

Autologous Blood versus Platelet Rich Plasma (PRP), Pericapsular Injection in the Treatment of Chronic Recurrent Temporomandibular joint dislocation

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Abstract

Background: Temporomandibular joint dislocation occurs when the condyle moves beyond the anterior surface of the articular eminence, stays locked, and is unable to reduce itself back to the original position in the glenoid fossa. Nonsurgical methods are preferred in management of TMJ dislocation. **Aim:** This study aims to compare between pericapsular injection of either platelet rich plasma or autologous blood for the management of recurrent dislocation of TMJ. **Subjects and methods:** Forty patients suffering from chronic recurrent TMJ dislocation were selected in this prospective cross-sectional study. Patients were divided into two groups: Group I for 20 patients who were treated by injection of autologous blood; 2 ml into the pericapsular tissues of the TMJ, and Group II for 20 patients were treated by injection of platelet rich plasma; 2 ml into the pericapsular tissues of the TMJ. Patients were evaluated as pain score and range of mandibular movements. **Results:** The mean age of patients was 30.2 years, 20% of patients were male and 80 % of patients were female. There is highly significant difference among studied groups as comparing preoperative and postoperative values after one or 3 months for pain assessment and lateral range of mouth opening. **Conclusion:** Both autologous blood and PRP are simple, low cost, and minimally invasive methods that allow a high concentrate of autologous growth factors in physiological proportions to be obtained from blood, which can be easily and safely injected directly into the TMJ. Higher levels of pain associated with whole blood injection.

Keywords: Autologous, blood, dislocation, PRP, TMJ.

Background:

The fibrocartilaginous temporomandibular joint composed of joint's capsule with multiple ligaments and muscles surrounding the capsule. The fibrocartilaginous disk positioned between the mandibular fossa and the mandibular condyle separating the joint into an upper compartment, which is involved in translational movement, and a lower compartment, which is involved in rotational movement (1).

When the mandibular condyle could be dislocated away from the glenoid fossa at the articulation site, this is called chronic arthritis due to weakness of the nature of the joint's capsule (2).

Recurrent dislocation of the temporomandibular joint could be unilateral or bilateral which makes the presented patient couldn't close the mouth with coaptation of both jaws. Reposting of the acute condition of TMJ dislocation could be proceeded manually (3). There are many daily activities could lead to the dislocation in these patients as yawning, laughing, and mastication. It could be precipitated also in certain clinics as dental procedures (4). Chronic Dislocated TMJ is diagnosed by recurrent attacks of dislocation events. Complications of recurrent temporomandibular dislocation

include injury to the disc, the capsule and the ligaments leading to progressive TMJ internal derangement and pain (5).

There is multiple therapies for management of the recurrent dislocation of the TMJ as medical or surgical therapy. Muscle relaxants, hot fomentation and soft diet control is the first medical treatment, but the recurrent events of TMJ dislocation could need surgical interference. So that the local injection of sclerosing material or blood products could be excellent alternative therapy for failed medical therapy (6).

Many articles confirmed the limited role of medical treatment, so the local injection is excellent alternative method for managing the pain and limited mobility of the recurrent attacks of TMJ dislocation. Sclerosing agents, botulinum toxin A, proved to have significant relief of manifestations accompanying this condition (7). The main advantages of autologous blood injection or PRP injection is that it is available and simple method that could be done at clinics under local anesthesia. The difference of these materials depends on the cost or time consuming or the less side effects of each local injected material (8).

PRP should be obtained from multiple blood samples from the same patient then by gradient density centrifugation the PRP was separated after precipitating the blood cells. The nature of growth factors in PRP helps in reduction of the inflammation aiming to minimize the pain and improve the range of the motion (9).

This study aims to compare between pericapsular injections of either by platelet rich plasma (PRP) or autologous blood in management of recurrent temporomandibular joint (TMJ) dislocation.

Subjects and methods

A total of 40 patients suffering from recurrent dislocation of temporomandibular joint were included in this prospective cross-sectional study when diagnosed at our clinic of Benha university hospital during the period from February 2021 to February 2022. Randomly included patients were treated by pericapsular injection of either 2 ml autologous blood injection (ABI) as group A or 2 ml platelet rich plasma (PRP) injection as group B. Patients were evaluated as pain score and range of mandibular movements. After approval of the ethical committee of the hospital, informed consent was taken

from all patients before having been included in this study

Inclusion and exclusion criteria:

Patients diagnosed with chronic recurrent anterior TMJ clinically dislocation either unilateral or bilateral were included. Aged patients from 20 - 60 years old were also included. Those suffering from systemic disease (platelet function disorder, fibrinogen deficiency) were excluded as well as patients who had recent fracture at TMJ level or who had previous surgical interference to TMJ.

Preoperative assessment:

The data was obtained from each patient diagnosed with clinical TMJ recurrent dislocation including the demographic data, any past history of diseases as chronic systemic diseases or history of medications intake. Trauma history or previous accident were also recorded. History of stressful life habits as grinding, headache history or chronic ear pain were also taken from each patient. Present history and main patient complaint were recorded including each symptom onset, course, duration, and increasing factors.

Certain scale called visual analog scale for pain was used ranging from zero to 10 ("0" indicating pain free and "10" indicating severe intolerable pain). Pain scored as visual analog scale were

assessed as main and referral locations of pain were also recorded including its level that was determined by self-assessment scale done by each patient.

Evaluation of the temporomandibular joint were done as physical examination consisted of palpation of both TMJ by compressing against the lateral aspects of the joint especially in open motion in order to examine the path of the condyle and to detect any abnormality or any detected clicking sounds. Estimation of the flexibility of jaw movement was done.

Evaluation of the muscles of mastication were done as palpation was done to head, neck & masticatory muscles to detect tenderness of muscles & to estimate pain.

Mandibular range of motion (ROM) were also evaluated as a caliper measuring the lateral protrusive motion (right and left) and the range of opening of the patient's mouth as shown in Figures (1, 2). Joint tenderness was also recorded. Masticatory muscles tenderness on palpation that include masseter, temporalis, lateral pterygoid and medial pterygoid muscles, palpation was done for each muscle to detect and record if tenderness is present or absent. Odontogenic evaluation was done to eliminate dental sources of pain, to find evidence of bruxism, nail biting, deep bite, presence of occlusal abnormalities, or missing posterior teeth.



Figure (1): Caliber used to measure the maximal interincisal opening (right), and the protrusive movement (left)

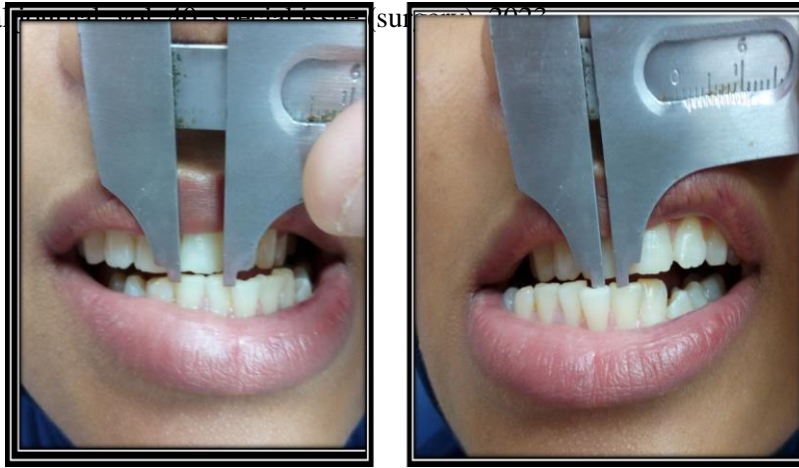


Figure (2): Caliber used to measure the left and right lateral movement

The operative assessment

The TMJ was palpated during mandibular movements to locate the condyle. The ear and preauricular skin over the TMJ were cleaned with Betadine solution and the area was isolated with sterile towels. Two points were marked over the auricular fossa and eminence, 1cm in front of the tragus along the lateral canthal tragus line and 2 mm below the tragus. The subcutaneous tissues lateral to the joint

were infiltrated with a local anesthetic solution Mupivacaine, then the auriculotemporal nerve was blocked by injection of the anesthetic solution posterior to the condylar neck. Randomly the patients were treated by pericapsular injection of either 2 ml autologous blood injection as group A or 2 ml platelet rich plasma injection as group B as shown in Figures (3, 4).



Figure (3): Autologous blood injection into the TMJ

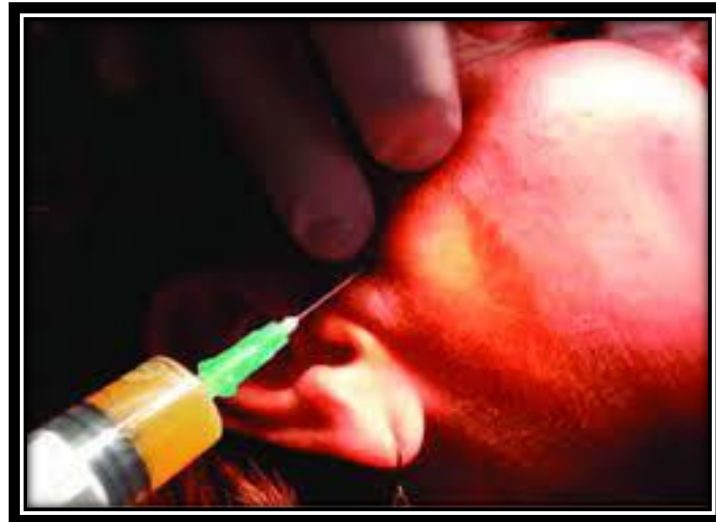


Figure (4): Platelet rich plasma injection into the TMJ

Post-operative phase

The patient was banned from mandibular movement by an elastic head splint for two weeks. On analgesic (Ibuprofen 400mg twice daily) and antibiotic (Amoxicillin clavulanic acid 1 gm twice daily) for one month, the patient was followed-up for one week with restriction of mouth opening (just soft drinks). Mandibular Exercises 4 times daily after first week. Patients were examined after removal of the bandage 2 weeks postoperatively and examined again a month after the injection to assess the pain score. Starting from the second week, trials of opening the mouth was started. Each patient was assessed for lateral and protrusive movements repeatedly. Measuring of the maximal incisal opening (MIO) using poly-gauge caliber was measured by asking the patient to open as wide as possible

between the incisal edge of the upper and lower incisors.

Statistical Analysis

After collecting the data, the statistical analysis was performed using SPSS software (version 16.0, SPSS, Inc., Chicago, Illinois, USA). The categorical variables were compared using a chi-square test. P values of 0.005 were statistically significant based on the Bonferroni correction

Results

A total of 40 patients suffering from recurrent dislocation of temporomandibular joint were included in the study when diagnosed at our clinic of Benha university hospital. Randomly included patients were treated by pericapsular injection of either 2 ml autologous blood injection (ABI) as

group A or 2 ml platelet rich plasma (PRP) injection as group B. The mean age of patients was 30.2 years ranging from 20 to 46 years old, 20% of patients were male and 80 % of patients were female

There is highly significant difference among studied groups as comparing preoperative VAS and either postoperative values after one or 3 months for pain assessment. There is no strict significant difference among studied groups as regard preoperative VAS or postoperative values after one or 3 months for pain assessment. (Table 1)

There is highly significant difference among studied groups as comparing preoperative MIO and either postoperative values after one or 3 months for MIO assessment. There is no strict significant difference among studied groups as regard preoperative MIO or postoperative values after one or 3 months for MIO assessment. (Table 2)

There is highly significant difference among studied groups as comparing preoperative protrusive movement of the jaw and either postoperative values after one or 3 months for the degree of protrusive movement of the jaw. There is no strict significant difference among studied groups as regard preoperative

protrusive movement of the jaw or postoperative values after one or 3 months for the degree of protrusive movement of the jaw. (Table 3)

There is highly significant difference among studied groups as comparing preoperative right lateral movement of the jaw and either postoperative values after one or 3 months for the degree of right lateral movement of the jaw. There is no strict significant difference among studied groups as regard preoperative right lateral movement of the jaw or postoperative values after one or 3 months for the degree of right lateral movement of the jaw. (Table 4)

There is highly significant difference among studied groups as comparing preoperative left lateral movement of the jaw and either postoperative values after one or 3 months for the degree of left lateral movement of the jaw. There is no strict significant difference among studied groups as regard preoperative left lateral movement of the jaw or postoperative values after one or 3 months for the degree of left lateral movement of the jaw. (Table 5)

There is highly significant difference among studied groups as comparing preoperative protrusive movement of the jaw and either postoperative values after one or 3 months for the degree of

protrusive movement of the jaw. There is no strict significant difference among studied groups as regard preoperative protrusive movement of the jaw or

postoperative values after one or 3 months for the degree of protrusive movement of the jaw (Table 6)

Table (1): Preoperative and postoperative pain score by VAS in each studied group:

VAS	preoperative	Postop. Month (1st.)	Postop. Months (3rd.)	t-test	P-value
Group A	6.8 ± 1.7	3.5 ± 0.6	0.8 ± 0.9	22.156	<0.001 HS
Group B	7.6 ± 1.8	2.8 ± 0.8	0.5 ± 0.6	25.021	<0.001 HS
t-test	1.451	1.334	1.496		
P-value	>0.05 NS	>0.05 NS	>0.05 NS		

P value: NS= Non-significant (P-value > 0.05), HS= highly significant (P-value ≤ 0.001).

Table (2): Preoperative and postoperative MIO in each studied group:

MIO	Preoperative	Postop. Month (1st)	Postop. Months (3rd)	t-test	P-value
Group A	46.8 ± 1.6	38.5 ± 1.6	33.6 ± 2.6	38.651	<0.001 HS
Group B	47.1 ± 2.2	36.6 ± 1.8	32.5 ± 1.7	39.349	<0.001 HS
t-test	0.549	0.234	1.633		
P-value	>0.05 NS	>0.05 NS	>0.05 NS		

P value: NS= Non-significant (P-value > 0.05), HS= highly significant (P-value ≤ 0.001).

Table (3): Preoperative and postoperative protrusive movement of the jaw in each studied group:

Protrusive movement of the jaw	Preoperative	Postop. Month (1st)	Postop. Months (3rd)	t-test	P-value
Group A	12.2 ± 1.	8.6 ± 1.2	5.5 ± 0.4	85.616	<0.001 HS
Group B	13.2 ± 1.4	8.2 ± 1.5	5.6 ± 0.2	88.236	<0.001 HS
t-test	2.079	1.749	1.566		
P-value	>0.05 NS	>0.05 NS	>0.05 NS		

P value: NS= Non-significant (P-value > 0.05), HS= highly significant (P-value ≤ 0.001).

Table (4): Preoperative and postoperative right lateral movement of the jaw in each studied group:

Right lateral movement of the jaw	Preoperative	Postop. Month (1st)	Postop. Months (3rd)	t-test	P-value
Group A	7.8 ± 0.4	5.5 ± 0.6	4.8 ± 0.6	52.104	<0.001 HS
Group B	8.7 ± 0.7	6.2 ± 0.8	4.5 ± 0.5	48.611	<0.001 HS
t-test	1.104	1.211	1.502		
P-value	>0.05 NS	>0.05 NS	>0.05 NS		

P value: NS= Non-significant (P-value > 0.05), HS= highly significant (P-value ≤ 0.001).

Table (5): Preoperative and postoperative left lateral movement of the jaw in each studied group:

Left lateral movement of the jaw	Preoperative	Postop. Month (1st)	Postop. Months (3rd)	t-test	P-value
Group A	9.1 ± 0.4	6.3 ± 1.1	5.4 ± 0.4	71.121	<0.001 HS
Group B	9.4 ± 0.5	6.6 ± 0.9	5.2 ± 0.5	73.124	<0.001 HS
t-test	2.122	1.834	1.461		
P-value	>0.05 NS	>0.05 NS	>0.05 NS		

P value: NS= Non-significant (P-value > 0.05), HS= highly significant (P-value ≤ 0.001).

Table (6): Preoperative and postoperative regional tenderness over the jaw in each studied group:

Regional tenderness over the jaw	Preoperative	Postop. Month (1st)	Postop. Months (3rd)	Chi-square test	P-value
Group A					
+ve	20 (100%)	8 (40)	2 (10%)	38.833	<0.001
-ve	0	12 (60%)	18 (90%)		HS
Group B					
+ve	20 (100%)	4 (20%)	1 (5%)	45.394	<0.001
-ve	0	16 (80%)	19 (95%)		HS
Chi-square test	-	6.457	3.057		
P-value	-	>0.05 NS	>0.05 NS		

P value: NS= Non-significant (P-value > 0.05), HS= highly significant (P-value ≤ 0.001).

Discussion:

The anatomical nature TMJ compartment for translational motor fibrocartilaginous type of joint with disk function and inferior compartment for dividing the joint into superior rotational motor function (1).

Hypermobility of tempromandibular joint is mainly caused by either its dislocation of the joint articulation or subluxation of its capsule. Dislocation could occur unilateral or bilateral when the condyle part of the mandible moves away from the glenoid fossa of the skull. It could be reducible or irreducible according to the ability to return the condyle process to be reduced in the glenoid fossa. Clinically the patient appeared as opened mouth with or without lateral deviation according to the laterality of the dislocation (10).

The dislocation of the TMJ could hinder the daily activities and affecting the ability to move the mandible with horrible pain. Its recurrent could leads to laxation of surrounding ligaments and muscles that leads to weakness of the joint and its capsule (11).

The main line of management of TMJ dislocation or subluxation is surgical therapy with great risk of facial nerve injury, hematoma, and bad scar. Avoiding this surgical interference, the local injection of certain materials to minimize the handicapping of the TMJ dislocation as non-surgical methods, such as intracapsular or pericapsular injections of sclerosing agents, and botulinum toxin injection into the affected muscles. Physiotherapy is also considered as the

least invasive technique dealing with TMJ dislocation (12).

Blood sampled from the same patient for ABI is available and cheap technique in management of chronic tempromandibular joint arthritis through its injection into the TMJ and could be manipulated under local anesthesia. The blood components induce fibrosis and develop fibrous bands through the capsule of the joint minimize the recurrence of the tempromandibular joint dislocation (13).

The autologous blood could hinder joint movements for long period so that it could be centrifuged to get platelet-rich plasma (PRP) from 5-8 samples. PRP plays an important role in minimizing the inflammation and the pain as it contains concentrated growth factors. It also provides proper regeneration of the cartilage at the site of injury (14).

This study was conducted on forty patients 20% were males (8 cases) and 80% were females (32 cases) complaining of clinical manifestations of recurrent dislocation of the tempromandibular joint. In the present study, the Mean \pm SD age was 30.2 ± 9.8 , categorized into two groups. Under local anesthesia, group (A) underwent 3 ml ABI in the pericapsular area of the joint, while group (B) underwent 3 ml platelet rich plasma in the pericapsular area.

In this study, it was found that there was an excessive movement range of the mandible in patients with recurrent dislocation of the TMJ, the mean of maximal interincisal opening (MIO) was 46.8 mm and 47.1 mm in both groups respectively. As well as our results were similar to what reported by Bayoumi et al. the mean range of movement of the mandible was 41.3 mm for patients with chronic dislocation of TMJ (14), also in agreement with the study conducted where it was found that the mean of MIO is 44.5 mm (15).

Comparing preoperative and postoperative measurement of range of movement of the mandible showed significant improvement for each group but with no significant parameters comparing the improvement measures between both groups, as postoperative mean \pm SD of MIO, decreased from 46.8 ± 1.6 to 33.6 ± 2.6 in group A, and from 47.1 ± 2.2 to 32.5 ± 1.7 in group B, also postoperative mean \pm SD of protrusive movement of the jaw decreased from 12.2 ± 1.8 to 5.5 ± 0.4 in group A, and from 13.2 ± 1.4 to 5.6 ± 0.2 in group B. The mean \pm SD of right lateral movement of the jaw decreased from 7.8 ± 0.4 to 4.8 ± 0.6 in group A and from 8.7 ± 0.7 to 4.5 ± 0.5 in group B. The mean \pm SD of left lateral movement of the jaw decreased from 9.1 ± 0.4 to 5.4 ± 0.4 in group A and

from 9.4 ± 0.5 to 5.2 ± 0.5 in group B with a significant P-value in all studied parameters.

The pain was measured by VAS (visual analogue scale), The mean \pm SD of preoperative VAS for pain in Group A was 6.8 ± 1.7 which decreased to 0.8 ± 0.9 in the 3rd month postoperative, also The mean \pm SD of preoperative VAS for pain in Group B was 7.6 ± 1.8 which decreased to 0.5 ± 0.6 in the 3rd month postoperative with no significant difference between the two studied groups and this was in a match with a study conducted by Lin et al who found more superior results after PRP injection (16).

A study was performed on patients with recurrent dislocation of TMJ who were treated with ABI and detected that after one year follow-up period the maximal range of mouth opening was 5.3 ± 2.1 mm (17). Twenty-five cases complained of recurrent dislocation of the TMJ who had ABI were studied. There was a significant reduction of range of movement in accordance with our results (18).

The injection of the blood in the pericapsular area of the TMJ depends mainly on the fibrosis in the cavity of the joint that minimize the range of movement of the mandible that decreases the chronicity of the inflammation (20).

Another study compared between arthrocentesis as control group and injection of PRP intraarticularly after joint reduction. They found out that there is a statistically significant improvement of mouth opening and pain reduction between two groups with better results to study group (9).

Another study done on 2012 concluded that the intraarticular injection of the temporomandibular or knee joints with PRP showed significant less pain scores and more rapid return to its function (20). The injection of 0.5 ml plasma into the TMJ was studied as a step in the basic prosthetic management showed significant improvement of pain score and intensity (21).

It was shown that PRP, which contains growth factors, may have therapeutic effects in osteoarthritis by modulating synovial cell biology. They also reported an increased hyaluronic acid (HA) concentration and stabilized angiogenesis after platelet concentrate exposure (22).

Our limitation in this study is a larger sample size is required with a longer follow-up period to determine the effectiveness of this technique and its safety. There are no significant differences between both groups.

Conclusion:

There are similar merits in the usage of either ABI or PRP in managing TMJ dislocation as it could be done at outpatient with less cost as a minimally invasive technique. Higher levels of pain associated with whole blood injection.

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