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EVALUATION OF THE ROLE OF PLATELET RICH PLASMA INJECTION IN TRIGGER POINT FOR TREATMENT OF MYOFACIAL PAIN

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ABSTRACT

Objective: This study was to evaluate the role of PRP injection in trigger points for treatment of myofacial pain (MFP). Methods: This study included 11 female patients complaining of MFP. Clinical examination was made to locate the trigger points in masseter and temporalis muscles. Preoperative evaluation was made for Maximal interincisal opening (MIO), pain using visual analogue scale (VAS) and tenderness. PRP was prepared from the blood of the patient and injected into the trigger points. Follow up was made to detect changes in VAS and MIO at 4, 12 and 24 weeks. All readings were recorded and analyzed statistically. Results: the study showed a statistical improvement in MIO and VAS in the muscles of mastication. Conclusion: the injection of PRP into trigger points can be considered as one of the treatments of MFP.

INTRODUCTION

Myofascial pain (MFP) is a myalgic condition in which muscle and musculotendinous pain are the primary symptoms. The core of the syndrome is the myofascial trigger point. Trigger point (TrP) is a small, localized painful spot within an abnormal muscle which is the source of the muscular dysfunction[1]. Moreover it is considered one of the categories of musculoskeletal pain, therefore, most of available data pertain to musculoskeletal pain in general, which is currently reported to affect approximately 85% of the population at some point during their life. The MPS represents the major cause of this pain and the mean prevalence of this condition among middle-aged adults (30–60 years) is reported to be 37% in men and 65% in women, respectively[2]. The research diagnostic criteria for temporomandibular disorders (RDC/TMD) is a well-standardized protocol for diagnosis myofascial pain[3,4]. Precipitating and perpetuating factors of MFP include many factors like trauma (microtrauma or macrotrauma contusion), sprains and strains. despite that, the effect of microtrauma is more subtle, chronic repetitive overloading or overuse of muscles may lead to fatigue and gradual onset of MFP[5]. These factors may cause the facilitated release of acetylcholine at motor end plates, sustained muscle fibre contractions and local ischaemia with release of vascular and neuroactive substances, and muscle pain. More acetylcholine may then be released, thus perpetuating the muscle pain and spasm[6]. Mechanical factors like poor posture and poor ergonomics within working environment of an individual have impact on physical conditions[7]. Also, ageing with its structural degeneration of bones and joints, with gradual loss of myofascial flexibility, may lead to MFP[8]. Nerve root compression; irritation of the nerve root may lead to sensitization of the spinal segment and MFP in the innervated muscles[5]. Moreover, emotional psychological stress, endocrine and metabolic deficiencies like thyroid and oestrogen insufficiencies, nutritional deficiencies like vitamins an mineral insufficiencies, chronic infection, all known to cause MFP[9]. Treatment of MFP is a multimodalities approach

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focusing on abolishing of TrP to achieve pain relief[8]. Physical therapy represented by heat therapy and/or electrical therapy that could eliminate inflammatory byproducts from the painful site. Additionally pharmaceutical modality represented by paracetamol or muscle relaxants may be prescribed for mild MFP. [10] non-steroidal anti-inflammatory drugs (NSAID) may be used . Narcotic analgesics may sometimes be necessary for severe MFP. Moreover, needling and infiltration modalities in the form of either acupuncture or hypodermic needles[11]. However non of these treatment modalities proved satisfactory either for the patient or the practitioner. Platelet-rich plasma (PRP) is an orthobiologic that has recently gained popularity as an adjuvant treatment for musculoskeletal injuries[12]. Platelet-rich plasma (PRP) is defined as a portion of the plasma fraction of autologous blood having a platelet concentration above baseline[13]. It is an emerging treatment in the modern health sector known as 'orthobiologics'. The goal of this discipline is to enhance the body's innate ability to repair and regenerate. PRP therapy has currently gained a lot of attention as a safe, nonsurgical, biological treatment of osteoarthritis and musculoskeletal repair differentiation[14,15]. An in vitro study suggested that administering autologous platelet-rich clots might be beneficial in the treatment of tendon injuries by inducing cell proliferation during the healing process[16]. Local delivery of PRP has been found to shorten the recovery time after a muscle strain injury in a small-animal model[17]. Moreover, rabbit model of osteochondral defect found improved healing and histological evaluation at 4 and 12 weeks with PRP in poly-lactic-glycolic acid[18]. Injection of PRP in the affected site increase the release of reparative growth factors , that enhance the healing process[19]. PRP could have an effective role in reducing pain score at 3 weeks and 6 months[20]. Accordingly, the aim of this study was to evaluate the effect use of PRP in treatment of myofascial pain.

PATIENTS AND METHODS

This interventional study was conducted on 11 adult female patients with age range between 20-40 years. They were selected from the outpatient clinic of Oral and Maxillofacial Surgery Department, Faculty of Oral and Dental Medicine in both Al-Azhar university and Misr University for Science and Technology. Patients included in this study were complaining of myofascial pain provided that they were systemically free with no any detected bony changes in the TMJ by OPG. Patients who were pregnant, lactating or with any bleeding disorder or infection at the proposed site of infection were excluded from the study. The selected patients were examined clinically for any trigger points or signs of hypertrophy of masticatory muscles. The maximal interincisal opening (MIO) was recorded. Clinical Intraoral examination included dental examination to detect any signs of teeth abrasion, cheek or lip injury . All patients were informed about the procedure and the possible postoperative complications prior to signing written consent form. All data were recorded and tabled . All patients included in the study were to be injected with PRP in the detected trigger points in the temporalis and masseter muscles.

Patient assessment

Patient assessment was made according to visual analogue scale (VAS) and maximum interincisal opening recorded by a digital calliper.. Temporalis and Masseter muscle tenderness was detected by palpation

Tenderness on palpation Tenderness was evaluated as follows zero (0); when there was no pain or tenderness reported by the patient. 1; when the patient responds that the palpation was uncomfortable (tenderness or soreness). 2; when the patient experienced definite discomfort or pain. 3; if the patients show evasive action or eye tearing or refuse to be palpated again. All parameters were measured preoperatively and after 1, 3 and 6 months of treatment.

Intervention: Platelet Rich Plasma(PRP) prepared then injected in trigger points in masseter and temporalis muscles according to Boris Bentsianov[21] technique. All injections are intra muscular.

PRP preparation: It began with a venous puncture and subsequent collection of autologous blood from the patient (10-ml of venous blood sample) into a tube containing an anticoagulant (sterile sodium citrated tubes) according to the technique of Anitua E[22]. The tubes were centrifuged at 1800 rotations/minute (rpm) (for 15 min) separating plasma (top layer) from packed red blood cells (RBCs) (bottom layer). The RBC layer is discarded and the second centrifuge at 3500 rpm for 10 min yields a more concentrated platelet layer after extraction of platelet poor plasma. Injection of masseter and temporalis muscles .The patient was set in upright position and asked to clench to detect and draw the boundaries of the muscle (Fig. 1). After needle insertion in the muscle aspiration performed to avoid injection in blood vessels then the content of syringe is injected slowly as shown in (Fig. 2). After injection a bandage was placed over the injected area. The patient was observed for 10 min and then discharged. Postoperative instructions included ice packs on the injected area for pain control. It was recommended to use acetaminophen as the optimal analgesic, and avoided use of NSAID's which may diminish the effectiveness of PRP.

Data management and analysis

Measurements of all parameters were recorded preoperatively ,one month, 3 months and 6 months The collected data was statistically analyzed applying suitable tests. Numerical data were explored for normality by checking the data distribution, calculating the mean and median values, evaluating histograms and normality curves and using Kolmogorov-Smirnov and Shapiro-Wilk tests. parametric Data were presented by mean, standard deviation (SD) and non parametric presented as median and inter quartile range(IQR). Anova test used for parametric data for repeated measure was used to compare between follow up periods followed by simple main effect with Bonferrioni correction and Fridman test used for non parametric data followed by Wilcoxon signes rank test with Bonfroni correction. The significance level was set at $p \leq 0.05$. Statistical analysis was performed with IBM® SPSS® Statistics Version 20 for Windows.

RESULTS

Clinical results were obtained after 4 weeks, 12 and 24 weeks postoperatively. These data were categorized into variable points and analysed statistically.

Maximum Mouth Opening (MMO)

Preoperatively MMO ranged from 21.86 mm to 46.26 mm with average of 40.2018 mm. 4 weeks post operatively, maximum mouth opening was measured and found to be improved in all cases with variable ranges. At 12 weeks postoperatively all patients showed improvement in comparison with the preoperative measurements, and continued to 24 weeks' post-operative.

No patients showed relapse in maximum mouth opening in comparison with the preoperative Measurements. The best results were obtained at the 4 weeks postoperatively.

Statistical analysis was conducted on the resulted measures and represented in table (1). The mean of MMO measurements was 40.2018^{ac} preoperatively, 43.0264^{bd} at 4 weeks, 42.1991^{ab} at 12 weeks and 41.2527^{cd} at 24 weeks. Standard deviation changed from 6.9 preoperatively to 5.3 at 4 weeks, then to 7.2 at 12 weeks and 6.5 at 24 weeks. P value was 0.006.

Dissimilarity in superscript letters indicated significant difference.

Anova for repeated MMO measures showed significant difference between follow up periods. Post hock test showed significant difference between preoperative and 4 weeks and between 12 and 24 weeks.

Graph (1) showed the relation between the follow up periods and maximum mouth opening measures which showed that, the best results was obtained at the 4 weeks postoperatively.

Tenderness:

Tenderness was measured in both temporalis muscle and master muscle based on the scoring system developed by Okeson. Regarding masseter muscle, Preoperatively, all patients showed tenderness with different degrees ranged from 1 to 3 tenderness scores. At 4 weeks, all patients showed reduction in tenderness score that the maximum was 2 and one patient showed tenderness free with zero score. On recording results along the follow up periods, fluctuant tenderness scores was recorded.

Table (1) shows statistical analysis of MMO results.

MMO / Time	Mean	Standard Deviation (S.D.)	P value
Preoperative	40.2018^{ac}	6.91838	0.006
4 weeks	43.0264^{bd}	5.29041	
12 weeks	42.1991 ^{ab}	7.23895	
24 weeks	41.2527^{cd}	6.52618	

ac, bd, ab and cd were superscript letters of mean values.

Table (3) showed Statistical analysis for temporalis tenderness scores.

Temporalis Tenderness / time	Median	IQR	P value
Preoperative	2	0	<0.001
4 weeks	1^{a}	1	
12 weeks	1^{a}	0	
24 weeks	1^{a}	0	

p value was <0.001

Statistical analysis that conducted on the masseter tenderness scores that represented in Table (5). The median of masseter tenderness scores was 2 preoperatively, 1^{a} after 4 weeks, 1^{a} after 12 weeks and 1^{a} after 24 weeks .

The interquartile range (IQR) was 1 preoperatively, 0 after 4 weeks, 0 after 12 weeks and 1 after 12 weeks.

a was superscript letter of median values. Dissimilarity in superscript letters indicated significant difference.

Fridman test showed significant difference between follow up periods.

Post hock test showed significant difference between preoperative and other follow up periods. Graph (2) depicted the relation between the follow up periods and tenderness score that showed reduction in tenderness postoperatively.

On recording tenderness results from temporalis

Table (2) showed the statistical analysis for masseter tendeness scores.

Masseter Tenderness / Time	Median	IQR	P value
Preoperative	2	1	<0.001
4 weeks	1^{a}	0	
12 weeks	1^{a}	0	
24 weeks	1^{a}	1	

p value was <0.001

Table (4) showed Statistical analysis for pain scores.

pain / time	Median	IQR	P value
Preoperative	8^{a}	1	<0.001
4 weeks	5^{ab}	2	
12 weeks	6^{bc}	3	
24 weeks	6^{c}	3	

p value was <0.001.

a, ab, bc, c were superscript letters of mean values.

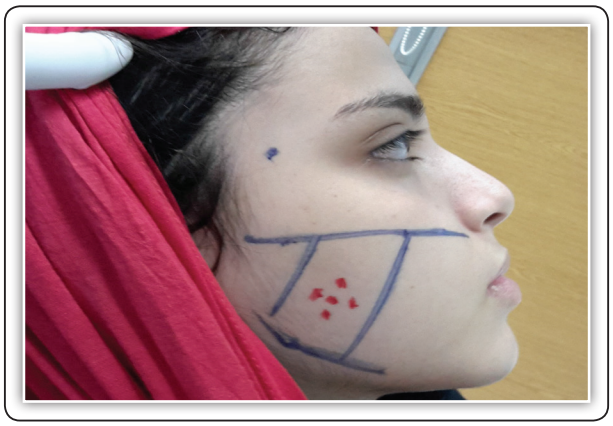


Fig. (1) Shows marked injection points

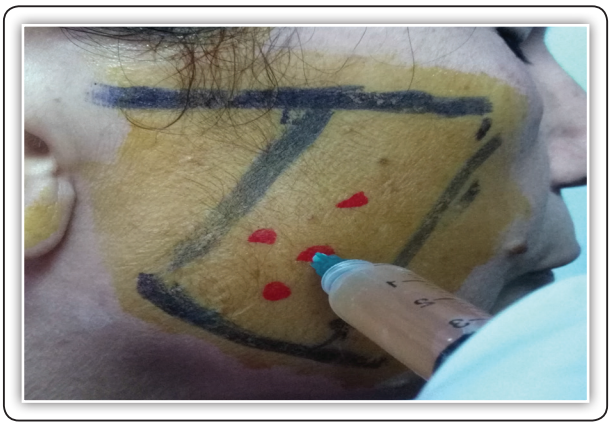
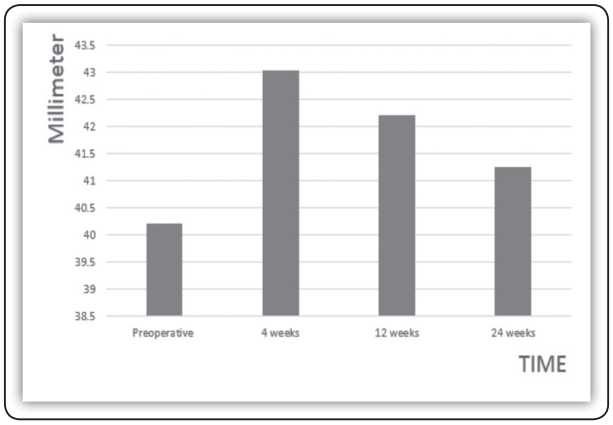
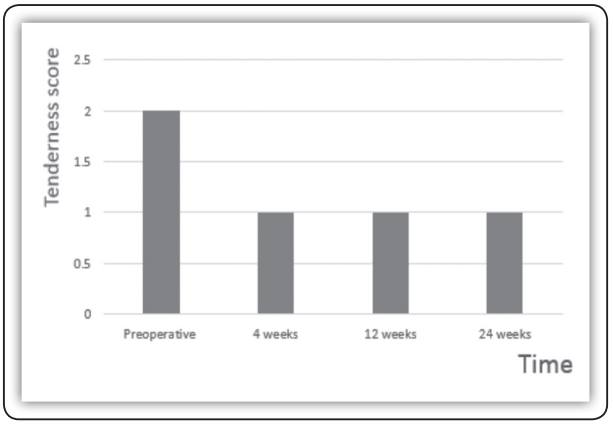


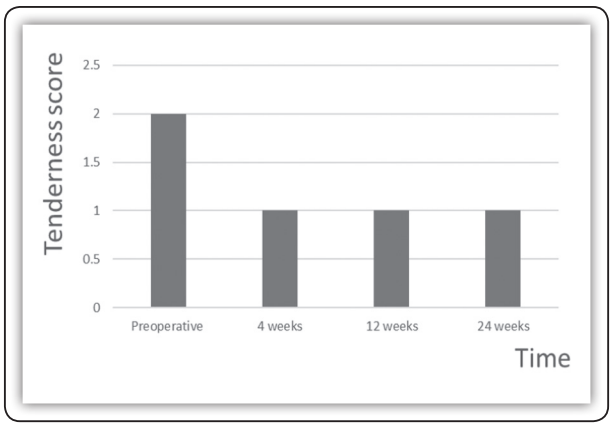
Fig. (2) Shows injection of PRP after disinfection to injection sites



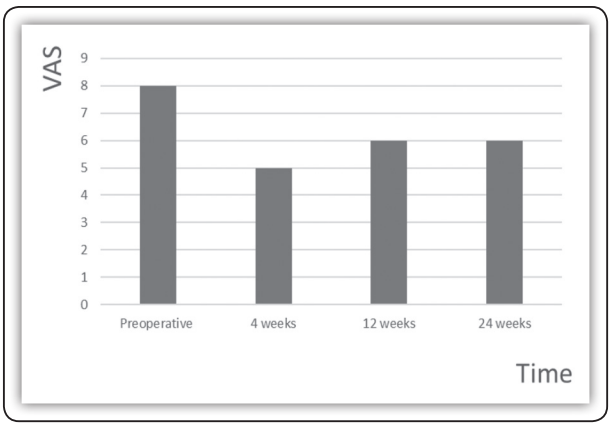
Graph (1) showed the relation between the follow up periods and MMO measurements.



Graph (2) shows the relation between the follow up periods and tenderness score.



Graph (3) showed the relationship between the follow up periods and tenderness score



Graph (4) depicted the relation between the follow up periods and pain score and showed reduction in pain postoperative.

muscle, it was found that all patients showed tenderness with different degrees ranged from 1 to 3 tenderness scores. After 4 weeks, all patients showed reduction in tenderness score that the maximum was 1 and 3 patients became tenderness free with zero score. Same fluctuation was detected in the 12 and 24 weeks postoperatively but to a lesser degree.

Statistical analysis in case of temporalis muscle which was represented by table (3) The median of temporalis tenderness scores was 2 preoperatively, 1^{a} after 4 weeks, 1^{a} after 12 weeks and 1^{a} after 24 weeks. The interquartile range (IQR) was 0 preoperatively, 1 after 4 weeks, 0 after 12 weeks and 0 after 12 weeks.

a was superscript letter of median values. Dissimilarity in superscript letters indicated significant difference. Fridman test showed significant difference between follow up periods.

Post hock test showed significant difference between preoperative other follow up periods.

Graph (3) depicted the relation between the follow up periods and tenderness score that showed reduction in tenderness postoperatively.

Pain:

Pain was studied according to pain scale visual analogue scale (VAS):

Preoperatively all patients recorded high scores ranged from 7 to 9. After 4 weeks postoperatively score declined to be less than 7 with range from 3 to 6 on VAS. 12 weeks postoperatively pain score records were variable, some patients showed minor increase while others showed no increase. 24 weeks postoperatively all patients showed increase in pain score. Statistical analysis of pain score which was represented in table (4) showed that the median of pain scores was 8^{a} preoperatively, 5^{ab} after 4 weeks, 6^{bc} after 12 weeks and 6^{c} after 24 weeks. The interquartile range (IQR) was 1 preoperatively, 2 after 4 weeks, 3 after 12 weeks and 3 after 12 weeks.

Dissimilarity in superscript letters indicated significant difference.

Fridman test showed significant difference between follow up periods.

Post hock test showed significant difference between preoperative and 12 and 24 weeks and between 4 weeks and 24 weeks.

DISCUSSION

Myofascial pain syndrome (MPS) is among the frequent conditions encountered in general population which characterized by muscular pain that originates from myofascial trigger points in skeletal muscle[23]. All selected patients in this study were adult female patients with age range between 20-40 years which represent the most affected gender and age range this was reported by many authors as, Laskin and Block who reported that the greatest incidence appears to be in the 20 to 40 years age group, while Carlsson et al and Butler et al reported that Women are affected by MPD syndrome more frequently than men, with the ratio in various reports ranging from 3:1 to 5:1[24]. Many studies tried to solve the problems associated with myofascial pain using different modalities including psychotherapy, Hawley biteplate, physical modalities, Medication, Exercise, Needling and infiltration were also used.[25] Our study used platelet rich plasma (PRP) injection in treatment of myofascial pain syndrome. PRP is a recently used treatment modality that has the advantages of concentrated platelets that activated and aggregated together to release their granules containing growth factors that stimulate the inflammatory cascade and healing process[26]. Also being a low cost easily prepared treatment in addition to the minimal risk of blood-borne pathogens or any negative reaction to PRP as being an autogenous material prepared from the blood of the patient himself.[27] Many authors adopted the use of PRP injection as treatment modality,

Borrione et al [28] held a study using Platelet rich plasma in muscle healing, also Quarteiro et al [29] used it in repair of muscle injury in rats. Hancı et al[30] conducted a study using PRP injection in treatment of temporomandibular disorders, in the same time both Covey et al[31] and Sherpy et al[32] used PRP injection in treatment of pain related to planter fasciitis. Finally, Knop et al[33] used PRP injection in treatment of osteoarthritis . Double spinning PRP preparation technique was the selected technique in this study. It was selected to increase in the concentration of platelets which in turn leads to increase the concentration and efficiency of growth factors[34]. As mentioned by Filardo et al[35] Single-spinning approach can concentrate platelets 1 to 3 times that of baseline levels, whereas 4- to 8-fold baseline levels are achieved by double-spinning. In a study conducted by Reurink et al [36] double spinning technique was used in preparation of PRP to treat acute muscle injury, this was coinciding with PRP preparation technique in our study ,On the other hand, Wang-Saegusa et al[37] Used single spinning technique in preparation of PRP. His point of view was that single spinning technique reduces preparation time, simpler technique and achieves the same results. Anyhow Filardo et al[35] held a study that showed that there is no significant difference between single and double spinning techniques regarding the efficiency of PRP. Maximum mouth opening, tenderness and pain were the parameters of concern in this study, maximum mouth opening was found to be improved in all cases with variable ranges. At 12 weeks, postoperatively all patients showed improvement in comparison with the preoperative measurements, as well as during the 24 weeks post-operative follow up. In comparison with preoperative measurements, maximum mouth opening showed no relapse in all patients. Best results were obtained at the 4 weeks postoperatively with 3 mm improvement in mean value in comparison with preoperative measurements. This was coinciding with variable studies held by different authors using different treatment modalities in management of MFP and Suvinen and Reade have also shown 10.02 mm and 7.4 mm increase in MIO after splint therapy in MFP patients[38]. Tenderness in both temporalis muscle and master muscle and pain were measured, all patients reported reduction in tenderness and pain scores. On recoding results along the follow up periods, fluctuant tenderness scores were recorded. best results were obtained at the 4 weeks postoperatively. Obtained results in all patients showed noticeable improvement that continuously decreased along follow up period. This can be explained by the fact that myofascial pain dysfunction syndrome is multifactorial disorder while platelet releasing growth factors led to heal the affected muscles other factor still affect them[39].

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