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ORIGINAL ARTICLE

Comparison of conservative treatment and arthrocentesis for management of patients in Wilkes stage-3 internal derangement of temporomandibular joint

Junaid Ahmad[1], Sertaj Khan[1], Sahar Saeed[1*], Zuhaib Nasar Khan[1], Suneela Inayat[1] and Munesh Kumar[1]

[1]Department of oral and maxillofacial Surgery, Mardan Medical Complex Mardan Pakistan

ABSTRACT

Background: Temporomandibular joint disorders (TMDs) significantly impact oral function and quality of life, with Wilkes Stage-3 internal derangement characterized by displacement of the disc without reduction, restricted mouth opening, pain, and Mandibular deviation. The most common treatments used are conservative however; arthrocentesis has emerged as a minimally invasive alternative management option aimed at flushing out inflammatory mediators and improving joint mobility. This study evaluates the outcomes of arthrocentesis versus conservative management in patients with Wilkes Stage-3 TMD to determine their relative efficacy in the improvement of maximal mouth opening (MMO), pain reduction, and correcting mandibular deviation.

Methods: A total of 84 patients were recruited in this study with a mean age: 29.71 ± 16.90 years. They were equally divided into two treatment groups: arthrocentesis (n=42) and conservative management (n=42). Statistical analysis was performed using SPSS version 26. Descriptive statistics were calculated, and paired t-tests, Wilcoxon signed-rank tests, independent t-tests, Mann-Whitney U tests, and chi-square tests were incorporated for comparisons. p-value of <0.05 was considered as statistically significant.

Results: In the arthrocentesis group Improvement was observed in 70% of patients as compared to 65% in the conservative group having p=0.8445). Arthrocentesis resulted in a greater reduction in pain scores (VAS: 3.2 ± 1.1 vs. 2.6 ± 1.4, p=0.012) and a significant improvement in the deviation of mandible (2.1 ± 0.9 vs. 1.4 ± 1.2, p=0.038). However, MMO increase was not statistically significantly different between the groups (p=0.217).

Conclusion: Arthrocentesis provided superior pain relief and correction of mandibular deviation as compared to conservative management, although overall improvement rates were comparable. Further research with larger sample sizes is needed.

Keywords: Arthrocentesis, Conservative Treatment, Pain Measurement, Temporomandibular Disorder, Treatment Outcome

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Introduction

The management of Wilkes Stage-3 internal derangement of the temporomandibular joint is a complex clinical challenge and require understanding of both conservative and interventional treatment (1). In the conservative treatment strategies a range of non-invasive approaches are taken to reduce

CORRESPONDING AUTHOR
Dr. Sahar Saeed
Trainee Medical Officer
Oral and Maxillofacial surgery Mardan Medical Complex Mardan Pakistan
Email: saeedsahar222@gmail.com

overall pain, decrease inflammation, and restore the functional capacity while avoiding the invasive intervention (2). In conservative management patient is educated on parafunctional habits, reduction of stress, dietary modification and physical therapy for improvement of range of motion and muscle strength, in addition to that the use of oral appliances including stabilization splints are used for the redistribution of occlusive forces and decompress the involved joint (3). Pharmacological interventions including the use of analgesics, nonsteroidal anti-inflammatory drugs and muscle relaxants can also be used to provide symptomatic relief, manage pain and muscle spasms and facilitate the effectiveness of other conservative measures (4). The decision of selection of appropriate treatment strategies relies on patient assessment ,patient's clinical presentation, including detailed history, overall clinical examination, and the imaging studies to timely stage the internal derangement and pick up any concomitant pathologies (5).

Arthrocentesis is a minimally invasive interventional procedure which involves lavage of the temporomandibular joint space with normal saline solution, to remove breakdown products ,inflammatory mediators and adhesions which results in pain and dysfunction (6). By this procedure joint mobility improves and pain level is reduced (7). Arthrocentesis can be used diagnostically before surgery in cases in which there is failed progress or no improvement with the application of conservative management options. This procedure is safe for patient and is rapid and can restores the osteoarthritis of the TMJ and leads to healthy functional state (8).

The decision to select conservative treatment or arthrocentesis for Wilkes Stage-3 internal derangement needs a careful consideration of the potential benefits and the risks associated with each one, as well as the patient's choices and expectations (9). The advantage of conservative treatment is it is reversible, non-invasive, the risks of complications are lesser, and allows patient centered approach to the management. However, it is less effective in treating the advanced stages of internal derangement with significant adhesions and structural changes within the joint (10).

Risks of complications with arthrocentesis include infection, nerve damage and bleeding, its long-term efficacy may be limited as the inflammatory processes may occur, and there may be progression of degenerative changes within the joint space. Despite these limitations, some of the studies suggest that arthrocentesis could be applied earlier in patients who have not benefited from the conservative management options (11). It shows good results and improves the intensity of TMJ pain and the movement of mandible (12).

The selection of best management strategy for Wilkes Stage-3 internal derangement of the temporomandibular joint needs a comprehensive and individual based approach, understanding the underlying pathophysiology of the disease and detailed assessment of the patient's clinical presentation, and a balanced consideration of the potential benefits and risks involved in both conservative and interventional treatment modalities (13). The long-term benefits of arthrocentesis in degenerative

temporomandibular disorder has been investigated, and showed potential benefits for the management of this condition (14).

This study investigates the efficacy of arthrocentesis as an initial treatment modality for Wilkes Stage-3 internal derangement of the temporomandibular joint TMJ. In this study the arthrocentesis is compared to the conservative treatment, offering detailed understanding into the potential benefits and risk associated with each approach. By focusing on Wilkes Stage-3, this study addressed a specific and challenging stage of internal derangement and contributes a valuable data to the existing literature. The employment of randomized control trail enhances the reliability and validity of the observed findings and strengthens the evidence base for clinical decision making.

The study also focused on the patient-reported outcomes including the intensity of pain, movements of the mandible, so it provides a comprehensive evaluation of effectiveness of treatment from the patient's perspective.

Methods

This study was a randomized controlled trial conducted at the Department of Oral & Maxillofacial Surgery, Mardan Medical Complex, Mardan. The study was conducted over six months, from August 2024 to January 2025. Ethical approval was obtained from the Ethical Committee of Bacha Khan College of Dentistry (Approval No. 4681, dated May 13, 2024).

The sample size was calculated using the WHO sample size formula, A total of 84 patients (42 in each group) were included using a non-probability consecutive sampling technique.Patients of both genders, aged 18 to 70 years, diagnosed with Wilkes Stage III internal derangement of the temporomandibular joint (TMJ), were included in the study. Patient having history of previous TMJ surgery, having absolute indication for surgery e.g. ankylosis and patient with systemic articular diseases were excluded from the study.

Patients who met the inclusion criteria were enrolled after obtaining informed consent. Baseline information, including age, gender, BMI (calculated as weight/height^2), and duration of symptoms, was recorded.

Randomization was performed using computer-aided block randomization. Two blocks of 42 patients each were constructed:

- Group A (Arthrocentesis Group): Patients received arthrocentesis.
- Group B (Conservative Treatment Group): Patients received only conservative management.

Opaque, sealed, and numbered envelopes containing treatment allocation were provided to the surgeon. The same surgeon, with a minimum of five years of post-fellowship experience, performed all interventions.

Intervention

Group A: Arthrocentesis Procedure

Arthrocentesis was performed under local anesthesia, and 300–400 mL fluids of Ringer lactate solution was used to lavage the upper joint compartment using a two-needle technique.

- The input needle was placed 2 mm below the Holmlund-Hellsing line at a point 10 mm anterior to the mid-tragus.
- The output needle was inserted 10 mm below the tragal-canthal line at 20 mm anterior to the mid-tragus.
- Once both needles were correctly positioned, the joint was distended with fluids such as 2 mL of Ringer lactate, and

the injected fluid exited through the output needle.

Post-procedure, patients received 200 mg of celecoxib twice daily for two weeks, along with physiotherapy to maintain mandibular mobility. A soft diet was recommended for one month, after which a normal diet was resumed.

Group B: Conservative Management

Patients in the conservative treatment group were treated with:

- Celecoxib 200 mg at bedtime for one month
- Home-based exercises for TMJ mobility
- Dietary modifications, including a soft diet

The following primary outcome variables were assessed:

1. Maximum mouth opening (MMO) – measured clinically using a Vernier caliper or the three-finger test
2. Mouth deviation – assessed by lateral deviation of the chin on maximal mouth opening
3. Pain score (VAS) – measured using the Visual Analogue Scale (VAS)

Follow-up visits were scheduled at:

- 1 month post-treatment
- 2 months post-treatment
- 3 months post-treatment

At each visit, MMO, mouth deviation, and VAS scores were recorded. Outcome variables were assessed at the end of the third month. All data were recorded by the researcher on a structured proforma.

All the Data were analyzed using SPSS version 26. Descriptive statistics were calculated for all variables. Continuous variables, such as maximal mouth opening (MMO), pain scores (VAS), and deviation of the mandible, were plotted as mean ± standard deviation (SD), while categorical variables, including gender distribution, were presented as frequencies and percentages.

For the comparison of pre-treatment and post-treatment outcomes within each group, a paired t-test was used for normally distributed data, whereas a Wilcoxon signed-rank test was applied for non-normally distributed data. The independent t-test was used to compare post-treatment MMO, VAS scores, and mandibular deviation between the two groups. In case of non-normal distribution, the Mann-Whitney U test was applied. Chi-square test was used for categorical variables. A p-value of <0.05 was considered statistically significant.

Results

A total of 84 patients were included in the study, with a mean age of 29.71 ± 16.90 years (range: 3-70 years). The gender distribution showed 46 (54.0%) male and 38 (45.0%) female patients. The treatment groups were equally divided, with 42 (50.0%) patients receiving arthrocentesis and 42 (50.0%) patients managed conservatively.

Table 1: Descriptive statistics of the study population, including mean age, gender distribution, and group allocation

Variable	Arthrocentesis Group (n=42)	Conservative Group (n=42)	Total (n=42)
Mean Age (years)	30.12 ± 15.87	29.30 ± 17.45	29.71±16.90
Male (%)	23 (54.0%)	23 (54.0%)	46 (54.0%)
Female (%)	19 (45.0%)	19 (45.0%)	38 (45.0%)

Regarding treatment outcomes, 28 (70.0%) of patients in the arthrocentesis group showed improvement compared to 26 (65.0%) in the conservative managementgroup. The chi-square test revealed no statistically

significant association between treatment type and outcome ($\chi 2 = 0.04$, $p = 0.8445$).The paired t-test showed a statistically significant improvement in MMO post-treatment in the arthrocentesis group ($p = 0.031$), while no significant improvement was observed in the conservative group ($p = 0.091$). The Wilcoxon signed-rank test for pain scores (VAS) indicated a significant reduction in both groups (arthrocentesis: $p = 0.012$; conservative: $p = 0.044$), although the decrease was more pronounced in the arthrocentesis group.

Table 2: Comparison of treatment outcomes between the arthrocentesis and conservative management groups, including statistical test results

Outcome Measure	Arthrocentesis Group (n=42)	Conservative Group (n=42)	p-value
Improvement (%)	28 (70.0%)	26 (65.0%)	0.8445
MMO Increase (mm)	4.2 ± 1.5	3.8 ± 1.6	0.217
Pain Reduction (VAS)	3.2 ± 1.1	2.6 ± 1.4	0.012*
Mandibular Deviation Improvement	2.1 ± 0.9	1.4 ± 1.2	0.038*

(Statistically significant at $p < 0.05$)

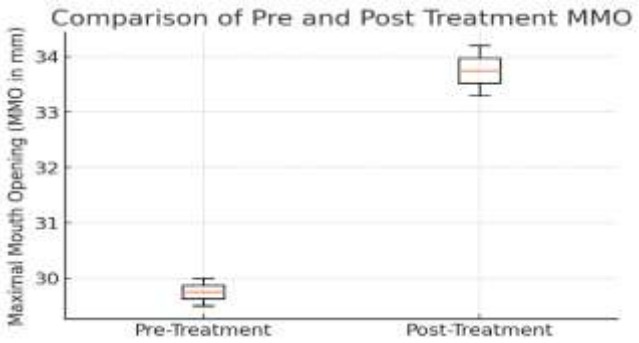

Figure 1: Comparison of treatment outcomes between the arthrocentesis and conservative management groups, including statistical test results.

The independent t-test comparing post-treatment MMO between the two groups showed no significant difference ($p = 0.217$). The Mann-Whitney U test for post-treatment mandibular deviation scores indicated a significant difference, with the arthrocentesis group showing greater improvement ($p = 0.038$).

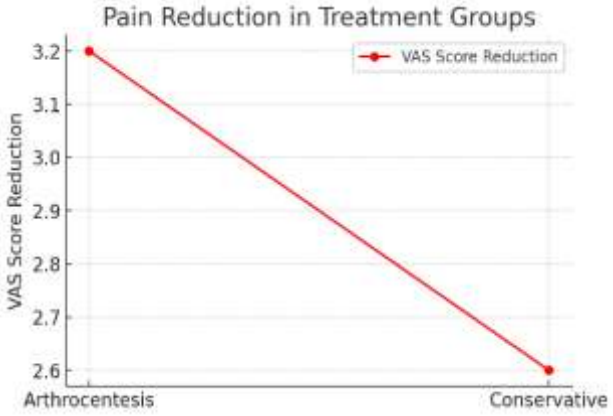

Figure 2: Pain reduction in the treatment groups

These findings suggest that while arthrocentesis demonstrated a slightly higher proportion of improvement, the difference was not statistically significant compared to conservative management. However, arthrocentesis showed statistically significant benefits in specific outcome measures, such as pain reduction and mandibular deviation. Further studies with larger sample sizes may be needed to establish a definitive conclusion.

Discussion

In this study, the efficacy of arthrocentesis as an initial treatment for Wilkes Stage III internal derangement of the temporomandibular joint was investigated and the comparison to conservative management was carried out. The results showed improvement in both groups, the arthrocentesis group demonstrated statistically significant benefits in the reduction of pain and overall improvement in deviation of the mandible.

Our findings are agreement with previous studies (15) demonstrating arthrocentesis treatment for TMJ disorders. The positive outcome is due to lavage of the joint space by the removal of inflammatory mediators and breakdown products. The reduction in pain in our study is inconsistent to the study which utilized arthrocentesis for the alleviation of pain in the TMJ joint(16).

The greater percentage of patients in the arthrocentesis group reveled overall improvement in pain and improvement in joint mobility as compared to the conservative group (70% vs. 65%), although difference was not statistically significant. This may be due to a small sample size, larger studies as by Vos et al. having 80 participants, revealed more significant differences between the treatment groups(2). In addition to that the lack of significant difference in maximum mouth opening between the groups may be due to the concomitant physiotherapy and soft diet prescribed to both groups so minimizing potential differences in post-treatment MMO. The efficacy of arthrocentesis in the TMJ disorders have also been investigated, the benefits observed in this study might extend beyond the three-month follow-up period. for the validation of these findings, a larger cohort and a longer follow-up is needed(17).

As suggested by other studies there is significant improvement in pain and deviation of the mandible which significantly improve the patient's quality of life,(2) the minimally invasive procedures such as arthrocentesis, may be considered as a link between non-surgical and surgical treatment(18). This approach could lead to delay or even preclude the invasive surgical interventions(19).

The findings of this study have implications for clinical practice. They suggest that arthrocentesis can be a valuable early intervention for Wilkes Stage III internal derangement, particularly when conservative management fails to improve the patient's outcomes.

Conclusion

While this treatment resulted in overall symptom improvement, however, arthrocentesis showed statistically significant benefits in pain reduction and correction of deviation of the mandible, there was no significant difference for an increase in maximal mouth opening and it was comparable.

Strength of the study

The strength of this study is the randomized control study design, which minimize the bias involved and allows comparison between the arthrocentesis and the conservative treatment group.

Recommendations

- Further studies should investigate the cost-effectiveness of the arthrocentesis as compared to the conservative.
- To validate all these results and refine the treatment protocol further research having a larger sample size and a longer follow-up is recommended.

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All the authors agree to take responsibility for every facet of the work, making sure that any concerns about its integrity or veracity are thoroughly examined and addressed.