hong, 2006) in a manner similar to hyper stimulation analgesia. This is probably the mechanism of remote pain control as demonstrated in this study.

Conclusion

In conclusion; findings suggest that PEMF has the most effective treatment for alleviating pain and improvement of mouth range of motion in MPD patients. However in spite of its effect in pain reduction and improvement of range of mouth opening we couldn’t rely on this line of treatment alone for TMD patients. It should be used as adjunctive treatment with other treatment modalities as; splint therapy or arthrocentesis.

There is no conflict of interest related to the current study.

Author’s Contribution and Competing Interests

No conflict of interest in the current study.

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