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The Safety and Efficacy of Intra-Articular Platelet Rich Plasma Injections in Comparison to Intra-Articular Steroid Injections in Treatment of Temporomandibular Joint Disorders

Sabah Abdul Rasool Hammoodi¹⁾, Wesam A. Sami²⁾, Elham Hazeim Abdulkareem¹⁾

ABSTRACT

Background: Temporomandibular disorders (TMDs) are steadily increasing. Intra-articular injections of medications have been proposed for pain relief, improvement in function, such as and platelet-rich plasma (PRP) and steroid. PRP is a minimally invasive method which is rich in growth factors that are necessary for tissue regeneration

Objectives: To compare the efficacy and safety of platelet-rich plasma and triamcinolone intraarticular injections for the management of TMJ disorders.

Methods: 40 patients (12 male, 28 female) with (TMDs) divided into two groups: In Group I: intraarticular injection of PRP was given while in Group II intraarticular injections of triamcinolone was performed. The results were assessed through the procedure using clinical assessment of pain, mouth opening and joint sounds.

Results: improvement of joint pain and mouth opening were seen in group I and II. There was significant difference ($P \leq 0.05$) in improvement of pain intensity and mandibular function in group I than group II. There was improvement in joint sounds in both groups I and I (24%, 36% respectively) than the preoperative level (44%, 50% respectively) but statistically not significant.

Conclusion: The results of this study show that the intraarticular injection of PRP and triamcinolone can improve the pain of joint, increase maximal interincisal opening but less effective in treating the joint sounds (clicking, crepitus). The outcomes of pain relief and increasing mouth opening were more effective with intraarticular PRP injection than intraarticular triamcinolone injection.

KEY WORDS

temporomandibular disorders, intraarticular injection, platelet rich plasma, steroid

INTRODUCTION

Temporomandibular disorders (TMDs) are a collective term that include a group of clinical features that involve the muscles of mastication, the TMJ, and the associated structures¹⁾.

Patients with (TMDs) most frequently present with pain, limited or asymmetric mandibular motion, and TMJ sounds. The pain or discomfort is often localized to the jaw, TMJ, and muscles of mastication. TMDs are classified into three groups (muscle disorders, disc displacement and arthralgia, arthritis and arthrosis) according to research diagnostic criteria system which is proposed by Samuel Dworkin and Linda LeResche at 1992²⁾.

Intra-articular injection of medications is well known method of treatment of (TMDs) and these medications include steroids, local anesthesia, hyaluronic acid and recently Platelet rich plasma (PRP). The

goals of intra-articular injection of corticosteroids are to reduce the inflammation and pain associated with TMD and to increase the relative viscosity with an increase in hyaluronic acid concentration^{3,4)}.

The intra-articular injectable corticosteroids are methylprednisolone acetate, triamcinolone acetate, betamethasone acetate and betamethasone sodium phosphate, triamcinolone hexacetonide, and dexamethasone. Intra-articular injection of corticosteroids has rare side effects such as progression of an existing joint pathology and bone resorption⁵⁾.

Platelet rich plasma (PRP) is volume of plasma that has a platelet concentration higher than a baseline level (one million platelets per microliter) and is prepared by various protocols. PRP is a rich source of growth factors and bioactive cytokines which stimulate cell proliferation, migration and synthesis of connective tissue matrix. The first attempt for using intra-articular PRP injections was performed by Sánchez *et al* to treat avulsion of knee articular cartilage. Although many articles are published about intra-articular PRP injections, the

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1) Department of Oral and Maxillofacial Surgery, College of Dentistry, University of Anbar
Iraq

2) Department of Prevention-Orthodontic-Pediatric, College of Dentistry, University of Anbar
Iraq

Correspondence to: Sabah Abdul Rasool Hammoodi
(e-mail: Dr_sabah1980@yahoo.com)



Figure 1. Canthal-tragus line and point of injection PRP and triamcinolone

Table 1. The mean and S.E of Visual analogue scale according to period of injection with-PRP, Triamcinolone.

Visual analogue scale	Group 1 PRP-injection Mean ± S.E	Group 2 Steroid injection Mean ± S.E
Pre-operative	6.3 ± 2.4	6.1 ± 1.53
Post-operative		
1-week	5.4 ± 1.2*	5.7 ± 0.25
1-month	4.5 ± 0.9 *	5.1 ± 1.74
3-month	3.7 ± 0.4*	4.6 ± 0.81

*Different P ≤ 0.05 a significant

Table 2. Comparison the measurement of maximum interincisal opening according in patient injection with-PRP, steroid.

Open mouth	Group 1 PRP-injection Mean ± S.E	Group 2 Steroid injection Mean ± S.E
Pre-operative	30.5 ± 3,1	33 ± 2.6
Post 1-week	48.6 ± 2.8*	45.6 ± 1.7
Post 1-month	51.4 ± 1.2*	47.2 ± 2.2
Post 3-month	53.6 ± 1.9 *	49.5 ± 1.8

*Different P ≤ 0.05 a significant

therapeutic benefits of intra-articular injections of PRP remain inconclusive. The aim of this study is to evaluate the clinical efficacy and safety of intra-articular PRP injection in comparison with triamcinolone injection in TMD.

MATERIALS AND METHODS

Between February 2015 and December 2018, Forty patients (12 males and 28 females); with age ranged from 20 to 65 years old were selected. On enrollment, each patient give informed consent, answered and comprehensive questionnaire, and were clinically assessed based on the Research Diagnostic Criteria (RDC/TMJ) of Dworkin and Leresche.

Inclusion criteria

Patient with one or more of the following features: pain in affected joint, clicking/crepitus, limited mouth opening, limited mandibular movements. These signs and symptoms may be due to disc displacement, osteoarthritis, arthralgia, and osteoarthrosis. Patients in whom other preventive treatments and medications are poorly tolerated or contraindicated, patients who are refractory to other treatments, and patients who simply prefer this treatment.

Exclusion criteria

Patient who had never been treated with or failed conventional ther-

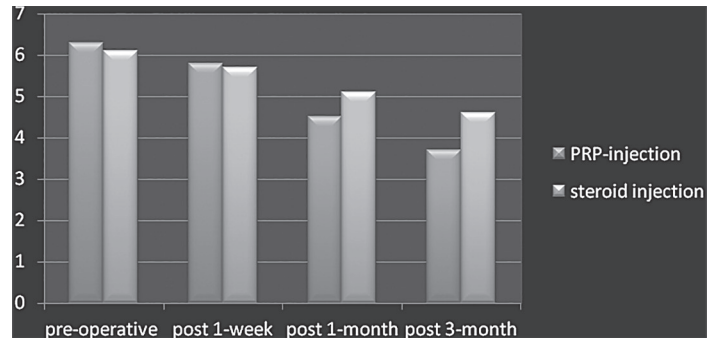


Figure 2. Comparison between the two study groups according to pain intensity

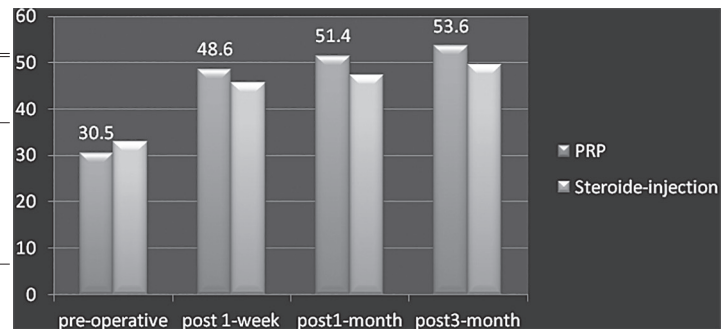


Figure 3. The measurement of maximum interincisal opening according in patient injection with-PRP, steroid.

apy for temporomandibular disorders (TMDs). Patients with bleeding disorder or any uncontrolled systemic disease.

Patients were divided into two groups:

Group I: which contain 20 patients with TMD who were treated with single intra-articular injection of PRP. The PRP was prepared by two centrifuge method where the first centrifuge was done at 3000 rpm for 10 minute for isolation of plasma then the plasma was condensed by second centrifuge at 3000 rpm for 10 minute then the PRP injected alone without platelet poor plasma (PPP).

Group II: which contain 20 patients who underwent single intra-articular injection with triamcinolone acetonide (kenacort 40 mg/ml).

Technique:

After disinfection of the joint area with povidone-iodine, subcutaneous infiltration of the affected joint with xylocaine 2% (with epinephrine 1:80000) was performed to anesthetize the auriculotemporal nerve.

In the first group: PRP was prepared by Drawing 8 ml of blood from patient into plasmolifting vacuum tube (commercial kit plasmolif-

Table 3. Clicking /crepitation value in TMJ patient treated with PRP or steroid injection during different period.

Clicking /crepiting	Group 1 PRF-injection (%)	Group 2 Steroid injection (%)
Pre-operative	44%	50%
Post 1-week	24%	36%
Post 1-month	23%	33%
Post 3-month	23%	33%

ting™) which contains heparin sodium as anticoagulant and polyethylene separating gel. Then the tube is placed into the centrifuge machine and was centrifuged at 3000 rpm for 10 min, the plasma would be isolated and then transported to another tube and centrifuged again at 3000 rpm for 10 min, then the upper two third of plasma was discarded (PPP) while the lower third (PRP) is injected by using 23-gauge needle.

Identification site of injections

(Figure 1): Holmlund-Hellsing line was drawn as canthotragal line and marking point A (10 mm from the middle of the tragus and 2 mm below the H-H line) and point B (20 mm from the middle of the tragus and 10 mm below H-H line). Single 23 gauge needle is inserted in the upper joint space at point A and inject 2 ml of PRP. Manual manipulation of jaw was performed after removal of needles.

In group II: 0.5 ml of Kenacort (triamcinolone acetonide 40 mg/ml) was injected in superior joint space and finger pressure was maintained for several minutes. Postoperative antibiotics (Amoxicillin/clavulanate potassium 625 mg tablet twice daily for 7 days) and analgesia (paracetamol tablet 500 mg thrice daily) were prescribed together with Ice packs application.

Clinical assessment of treatment results includes the following parameters:

- 1- Level of pain by using visual analogue scale (VAS)
- 2- Unassisted maximum interincisal opening (MIO)
- 3- Presence or absence of clicking/crepitus: recorded for each patient pre- and postoperatively then the average score was recorded for each group

Follow up (clinical evaluation and recording of any side effects) was done at 1 week and then monthly for 3 months.

RESULTS

40 patients were diagnosed with TMDs according to Research Diagnostic Criteria (RDC/TMJ) of Dworkin and Leresche. There are 12 male and 28 female who were divided into 2 groups.

Subjective assessment of pain (Visual analogue scale)

There was significantly less pain level in group I and II as shown in table 1 and figure 2. The improvement of pain was increased with time especially in group I. In comparison between group I and group II, there was significant difference in improvement of pain intensity in group I than group II.

Assessment of maximal interincisal opening

The patients in both group I and II show improvement of mandibular movement including maximal interincisal opening at 1 week as shown in table 2 and figure 3. The improvement was better and significant in group I compared to group II. The range of improvement was 1-23mm in group I and 1-16.5 mm in group II

Joint sounds

There were 44% of patients with clicking and/or crepitus in group I and 50% of patients in group II. A decrease in joint clicking and crepitations was seen in both groups at the end of first week (24%, 36% respectively) but is not statistically significant.. There were no further

Table 4. complications associated with PRP and triamcinolone injection.

Complication	PRP injection	Triamcinolone injection
Localized pain after injection	12	10
swelling	2	1
Ear pressure	0	0
infection	0	0
Open bite	0	0

significant improvement in joint sounds at 1 and 3 months.(Table 3)

Complications

The complications associated with PRP and triamcinolone injections were recorded during the period of 3 months and listed in table 4.

The localized pain at site of injection is the most common complication and is temporary. No serious complications occurred in this study.

DISCUSSION

TMD pain is the second most common cause of orofacial pain after dental pain and it is often the chief reason why patients seek for medical treatment⁹. In this study, there were 28 female and 12 male who were complaining of TMDs and this in agreement with other studies that females are more often affected by TMDs than males⁷⁻⁹.

The optimal treatment of TMDs is still not established. Intraarticular injection with triamcinolone and PRP are one of their treatments. In this study the reduction of pain level was documented in group I (PRP Injection) and group II (Kenacort injection). There is significant difference pre and postinjection (p value $P \leq 0.05$) in both groups. These results come in line with results of other studies (such as Machoň *et al*¹⁰), Pihut *M et al*¹¹) bothers¹²⁻¹⁵.

The reduction of pain by intraarticular PRP can be explained by the analgesic and anti-inflammatory action of cytokines and peptides which are released from alpha granules of platelets. In group II, the reduction of pain was significant due to anti-inflammatory action of the steroid (triamcinolone) and this comes in accordance with many well-established studies about the benefits of intraarticular steroid¹⁶⁻²⁰.

Comparing intraarticular PRP injections with triamcinolone injections, there were significant differences ($P \leq 0.05$) during the first month after injection but IA PRP was shown to be more effective 3 months post injection. This is in agreement with other studies where PRP and corticosteroids were used separately^{16-18,20}.

The triamcinolone is a synthetic glucocorticoid with anti-inflammatory and Immunomodulating properties. It is bind to and activates glucocorticoid receptor after entrance to cell, inducing expression of glucocorticoid genes like lipocortins, which inhibit phospholipase A2, thereby blockade the release of arachidonic acid from membrane phospholipids and thus preventing the formation of prostaglandins and leukotrienes, both mediators of inflammation and pain²¹.

The action of PRP is more lasting and profound than triamcinolone. There was increase in all mandibular movement including maximum interincisal opening in both groups but the improvement was better and statistically significant in group I in comparison with group II. This is in agreement with the results obtained by many authors²²⁻²⁵.

The improvement in mouth opening may be result from reduction of inflammation, enhancement of fluid viscosity and disc movement although the exact mechanism is still unknown. Kon *et al.* hypothesize that there are further unknown biological mechanisms which are responsible for the improvement of joint symptoms such as stiffness in osteoarthritis after PRP treatment²⁶.

Although several studies reported improvement of clicking and crepitus after PRP injection^{10,11,27} and after steroid injection^{28,29}, the findings in this study show that PRP and Triamcinolone injection are less effective in treating joint noises (clicking or crepitus). This comes in agreement with results of studies (Kopp *S. et al*¹⁸), Savina Gupta *et al*³⁰), and Moon *et al*¹⁴). De Bont clarify in his studies (1986) and later in (1992) the mechanism and clinical significance of joint sounds which may result from reducing disc displacement and /or osteoarthritic changes^{31,32}.

Although the PRP is associated with chondrogenesis, increased proteoglycans synthesis in the articular cartilage, enhance synovial action and prevention osteoarthritic changes progression³³, the PRP formula is more complex and their mechanisms of action remain obscure. Also the benefit of intraarticular triamcinolone injection in improvement of joint sounds is questionable despite the improvement in patient with reducing disc displacement but statistically not significant. None or minimal complications were reported after intraarticular injection such as mild pain, swelling. None of patients in this study reported major complication such as hematoma, infection and facial palsy. The proper technique of injection is important factor in reducing the side effects and improvement of result. The allergic reaction is possible but it is rare. The most serious complication is an intra-capsular infection, which could be prevented by aseptic technique³⁴.

CONCLUSION

The results of this study show that the intraarticular injection of PRP and triamcinolone can improve the pain of joint, increase maximal interincisal opening but less effective in treating the joint sounds (clicking, crepitus). The outcomes of pain relief and increasing mouth opening were more effective with intraarticular PRP injection than intraarticular triamcinolone injection.

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