



Isolate or combined use of platelet-rich plasma in the treatment of temporomandibular joint osteoarthritis: a concise systematic review

Camila Alves Manna¹, Monique Costa¹, Carlos Alberto Alves Filho¹,
Igor Mariotto Beneti^{1,2*}

¹ UNORTE - University Center of Northern São Paulo, Dentistry department, São José do Rio Preto, São Paulo, Brazil.

² UNIPOS - Post graduate and continuing education, Dentistry department, São José do Rio Preto, São Paulo, Brazil.

*Corresponding author: Dr. Igor Mariotto Beneti.

UNORTE/UNIPOS - Graduate and Postgraduate in Dentistry,
Sao Jose do Rio Preto, Sao Paulo, Brazil.

Email: igor.beneti@globo.com

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Abstract

Introduction: In the context of temporomandibular disorders (TMD), temporomandibular joint osteoarthritis (TMJOA) is a common disease in the oral and maxillofacial regions, as well as being the most severe type. The incidence of TMD is high, affecting approximately 5%-12% of the population. There is evidence for the potential superiority of intra-articular platelet-rich plasma (PRP) injections in patients with TMJOA. **Objective:** This study aimed to carry out a systematic review to highlight the main clinical outcomes of the minimally invasive treatment of osteoarthritis of the temporomandibular joint through the injectable use of platelet-rich plasma. **Methods:** The research and development of the work were carried out from December 2022 to March 2023 in the Scopus, PubMed, Science Direct, and Scielo databases, using scientific articles from 2011 to 2022, following the PRISMA rules. The quality of the studies was based on the GRADE instrument and the risk of bias by the Cochrane instrument (Funnel Plot). **Results and Conclusion:** It was found 134 studies that underwent eligibility analysis. The final sample had 48 eligible studies and only 25 studies were described in the systematic review. Most studies showed homogeneity in their results, with $X^2 = 91.2\% > 50\%$, with $p < 0.05$. The symmetrical funnel plot did not suggest a risk of bias among studies with small sample sizes. Based on the objective of the present study, important clinical outcomes of the treatment of osteoarthritis of the temporomandibular joint were evidenced through the injectable use of platelet-rich plasma, alone or in

combination with other types of treatment. However, it was observed that despite the extensive literature on the use of PRP in the treatment of joint disorders, its application in TMD is still largely unexplored.

Keywords: Temporomandibular disorders. Temporomandibular joint osteoarthritis. Clinical symptoms. Platelet-rich plasma.

Introduction

In the context of temporomandibular disorders (TMD), temporomandibular joint osteoarthritis (TMJOA) is a common disease in the oral and maxillofacial regions, as well as being the most severe type [1]. The incidence of TMD is high, affecting approximately 5%-12% of the population [2,3]. In this regard, TMJOA is a chronic and progressive disease that causes cartilage degeneration of the temporomandibular joint [1,4], thus pathologically characterized by degeneration, destruction, loss of joint cartilage, osteosclerosis, formation of osteophytes, formation of sub osseous microcapsules, and varying degrees of synovial inflammation. Clinical symptoms of TMJOA include joint pain and joint clicking, which may eventually destroy the joint structure, severely affecting patients' quality of life [5,6].

In this context, the temporomandibular joint (TMJ) is one of the most complex joints in the human body due to its anatomical shape and physiological perspectives. The TMJ is the only bilateral joint, where the right and left joints are fused and function together during mandibular movements [6]. In addition, TMJ

comprise ginglymoarthroidal joint compounds between the mandibular condyles, articular discs, and glenoid fossae of the temporal bones [7]. The TMJ is the only ginglymoarthroidal joint because it shows hinge and glide movements. In this sense, TMD have a considerable and direct impact on patient's quality of life [8,9]. There are inflammatory disorders in which various joint tissues become inflamed as a result of the degradation of joint cartilage (osteoarthritis) [10].

As a corollary of this, TMJOA is a common chronic joint disorder that can be caused by micro or macro-trauma to the TMJ, or by other pathological processes, causing progressive inflammatory degeneration of the articular cartilage of the TMJ [11]. Thus, patients with TMJOA generally present dysfunction and pain in the TMJ region [12].

In this context, treatment for TMJOA mainly includes non-surgical and minimally invasive options, for example, therapies, dietary adjustments, occlusal splints, oral non-steroidal anti-inflammatory drugs (NSAIDs), muscle relaxants, intra-articular drug therapies and arthrocentesis [13-16]. In addition, the literature has highlighted platelet-rich plasma (PRP), which is a biological therapy comprising an autologous concentrate of platelets acquired by blood centrifugation [17]. This concentrate has shown potential benefits due to the abundance of growth factors within it.

A systematic review in 2018 showed some evidence for the potential superiority of intraarticular PRP injections in patients with TMJOA [18]. Furthermore, the additional injection of PRP at the end of arthrocentesis may provide better results than arthrocentesis alone [19]. However, there is still controversy about which minimally invasive method is more effective in TMJOA. Thus, this study was conducted to compare the results of three treatment protocols, namely arthrocentesis, PRP injection, and a combination of both in relieving TMJOA symptoms.

Given the above, the present study aimed to carry out a systematic review to highlight the main clinical outcomes of the minimally invasive treatment of osteoarthritis of the temporomandibular joint through the injectable use of platelet-rich plasma

Methods

Study Design

This was followed by a systematic literature review model on the main clinical findings of mandible fractures, according to the PRISMA rules.

Data Sources and Research Strategy

The literary search process was carried out from December 2022 to March 2023 and was developed

based on Scopus, PubMed, Science Direct, Scielo, and Google Scholar, using scientific articles from 2011 to 2022, using the descriptors (MeSH Terms): *Temporomandibular disorders*, *Temporomandibular joint osteoarthritis*, *Clinical symptoms*, *Platelet-rich plasma*, and using the Booleans "and" between the descriptors (MeSH Terms) and "or" between the historical findings.

Study Quality and Risk of Bias

The quality of the studies was based on the GRADE instrument, with randomized controlled clinical studies, prospective controlled clinical studies, and studies of systematic review and meta-analysis listed as the studies with the greatest scientific evidence. The risk of bias was analyzed according to the Cochrane instrument.

Results and Discussion

Summary

A total of 134 articles were found. Initially, duplication of articles was excluded. After this process, the abstracts were evaluated and a new exclusion was performed, removing the articles that did not include the theme of this article, resulting in 74 articles. A total of 48 articles were evaluated and 25 were included and developed in this systematic review study (Figure 1). Considering the Cochrane tool for risk of bias, the overall assessment resulted in 30 studies with a high risk of bias and 21 studies that did not meet GRADE. Most studies showed homogeneity in their results, with $X^2 = 91.2\% > 50\%$, with $p < 0.05$.

Figure 1. Selection of studies.

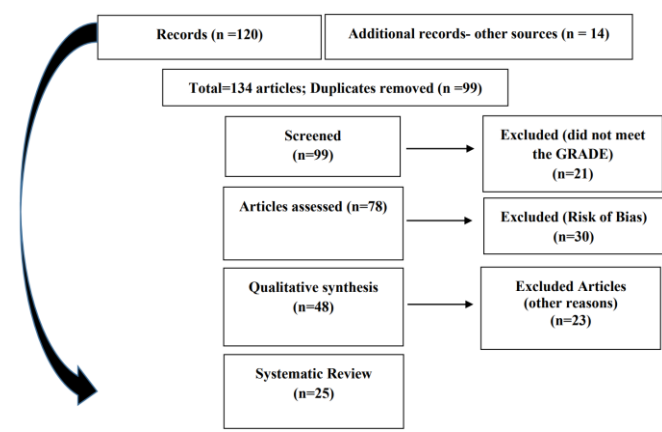
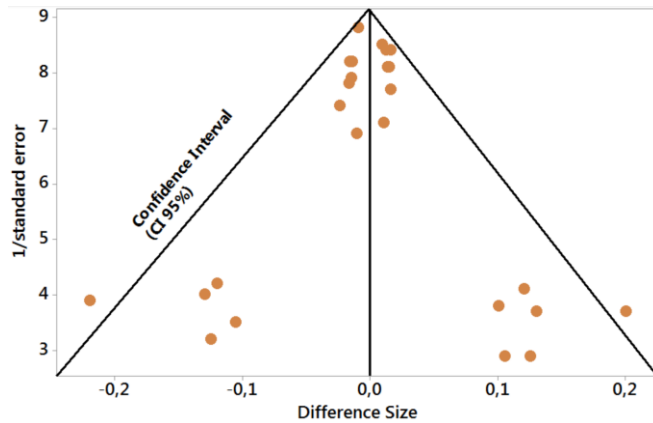


Figure 2 presents the results of the risk of bias in the studies using the Funnel Plot (Effect Size - Cohen's Test). The sample size was determined indirectly by the inverse of the standard error. The graph showed symmetric behavior, not suggesting a significant risk of bias in studies with small sample sizes, which are shown

at the bottom of the graph.

Figure 2. The symmetric funnel plot does not suggest a risk of bias between the small sample size studies that are shown at the bottom of the graph (N = 25 studies).



Source: Own authorship.

Clinical Findings – TMJOA AND PRP Treatment

Osteoarthritis is one of the most common disorders of the TMJ. The complex etiopathogenesis of TMD and the variability of symptoms make it difficult to adopt standardized therapeutic protocols [6]. Thus, PRP injections have been applied to the TMJ in patients with TMJ osteoarthritis. Furthermore, arthrocentesis has received wide acceptance as a minimally invasive surgical procedure for TMDs [7].

Based on this, a randomized controlled clinical study designed by the authors Abbadi, Kara, and Al-Khanati, 2022 [20], evaluated and compared the effect of each of these protocols (arthrocentesis, PRP injection, and their combination) in the management of OA -ATM. A total of 33 participants with limited mouth opening, pain in function, and joint sounds due to OA-TMJ. Participants were randomly divided into three groups: arthrocentesis with PRP group; PRP group; arthrocentesis group. Participants in all study groups showed statistically significant improvement in terms of mouth opening and pain during the six-month postoperative period ($p < 0.05$) and did not show significant improvement concerning joint noises ($p > 0.05$). Pain assessments showed better results in the arthrocentesis with PRP group compared with arthrocentesis or injectable PRP alone after six months of follow-up ($p < 0.05$). There were no significant differences in the results of mouth opening and joint sound assessments between the three groups after six months. Therefore, the three treatment protocols evaluated were effective in improving mouth opening limitation and pain in patients with TMJOA. A combination of TMJ arthrocentesis and intraarticular

PRP injections showed the best results regarding pain symptoms.

Still, the author Wu et al. 2022 [21] evaluated the effectiveness of combined splints (splint combined) with PRP for the treatment of TMJOA. A total of 31 TMJOA patients treated with platelet-rich plasma (PRP) combination splints from January 2021 to June 2021 at the Department of Oral and Maxillofacial Surgery at the School of Stomatology of China Medical University (Shenyang, China) were retrospectively reviewed. VAS scores of all patients were recorded before and 6 months after treatment and maximum comfortable mouth opening were recorded. Treatment with combined splints + PRP was successful in 31 patients. The mean pretreatment VAS score was 6.1, and the mean VAS score 6 months after treatment was 4.1. The post-treatment VAS score was significantly lower than the preoperative VAS score ($p < 0.05$). The average maximum comfortable mouth opening before treatment was 27.6 mm, and the average 6 months after treatment was 34.8 mm. Comfortable mouth opening increased significantly ($p < 0.05$).

Added to this, the authors Asadpour et al. 2022 [22] evaluated, through a randomized clinical study, the efficacy of PRP and HA injection after arthrocentesis in individuals with TMJOA. Healthy adults diagnosed with TMJOA who were initially treated with non-surgical methods but did not respond participated in this study. Subjects were randomly allocated to AH, PRP, or combined AH + PRP groups after arthrocentesis. A total of 30 consecutive patients (15 men and 15 women) with a mean age of 29.63 ± 8.34 years were followed for 6 months in this study. Mean pain reduction at 6 months was 4.1 ± 0.9 , 4.1 ± 1.1 , and 5.1 ± 1.0 for HA, PRP, and HA/PRP, respectively ($p < 0.05$). In all 3 treatment groups, mean VAS parameters significantly reduced after treatment and these postoperative values were significantly lower in the PRP+AH group ($p < 0.001$). The mean increase in mouth opening after 6 months was 8.0 ± 2.8 , 8.0 ± 3.0 , and 10.1 ± 3.3 for HA, PRP, and HA/PRP, respectively ($p < 0.05$). Opening, lateral, and protrusive mandibular movements significantly improved after treatment in all 3 groups ($p < 0.001$). TMJ noises were significantly reduced in all treatment groups ($p < 0.001$), with the PRP+HA group showing a greater reduction.

Authors Liu et al. 2022 [23] analyzed the effectiveness of PRP injection combined with individualized comprehensive physical therapy for the treatment of TMJOA through a prospective cohort study of 40 patients. Pain intensity, maximum mouth opening, temporomandibular joint sounds, and Jaw Functional Limitation Scale (JFLS) scores and imaging findings were compared before treatment and during follow-up. Pain

intensity, maximum mouth opening, and temporomandibular joint sounds of both groups improved significantly with increasing treatment time ($p < 0.05$). Improvement in pain in the combination treatment group was greater than in the PRP injection group at 3 and 6 months ($p < 0.05$). Improvement in mouth opening was better in the combined treatment group, while improvement in joint sounds was better in the PRP injection group. Improvement in JFLS scores in the combination treatment group was greater than in the PRP injection group at 6 months ($p < 0.05$). The image improvement rates of the two groups were similar.

Furthermore, the author's Li et al. 2021 [24] observed through a retrospective study the effect of autologous PRP injected into the upper cavity versus chitosan for the treatment of TMJOA. Data from 27 patients with TMJOA treated at China Medical University Stomatology Hospital from September 2018 to September 2019 were analyzed. Maximum interincisal opening, pain intensity, and TMJ sounds were recorded and compared before treatment and at the 3rd and 6th months after treatment. Better results were observed in the PRP-treated group in maximum interincisal opening and pain intensity than in the chitosan-treated group. Concerning TMJ sounds, relief was observed in both groups, with no significant difference.

Another randomized clinical trial was implemented in adult patients with TMJOA. The sample comprised 49 osteoarthritic joints in 31 consecutive patients. Patients in the platelet-rich plasma (PRP) group underwent initial arthrocentesis plus PRP injection and then four consecutive PRP injections. Patients in the hyaluronic acid (HA) group underwent one session of arthrocentesis plus an injection of HA. The predictor variable was the treatment technique. Outcome variables included visual analog scale (VAS) assessments and maximum interincisal opening (MIO) measurements. Outcome variables were recorded preoperatively and at 12 months postoperatively. The PRP group included 32 joints in 18 subjects, and the AH group included 17 joints in 13 subjects. No statistically significant differences were observed between groups for any of the changes in VAS parameters or MIO measurements. Both treatment techniques resulted in significant clinical improvements in all VAS parameters and painless MIO [25].

Conclusion

Based on the objective of the present study, important clinical outcomes of the treatment of osteoarthritis of the temporomandibular joint were evidenced through the injectable use of platelet-rich

plasma, alone or in combination with other types of treatment. However, it was observed that despite the extensive literature on the use of PRP in the treatment of joint disorders, its application in TMD is still largely unexplored.

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Ethical Approval

Not applicable.

Informed consent

Not applicable.

Data sharing statement

No additional data are available.

Conflict of interest

The authors declare no conflict of interest.

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