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Evaluation of regional nerve block efficacy in the treatment of myofascial pain of masseteric origin: Clinical Study

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ABSTRACT

Background: Myofascial pain dysfunction syndrome (MPS) is considered the most common temporomandibular disorder (TMD) and one of stress-related disorders that defined as a complex, non-articular and non-inflammatory musculoskeletal disorder that affects the masticatory muscles. **Objective:** to evaluate the regional nerve block efficacy in the treatment of myofascial pain of massetric origin. **Patients and methods:** This study included 30 healthy patients were randomly divided into two equal groups, fifteen patients each, Group A consisted of 15 patients who injected by local anesthesia at the masseteric nerve (nerve block). Group B consisted of 15 patients who injected by local anesthesia at trigger points in the masseter muscle. Standard pain scoring (VAS) and the maximal mouth opening (MMO) were measured**. Results:** Comparison between VAS for pain severity at all-time intervals in both group indicated that the groups were similar at baseline (T1) and (T2) time intervals without significant difference ($p>0.05$). After intervention at T3 time interval a significant reduction in group A of mean VAS compared to group B ($p<0.05$). At the rest of follow up sessions (T3, T4), there were statistically insignificant differences between two groups ($p>0.05$).Comparison between MMO at different assessment sessions in both groups showed that the groups were similar at T1 and T2 time intervals without significant difference ($p>0.05$). After intervention at T3 time interval, group B showed significantly higher mean MMO compared to group A ($p<0.05$). At the rest of follow-up intervals (T4), there were statistically insignificant differences between both groups ($p>0.05$). **Conclusion:** Masseteric nerve block, TrPs injection with local anesthetic methods are effective treatment modalities in masseteric myofascial pain treatment.MNB has a beneficial effect in managing pain that originates from the masseter muscle, MNB injection with local anesthetic are more effective**.**

Keywords: Myofascial Pain; Temporomandibular Disorder; Maximal Mouth Opening

Introduction

Masseter muscle is one of the four principal muscles of mastication which covers the angle of the mandible and mandibular ramus. Its main function is elevation of the mandible and it has a small effect on side-to-side movements. [(1)]

The masseter muscle plays an important role in jaw elevation and is the major contributor to jaw closure strength and its size is closely associated with bite force. Masseter is a rectangular multipenate muscle, which attaches proximally to the inferior margin on the medial surface of the maxillary process of the zygomatic bone and to the zygomatic arch. Its distal insertion occurs at the angle and lateral face of the mandible ramus. Its innervation is performed by the masseteric nerve, a branch from the trigeminal nerve (V cranial nerve). [(2)]

The most common muscles in the head and neck region referring pain to the teeth are the temporalis, masseter, and digastric muscles. The anterior temporalis muscle commonly refers pain to the maxillary anterior teeth, middle temporalis to maxillary premolars, and posterior temporalis muscle to maxillary molars. Similarly, pain from the superficial and deep masseter muscle can refer to the maxillary and mandibular posterior teeth and to the pre auricular region of the face, mimicking a temporomandibular joint (TMJ) complaint. The anterior belly of digastric muscle can refer pain to the mandibular anterior teeth. [(3)]

Myofascial pain syndrome (MPS) is a major cause of chronic musculoskeletal pain and is characterized by the presence of hypersensitive areas and myofascial trigger points (MTrPs) in a muscle or its fascia that, when palpated, may trigger a characteristic referred pain, tenderness and autonomic phenomena. [(4)]

MPS create a diagnostic and management challenge to clinical practitioners and it usually misdiagnosed, leaving a marked number of patients without proper treatment. Also, early well diagnosis for MPS prevent invasive treatment. This correct diagnosis is performed through an accurate collection of information about the potential etiological factors, symptoms and signs because diagnosis of MPS can be accomplished only by history and clinical examination. [(5)]

In the temporomandibular area, TrPs associated with MPS usually do not resolve without treatment. Management can include the control of parafunctional habits, use of a mouth guard, and analgesic-anti-inflammatory therapy. This can be in conjunction with inactivation of TrPs by non-invasive methods. Other mechanical treatments such as acupuncture or the direct application of medication to TrPs may be considered. To date, several minimally invasive methods have been described. [(6)]

The aim of the present study was to evaluate the regional nerve block efficacy in the treatment of myofascial pain of massetric origin.

Patients and Methods

The current study involved 30 patients from outpatient clinic of oral and maxillofacial surgery department, faculty of dentistry, Suez Canal University. The selected patients complained of a dull regional aching pain in orofacial region that aggravated during mandibular movement. The palpation of masticatory muscles revealed localized tender sites (MTrPs) in one or more of the masticatory muscles where this palpation triggered pain in other areas with replication of patient's chief complaint. Moreover, they presented with various clinical pictures such as orofacial pain, headache, limited mouth opening, inability to eat, difficulty in jaw movements, deviation of the mandible, muscles tenderness, otolaryngological symptoms, or cervical symptoms.

Inclusion criteria:

Patients who presented with MPDS with limitation of mouth opening. Palpation of trigger points related to masseter muscle.

Exclusion criteria:

Patients with intraarticular disc displacement, patients who have performed any previous treatment for MPDS, patients with skin lesion, wound, and inflammation at site of injection, patients with any systemic muscle or joint diseases. (E.g. fibromyalgia & rheumatoid arthritis), pregnant and lactating women, and patients with any allergy to local anesthesia solution.

Patients grouping:

The thirty patients randomly divided into two equal groups:

Group A (study group): consisted of 15 patients were injected by local anesthesia at the masseteric nerve (nerve block).

Group B (control group): consisted of 15 patients were injected by local anesthesia at trigger points in the masseter muscle.

Preoperative assessment:-

Personal, medical and dental histories were taken through a printed questionnaire and discussion with the patient. The clinical examination performed through inspection for facial symmetry, opening pattern and intraoral structures, palpation of muscles and TMJ, auscultation of TMJ, and assessment of range of motion (ROM) that are vertical and horizontal ROM. The following clinical parameters were clinically evaluated as:

1. **VAS Score** was obtained from all patients who were instructed to mark on visual analogue scale VAS which ranged from 0 score for no pain to 10 score for the severe pain experienced at all three points: baseline, at 30 minutes ,2 weeks post-treatment and 8 weeks post-treatment.

2. **The maximal mouth opening (MMO)** was measured from incisal edge of upper central incisors to incisal edge of lower central incisors by mm. ruler at each time point where all patients instructed to set in an upright position in a dental chair, their head supported by the headrest and open their mouth maximally as much they can for measurement of MMO.

3. **Masseter muscle palpation** done as patients were asked if any tenderness or pain was the same as or similar to the pain reported as their chief complaint besides patients were asked whether they hurts or are just uncomfortable during palpation. Palpation was performed with palmer surface of the middle finger of operator who faces the patient to observe the patient's eyes and facial expression during palpation technique.

The patient was asked to clench his\her teeth while sitting upright. This would cause the masseter to bulge and clearly disclose the outline of the anterior border of the superficial portion stretching between the zygomatic arch and the angle of the mandible. The reaction to pressure graded from 0-3 where 0 indicated no discomfort on firm palpation and 3 indicated severe discomfort with minimal pressure.

Operative Procedures:

For both groups, the patient's skin over the selected site of injection of the face was disinfected using povidone iodine 10 (Betadine*, EL-Nile Co. for pharmaceuticals and chemical industries). An aspirating syringe and 1.8 mL of 2% mepivacaine with 1: 100 000 epinephrine, using a 27-gauge (0.4 x 38 mm) needle is appropriate for most patients.

I. Group A:

To achieve the masseteric nerve block, the width of the mandible is first visualized with the thumb and middle finger grasping the anterior and posterior borders of the mandible. With the thumb and middle finger in this position, the index finger from the same hand is used to locate the zygomatic arch, noting the point halfway between the thumb and middle finger. Once the zygomatic arch is identified, the index finger is moved inferiorly from the

halfway point on the zygomatic arch to locate the mandibular notch. A negative aspiration was performed to prevent any intravascular injections. Local anesthetic is injected posterior to the index finger at this location at approximately a 40º angle in the coronal plane and a 20º angle in the sagittal plane **(Figure 1)**, with the needle directed toward the neck of the mandibular condyle 0.6 mL of anesthetic is injected at this location. [8]

Figure (1): Determination of site of injection and local anesthesia delivery in patients who injected by local anesthesia at the masseteric nerve (nerve block) (Group A).

II. Group B :

After the masseter trigger point (MTP) was located and the overlying skin had been disinfected with betadine, the taut muscle band was pinched between the thumb and index finger, and the needle was inserted 1–2 mm away from the targeted MTP at an angle of 30º to the skin. A negative aspiration was performed. Injection of the local anesthetic (0.2 ml of 2% mepivacaine without epinephrine) was performed using a 27-gauge (0.4 x 38 mm) needle **(Figure 2)**. Hemostasis was achieved by applying compression on the injection site. [9]

Figure (2): Trigger point determination and local anesthesia injection in patients who injected by local anesthesia at at trigger points in the masseter muscle (Group B).

I. Postoperative assessment:-

Assessment of the clinical parameters or outcomes were carried out by the same operator throughout the postoperative follow up course at the intervals baseline (T1), 30 min. (T2), 2nd week (T3), 8th week (T4). Those clinical parameters were assessed as the following:

A. Subjective pain score through visual analogue scale (VAS).
B. Measurement of maximal mouth opening (MMO).
C. Objective tenderness to masseter muscles palpation.

Statistical analysis:

All data recorded and tabulated for each parameter assessed and at each point of assessment. Statistical analysis (one-way ANOVA) and charts was performed to compare between the data collected from both groups before and after treatment and between the outcomes of the two treatment modalities used for both groups.

Results

There wasn't statistically significant difference between mean age of both groups where mean age of group A and group B. In A group the mean (range) age was 26 (25–31) years, and in the control group 31(28–37) years. Comparison between VAS for pain severity at all-time intervals in both group indicated that the groups were similar at baseline (T1) and (T2) time intervals without significant difference ($p>0.05$). After intervention at T3 time interval group A showed a significant reduction of mean VAS compared to group B ($p<0.05$). At the rest of follow up sessions (T3, T4), there were statistically insignificant differences between two groups ($p>0.05$) **(Table 1)**.

Table (1): Comparison between the two studied groups according to pain VAS score

Pain VAS score	Group A (n = 15)	Group B (n = 15)	U	p
Before (T1)				
Min. – Max.	**4.0 – 9.0**	**5.0 – 9.0**	**106.0**	**0.806**
Mean ± SD.	**7.47 ± 1.60**	**7.60 ± 0.99**		
Median(IQR)	**8.0 (7.0 – 8.5)**	**8.0 (7.5 – 8.0)**		
30 min (T2)				
Min. – Max.	**0.0 – 3.0**	**0.0 – 5.0**	**83.50**	**0.233**
Mean ± SD.	**1.53 ± 1.13**	**2.33 ± 1.76**		
Median(IQR)	**2.0 (0.50 – 2.0)**	**3.0 (1.0 – 3.0)**		
2 weeks (T3)				
Min. – Max.	**0.0 – 4.0**	**1.0 – 5.0**	**62.50***	**0.037***
Mean ± SD.	**1.60 ± 0.91**	**2.27 ± 0.88**		
Median(IQR)	**2.0 (1.0 – 2.0)**	**2.0 (2.0 – 2.0)**		
8 weeks				
Min. – Max.	**1.0 – 4.0**	**1.0 – 5.0**	**91.50**	**0.461**
Mean ± SD.	**2.07 ± 0.80**	**2.33 ± 0.90**		
Median(IQR)	**2.0 (2.0 – 2.0)**	**2.0 (2.0 – 2.5)**		

*U: Mann Whitney test,, P: p value for comparing between the studied group, *: Statistically significant at $p \leq 0.05$*

Comparison between MMO at different assessment sessions in both groups showed that the groups were similar at T1 and T2 time intervals without significant difference ($p>0.05$). After intervention at T3 time interval, group B showed significantly higher mean MMO compared to group A ($p<0.05$). At the rest of follow-up intervals (T4), there were statistically insignificant differences between both groups ($p>0.05$) **(Table 2)**.

Comparison between masseter muscle tenderness to palpation in both groups showed that the groups were similar at T1 and T2 time intervals without statistically significant difference ($p>0.05$). After intervention at T3 time interval, group A showed better compared

to group B (p>0.05). At T4 time interval, there were statistically insignificant difference between both groups (p<0.05) **(Figure 1)**.

Two patients in the masseteric nerve block group reported adverse effects such as dizziness, transient facial nerve paralysis (unable to close the eye) and tachycardia. There were no adverse effects noted in the trigger point injection group.

Table (2): Comparison between the two studied groups according to maximal mouth opening (MMO) at all-time intervals in both groups.

Interincisal distance	Group A (n = 15)	Group B (n = 15)	Test of Sig.	p
Before (T1)				
Min. – Max.	12.0 – 46.0	25.0 – 47.0	t= 1.547	0.133
Mean ± SD.	33.60 ± 9.09	38.20 ± 7.06		
Median(IQR)	34.0 (27.0-40.0)	40.0 (33.0-44.0)		
30 min (T2)				
Min. – Max.	24.0 – 50.0	32.0 – 51.0	t= 1.994	0.056
Mean ± SD.	38.67 ±7.54	43.67 ± 6.13		
Median(IQR)	40.0 (33.0-43.5)	45.0 (40.5-49.0)		
2 weeks (T3)				
Min. – Max.	24.0 – 49.0	31.0 – 53.0	t= 2.308*	0.029*
Mean ± SD.	37.73 ± 7.88	43.53 ± 5.72		
Median(IQR)	41.0 (30.5-43.5)	46.0 (40.5-47.0)		
8 weeks (T4)				
Min. – Max.	23.0 – 48.0	31.0 – 50.0	t= 1.902	0.069
Mean ± SD.	37.27 ± 7.93	42.0 ± 5.48		
Median(IQR)	41.0 (30.5-43.0)	45.0 (39.5-45.0)		

*t: Student t-test, p: p value for comparing between the studied group, *: Statistically significant at p ≤ 0.05*

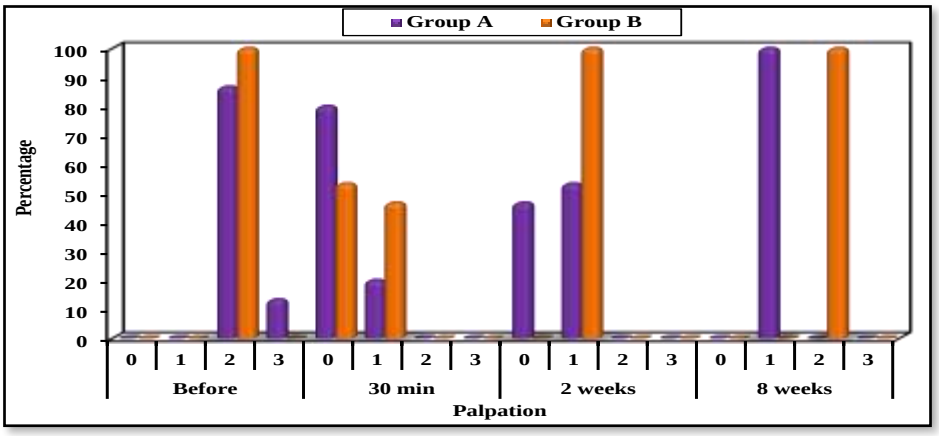

Figure (1): Comparison between the two studied groups according to palpation.

DISCUSSION:

Masticatory myofascial pain is one of the most common causes of non-odontogenic facial pain, which is characterized by the presence of MTPs in a taut, skeletal muscle band. Injection of trigger points with a local anesthetic is a widely

accepted treatment modality in the management of myofascial pain, which assures prolonged pain relief other than the anesthetic effect. [10]

In both dentistry and medicine, peripheral nerve blocks are routinely used for anesthesia and pain management, which can be classified as diagnostic, prognostic or therapeutic blocks. Peripheral nerve blocks are often used in the management of acute pain, chronic pain and headaches. [11]

Recently, Quek et al. [12] showed promising short-term therapeutic effects of the masseteric nerve block in the management of myogenous face pain. They also demonstrated the efficacy of the twin block for the management of chronic myofascial pain in an uncontrolled, unblended case series.

Application of peripheral nerve blocks is an effective method in the management of chronic and acute pain. Quek et al. [13] showed promising short term therapeutic effects of the MNB for the management of myofascial pain with masseteric origin. In addition, the control of myofascial pain with twin block application has also been shown to be effective in different studies.

Ananthan et al. [14] showed longer-lasting pain relief from the peripheral nerve block, which outlasted the effects of local anesthesia. While the exact mechanism of this prolonged effect is unknown, it is believed that the use of a local anesthetic disrupts the vicious pain cycle.

The aim of the present study was to investigate the effectiveness of MNB and TrP injection with local anesthetic methods in masseteric myofascial pain. This study demonstrated that the two different injection therapies had an improvement in terms of pain and jaw function. The most important finding in this study is that the use of MNB may be effective in treating myofascial pain of the masseter muscle with a single injection.

The present study was in agreement with Quek et al. [12] study in which sixty patients were grouped based on their treatment regimen: intra-oral stabilization appliance (IOA), TrP-Inj or MNB. He reported that treatment with MNB resulted in significant reduction in pain at 30 minutes and two weeks post treatment compared to TrP-Inj and IOA.

In the current study, comparing the long-term therapeutic effects of the trigger point injections versus the masseteric nerve block showing that both techniques are equivalent in their ability to be effective for the management of chronic myofascial pain. The masseteric nerve block offered a distinct advantage over the traditional trigger point injection: a single injection is sufficient to get the same effect as from multiple trigger point injections, thus reducing the post-operative discomfort experienced by patients receiving multiple trigger point injections.

Pain intensity significantly improved with both techniques and there were between trigger point injection and the masseteric nerve block. However, the distinct advantage of the masseteric nerve block technique is that a single injection can be used to globally treat all the trigger points present in the masseter muscle without requiring multiple trigger point injections.

Venancio et al. [15] also reported that dry needle (DN) relieves pain only for a short time compared to TrP and Botox. In parallel with results of the current study, they stated that TrP injection group is similar to my study.

Quek et al. [13] hypothesized that masseteric nerve block may have a beneficial effect on the symptoms of patients with masseteric myofascial pain. They suggested that the MNB method is more effective than the TrP and intraoral appliance methods in reducing pain in their 2-week follow-up study. The authors speculated that the management of local pain can be achieved by MNB-related analgesia and particularly decreased muscle tone that will break the perpetuating local pain cycle. They also proposed another explanation of this possible mechanism: the local nerve block can act by inactivating all the trigger points in the muscle, whereas TrP injection manages to eliminate only selective trigger points.

Taşkesen and Cezairli [16] evaluated the pain on palpation values. In order to make an accurate statistical analysis, the values were categorized, and the distribution of the patients in these categories was compared. Study groups showed no statistically significant difference.

In the present study pain on palpation in the MNB group results showed more effective than TrP injection group in the treatment of myofascial pain from massetric origin.

In the present study, pain-free MMO values increased significantly in all groups compared to baseline values at the end of treatment. This increase may be due to local anesthesia injections that can relieve muscle tension of taut bands in the masseter muscle. In the MNB group, it can be anticipated that the regional block reduces pain and increases the range of motion of the muscles, thus taut bands dissolved in the long term, and the mouth opening increased.

CONCLUSION:

Masseteric nerve block, TrPs injection with local anesthetic methods are effective treatment modalities in masseteric myofascial pain treatment.

MNB has a beneficial effect in managing pain that originates from the masseter muscle, MNB injection with local anesthetic are more effective.

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