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Management of internal derangement of Temporomandibular joint with platelet rich plasma: Pilot study

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Abstract

Introduction: Temporomandibular joint internal derangements are progressive painful conditions that associated with limitation of mouth opening that caused by disruption within the internal aspects of the TMJ.

The aim of this study was to evaluate the management of internal derangement of TMJ regarding pain intensity in temporomandibular joints and muscles of mastication and mouth opening.

Materials and methods: This study was conducted in the Department of oral and maxillofacial surgery-college of dentistry Tikrit University. Twenty-one patients, 14 women and 7men with age range between 18-33 years old, were diagnosed with internal derangement of TMJ that were treated by intraarticular PRP.

Results: show significant reduction of pain experienced by the patient after 12 weeks(P- < 0.0001). And show significant improvement of maximal interincisal mouth opening (P-<0.000).These finding demonstrating clearly that a significant improvement in both pain , mouth opening and clicking in the TMJ was achieved after the management.

Conclusion: PRP injection to TMJ space for treatment of internal derangement are safe, effective, non-invasive method that help to reduce pain, joint noise and increase mouth opening, thus improving the jaw function.

Key words: internal derangement, platelet rich plasma, disc displacement

Introduction

TMJ internal derangements are progressive conditions that caused by disruption within the internal aspects of the TMJ. With the most common form of disruption is anterior displacement of the articular disk from its normal functional relationship between the mandibular condyle and the glenoid fossa that lead to joint dysfunction, that manifested as painful joint, joint noise, with or without locking of the mouth.(1,2)Pain

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measurement is difficult as it is unpleasant subjective emotional experience that triggered by noxious stimuli which may or may not be associated with actual tissue damages, (11, 12) Pain measurement scales like four-point scale and visual analogue scale (VAS)have been used by author for measurement of this subjective sensation(4, 5, 6).Normal maximal mouth opening, measured as the distance between the maxillary and mandibular incisors edgesin healthy adults and its values range from (35-50mm) .The maximal interincisal opening (MIO) of at least 35mm is used as a cutoff point to determine trismus,(4,7, 8, 9, 10) Regarding the treatment of temporomandibular joint dysfunction pain syndrome, a number of conservative methods are used, including physical therapy procedures, occlusal splints, rehabilitation and specialist psychological support(11, 12, 13, 14)When the conservative methods fail, surgical methods are followed such as disc repositioning meniscectomy, etc.(15, 16)Platelet-rich plasma (PRP) has been used medicinally since the 1970s (1)and is obtained by centrifugation of whole autogenous blood which yield platelet concentration in PRP is at least 5-fold greater than that in physiological blood.(17,18), Platelets are a nucleated fragments of megakaryocytes that formed in the marrow with the life span ranges from 8-12 days,(19, 20)Platelet contain more than 30 bioactive proteins, that play a considerable role in hemostasis, and tissue regeneration or healing,(21)

After secretion of the active proteins, they bind to target cells, which include fibroblasts, osteoblasts mesenchymal stem cells and endothelial cells. These bindings have different consequences. Can cause cellular proliferation, collagen synthesis, matrix formation, osteoid production, etc. thus provoking tissue healing and regeneration of tissue.(22, 23, 24, 25, 26)Growth factors secretion by platelets start within 10 min after activation.(25)PRP is used particularly in orthopedic for regeneration of Osteoarthritis-induced changes, in the management of injured ligaments and tendons.(27, 28)In oral surgery, PRP has extensive uses. PRP is used to induce bone generation in sinus lift procedures and induce bone formation in clef surgery, and jaw reconstruction. It is used to fill the bony gap in Oro-antral fistula and after bone resection or defect after cyst or tumor removal (18, 29)PRP used also in Alveolar socket preservation procedures after tooth extraction, in implant surgery and in sinus lifting.(30, 31, 32, 33)The efficacy of PRP has been highlighted in many researches as a method of management of TMJ disorders and the safety of this methods has been mentioned due to the use of autologous material.(34, 35, 36)TMJ internal derangements are painful progressive conditions that caused by many different factors including displacement of the articular disk from its normal position, alterations in TMJ internal pressure and/ or alteration of various biochemical constituents of the synovial fluid that may lead to failure of lubrication.(37)

The aim of this study was to evaluate the management of internal derangement of TMJ regarding pain intensity in temporomandibular joints and muscles of mastication and mouth opening.

Material and methods

This study was conducted in the Department of Oral and Maxillofacial surgery-college of Dentistry Tikrit University. Twenty-one patients, 14 women and 7men with age range between 18-33 years old, were

diagnosed with internal derangement of TMJ that were treated byintraarticular PRP

Inclusion criteria:

1- Patients with painful joint.
2- Patients without systemic disease were selected.
3- Patients were free from any type of drug for the last month.
4- Have not treated with any form of joint surgery.

The assessment include:

Pain intensity, which was recorded for each patient using a Visual Analog Scale (VAS). A scale starts from (0 to 10) grades in which (0) represents no pain, while (10) represents the worst possible pain..(38) (39).Mouth opening in millimeter was measured as distant between incisal edge of upper and lower incisor teeth Maximum Inter-incisal Opening (MIO) was also clinically recorded .(38)(39).Clicking was assisted clinically and classified into absent, the same , decrease, and increased

The assessments were performed at the prior to treatment and then at a follow –up post 1 week, 2 weeks, 4 weeks, 12 weeks examination.

Steps of the procedure

1- OPG was taken for all patients
2- Platelet, RBC and WBC count were done before the procedures to ensure that all blood elements were within normal limits. Patients with any blood disorder, were excluded from the study.
3- Preparation of PRP**,**double PRP extraction technique been with drawl of 10ml of patient venous blood using wide bore needle. Median cubital vein was selected for venipuncture.(38)The blood is transferred directly to tube containing sodium citrate to prevent coagulation process. Then centrifuged 6 minutes at 1500 RPM order to separate RBC from plasma and platelets.(38) The supernatant plasma which contain platelets were Transferred into another sterile tube. Centrifuge tube at a higher speed 3000 rpm for 10 minutes to obtain a platelet concentrate. The lower $1/3^{rd}$ is PRP and upper $2/3^{rd}$ is platelet-poor plasma (PPP).Remove PPP and we get PRP that is ready for use about (2 mL).
4- The injection sites were determined by drawing on patient's skin between the middle of the tragus and the outer eye corner. The posterior entrance point is located along this canthotragal line, about 10mm from tragus and 2 mm below the line.(38)(39).In the Department of oral surgery, while sitting on the dental chair, The patients were requested to open the mouth forcing the condyle forward with the surgeon hand palpating the zygomatic arch and the resultant preauricular concavity.(38).The skin injection site was decontaminated with a disinfectant. Then whole joint area was anesthetized with lidocaine with epinephrine. One mL of plasma was injected into each temporomandibular joint.(38),Patients were informed before the procedures about the possibility of experiencing an unpleasant and transient sensation in the joint regions.

Result

Twenty-one patients, 14 women and 7men with age range between 18-33 years old.

The overall mean for pain experience by the patient before the treatment 5.33 ± 2.06 (range 2-9). Table (1) shows the pain index after I

weeks of PRP injection ,After 12 weeks follow up the pain values have been decrease with mean 1.14 ± 2.03.(Range 0-5). The P-value for pain experience was < 0.0001 as shown in Table (2).Theoverallmean for maximal interincisal mouth opening before treatment was 27.8 ± 7.11mm (range 14–35 mm). After 1 week be 31.1± 9.01mm, table (3). After 12 weeks follow up the mean of maximalinterincisal mouth opening was47.8± 7.7mm (range 35-55). The P-value for maximal interincisal distance was <0.0001 as shown in Table (4).the symptoms outcome of clicking shows that it was be the same in 33% of the patient , decrease in 43 %, absent in 14% ,and increase in 10% 0f patient clicking fig(1).

Discussion

Facial pain is a common and leading cause of impairment in the jaw function. TMJ pain in is a special problem as the pain increase with mandibular function during chewing and talking.(11, 12,) Several articles and studies have been published concerning the appropriate management of internal derangement of TMJ, with conflicting reports of its efficacy, safety and associated complications.(40, 41)Treatment with rest, education, reassurance and instructions to avoid contributing factors, and mild analgesic as first-line treatment.(42)An interocclusal appliance can be helpful for patient complains with pain. Physical therapy have been also attempted for reduction of dysfunction.(43)A variety of agents, such as steroidal anti-inflammatory, hyaluronic acid and chondroitin sulphate have been used as a noninvasive solution for controlling sign and symptom related to TMJ problem.(44)Injection of PRP TMJ is a minimally invasive modality with effectiveness in management of TMJ dysfunctions involving disc derangement without blocking have been highlighted in many researches.(45)

This study demonstrates significant pain reduction after 12 weeks P-value< 0.0001 (table 2). The maximal interincisal distance was increased significantly after 12 weeks P-value<0.0001 (table 4). The patients reported reduction in clicking as shown in the figure (1) which demonstrate reduction in the clicking. These finding was in agreement with study “Hancı M et al who describe in his study a significant reduction in pain intensity, joint sound and increase in mouth opening.(3)The result of this study supported by study that performed by Al-Delayme R.M.A who demonstrate that PRP significantly effective in improvement of the extent of mouth opening with reduction of VAS value. (46)Platelets have golden role in tissue healing. It act as reservoir for growth factors including vascular endothelial growth factor (VEGF), transforming growth factor-beta 1 (TGF-β1), fibroblast growth factor (FGF), epidermal growth factor (EGF), and platelet-derived growth factor (PDGF). Once these growth factors activated it stimulate the healing cascade in cartilage, muscle ligament, tendon, and in bone, through the effect of PRP on cell proliferation, cellular metabolism and anti-inflammatory effect in injection site.(47, 48, 18, 49, 50) Lippross et al. reported that PRP reduced inflammatory mediator synthesis in the synovial membrane. (47)

The findings in our study demonstrating a significant improvement in both pain and mouth opening was achieved after the management. The symptom of clicking in the TMJ was not significant need amore studies. These improvement can

be attributed to PRP properties such as growth modifier and stimulator with its anti-inflammatory effect.

Conclusion

PRP injection to the upper TMJ space for treatment of internal derangement is safe, effective, non-invasive method that help to reduce pain, joint noise or clicking and increase mouth opening, thus improving the jaw function. More studies using the lateral movements of the mandible as a parameter are needed, Also need to depend on other criteria for selection of patient for internal derangement such as RDC criteria.

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Table (1): Statistical comparison regarding the pain index before and after 1 weeks of the PRP injection (df= 20).

Study group	Mean pain index ± SD	T- test	S.E.	Confidence Interval	P- value
Before (n= 21)	5.33 ± 2.06	3.2	0.16	0.18 to 0.87	0.0045*
After 1 weeks (n= 21)	4.81 ± 2.14				

* Highly significant

Table (2): Statistical comparison regarding the pain index before and after 12 weeks of the PRP injection(df= 20).

Study group	Mean pain index ± SD	T- test	S.E.	Confidence Interval	P- value
Before op (n= 21)	5.33 ± 2.06	11.55	0.36	3.43 to 4.95	< 0.0001*
After 12 weeks (n= 21)	1.14 ± 2.03				

* Highly significant

Table (3): Statistical comparison regarding the MIO before and after 1 weeks of the operation (df= 20).

Study group	Mean MIO ± SD	T- test	S.E.	Confidence Interval	P- value
Before (n= 21)	27.8 ± 7.11	3.05	1.09	1.05 to 5.62	0.0064*
After 1 weeks (n= 21)	31.1 ± 9.01				

* Highly significant

Table (4): Statistical comparison regarding the MIO before and after 12 weeks of the operation (df= 20).

Study group	Mean MIO ± SD	T- test	S.E.	Confidence Interval	P- value
Before op (n= 21)	27.8 ± 7.11	11.8	1.697	16.5 to 23.6	<0.0001*
After 12 weeks (n= 21)	47.8 ± 7.7				

* Highly significant

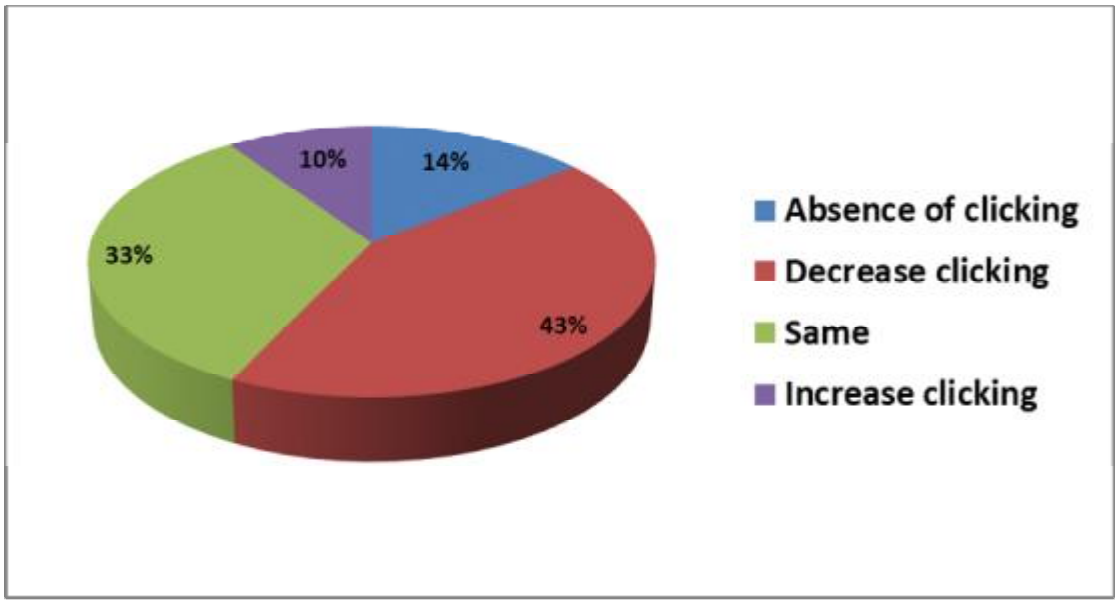

Figure1: Distribution of cases according to the symptomatic outcome of patient clicking.