

Effectiveness of platelet-rich plasma injection in temporomandibular joint osteoarthritis: Narrative Review

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Abstract

Aim: This study aimed to evaluate the effectiveness of Platelet-Rich Plasma Injection in the treatment of temporomandibular joint osteoarthritis.

Material and Method: A search on MEDLINE (PubMed), science direct was conducted using keywords. Papers published between 2010 and 2020 and meeting the eligibility criteria were identified after reading their titles, abstracts and full text.

Results: Among the 22 references initially found, 16 articles met the inclusion criteria. The researchers confirmed the effectiveness of Platelet-Rich Plasma Injection in the treatment of temporomandibular joint osteoarthritis. Studies have compared the use of Platelet-Rich Plasma with others treatments and they revealed that it significantly reduced pain better. The combination between PRP and arthrocentesis or arthroscopy was evaluated and the results showed significant benefits.

Conclusion: Platelet-Rich Plasma Injection is considered as an effective minimally invasive treatment in the management of temporomandibular joint osteoarthritis. Further clinical randomized trials with standardized protocols are required to study the efficacy in the long term.

Introduction

The Temporomandibular Joint Osteoarthritis (TMJ.OA) is a very frequent pathology. Patients present different clinical symptoms like temporomandibular joint tenderness, joint sound, Chronic pain, dysfunction of the masticatory system, restriction of oral motions and functional difficulty... All these symptoms can affect the quality of life and work productivity [1].

Multiple factors can contribute to the cause of TMD such as psychological stress, traumatic injuries, and parafunctional habits and a complete clinical and radiological study should be conducted to better understand the circumstances of the disease and to establish an appropriate treatment plan [1].

For the management of (TMJ.OA), various conservative and surgical interventions are proposed. Respecting a therapeutic gradient, the dental doctor has to choose the treatment according to the clinical situation.

The literature classifies the therapeutic modalities for treatment of (TMJ.OA) into 3 groups (1,2,3):

Non-invasive treatments:

Medication: non-steroidal anti-inflammatory drugs (NSAIDs), and muscle relaxants

physical and behavioral therapies

Occlusal splint

Treatments with minimal invasion:

Arthrocentesis: washing of the joint with saline or sodium hyaluronate.

intra-articular injections: hyaluronic acid and PRP

Invasive treatments:

Intervention in the bone and disc: arthroscopy or arthroplasty

Autogenous hemiarthroplasty

Alloplastic hemiarthroplasty

In contrast to traditional concepts minimally invasive procedures, therefore, deserve to be implemented as efficient first-line treatments or should be considered rather early, as soon as patients do not show a clear benefit from an initial conservative treatment. Among the proposed treatments, the Platelet-Rich Plasma Injection (PRP) is considered as a promising minimally invasive alternative. It is a method for acceleration of bone and soft tissue healing through the application of natural materials from biological sources. Platelet-Rich Plasma is defined as a volume of autologous plasma with a platelet concentration above the reference level in a human. The reference concentration in blood is between 150,000 platelets/ μ l and 350,000 platelets/ μ l [2]. The ideal PRP composition should contain a minimal amount of red and white blood cells and a platelet concentration of approximately 1,000,000/ μ l. PRP injections are used to treat torn tendons, tendinitis, muscle injuries, arthritis-related pain, and joint injuries. Al-Moraissi, and all [1] published that minimally invasive procedures, particularly in combination with IAI of adjuvant pharmacological agents (PRP, Hyaluronic Acid "HA" or Corticosteroid "CS"), are significantly more effective than conservative treatments for both pain reduction and improvement of MMO in both short (\leq 5 months) and intermediate term (6 months-4 years) period [1]. In contrast to traditional concepts,

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minimally invasive procedures, therefore, deserve to be implemented as efficient first-line treatments or should be considered rather early as soon as patients do not show a clear benefit from an initial conservative treatment.

The objective of our study was to evaluate the effectiveness of Platelet-Rich Plasma Injection in the treatment of Temporomandibular Joint Osteoarthritis.

Material and methods

Literature was searched from January first, 2010 to 31 August 2022 in PubMed and science direct. 3 Anglo-Saxon keywords from recent publications that deal with the topic were used: Temporomandibular joint osteoarthritis, Platelet-Rich Plasma Injection, Temporomandibular joint disorders.

The following inclusion criteria were adopted:

- Articles studying and comparing the effect of platelet-rich plasma injection in the treatment of TMJ.OA

- In vitro studies randomized controlled trials, prospective studies, retrospective studies, systematic reviews, meta-analysis
- Papers published articles between 2010 and 2022.

After a first selection based on the content of the titles and abstracts, a second reading of complete content of the selected articles was carried out, eliminating articles that did not meet the inclusion criteria

Results

The search identified initially 22 studies, from which we selected 19 articles based on the contents of the titles and summaries. From the 19 articles, we eliminated 2 publications that did not meet our inclusion criteria after reading the full text. The 16 references selected were written in English by researchers from different countries (Figure 1).

The summarized data of the 16 articles are shown in Table 1.

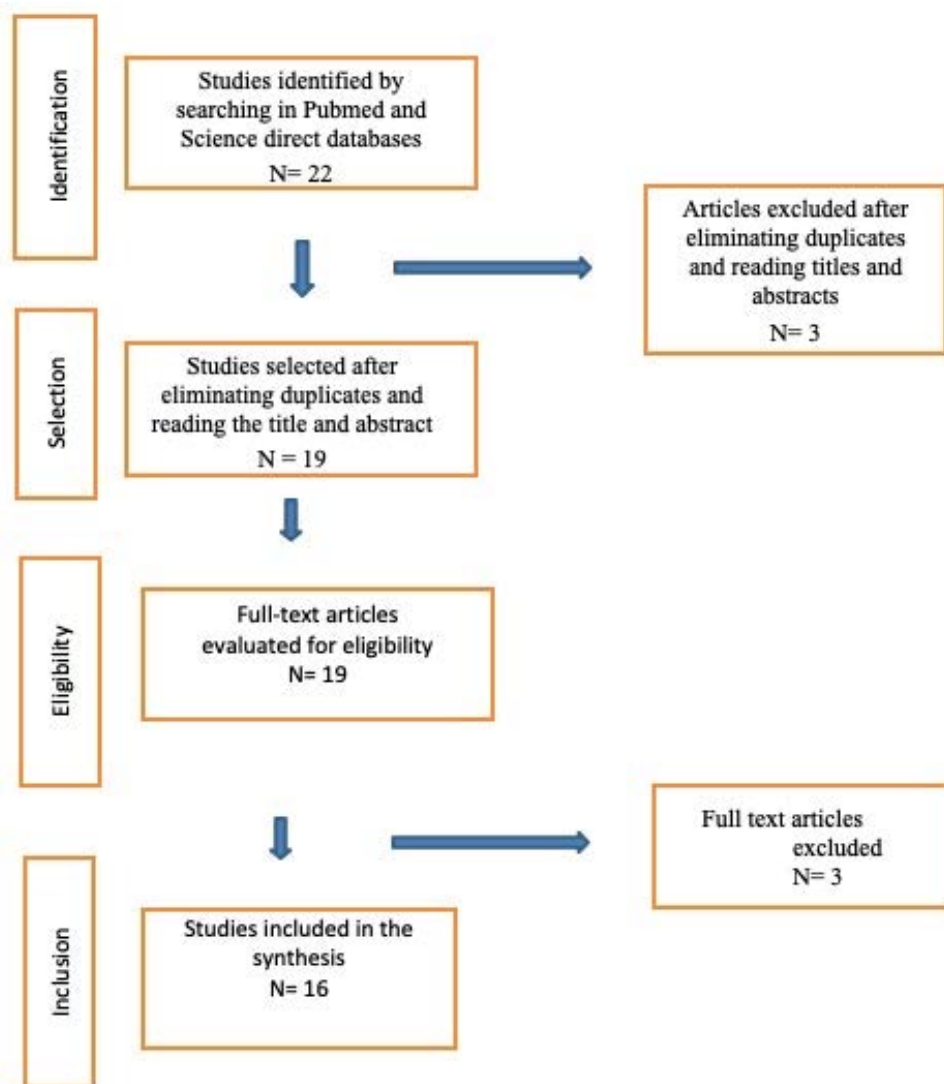


Figure 1. Flow diagram illustrating the study selection process

Table 1. The Effectiveness of Platelet-Rich Plasma Injection in the treatment of Temporomandibular Joint Osteoarthritis

Author and year	Objective	Results
A Almoraisi, <i>et al.</i> [1]	To identify the most effective treatment of arthrogenous TMDs with respect to pain reduction and improved mouth opening, and to generate a ranking according to their effectiveness.	Minimally invasive procedures, particularly in combination with IAI of adjuvant pharmacological agents (PRP, HA or CS), are significantly more effective than conservative treatments for both pain reduction and improvement of Maximum mouth opening (MMO) in both short (≤ 5 months) and intermediate term (6 months-4 years) period -Hyaluronic acid acts as a lubricator while PRP is a tissue healer.
M Derwich, <i>et al.</i> [3]	To present the current state of knowledge regarding the mechanisms of action and the efficacy of hyaluronic acid (HA), corticosteroids (CS) and platelet-rich plasma (PRP) in the treatment of TMJ OA	-Additional injections of HA, or CS at the end of the arthrocentesis do not improve the final clinical outcomes. -CS presents several negative effects on the articular cartilage. -Additional PRP injections are not consistent and are rather questionable Further studies should be multicenter, based on a larger group of patients and should answer the question of whether other methods of TMJ OA treatment are more beneficial for the patients than simple arthrocentesis.
F Zotti, <i>et al.</i> [4]	To evaluate the effectiveness of arthrocentesis or injections with PRP in temporomandibular affections and to compare them to arthrocentesis alone or with hyaluronic acid (HA) or to hyaluronic acid injections.	Arthrocentesis with platelet-rich plasma and platelet-rich plasma injections in temporomandibular disorders' management were found to be effective in reducing pain and joint sound as well as in improving mandibular motion in a maximum follow-up of 24 months.
S Gokce Kutuk, <i>et al.</i> [5]	To compare the clinical results of intra-articular CS, HA, and PRP injections in patients who presented TMJ osteoarthritis	Intra-articular PRP injections decreased TMJ palpation pain more effectively compared with the HA and CS groups.
M Bousnaksi, <i>et al.</i> [6]	To investigate the effect of (PRP) compared to other treatments, such as injections of hyaluronic acid (HA) or saline	There is slight evidence for the potential benefits of intra-articular injections of PRP in patients with TMJ-OA.
AF Hegab [7]	To compare the use of PRP and hyaluronic acid (HA) in the treatment of (TMJ OA) with long- term follow-up data	PRP performed better than HA acid in the treatment of TMJ-OA during long-term follow-up in terms of pain reduction and increased interincisal distance.
AL Hamed FS, <i>et al.</i> [8]	To compare platelet concentrates (PCs) versus hyaluronic acid (HA) or saline/Ringer's solution injections as treatments of temporomandibular osteoarthritis and disc displacement in terms of pain and maximum mouth opening (MMO)	PC reduces pain VAS scores compared to HA during the first 3 m after treatment, and when compared to saline, it reduces pain and increases MMO for longer durations. However, due to differences between groups regarding PC preparation protocols and study heterogeneity, further standardized RCTs are required.
MC Haigler, <i>et al.</i> [9]	To determine whether arthrocentesis or arthroscopy combined with platelet-rich plasma (PRP) or platelet-rich growth factor (PRGF) injection compared with no injection or saline injection (control group) or hyaluronic acid (HA) injection reduced pain and increased maximum mouth opening (MMO) in patients with (TMJ. OA).	PRP or PRGF with arthrocentesis or arthroscopy significantly improved pain but did not increase MMO compared with findings in the control or HA groups. Further studies are needed to confirm
A Liapaki [10]	To investigate and compare treatment with hyaluronic acid (HA), corticosteroids, and blood products in patients with (TMJOA).	All injectables in conjunction with arthrocentesis were efficient in alleviating pain and improving MMO
G Isik, <i>et al.</i> [11]	To assess the treatment outcomes of intraarticular injection of injectable platelet-rich fibrin (i-PRF) after arthrocentesis in patients with (TMJ-OA).	Intraarticular injection of i-PRF after arthrocentesis should be preferred whenever appropriate because when reducing pain intensity and improving functional jaw movement is the priority.
Chung, <i>et al.</i> [12]	To study the effectiveness of PRP injection after arthrocentesis in patients with TMJ.OA	The addition of PRP to arthrocentesis treatment increases the effectiveness in long-term pain management. PRP significantly reduces pain compared to HA, placebo or no injection.
M Fernandez-Ferro, <i>et al.</i> [13]	To evaluate the effectiveness of the injection of plasma rich in platelet-derived growth factors (PRGF) versus hyaluronic acid (HA) following arthroscopic surgery in patients diagnosed with internal derangement of the TMJ.OA.	The injection of PRGF following arthroscopy is more effective than the injection of HA with respect to pain in patients with advanced internal derangement of the TMJ
Lin, <i>et al.</i> [14]	To compare the effectiveness of arthrocentesis (A) plus PRP and PRP alone.	A+PRP is more effective/ PRP alone in improving associated migraine, facial and masticatory pain, and better cartilage repair on CBCT. (injection of 2mL of concentrated and purified PRP in TMJ OA.)
Giacomello, <i>et al.</i> [15]	To evaluate the efficacy of intraarticular injection of PRP in the treatment of TMJ.OA	After the 1st injection: Improvement of pain at 7 days. 5 patients were symptom free at 30 days and 8 had partial resolution. After the 2nd injection: Joint pain completely disappeared in 11 patients. At 1 year: Effectiveness of the treatment confirmed by the absence of joint pain
KS Cömert, <i>et al.</i> [16]	To compare the therapeutic efficacy of arthrocentesis plus PRP/ arthrocentesis plus hyaluronic acid in TMJ. OA	-arthrocentesis and PRP injections constitute a safe and promising method for the treatment of TMJ-OA that is superior to arthrocentesis alone. Decrease in symptoms and improvement in mouth opening amplitude, with no significant difference between the 2 groups. These findings suggest that arthrocentesis plus PRP injections is not superior to arthrocentesis plus a single HA injection; thus, PRP injection should not be considered as the first line treatment. Arthrocentesis plus HA injection would appear to be more acceptable for patients.
M Giacomello, <i>et al.</i> [17]	To investigate the efficacy of PRGF-Endoret® injections for the treatment of TMJ.OA by providing patient evaluations at a one-year follow-up.	The efficacy of PRGF-Endoret injections to reduce symptoms of osteoarthritis and to maintain improvements over time.

Discussion

We chose to review the efficacy of PRP for the treatment of Temporomandibular Joint Osteoarthritis and we found 16 studies. Despite the complexity that characterizes temporomandibular joint (its size, its anatomical structure, with a double cavity that make its access very meticulous as well as the proximity of anatomical elements), the researchers have confirmed the effectiveness of PRP in the treatment of TMJ.OA. Al-Moraissi, and all [1] published that PRP and the other pharmacological agents are significantly more effective than conservative treatments for pain reduction and improvement of Maximum mouth opening (MMO) in both short (≤ 5 months) and intermediate term (6 months-4 years) period [1]. ZOTTI and all FOUND that injection of 2ml of concentrated and purified PRP in TMJ was found to be effective in reducing pain and joint sound as well as in improving mandibular motion in a maximum follow-up of 24 months [4]. Other studies confirmed the efficacy [6,15,17].

The use of PRP with Arthrocentesis was studied by 7 studies. Liapaki, and all [10] found that all injectables in conjunction with arthrocentesis such as PRP were efficient in alleviating pain and improving MMO. Isik, and all [11] concluded that intraarticular injection of i-PRF after arthrocentesis should be preferred whenever appropriate [11]. The team of Zotti found that PRP was effective in reducing pain and joints [4]. Chang, and all [12] found that the addition of PRP to arthrocentesis treatment increases the effectiveness in long-term pain management. Comert, and all [16] found that arthrocentesis and PRP injections constitute a safe and promising method for the treatment of TMJ-OA and its result is superior to arthrocentesis alone [17]. Lin, and all [14] found that arthrocentesis plus PRP is more effective than using PRP alone. Derwich, and all [3] found that additional PRP injections are not consistent and are rather questionable and suggested further studies [9].

The comparison between the use of PRP and the other treatments was studied. The team of kutuk found that PRP decreased TMJ palpation pain more effectively compared with the HA and Corticosteroid [5]. Bousnaksi, and all [6] confirm this result. The team of hegab confirmed this result during long-term follow-up hegab [7]. Other researchers found that PRP significantly reduces pain compared to HA, placebo or no injection [12,13]. Hamed, and all [8] confirmed these results but due to differences between groups (preparation protocols and study heterogeneity) they recommended further standardized studies. The study of Haigar and all found that PRP with arthrocentesis or arthroscopy significantly improved pain but did not increase MMO compared with findings in the control group or HA groups and suggest further studies [8]. Comert, and all [16] compared the PRP and HA with arthrocentesis and revealed a decrease in symptoms and improvement in mouth opening amplitude, but with no significant difference between the group, the team suggest that arthrocentesis plus PRP injections is not superior to arthrocentesis plus a single HA injection and PRP injection should not be considered as the first line treatment [16]. The same team published another work and recommended arthrocentesis plus PRP injections as a safe promising method for the treatment of TMJ.OA [17]. The team of DERWICH suggest further studies.

This narrative review confirmed the effectiveness provided by PRP injections for the management of temporomandibular joint osteoarthritis. Indeed, in an osteoarthritic environment, PRP has a dual action: first, it stimulates the proliferation of cell as well as the growth of numerous cells (chondrocytes, fibroblasts, osteoblasts), the secretion of hyaluronic acid by synoviocytes, the secretion of collagen, and cartilage and bone regeneration. And second, it reduces the secretion of inflammatory mediators and consequently the reduction of pain and the improvement of healing.

Conclusion

Our objective was to evaluate the effectiveness of Platelet-Rich Plasma Injection in the treatment of Temporomandibular Joint Osteoarthritis. PRP is considered as an effective minimally invasive treatment in the management of TMJ.OA. Further randomized controlled clinical trials in the long term must be done to define a standardized protocol for PRP preparation, volume injected, and frequency of injections.

Data availability

The data are conserved in the fixed prosthesis department of the Faculty of Dentistry of Casablanca.

Conflicts of interest

The authors declare that they have no conflicts of interest.

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References

1. AL-Moraissi EA, Wolford LM, Eellis (2020) A hierarchy of different treatments for arthrogenous temporomandibular disorders: A network meta-analysis of randomized clinical trials. *J Craniomaxillofacial Surg* 48: 9-23. [Crossref]
2. Boswell SG, Cole BJ, Sundman EA, Karas V, Fortier LA (2012) Platelet-Rich Plasma: A Milieu of Bioactive Factors. *Arthroscopy* 28: 429-39. [Crossref]
3. Derwich M, Mitus-Kenig M, Pawlowska E (2021) Mechanisms of Action and Efficacy of Hyaluronic Acid, Corticosteroids and Platelet-Rich Plasma in the Treatment of Temporomandibular Joint Osteoarthritis-A Systematic Review. *Int J Mol Sci* 22: 7405. [Crossref]
4. Zotti F, Albanese M, Rodella LF, Nocini PF (2019) Rich Plasma in Treatment of Temporomandibular Joint Dysfunctions: Narrative Review. *Int J Mol Sci* 20: 277. [Crossref]
5. Kutuk SG, Gökçe G, Arslan M, Özkan Y, Küçük M, et al. (2019) Clinical and Radiological Comparison of Effects of Platelet-Rich Plasma, Hyaluronic Acid, and Corticosteroid Injections on Temporomandibular Joint Osteoarthritis. *J Craniofac Surg* 30: 1144-1148. [Crossref]
6. Bousnaki M, Bakopoulou A, Koidis P (2018) Platelet-rich plasma for the therapeutic management of temporomandibular joint disorders: a systematic review. *Int J Oral Maxillofacial Surg* 47: 188-198. [Crossref]
7. Hegab AF, Ali HE, Elmasry M, Mustafa G, Khallaf MG (2015) Platelet-Rich Plasma Injection as an Effective Treatment for Temporomandibular Joint Osteoarthritis. *J Oral Maxillofac Surg* 73: 1706-1713. [Crossref]
8. Al-Hamed FS, Hijazi A, Gao Q, Badran Z, Tamimi F (2021) Platelet Concentrate Treatments for Temporomandibular Disorders: A Systematic Review and Meta-analysis. *JDR Clin Trans Res* 6: 174-183. [Crossref]
9. Haigler MC, Einas A, Savitha S, Rekha K, Mariela P, et al. (2018) Use of platelet-rich plasma, platelet-rich growth factor with arthrocentesis or arthroscopy to treat temporomandibular joint osteoarthritis: Systematic review with meta analyses. *J Am Dent Assoc* 149: 940-952. [Crossref]
10. A Liapaki, JR Thamm, S Ha, Monteiro JLGC, JP McCain, et al. (2021) Is there a difference in treatment effect of different intra-articular drugs for temporomandibular joint osteoarthritis? A systematic review of randomized controlled trials. *Int J Oral Maxillofac Surg* 50: 1233-1243. [Crossref]
11. Gozde I, Kenc S, Koyuncu BO, Gunbay S, Günbay T (2022) Injectable platelet-rich fibrin as treatment for temporomandibular joint osteoarthritis: A randomized controlled clinical trial. *J Cranio maxillofac Surg* 50: 576-582. [Crossref]
12. Chung PY, Meng-Ting Lin, Hsien-Po C (2019) Effectiveness of platelet-rich plasma injection in patients with temporomandibular joint osteoarthritis: a systematic review and meta-analysis of randomized controlled trials. *Oral Surg Oral Med Oral Pathol Oral Radiol* 127: 106-116. [Crossref]
13. Fernández-Ferro M, Fernández-Sanromán J, Blanco-Carrión A, CostasLópez A, López-Betancourt A, et al. (2017) Comparison of intra-articular injection of plasma rich in growth factors versus hyaluronic acid following arthroscopy in the treatment of temporomandibular dysfunction: A randomized prospective study. *J Cranio maxillofac Surg* 45: 449-454. [Crossref]

14. Lin SL, Chiang-Chin T, Shang-Liang W, Shun-Yao K, Wei-Fan C, et al. (2018) Effect of arthrocentesis plus platelet-rich plasma and platelet-rich plasma alone in the treatment of temporomandibular joint osteoarthritis: A retrospective matched cohort study. *Medicine (Baltimore)* 97: 477. [[Crossref](#)]
15. Giacomello M, Giacomello A, Mortellaro C, Gallesio G, Mozzati M (2015) Temporomandibular Joint Disorders Treated with Articular Injection: The Effectiveness of Plasma Rich in Growth Factors-Endoret. *J Craniofac Surg.* 26: 709-713. [[Crossref](#)]
16. Cömert Kiliç S, Güngörmüş M (2016) Is arthrocentesis plus platelet-rich plasma superior to arthrocentesis plus hyaluronic acid for the treatment of temporomandibular joint osteoarthritis: a randomized clinical trial. *Int J Oral Maxillofac Surg* 45: 1538-1544. [[Crossref](#)]
17. Giacomello M, Mortellaro C, Viganon C, Crimella A, Fossati J, et al. (2019) PRGF® endoret injections for temporomandibular joint osteoarthritis treatment: a one-year follow-up. *J Biol Regul Homeost Agents* 33: 215-222. [[Crossref](#)]