

MANAGEMENT OF TEMPOROMANDIBULAR JOINT OSTEOARTHRITIS: A
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ABSTRACT

Background: Temporomandibular joint (TMJ) osteoarthritis is a prevalent, debilitating degenerative joint disease characterized by localized pain, restricted mandibular range of motion, and structural joint degradation. When conservative treatments fail, minimally invasive procedures such as TMJ arthrocentesis are indicated to clear pro-inflammatory mediators via joint lavage. To augment clinical efficacy, various intra-articular pharmacological and biological adjuncts are frequently utilized, though controversy persists regarding the optimal therapeutic protocol. **Objectives:** This systematic review aims to evaluate the biological mechanisms and clinical efficacy of minimally invasive interventions, directly comparing exclusive arthrocentesis against combined protocols utilizing intra-articular adjuncts such as hyaluronic acid, corticosteroids, non-steroidal anti-inflammatory drugs (NSAIDs), platelet-rich plasma (PRP), and platelet-rich fibrin (PRF). **Methods:** Following PRISMA guidelines, an exhaustive literature search was conducted across PubMed, Web of Science, Embase, and Scopus to identify randomized controlled trials (RCTs) evaluating adult patients diagnosed with TMJ osteoarthritis undergoing arthrocentesis. The primary clinical outcomes analyzed were maximum mouth opening (MMO) in millimeters and subjective pain perception. **Results:** From an initial identification of 181 records, a synthesized evaluation of rigorous RCTs indicates that exclusive arthrocentesis is fundamentally effective as a baseline mechanical intervention. Pharmacological adjuncts (such as corticosteroids and NSAIDs) fail to demonstrate long-term superiority over simple mechanical lavage in pain reduction, and the benefits of hyaluronic acid are largely confined to short-term follow-ups. Conversely, autologous blood concentrates—specifically PRP and PRF—yield statistically significant, sustained long-term improvements in both pain reduction and maximum mouth opening at 12-month follow-ups, driven by the prolonged release of regenerative growth factors. **Conclusions:** While conventional arthrocentesis serves as an effective primary intervention, therapeutic outcomes in TMJ osteoarthritis are significantly enhanced by specific biological augmentations. Combining arthrocentesis with autologous blood derivatives like platelet-rich plasma and platelet-rich fibrin provides the most robust, sustained long-term clinical improvements in joint mobility and pain relief.

KEYWORDS: Temporomandibular disorders; Temporomandibular joint osteoarthritis; Arthrocentesis; Platelet-rich plasma; Hyaluronic acid.

INTRODUCTION

Temporomandibular disorders represent a broad, complex, and highly heterogeneous group of clinical conditions affecting the temporomandibular joint, the masticatory musculature, and the contiguous maxillofacial structures.^[1, 2, 3] The clinical presentation of these disorders is remarkably diverse, typically manifesting as localized pain and tenderness, restricted

or asymmetric mandibular translation, and the presence of articular sounds such as clicking, popping, or crepitation.^[3] The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) and the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) serve as the standard frameworks for identifying and classifying these conditions.^[4]

Among the arthrogenic disorders, temporomandibular joint osteoarthritis is a highly prevalent degenerative joint disease that significantly compromises patient quality of life.^[5] The clinical management of this condition requires a highly structured approach. First-line therapeutic modalities remain conservative.^[6] However, when conservative management fails, minimally invasive surgical procedures, most notably temporomandibular joint arthrocentesis, are indicated.^[7,8] Arthrocentesis utilizes hydraulic pressure from a lavage solution within the glenoid cavity to evacuate pro-inflammatory mediators and release fibrous adhesions.^[8,9]

To augment the clinical efficacy of arthrocentesis, various intra-articular pharmacological and biological adjuncts have been rigorously investigated. These include hyaluronic acid, corticosteroids, autologous platelet-rich plasma, platelet-rich fibrin, and non-steroidal anti-inflammatory drugs.^[9] Despite the application of these adjuncts, controversy persists regarding the most effective therapeutic protocol and the optimal intra-articular injectable.^[1,9]

METHODOLOGY

Search Strategy

This review synthesis aligns with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.^[10] The clinical inquiry evaluated patients diagnosed with temporomandibular joint osteoarthritis.

Inclusion Criteria

- **Study Design:** Randomized controlled trials (RCTs) and randomized clinical trials.
- **Study Population:** Human adults and adolescents (e.g., aged 16 or 18 years and older) formally diagnosed with temporomandibular joint osteoarthritis (TMJ OA) or arthrogenic TMD (such as Wilkes stages II-IV). Diagnosis must be confirmed using standardized frameworks like the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) or the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD).
- **Intervention:** Minimally invasive surgical procedures—specifically TMJ arthrocentesis or arthroscopy—combined with adjunctive intra-articular injections such as hyaluronic acid (HA), corticosteroids (CS), platelet-rich plasma (PRP), platelet-rich fibrin (PRF), or non-steroidal anti-inflammatory drugs (NSAIDs).
- **Comparator/Control Group:** An adequate control group undergoing exclusive arthrocentesis/joint lavage (using normal saline or Ringer's lactate solution) or receiving a placebo.
- **Clinical Outcomes:** Studies must report baseline and follow-up data for primary clinical outcomes, specifically maximum mouth opening (MMO,

measured in millimeters) and subjective pain perception (measured via a Visual Analog Scale or Numerical Rating Scale). Some methodologies require a minimum follow-up period of at least three months.

- **Language:** Articles published in the English language.

Exclusion Criteria

- **Study Design:** Case reports, case-control studies, descriptive and analytical observational studies, systematic reviews, meta-analyses, comments, and letters to the editor.
- **Study Population:** In vivo animal models, children under 16 years of age, and patients diagnosed with other types of TMD without concomitant TMJ OA. Patients with a history of head trauma, intracranial disorders, congenital abnormalities, or concurrent mental/physical problems are also excluded.
- **Interventions:** Studies evaluating exclusively conservative treatment modalities (e.g., physiotherapy, occlusal splints, oral pharmacotherapy) or highly invasive surgical procedures (e.g., open joint surgery). Studies applying intra-articular substances exclusively without concurrent arthrocentesis in the experimental group are excluded in specific review protocols.
- **Methodological Deficiencies:** Studies lacking an adequate control group, lacking verified diagnostic criteria, or presenting a high risk of bias.
- **Language:** Papers published in languages other than English.

PRISMA SELECTION PROCESS

An exhaustive electronic search strategy was executed across databases including PubMed, Web of Science, Embase, and Scopus to capture randomized controlled trials. The initial screening process involved reviewing titles and abstracts, followed by a full-text reading to ensure strict adherence to inclusion and exclusion criteria. Figure (1) shows the PRISMA flow chart.

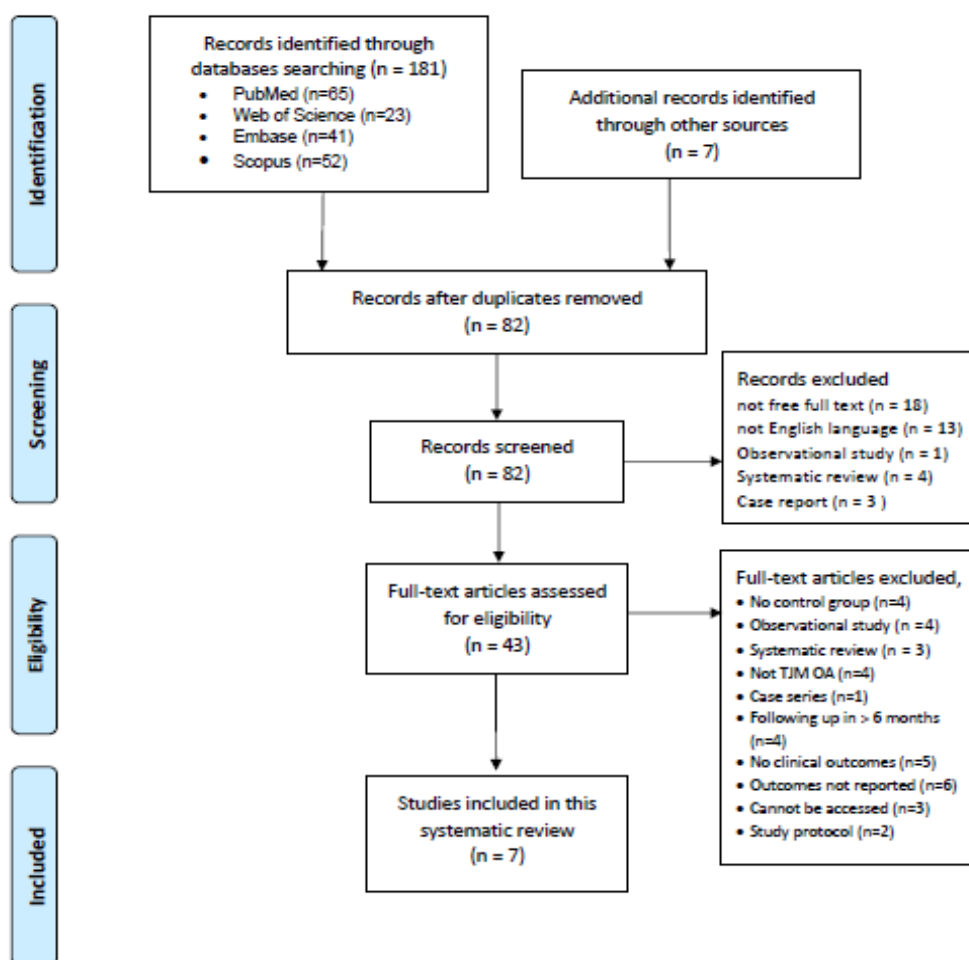


Figure (1): PRISMA flow chart.

RESULTS

Data Extraction and Study Characteristics

Data extraction captured critical parameters including study design, follow-up duration, and primary clinical

outcomes (maximum mouth opening and pain). The synthesized literature includes randomized clinical trials evaluating combined arthrocentesis techniques. Table (1) shows the data extraction table.

Table 1: Extraction Table of Included Studies.

Study & Year	Country	Patient Number (N) & Demographics	Diagnosis	Intervention vs. Control Protocol	Follow-up Duration	Key Clinical Findings
Abbadi et al. (2022) ^[11]	Syria	N=33; Mean age ~27-28 years	TMJ OA	Arthrocentesis + PRP vs. intra-articular PRP vs. Arthrocentesis alone	24 weeks	PRP group showed statistically superior pain reduction at 6 months compared to arthrocentesis alone.
Bayramoglu et al. (2023) ^[12]	Turkey	N=30; Mean age ~40-43 years	TMJ OA	Arthrocentesis + Tenoxicam (NSAID) vs. Arthrocentesis alone	24 weeks	Both groups improved; no statistically significant difference was observed between the NSAID and control groups for pain reduction.
Bergstrand et al. (2019) ^[13]	Norway	N=37; Mean age ~47-55 years	TMJ OA	Arthrocentesis + Hyaluronic Acid vs. Arthrocentesis alone	47 months	Both methods significantly improved jaw function. The adjunctive injection of HA did not statistically improve long-term outcomes over lavage alone.
Cömert Kiliç et al. (2015) ^[14]	Turkey	N=30; Mean age ~32-35 years	TMJ OA	Arthrocentesis + PRP (4 monthly injections) vs. Arthrocentesis alone	48 weeks	The PRP group demonstrated pronounced pain reduction and higher masticatory efficiency at the 12-month endpoint.
Cömert Kiliç	Turkey	N=24; Mean age ~32-35 years	TMJ OA	Arthrocentesis + Corticosteroid vs.	48 weeks	Both groups demonstrated significant pain reduction. Additional

(2016) ^[15]				Arthrocentesis alone		corticosteroid application did not significantly augment clinical results over arthrocentesis alone.
Gurung et al. (2017) ^[16]	India	N=20; Age range 18-60 years	TMJ OA	Arthrocentesis + Sodium Hyaluronic Acid vs. Arthrocentesis alone	12 weeks	The HA group showed significant improvements in maximum mouth opening at 3 months compared to the control group.
Işık et al. (2022) ^[17]	Turkey	N=36; Mean age ~44-45 years	TMJ OA	Arthrocentesis + PRF vs. Arthrocentesis alone	48 weeks	Combined therapy with PRF achieved significantly better maximum mouth opening and profound pain reduction at 12 months.

Therapeutic Interventions: Biomechanical Mechanisms

Intra-articular Pharmacological Adjuvants

To prolong clinical remission following joint lavage, various pharmacological agents have been utilized.

- **Corticosteroids:** Administered to aggressively suppress joint inflammation.^[18] While effective for short-term relief, their long-term benefit is debated, and randomized trials reveal that additional corticosteroid injections do not significantly improve long-term maximum mouth opening or pain outcomes over arthrocentesis alone.^[15] Furthermore, corticosteroids can alter cartilage matrix metabolism and lead to chondrotoxicity.^[19]
- **NSAIDs:** Intra-articular injections of NSAIDs like Tenoxicam aim to inhibit cyclooxygenase enzymes locally.^[20] Clinical trials show that while NSAIDs improve mouth opening at six months, they do not provide significantly superior pain reduction compared to control groups.^[12]
- **Hyaluronic Acid:** Viscosupplementation with hyaluronic acid aims to regenerate articular fibrocartilage and restore joint lubrication.^[21] While effective in multi-session cycles or short-term follow-ups (e.g., 12 weeks), long-term evaluations extending to 47 months suggest that hyaluronic acid does not statistically outperform exclusive mechanical lavage.^[13, 16]

Autologous Biological Therapies

Autologous blood derivatives—specifically Platelet-Rich Plasma (PRP) and Platelet-Rich Fibrin (PRF)—have emerged as premier regenerative adjuncts due to their high concentration of leukocytes and growth factors.^[22, 23]

- **PRP:** Obtained via density gradient centrifugation with an anticoagulant, PRP delivers a rapid influx of regenerative factors.^[22] Studies consistently show that combined arthrocentesis with PRP offers superior long-term pain reduction compared to isolated arthrocentesis.^[11, 14]
- **PRF:** Processed without anticoagulants, PRF generates a fibrin matrix that allows for a gradual, prolonged release of growth factors, resulting in a more sustained anti-inflammatory response.^[23] Clinical trials indicate that combined arthrocentesis with PRF achieves significantly better maximum mouth opening values and profound pain reduction

at 12-month follow-ups, establishing it as arguably the most effective biological adjunct.^[17]

DISCUSSION

The synthesis of these comprehensive clinical trials dictates a clear, evidence-based mandate for the optimal management of temporomandibular joint osteoarthritis. Exclusive temporomandibular joint arthrocentesis is fundamentally effective as a baseline mechanical intervention, successfully clearing the joint of destructive inflammatory mediators.^[8, 9]

Regarding intra-articular adjuncts, pharmacological options exhibit limitations. Corticosteroids and NSAIDs fail to demonstrate long-term superiority over simple mechanical lavage in pain reduction, and hyaluronic acid's benefits appear primarily confined to the short term.^[12, 16] In contrast, pooled meta-analysis data confirms that autologous blood concentrates—particularly PRF and PRP—yield statistically significant improvements in both pain reduction and maximum mouth opening at 12-month follow-ups.^[17, 23] The sustained regenerative environment fostered by the gradual release of growth factors from PRF matrices addresses the underlying degenerative nature of osteoarthritis far more effectively than isolated pharmacological suppression.^[22, 23]

Temporomandibular joint osteoarthritis is a debilitating condition requiring progressive clinical management.^[3] The integration of current randomized clinical trials demonstrates that while conventional arthrocentesis is effective, therapeutic outcomes are vastly improved by specific biological enhancements.^[223] While pharmacological agents like NSAIDs, corticosteroids, and hyaluronic acid offer varying degrees of temporary relief, combining arthrocentesis with autologous biological adjuncts—specifically platelet-rich plasma and platelet-rich fibrin—yields the most significant, sustained long-term improvements in both pain reduction and functional joint mobility.^[11, 14, 17]

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