Journal of Carcinogenesis
Covering Genesis to Therapeutics

Journal of Carcinogenesis, ISSN: 1477-3163
2025; Vol 24: Issue 3s, https://carcinogenesis.com/

Assessment of the Platelet-Rich Plasma effect on treating Anterior Disc Dislocation in the Temporomandibular Joint

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ABSTRACT

Background: Temporomandibular joints disc displacement frequently cause pain, restricted function, and impaired quality of life. Conventional treatments, include splint therapy and arthrocentesis, may not provide adequate relief in refractory cases.

Platelet-rich plasma (PRP), with its regenerative and anti-inflammatory properties, has recently been investigated as a potential minimally invasive treatment however long-term studies remain limited.

Aim: The present study aimed to evaluate the clinical and radiographic outcomes of PRP injections following arthrocentesis in patients suffering from TMJ disc displacement unresponsive to conservative therapy.

Methods: This study evaluated 18 patients diagnosed with TMJ disc displacement who did not respond to conservative management and minimally invasive arthrocentesis. Inclusion criteria were persistent pain and impaired function without systemic or autoimmune or septic joint disease. All patients received two intra-articular autologous PRP injections. Clinical outcomes, including pain level assessed through 10-point Visual Analog (VAS Scale) and maximum inter-incisal mouth opening (MIO), were evaluated before treatment and at 3, 6, 9, and 12 months post-injection. MRI was performed to assess disc position.

Results: Baseline mean pain intensity was 7.5 on the VAS scale. At 3 months, pain decreased to 4.2, continue to decrease to reach 2.0 at 6 months, and 0.5 by 12 months. Significant improvements in MIO were observed in all patients across follow-up intervals. MRI findings demonstrated improved disc positioning in the majority of cases. No adverse events were reported.

Conclusion: PRP Intra-articular injection demonstrated significant pain reduction and improving function in patients with TMJ disc displacement unresponsive to conventional treatments. These findings support PRP as an effective, predictable, and minimally invasive management option.

Keywords: *PRP; TMJ; disc displacement; Intraarticular injection*

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How to Cite: Mustafa.G. khallaf,AndrewJ.Sidebottom, Shahad Azawi, Mahmoud Agha, Alsayed Abdulkarem Mehana, Arafa GadAllah Ibrahim Ahmed, Ahmed Omar Ahmed Abdelrahman, (2025) Assessment of the Platelet-Rich Plasma effect on treating Anterior Disc Dislocation in the Temporomandibular Joint Journal of Carcinogenesis, Vol.24, No.3s, 804-811

1. INTRODUCTION

Temporomandibular joints (TMJ) disc displacement is known as aberrant location of the articular disc in relation to joint components, often presenting with pain, joint sounds, restricted movement, or headaches. The etiology is multifactorial, involving both biomechanical and biochemical factors [1,2]. Conservative treatments such as occlusal splints, physiotherapy, and pharmacological management are first-line approaches, while surgical interventions—including arthroscopy, arthrocentesis, discopexy, and discectomy—are reserved for refractory cases. Arthrocentesis, introduced by Nitzan et al, is minimally invasive technique that improves joint function by lavage of inflammatory mediators [3]. Adjunctive intra-articular injectables such as corticosteroids and hyaluronic acid (HA) have been widely studied but often provide only short-term benefit. In contrast, platelet-rich plasma (PRP), rich in growth factors and cytokines, has demonstrated regenerative potential in cartilage and soft tissue repair [4,5].

Temporomandibular joints (TMJ) disc displacement is determined when an abnormal relationship between the disc and adjacent joint components present [6]. Its pathogenesis has shifted from just mechanical disorder to a more complex biochemical mechanisms. Clinically symptoms include movement pain, muscle tenderness, otalgia, , restricted motion, joint noises, headache and spasm [7]. Management begins generally with conservative occlusal appliances and dietary modification. Surgical options, including (discopexy, discectomy, arthrotomy, pterygoid dysjunction, and joint replacement) and less invasive (arthroscopy, arthrocentesis) approaches, are reserved for refractory cases and remain controversial[8] [9]. Arthroscopy, while minimally invasive and joint-preserving, is limited by lack of instrumentation [10]. Arthrocentesis, first pioneered by Nitzan et al., is extensively utilized as a minimally invasive alternative with favorable clinical outcomes. Intra-articular sodium hyaluronate and corticosteroids are commonly used but provide only short-term relief effect [11]. Platelet-rich plasma (PRP) application has gained attention as a biological adjunct. In vitro, PRP promotes stromal and mesenchymal stem cell proliferation, and in vivo studies it demonstrates symptomatic improvement in knee injuries [12]. Its mechanism is attributed to concentrated growth and transforming growth factors, which facilitate cartilage tissue repair, increase hyaluronic acid production, and stabilize angiogenesis, supporting joint regeneration in osteoarthritic cases [13,14].

This research aimed to enhance the results of Arthrocentesis as a therapy method, followed by PRP injection, to rectify the misplaced disc and reduce pain.

Materials and Methods

Study Design

This prospective clinical study was conducted on 18 patients (7 males, 11 females; mean age 35 years, range 20–50) who suffered from temporomandibular joints (TMJ) internal derangement. All participants were recruited from the outpatient clinic at Al-Sayed Galal Hospital, Al-Azhar University, Cairo, Egypt. The study followed STROBE reporting guidelines, and informed consents were obtained from all patients before operative procedures.

Inclusion and Exclusion patients Criteria

Patients were eligible if they presented with persistent TMJ pain and dysfunction despite at least 45 days of conservative management through (soft diet, occlusal splint and analgesics). Exclusion criteria included systemic joint diseases, autoimmune arthritis, septic arthritis, or TMJ infection. Radiographic evaluation with orthopantomogram was performed to rule out osseous pathology.

Treatment Protocol

Conservative management: One month: soft diet and analgesics and two months: soft diet, analgesics, and occlusal splint therapy. Then Arthrocentesis and lavage: minimally invasive lavage with 250 ml of Ringer solution, and intra-articular Platelet-Rich Plasma) PRP) injection following lavage (Fig 1 A&B)

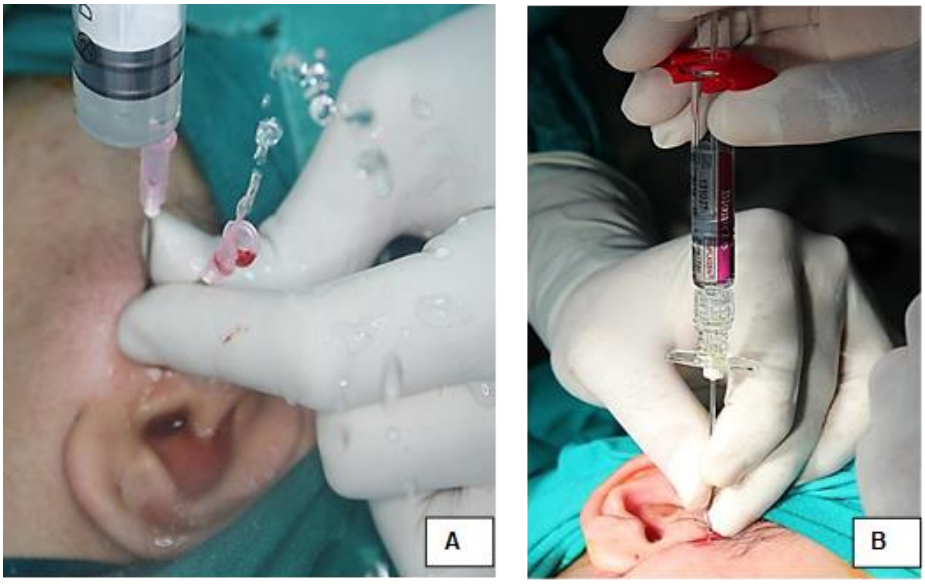

Fig 1. A - showing the lavage process of the TMJ. B- showing PRP injection.

PRP preparation and injection:

Preparation: 10 mL of autologous venous blood was drawn, anticoagulated with sodium citrate, and centrifuged at 1500 rpm for 6 minutes. The PRP layer was separated into 2 ml for intra-articular injection into the upper joint area and one ml for injection into the posterior attachment. The first PRP injection was administered immediately following arthrocentesis. A second injection was repeated after 3 months without lavage.

All procedures were performed under moderate sedation using midazolam (Dormicum®, 1 mg) and fentanyl (2–20 µg/kg). Broad-spectrum antibiotic prophylaxis (Unictam®, 1000 mg IV) was given 1 hour preoperatively. The surgical field was prepared with betadine and draped under sterile conditions.

Arthrocentesis was performed using a two-needle technique under CT guidance. Needle placement was confirmed with sagittal, coronal, and axial imaging. Continuous lavage was performed with 150 mL saline. PRP injections were delivered as described above.

Follow-up Parameters:

Clinical and radiographic evaluations were performed preoperatively and at 3, 6, 9, and 12 months postoperatively. Clinical Evaluation: Maximum interincisal opening in millimeters. Lateral and protrusive jaw motions (in millimetres). TMJ pain on palpation (0 = none, 1 = mild, 2 = moderate, and 3 = severe). Pain is measured on a Visual Analogue Scale (VAS) from 0 to 10. TMJ clicking frequency and timing (early, late, or absent).

Radiographic evaluation:

Orthopantomogram for joint space and osseous changes. Magnetic resonance imaging (MRI) using a 3 Tesla system (Siemens Magnetom Vision) with bilateral imaging to assess disc position, capsular effusion, and degenerative changes. MRI was obtained pre-treatment (picture 2A&B) and 12 months post-treatment (picture 3 A&B). Epi Info (version 6.04) was used to analyze the data. The Paired Student's t-test was used, with statistical significance set at $p < 0.05$ and high significance at $p < 0.01$.

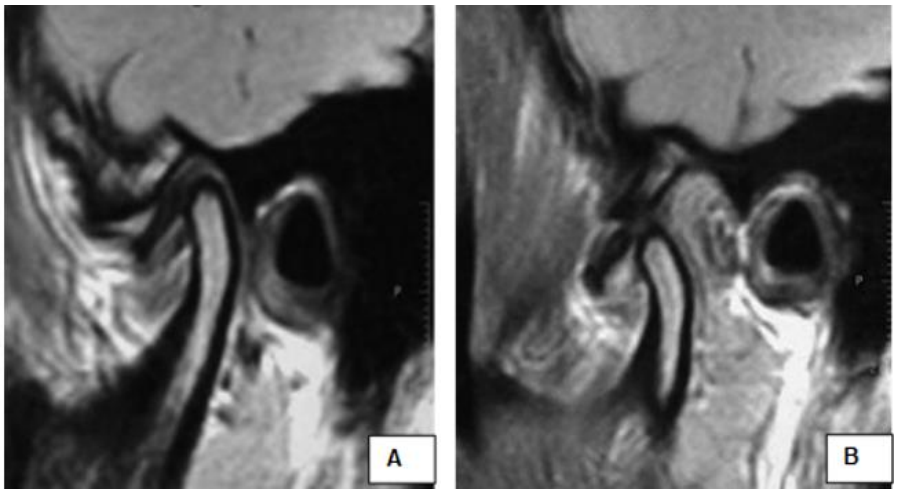

Fig.2. A- showing anterior disc displacement in MRI (closed mouth). B- confirming that the disc is not reducible in open position MRI

2. RESULTS

Pain Outcomes

At the 12-month, patients reported a substantial decrease in pain severity. Among the 18 participants treated with PRP, 14 reported pain relief as early as the first month, with varying degrees of improvement. The mean VAS score reduced from 7.46 (SD=1.10) to 7.10 (SD=1.22), with a mean reduction of 3.38, which was not statistically significant (*P*=0.002). At the third month, pain reduction became more evident, with VAS decreasing from 7.46 to 4.22, with a significant change (22.28, *P* =0.001). Continued improvement was observed at six months, with mean VAS reduction to 1.67 (SD=0.77), corresponding to a decrease of 5.79 points from baseline which showed high statistical significance (41.47, *P* =0.001). At nine months, VAS values decreased further to 0.71, again and showed significant improvement (*P* =0.001). By the end of the 12-month follow-up, the mean pain score had decreases to 0.50, revealing a marked and statistically significant difference compared with baseline (*P*=0.001).

Functional Improvement in Mouth Opening

Average baseline inter-incisal mouth opening was 33.5 mm (SD 3.1, range 16–39 mm). At three months, increased to 36.8 mm, with an average gain of 3.3 mm. This improvement continued, with an increase of 4.8 mm at six months (*P* =0.001) and a total gain of 8 mm (±1.5 mm) by 12 months, which was highly significant (*P* =0.001).

Disc Position on MRI

After 12 months, MRI evaluations demonstrated improvements regarding the disc position. Patients with disc displacement with early reduction (DDWER) improved from 9 cases preoperatively to 13 cases postoperatively. Cases of displacement with late reduction (DDWLR) decreased from 10 to 7, while displacement without reduction (DDWOR) decreased from 9 to 4. In addition, the number of patients with normal disc position increased from 0 to 4. These changes were considered highly significant, reflecting disc normalization changes over the follow-up period (Fig 3A&B) and Fig4

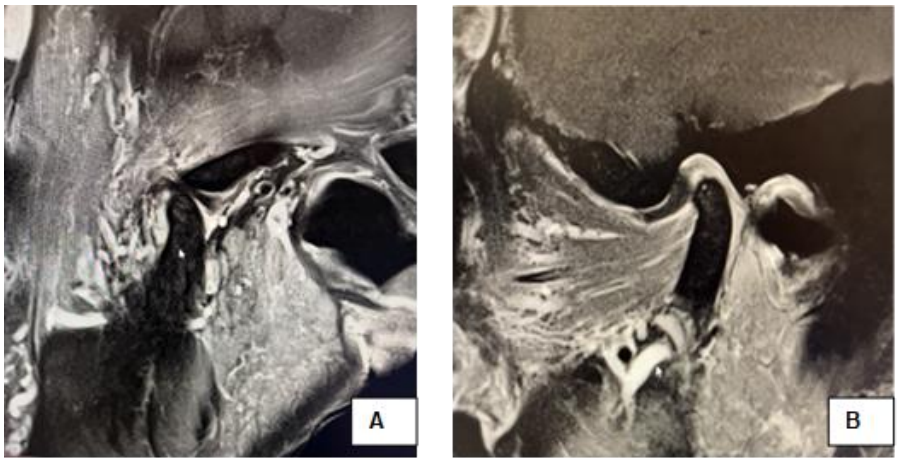

Fig.3A&B_showing a postoperative MRI for the patient with disc recapturing in open mouth position.

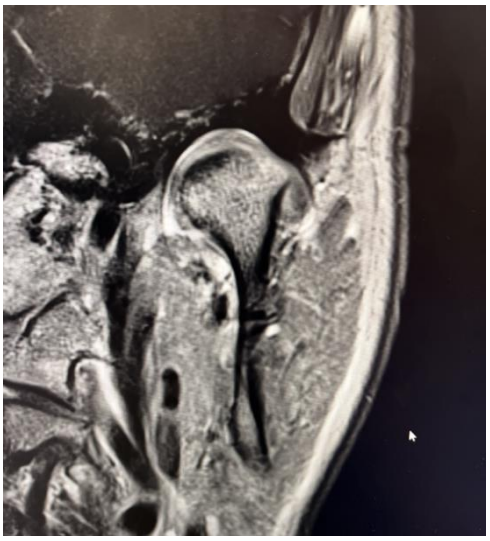

Fig.4- Coronal cut of MRI confirming the disc position in mediolateral direction.

3. DISCUSSION

Minimally invasive modalities as the intra-articular administration of hyaluronic acid, or corticosteroids, and arthrocentesis are widely applied for management of TMJ disc displacement disorders [14,15]. Previous studies have shown variable efficacy of HA and corticosteroids, often with limited long-term results. Arthrocentesis provides mechanical lavage and decompression but may not sufficiently restore joint homeostasis. In contrast, PRP delivers a concentrated amount of growth factors that enhance tissue regeneration, reduce inflammation, and improve joint function [15–17]. In this study, PRP provided significant improvements in pain reduction, mouth opening, and disc position, surpassing outcomes typically reported with HA or corticosteroids. The findings align with orthopedic literature where PRP has shown benefits in osteoarthritis and cartilage repair [18,19]. Importantly, PRP therapy in TMJ disorders appears safe, with no complications observed.

Despite promising outcomes, this pilot study is limited by its small sample size and lack of a control group. Therefore, larger randomized controlled trials are needed to confirm these findings and to refine treatment protocols concerning dosage, frequency, and long-term outcomes.

Minimally invasive approaches are commonly applied in the management of disc displacement which could include intra-articular injections of hyaluronic acid (HA), corticosteroids, and arthrocentesis [20]. Bjornland et al. reported that two HA injections yielded superior pain relief compared to corticosteroids in 40 participants who having TMJ internal derangement (ID) [21]. However, Moystad et al. and other studies showed that HA and corticosteroid efficacy did not differ significantly

[22]. Administering drug intra-articularly enhances joint lubrication, while arthrocentesis removes inflammatory mediators and loose cartilage fragments, helping to release adhesions. Clinically, HA is often administered following arthrocentesis due to its anti-inflammatory and regenerative properties in degenerative and disc displacement disorders [23]. Manfredini et al. found that arthrocentesis combined with HA produced better outcomes than corticosteroids, especially with repeated treatments [24]. Guarda-Nardini et al. also reported improvement after two HA-assisted arthrocentesis sessions [25] though the response rate was lower (20%) among patients unresponsive to previous conservative and surgical interventions. In contrast, the present study demonstrated greater efficacy of intra-articular platelet-rich plasma (PRP) therapy, with 90% of participants reporting pain reduction and enhanced mouth opening. PRP acts through the release of growth factors (GFs) that regulate cellular proliferation, metabolism, and chondrogenic differentiation [26,27]. It supports regeneration of cartilage, bone, and synovial tissue and has been widely applied in orthopedic conditions such as ligament injuries and osteoarthritis (OA) [28,29]. Although cartilage has limited self-repair capacity, GFs like TGF-β, basic fibroblast growth factor, and bone morphogenetic proteins promote cartilage regeneration. Experimental studies have also demonstrated PRP's anti-inflammatory effects. Lippross et al. showed reduced inflammatory mediator production in porcine knee arthritis [30]. Liu et al. subsequently validated findings in rabbit knee synovitis [31]. Sun et al. and Ying et al. further documented enhanced osteochondral healing and TGF-mediated improvement in rabbit TMJ OA [32,33]. Clinically, PRP therapy has shown favorable outcomes in joint pain and function: Sánchez et al. reported 57.5% pain reduction in hip OA after six months [34] and Filardo et al. observed significant 91 individuals who having chronic knee degeneration had long-term pain alleviation over 12 months [35]. In 14 individuals having OA on their knee, Sampson et al. saw an enhancement in the condition and a decrease in pain [36]. Napolitano et al. observed similar outcomes in 27 individuals having knee OA, while Kon et al. showed similar outcomes in 150 individuals having knee OA [37,38]. PRP was applied to individuals with TMJ OA in the current investigation. Ninety percent of participants reported less pain and increased jaw mobility. In the present research, the afflicted TMJs received two consecutive injections of PRP separated by three months. Numerous orthopedic research, however, have documented a higher number of repeated applications, typically three at intervals of three to five weeks or nine weeks. Similar to previous research, there were no issues with PRP administration [39]. Hemodynamic instability, hypofibrinogenemia, critical thrombocytopenia, and platelet dysfunction syndrome are among the conditions that preclude the use of PRP [40].

In individuals with TMJ disc dislocation, the results showed that double injection of PRP concurrently with Arthrocentesis is an efficient and reliable substitute therapy of injectable material, both early and late. PRP administration demonstrated a noticeably greater impact on clicking, painless mouth opening, and decrease in pain among individuals who didn't react to conventional therapy if two injections were made. To determine whether the advantages of a single injection last and whether PRP is dose dependent or not, more research is necessary.

4. CONCLUSION

This study demonstrates that double intra-articular PRP injections combined with arthrocentesis are reliable and efficient therapy for TMJ disc dislocation in patients unresponsive to conservative therapy. PRP significantly reduced pain, improved functional mouth opening, and enhanced disc position over a 12-month follow-up period. The outcomes highlight PRP as a promising biological alternative to conventional injectable agents. Future studies are needed to determine whether a single injection is sufficient, to assess dose dependency, and to compare PRP with other regenerative approaches in TMJ disorders

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