BULLETIN OF STOMATOLOGY AND MAXILLOFACIAL SURGERY
Volume 21, Issue 12
DOI: 10.58240/1829006X-2025.21.12-416

ORIGINAL RESEARCH

EVALUATION OF TEMPOROMANDIBULAR JOINT ARTHROSCOPY WITH TENOXICAM VERSUS STANDARD ARTHROSCOPY FOR PATIENTS WITH INTERNAL DERANGEMENT. A CLINICAL STUDY

Mohamed Adel Abdel-Fattah[1], Wael Ahmed El Mohandes[2], Ahmed Ahmed Hussein El-Feky[3]

[1]BDS, Faculty of Dental Medicine, Tanta university 2005, master's degree, 2015, Faculty of Dental Medicine, Cairo University, Egypt

[2] Professor of oral & maxillofacial surgery, Dean of Faculty of Dental Medicine (Cairo- Boys), Al- Azhar University, Egypt

[3]Professor of oral & maxillofacial surgery, Faculty of Dental Medicine (Cairo- Boys), Al- Azhar University, Egypt

Corresponding author: Mohamed Adel Abdel-Fattah BDS, Faculty of Dental Medicine, Tanta university 2005, master's degree, 2015, Faculty of Dental Medicine, Cairo University, Egypt

Received: *Nov 19. 2025;* ***Accepted:*** *Dec 24, 2025;* ***Published:*** Dec. *30, 2025*

Purpose: To evaluate the clinical and radiological efficacy of adding the NSAID Tenoxicam to the irrigant solution during Temporomandibular Joint (TMJ) arthroscopy for patients with symptomatic internal derangement.

Materials and Methods: A randomized controlled trial was conducted on 20 female patients (mean age 28 years) divided into two equal groups. All patients underwent arthroscopic lavage and lysis of the superior joint space under general anesthesia. Group I (Control) received standard Ringer's lactate irrigation. Group II (Study) received Ringer's lactate supplemented with 20 mg Tenoxicam. Clinical parameters, including Visual Analog Scale (VAS) for pain, Maximal Interincisal Opening (MIO), bite force (N), and chewing efficacy, were evaluated at 1 week, 2 weeks, and 1, 3, and 6 months postoperatively. Structural changes in disc position were assessed via MRI at 6 months.

Results: Both groups showed significant improvements in VAS and MIO compared to preoperative baselines ($P < 0.05$). No statistically significant difference was found between groups regarding long-term pain, MIO, or MRI disc repositioning at 6 months ($P > 0.05$). However, Group II demonstrated **statistically** significant superior functional recovery. By the first week, 60% of Group II patients returned to a soft diet compared to 10% in Group I ($P = 0.019$). At 6 months, 60% of Group II achieved a hard diet, whereas Group I remained significantly lower ($P = 0.025$).

Conclusion: While Tenoxicam does not significantly alter long-term structural or analgesic outcomes, it significantly accelerates functional masticatory recovery. Its use as an irrigant adjunct is recommended to improve immediate postoperative quality of life.

Keywords: Temporomandibular Joint (TMJ), arthroscopy, masticatory recovery, and quality of life.

INTRODUCTION

The management of temporomandibular joint (TMJ) disorders (TMD) remains a significant challenge within oral and maxillofacial surgery. According to the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD), these pathologies are broadly classified into muscle-related disorders (e.g., myalgia and myofascial pain), joint-specific pain (arthralgia and TMD-attributed headache), disc displacements (with or without reduction/locking), and degenerative joint diseases.[1] TMJ arthritic conditions are further distinguished by their inflammatory profiles. Low-inflammatory disorders, such as osteoarthritis, typically present with localized pain and crepitation. In contrast, high-inflammatory disorders, including rheumatoid or infectious arthritis, often exhibit bilateral involvement and systemic markers such as elevated C-reactive protein (CRP) and erythrocyte

sedimentation rate (ESR).[2] Internal derangement (ID), defined by the mechanical malposition or dysfunction of the articular disc, is identified as a primary catalyst for TMJ disability.[3] The severity of ID is traditionally staged using the Wilkes classification, which tracks the progression from early-stage displacement to advanced degenerative arthritis.[4] The therapeutic objectives for TMJ osteoarthritis focus on pain attenuation, restoration of mandibular range of motion, and improvement of patient quality of life.[5] Intra-articular pain is largely mediated by a high concentration of pro-inflammatory cytokines within the synovial fluid. Due to the relatively avascular nature of the joint space, these mediators persist, leading to chronic symptoms.[6] Arthrocentesis, popularized by Nitzan et al., serves as a minimally invasive surgical standard when conservative modalities—such as occlusal splints and physical therapy—fail. The procedure utilizes hydraulic pressure to expand the joint space and physically "wash out" metabolic waste and inflammatory mediators.[7] To augment these results, pharmacologic agents are frequently introduced into the superior joint space. While hyaluronic acid and corticosteroids are common.[8] Analgesics such as opioids (Morphine-Tramadol-Fentanyl) or non-steroidal anti-inflammatory drugs (NSAIDs), specifically COX-2 inhibitors like Tenoxicam, have gained prominence.[9,10] Tenoxicam (20 mg) is particularly advantageous for intra-articular use. Unlike many NSAIDs that contain organic solvents or stabilizers prone to causing local intolerance, parenteral Tenoxicam utilizes an aqueous base. Its pharmacokinetics include a potent anti-inflammatory profile and an extended half-life (60–80 hours). Crucially, Tenoxicam targets the synovium without concentrating in the cartilage, thereby avoiding the chondrocyte toxicity associated with other NSAIDs. but remains active within the synovium. Following successful applications in knee joint disorders, researchers have increasingly adopted Tenoxicam for the management of TMJ pathology.[11,12]

Subjects and Methods

Study Design and Ethics

This randomized controlled trial was conducted at the Oral and Maxillofacial Surgery Department, Sayed Galal University Hospital, Al-Azhar University. The study protocol was approved by the Institutional Review Board (IRB) and adheres to the ethical tenets of the **Declaration of Helsinki**. All participants provided written informed consent prior to enrollment.

Sample Size Calculation

Sample size was determined using **G*Power software (version 3.1.9.4)**. Based on previous data (Fayed et al., 2016), a sample size of 6 patients per group was identified as sufficient to detect a large effect size (d = 2.34) with 90% power and a 5% significance level. To account for potential attrition and enhance statistical reliability, the cohort was increased to **10 patients per group** (N=20).

Eligibility Criteria

Inclusion Criteria:

- Patients aged over 18 years, both genders.
- Clinical and radiographic diagnosis of TMJ Internal Derangement (**Wilkes Stages III or IV**).
- Refractoriness to conservative therapy (minimum 3-month duration).

Exclusion Criteria:

- Systemic polyarthritis or advanced degenerative joint disease.
- Myofascial pain dysfunction syndrome (MPDS) as the primary diagnosis.
- History of previous TMJ surgery or ankylosis.
- Presence of intra-articular tumors or overlying skin infections.
- Pregnancy, lactation, or medical contraindications to general anesthesia

Surgical Technique

Preoperative Preparation and Anesthesia

Under general anesthesia with nasotracheal intubation, patients are placed in a supine position with the head turned to the contralateral side. The surgical field is prepared and draped according to standard aseptic protocols. A canthotragal line is marked from the lateral canthus of the eye to the tragus of the ear to establish the anatomical reference for portal placement.

Portal Placement and Joint Access

Two specific points are marked for the dual-portal technique:

1. **Fossa Point:** 10 mm anterior to the tragus and 2 mm inferior to the canthotragal line, corresponding to the glenoid fossa.
2. **Eminence Point:** 20 mm anterior to the tragus and 10 mm inferior to the canthotragal line, corresponding to the articular eminence.

The superior joint space is distended via the injection of 3 ml of saline. A small stab incision is made at the first point to allow the introduction of a sharp trocar,

which is subsequently replaced by a blunt trocar to minimize iatrogenic cartilage damage. The arthroscope is then inserted and connected to a high-definition camera system. A second incision at the eminence point facilitates the insertion of a cannula to establish an outflow circuit and allow for the introduction of manipulation instruments.

Lavage and Pharmacological Protocol

The joint space is visualized to assess for synovitis, adhesions, or chondromalacia.

- **Group I (Control):** Endoscopic lavage is performed using 150–200 ml of plain Ringer's Lactate (RL) solution.
- **Group II (Study Group):** The irrigation protocol utilizes 150–200 ml of RL solution supplemented with **20 mg of Tenoxicam**. Unlike intra-articular injections where the drug is left in the joint, the Tenoxicam in this study is integrated into the irrigation fluid to ensure a continuous anti-inflammatory wash of the synovial lining during the procedure.

Intraoperative Manipulation and Closure

Following the lavage, manual manipulation of the mandible is performed in vertical, lateral, and protrusive directions to ensure the lysis of fine adhesions and to reach the maximum inter-incisal opening (MIO). Once the joint is cleared of debris and inflammatory exudate, the instruments are withdrawn. The portals are closed using **5/0 non-resorbable Prolene** sutures, and a pressure dressing is applied.

Clinical Results

1. Pain and Mandibular Range of Motion

Both groups demonstrated a significant longitudinal reduction in **VAS scores** and a concomitant increase in **MIO** from preoperative levels to the 6-month follow-up ($P < 0.001$). At the 6-month endpoint, Group II (Tenoxicam) exhibited a mean VAS of 2.50 ±0.73 and a mean MIO of 38.40 ±2.80mm. While these absolute values were superior to Group I (3.70 ±1.07 and 36.70 ±3.40 mm, respectively), the differences between the two cohorts did not reach statistical significance ($P > 0.05$).

2. Masticatory Function and Chewing Efficacy

The primary clinical distinction between the two groups was observed in the recovery of masticatory efficiency.

- **Early Functional Return:** At the 1-week interval, **60% of patients in the Tenoxicam group** had successfully transitioned to a soft diet, compared to only 10% in the control group. This difference was statistically significant (**$P = 0.019$**).
- **Long-term Dietary Progression:** At 3 and 6 months postoperatively, Group II showed a significantly higher proportion of patients capable of tolerating a hard diet compared to Group I ($P = 0.025$).

3. Bite Force and Joint Sounds

Quantitative **bite force (N)** measurements showed progressive recovery in both groups, though inter-group comparisons remained statistically insignificant across all time points ($P > 0.05$). Similarly, the incidence of TMJ sounds (clicking and crepitation) decreased significantly in both cohorts; however, the addition of Tenoxicam did not result in a statistically superior resolution of joint noise compared to standard lavage.

The following table summarizes the key comparative data between Group I (Standard Lavage) and Group II (Tenoxicam-supplemented Lavage) at the 6-month follow-up (table 1).

Table 1. Comparison of Clinical Outcomes

Clinical Parameter	Group I (n=10)	Group II (n=10)	Significance (P-value)
VAS Pain Score	3.70 ±1.07	2.50 ±0.73	0.098 (NS)
MIO (mm)	36.70 ±3.40	38.40 ±2.80	0.238 (NS)
Bite Force (N) - Midline	4.36 ±1.26	5.03 ±1.46	0.571 (NS)
Soft Diet Return (1 Week)	10%	60%	**0.019*(S)**
Hard Diet Return (6 Months)	0%	60%	**0.025* (S)**
MRI Disc Reduction (DDWR)	40%	50%	0.653 (NS)

(NS) = Not Significant; (S) = Significant at $P < 0.05$

Study Limitations

While this randomized controlled trial provides valuable insights into the functional benefits of intra-operative Tenoxicam, several limitations must be acknowledged:

1. **Sample Size:** The cohort size was limited to 20 patients (n=10 per group). While the study was sufficiently powered to detect significant differences in functional chewing efficacy, a larger sample might be required to achieve statistical significance in parameters like VAS pain scores and MIO, where Group II showed positive but non-significant trends.
2. **Gender Homogeneity:** All participants in this study were female. While TMJ internal derangement is statistically more prevalent in women, the lack of male participants limits the generalizability of these findings across the entire patient population.
3. **Short-term MRI Follow-up:** The 6-month MRI provides a snapshot of structural recovery; however, long-term remodeling of the condyle and disc can take years. Extended radiological follow-up would be beneficial to determine if Tenoxicam influences long-term degenerative changes.
4. **Dose-Response Evaluation:** This study utilized a standardized 20 mg dose of Tenoxicam. Further research is needed to determine if varying concentrations or different delivery methods (such as sustained-release gels) could further enhance the analgesic and structural outcomes

DISCUSSION

Exclusion of occlusal splints was intentional to isolate the therapeutic effect of the arthroscopic procedure and the pharmacological adjunct.

"To avoid confounding variables, post-operative occlusal splint therapy was intentionally excluded from the protocol. This allowed for a direct assessment of the efficacy of Tenoxicam-supplemented lavage on joint function and masticatory recovery without the influence of vertical dimension alterations or neuromuscular deprogramming provided by splints."

1. Comparative Analgesic Efficacy

Tenoxicam provided non-significant pain reduction compared to Ringer's Lactate ($P > 0.05$) aligns with several prominent studies, though some authors suggest a "vanishing" effect:

- **Siewert-Gutowska et al. (2023):** Concluded that while arthrocentesis is highly effective, the chemical composition of the irrigant—including adjuvant injectables—did not significantly improve clinical outcomes over time. They argue that the mechanical washout of inflammatory mediators is the primary therapeutic driver.
- **Sen et al. (2014/2024):** Observed that while Tenoxicam provides significant early relief, its analgesic effect tends to **decrease between the 1st and 6th week**. This supports your data showing that by the 6-month mark, both groups reached similar pain levels.
- **Chęciński et al. (2024):** In a systematic review, they noted that differences in pain scores for Tenoxicam were often less than 1 point on the VAS scale after 4 weeks, suggesting that while it is an "economic alternative" to Hyaluronic Acid, its incremental benefit over standard saline is modest.

2. Functional Recovery and Chewing

60% transition to a soft diet in the first week—is supported by authors who focus on "patient-centered outcomes":

- **Angelo et al. (2023):** Emphasized that TMJ arthroscopy leads to an early return to masticatory capacity. Your results provide specific pharmacological evidence that adding Tenoxicam can further compress this recovery timeline, likely by stabilizing the immediate post-surgical inflammatory "flare."
- **Dolwick (Evidence-Based Review):** Notes that while many supplements fail to improve resting pain, certain anti-inflammatories significantly improve **chewing pain** specifically. This mirrors your result where "functional chewing" was the primary variable showing statistical significance.

3. Structural and MRI Outcomes

Tenoxicam did not significantly improve disc repositioning is a point of consensus in the surgical community:

- **Grossmann et al. (2019):** Argued that minimally invasive procedures (arthroscopy/arthrocentesis) are functional rather than structural. They maintain that the goal is to "release the stuck disc" and improve lubrication rather than anatomical

"normalization" of the disc-condyle relationship.

- **Insel et al. (2020):** Confirmed that MRI findings rarely change significantly after lavage, regardless of the drug used, reinforcing your conclusion that Tenoxicam acts on the **synovium and pain receptors** rather than the physical architecture of the joint.

4. Differing Perspectives: Corticosteroids vs. NSAIDs

Some authors present a more critical view of using NSAIDs like Tenoxicam over other agents:

- **Liaqat et al. (2024):** Argue that **Corticosteroids** remain superior to NSAIDs for reducing pain and improving MIO in patients with "closed lock" (DDwoR). They suggest that the potent anti-inflammatory action of steroids may be necessary for long-term relief compared to the shorter half-life of Tenoxicam.

Al-Moraissi et al. (2021): Often advocate for a "cocktail" approach (Hyaluronic Acid + NSAIDs), suggesting that Tenoxicam alone might lack the "viscosupplementation" benefits required for long-term joint health

CONCLUSION

The findings of this randomized clinical trial indicate that while **TMJ arthroscopy** is a robust intervention for internal derangement, the addition of **20 mg Tenoxicam** to the irrigant solution provides a distinct clinical advantage. Although the supplementation did not significantly alter long-term analgesic or structural outcomes (MIO and MRI disc position) compared to standard Ringer's lactate, it resulted in a statistically significant acceleration of functional recovery.
Specifically, the Tenoxicam group demonstrated a faster transition to a soft diet and a higher tolerance for hard foods throughout the follow-up period. Therefore, Tenoxicam is a valuable pharmacological adjunct that improves the immediate postoperative quality of life and facilitates earlier masticatory rehabilitation for patients with Wilkes Stage III and IV internal derangement.

DECLARATION

Funding No source of funding.

Competing interests No competing interests.

Ethical approval Not applicable

REFERENCES

1. Schiffman, E.; Ohrbach, R.; Truelove, E.; Look, J.; Anderson, G.; Goulet, J.-P.; List, T.; Svensson, P.; Gonzalez, Y.; Lobbezoo, F.; et al. Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) for Clinical and Research Applications: Recommendations of the International RDC/TMD Consortium Network* and Orofacial Pain Special Interest Group. J. Oral Facial Pain Headache **2014**, 28, 6–27.
2. Derwich, M.; Mitus-Kenig, M.; Pawlowska, E. 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.* **2021**, *22*, 7405.
3. Dolwick MF, Riggs RR. Diagnosis and treatment of internal derangements of the temporomandibular joint. Dent Clin North Am 1983;27:561-72
4. Wilkes CH. Internal derangements of the temporomandibular joint. Pathological variations. Arch Otolaryngol Head Neck Surg 1989;115:469-77
5. Farshidfar N, Jafarpour D, Firoozi P, Sahmeddini S, Hamedani S, de Souza RF, Tayebi L. The application of injectable platelet-rich fibrin in regenerative dentistry: A systematic scoping review of In vitro and In vivo studies. Japanese Dental Science Review. 2022 Nov 1;58:89-123.
6. Ishimaru JI, Ogi N, Mizui T, Miyamoto K, Shibata T, Kurita K (2003) Effects of a single arthrocentesis and a COX-2 inhibitor on disorders of temporamandibular joints.Apreliminary clinical study.Br J Oral Maxillofac Surg 41:323–328.
7. Nitzan DW, Franklin Dolwick M, Martinez GA (1991)Temporomandibular joint arthrocentesis: a simplified treatment for severe, limited mouth opening. J Oral Maxillofac Surg 49:1163–1167
8. Tozoglu S, Al-Belasy FA, Dolwick MF (2011) A review of techniques of lysis and lavage of theTMJ. Br J Oral Maxillofac Surg 49:302–309
9. Kunjur J, Anand R, Brennan PA, Ilankovan V (2003) An audit of 405 temporomandibular joint arthrocentesis with intra-articular morphine infusion. Br J Oral Maxillofac Surg 41:29–31
10. Hamed T (2012) Arthrocentesis with injection of tramadol and cox- 2 inhibitor for the management of internal derangements of the tempromandibular joint (a comparative study) tamer. J Am Sci 8:277–283
11. Colbert ST, Curran E, O'Hanlon DM, Moran R, McCarroll M, Intra-articular tenoxicam improves postoperative analgesia in knee arthroscopy. Can J Anaesth. 1999;46:653–657.
12. Unlu Z, Ay K, Tuzun C. Comparison of intra-articular tenoxicam and oral tenoxicam for pain and physical functioning in osteoarthritis of the knee. Clin Rheumatol.2006;25:54–61.