

A Comparative Study between the Effects of Intra-Articular Injections of Platelet-Rich Plasma versus Corticosteroid with Local Anaesthetic in Refractory Cases of Temporomandibular Joint Disorders

<https://doi.org/10.47210/bjohns.2023.v31i3.81>

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ABSTRACT

Introduction

Temporomandibular disorders (TMD) are a group of disorders that affect the temporomandibular joint (TMJ), associated musculoskeletal tissues, or both, such as myofascial pain, internal derangements, and certain degenerative and rheumatological diseases. In recent practice corticosteroid and Platelet Rich Plasma (PRP) has been proposed as an interventional mode of treatment in TMD patients. We aimed to compare the efficacy of PRP and corticosteroid injection in reducing symptoms of TMD after failure of conservative treatment.

Materials and Methods

A total of 60 cases (30 in each of the study and control groups) of TMD patients were included in this study. Clearance from the Institutional Ethics Committee was obtained and the subjects were recruited after due consent. They were divided into two groups, study and control, by simple randomization. In patients of study group, intrarticular injection of PRP, and in the control group, Lignocaine with Triamcinolone was injected in the TMJ. Both the groups were assessed for pain, inter-incisal mouth opening and joint click at at 1st, 6th and 12th week respectively.

Results

Pain and joint click was markedly reduced in PRP group as compared to the corticosteroid group. Inter-incisal mouth opening also shows better result in PRP group.

Conclusion

Intra-articular PRP injection has significantly better outcome in terms of pain, inter incisal mouth opening, and joint sound in refractory cases of TMD than intra-articular corticosteroid injection.

Keywords

Temporomandibular Disorders; Intra-articular; Platelet Rich Plasma; Corticosteroid; Injection

The temporomandibular joint (TMJ) is a part of the masticatory system, having important role in functions such as speaking, chewing, swallowing, tasting and breathing. The masticatory system can sometimes become affected by problems involving the TMJ, the masticatory muscles, nearby structures, or a combination of these. When such problems occur they are defined as temporomandibular disorders (TMD).¹

Literature review shows that 8.9% of the general

population suffers from TMJ Osteo-arthritis and around 55.6% of TMD patients suffer from TMJ Osteo-arthritis.

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Moreover, up to 44.2% of TMD patients present with TMJ disc displacement² and around 7% of the population between 12 and 18 years of age are diagnosed with TMJ disorders. Temporomandibular disorders (TMD) are more frequent in females.³

The Temporo-Mandibular joint is a complex structure that normally can respond to heavy loading, though there must be a balance between healthy loading and overloading. When there is mechanical overloading, due to para-functional abnormality, malocclusion, micro or macro trauma, TMJ shows biochemical changes in the form of synovial tissue inflammation, cartilage degradation, and immobilization of the joint, adhesions of the disc and TMJ arthritis. Other etiologic factors of TMJ disorders are systemic inflammatory disease and consequences of general degenerative joint disease.⁴ According to previous epidemiological studies, different factors such as sex, age, general health status, nutrition and genetics can affect the susceptibility towards degenerative disease in the TMJ.⁵

There are several treatment options for management of TMJ disorders. If the patient does not show improvement on conservative treatment e.g. counseling, mandibular exercises, non steroidal anti-inflammatory drugs (NSAID), occlusal splints or occlusal grinding, then the option of intra-articular injection to the TMJ has been found to be effective.⁶ Symptoms such as pain, joint click or restricted mouth opening from inflammation in TMJ disorders can be suppressed by local intra-articular injection of corticosteroids or PRP.⁷

Gupta et. al. conducted a study on twenty patients for a total of 32 joints with reducible anterior disc dislocation. They were divided in two groups. One group received PRP injection and the other received hydrocortisone with local anesthetic in their affected joints. Both patients and operator were blinded as to the contents of injections. Subsequently, the patients were assessed for pain, maximum inter-incisal mouth opening and TMJ click. In the group receiving PRP injection, pain was found to be markedly reduced, mouth opening was assessed to have increased and the TMJ click was experienced lesser compared to the patients who received hydrocortisone with local anesthetics.⁸

In the present study, comparison was made between the therapeutic effects of intra-articular injection of PRP versus Corticosteroid with anesthetic in TMJ disorder patients, when conservative management had failed to relieve the symptoms.

Materials and Methods

A randomized controlled study was conducted in the Department of Otorhinolaryngology of a tertiary care hospital for a period of 18 months from January 2020 to June 2021. Clearance from the Institutional Ethics Committee was obtained for this study including the appropriate consent from the participants. Simple randomization was used to allocate the patients into the study and control groups. The patients were selected based on the following criteria- aged more than 18 years attending out-patient department with history and clinical presentation of TMD like pain, tenderness, joint click, facial asymmetry, swelling, deviation of mouth, dental malocclusion, open bite, restricted mouth opening, who were treated with muscle relaxant, pain killers or ultrasound therapy for 3 weeks but did not show any improvement of symptoms. Patients with known history of connective tissue disorder, neurological disorder, severe anemia, thrombocytopenia, malignant disease in the head and neck region or having any inflammatory disease for last 3 months were excluded from the study. A detailed clinical history was taken and examination was done. Focus was given to the following three criteria, namely, pain intensity recorded by Visual Analog Scale (VAS; scale 0-10), Maximum Inter incisal Opening (MIO) measured in millimeters and presence or absence of TMJ click. This assessment was performed at the beginning before any therapy was instituted and then at a follow-up examination at 1st, 6th and 12th week after the administration of PRP or corticosteroid, as the case may be. The patients were randomly divided into 2 groups by simple randomization technique. The patients in group A, the study group, were administered PRP (1 application), while the patients in group B, the control group, were administered corticosteroid with local anesthetic into both the TM joints (1 application).

For intra-articular injection in the control group, 0.5 ml solution consisting of 0.1 ml of triamcinolone acetonide (Kenacort®-40, 40 mg/ml,) and 0.4 ml lignocaine hydrochloride (Xylocaine®, 20 mg/30ml) was prepared in a 2 ml syringe. In the study group, 5ml autologous venous blood sample from the antecubital vein of the patient was collected in a test-tube with sodium citrate (0.5ml) as anticoagulant. The blood sample was then centrifuged at the rate of 2100 revolutions per minute (RPM) for 15 minutes. The blood was separated into 3 layers, a red bottom layer containing red blood cells, a pink middle layer containing PRP and a yellow top layer containing Platelet poor plasma (PPP). Then, the plasma of the first harvest (1st and 2nd layer) was fractionated using centrifugation at 3500 RPM for 10 minutes and pellet was collected. For each TMJ, 0.6 ml PRP was drawn from the test tubes using a micropipette into 2 ml syringes.

Intra articular injection was given in the outpatient clinic under vision. Normally the superior joint space is the target for an intracapsular (intraarticular) injection according to the standard guideline, the TM joint can be entered by first locating the lateral pole of the condyle that can be assessed by asking the patient to open and close the mouth. Subjects under study were prepared for the procedure by drawing a line on their skin between the earlobe and the outer eye canthus. Three segments were marked at 10 mm intervals starting from the earlobe. The skin at the injection site was washed with a disinfectant to decontaminate the field. The patient was then asked to open their mouth and a 19 gauge needle

was inserted 10 mm in front of the tragus and 2 mm below the lateral cantho-tragal line just behind the posterior and superior aspect of the condyle. The needle is angulated slightly antero-superiorly to avoid the retro-discal tissues. Once the capsule is penetrated, the tip of the needle will be inside the superior joint space. The solution is then deposited and the needle removed. The TMJs of Group A patients were injected with 0.6 ml of PRP; those in group B were administered 0.1 ml of triamcinolone with 0.4 ml 2% lignocaine. A sterile gauze is held over the injection site for a few seconds to assure hemostasis. The patient is then asked to open and close the mouth a few times to distribute the solution throughout the joint space.

Change of VAS, MIO and joint click were assessed and compared in 1st, 6th and 12th week in both group A and group B.

Results

Among 60 patients, the mean age was 37.91 years ranging from 21-50 years. The gender distribution was 27 (45%) male and 33 (55%) female, with male: female ratio of 0.819.

After 1st wk of intra-articular injection the mean VAS score in case of Group-A (PRP) is 6.03, standard deviation (SD) was 1.13. And in the case of Group-B (corticosteroid) VAS Score is 7.80 (SD-1). Calculation shows that the p-value it is <0.001 which is statistically significant (Table I)

Table I: Distribution of VAS in both group after 1st, 6th and 12th wk of injection

VAS AFTER INJECTION								
INTERVAL	PRP (GROUP-A)			CORTICOSTEROID (GROUP-B)			p VALUE	SIGNIFICANCE
	Mean	Median	SD	Mean	Median	SD		
1 st week	6.03	6.00	1.13	7.80	8.00	1.00	<0.001	Significant
6 th week	4.10	4.00	1.09	5.23	5.00	1.10	0.001	Significant
12 th week	1.70	2.00	0.88	3.60	3.50	0.97	<0.001	Significant

Table II: Distribution of MIO in both group after 1st, 6th and 12th wk of injection

MAXIMUM INCISOR OPENING-MIO (IN MM) AFTER INJECTION								
INTERVAL	PRP (GROUP-A)			CORTICOSTEROID WITH ANESTHETIC (GROUP - B)			p VALUE	REMARKS
	Mean	Median	SD	Mean	Median	SD		
1 st week	33.20	34.00	3.21	29.37	29.50	3.71	<0.001	Significant
6 th week	39.63	40.00	3.23	34.60	34.50	3.86	<0.001	Significant
12 th week	45.83	46.00	3.30	39.10	39.50	3.75	<0.001	Significant

After 1st wk of intra-articular injection, the mean of MIO (mm) in case of Group-A (PRP) is 33.20, (SD 3.21) and in case of Group-B (corticosteroid), it was 29.37 (SD 3.71) (Table II)

After 1st week of intra-articular injection the joint click was present in 15 patients out of 30 patients in the Group-A (PRP). In the Group-B (corticosteroid) group, out of 25 patients who had joint click; only 5 patients recovered

from joint click. The p-value it is 0.006 which was statistically significant.

At the end of 12th week of intra-articular injection, the mean of MIO (mm) in group 1 is 45.83, standard deviation 3.30 and in group 2 mean MIO (mm) is 39.10, standard deviation 3.75. The mean of VAS score in group 1 is 1.70, standard deviation 0.88 and in group 2 is 3.60, standard deviation 0.97.

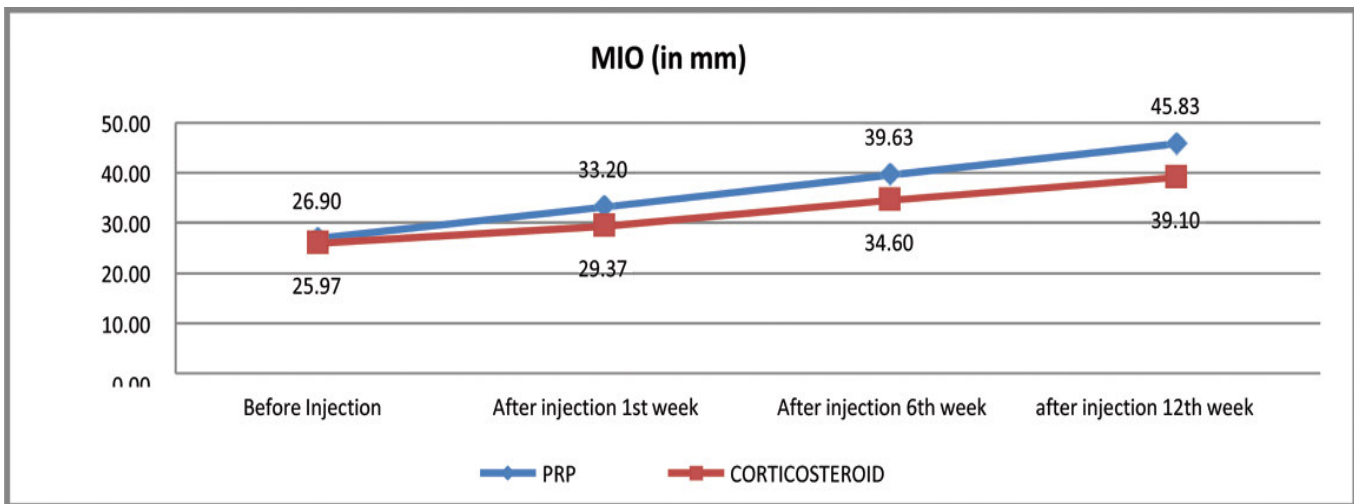


Fig. 1. Both Groups showed statistically significant improvements in MIO post-injection

After intra-articular injection of PRP, 28 patients among the 30, recovered from joint click. Only 2 patients had persisting joint click. In case of corticosteroid, 14 patients joint click was found to be resolved, but 16 patients

still had joint click. By using chi square test, p value comparing both group is <0.001 which is statistically significant (Figure 3)

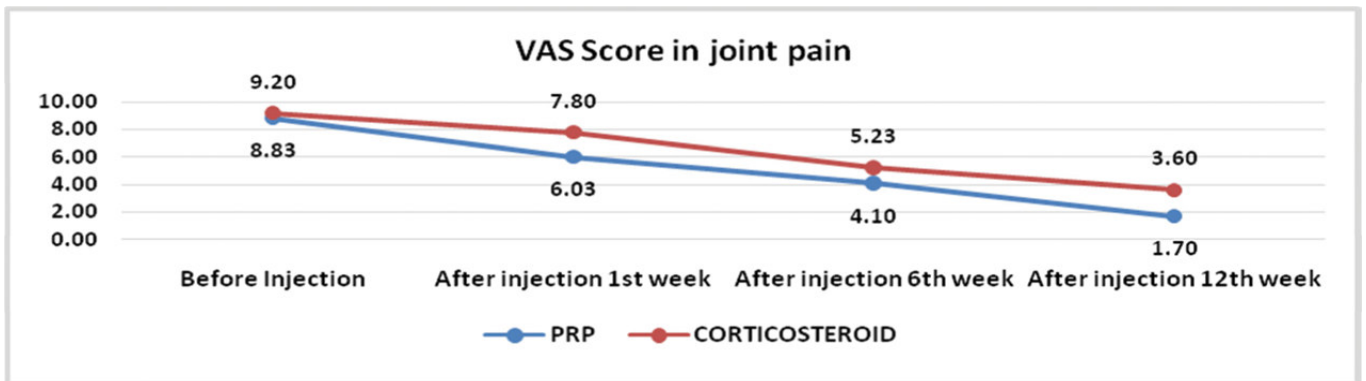


Fig. 2. Both Groups showed statistically significant improvements in VAS post-injection

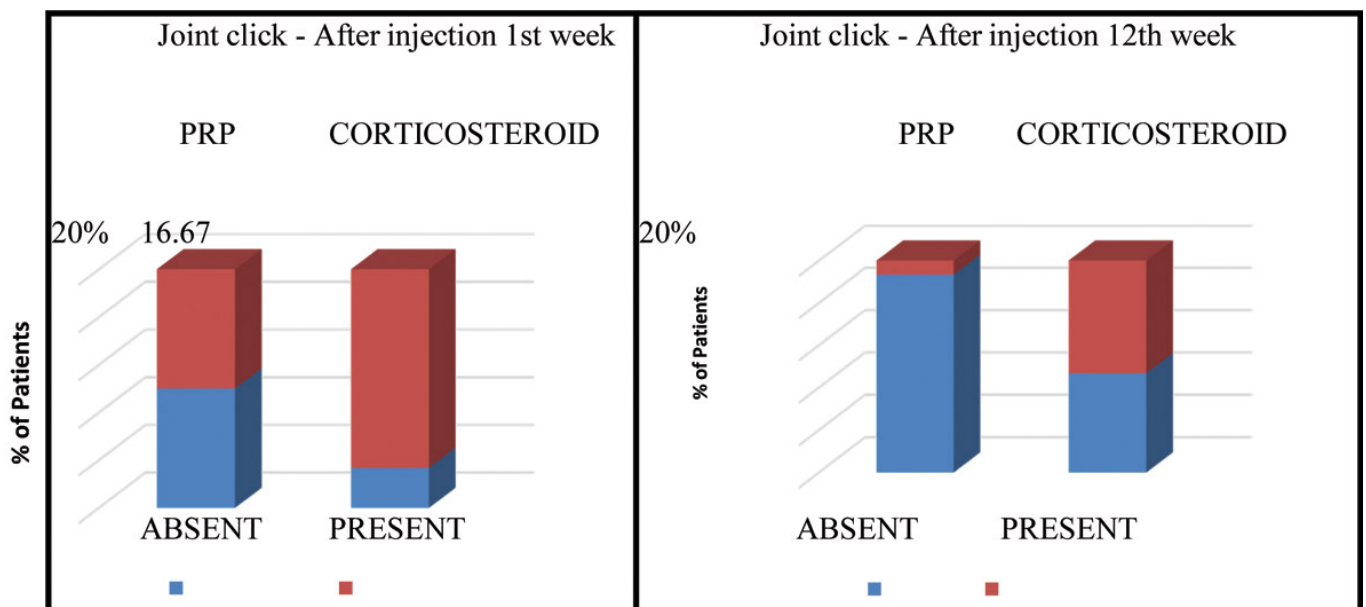


Fig. 3. Groups showed statistically significant improvements in joint click post-injection 1st-12th Week

Discussion

The Temporomandibular joint (TMJ) is one of the most important and complex joints in the body which provides the articulation between the movable mandible and the fixed temporal bone of the cranium. The TMJs are bilateral, diarthrodial, ginglymoid, synovial, and freely movable. The term diarthrodial is used because the joint has two articular bone components – the mandibular condyle inferiorly and the articular eminence and glenoid fossa of the temporal bone superiorly. Movement

occurring at the joint are of two varieties - free movements and masticatory movements. The basic free movements are: 1) opening and closing of mouth; 2) protrusion and retrusion; and 3) rotation and translation.

Temporomandibular joint disorders (TMDs) cause internal derangement of joint space, bone alterations and degenerative pathologies.⁸ The American Academy of Orofacial Pain has also followed a classification for the last three editions of their guidelines⁹ - it begins by separating all TMDs into four broad categories having

similar clinical characteristics: masticatory muscle disorders, TMJ disorders, chronic mandibular hypomobility disorders, and growth disorders.

The current conservative treatments suggested for TMD include patient behavioral education, resting the jaw, soft diet, analgesic agents, splints, and physiotherapy. Surgical interventions include arthrocentesis, disc repositioning, or discectomy for patients with resistant internal derangement.

Here we assessed the efficacy of PRP injections compared to triamcinolone with local anesthetic in the failure of conservative management of TMD.

Platelet-rich plasma (PRP) is blood plasma that has been enriched with platelets and contains several different growth factors and cytokines that can stimulate the healing of various tissues. Therefore, autologous PRP has been considered a clinical anabolic material for patients with chronic joint pain caused by progressive cartilage degeneration of the synovial joints. Pihut et. al.⁹ in 2014, conducted a Clinical Study (Preliminary) on patients of temporomandibular dysfunctions with single dose of PRP injection (Single group, N = 10, Mean age: 37.6). After 6 weeks of treatment, pain improvement was noted (VAS from 6.5 to 0.6). Mouth opening increased by 1mm. Joint Click Sound was found to have been resolved in three quarters of the patients.

On the other hand, corticosteroids is one of the tools used in the management of TMJ disorders, due to its anti-inflammatory effect (due to the inhibition of the production and secretion of pro-inflammatory cytokines such as interleukins, tumour necrosis factor alpha, interferon gamma and factor stimulating granulocytic and macrophage colonies by direct interference on cascades and genomic mechanisms).

Stoustrup et. al.¹⁰ in a systematic review reported pain relief with corticosteroid injection in TMD patients. Improvement of pain was noted from 67% to 100%. Five of the seven studies evaluated, they reported minor adverse effects such as facial edema in 2 of 25 patients, subcutaneous atrophy in 1 of 25 patients and intra joint calcification in 2 of 25 patients. To alleviate these

disadvantages of corticosteroids, we embarked on this study of intra-articular PRP in comparison to corticosteroid with long acting injections. Moreover, we found substantially good results with PRP.

Conclusion

The study showed there is significant improvement of joint pain, mouth opening and joint click after intra articular injection of both PRP and corticosteroid with local anesthetic in patients of TMDs. It was also found that intra-articular injection of PRP is more effective in comparison to corticosteroid with local anesthetic in our study. Although intra-articular corticosteroid injection has been used for a long time in TMD, intra articular PRP injection is a new therapeutic approach and it may be a good alternative for the treatment of refractory TMD in the future. So to explain the regenerative properties, cellular and molecular effects, and stem cell activation potential of PRP in the TMJ, we need long term studies on a large scale population.

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