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Original Article

Arthrocentesis Versus Pharmacological Therapy for the Management of Patients with Temporomandibular Joint Disc Displacement Disorders

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Abstract

Objective: To compare the effectiveness of arthrocentesis versus pharmacological therapy in improving maximal mouth opening (MMO) in patients with temporomandibular joint (TMJ) disc displacement disorders.

Methodology: This clinical experimental study was conducted at the Department of Oral and Maxillofacial Surgery, Lahore Medical and Dental College, from June 20 to December 20, 2024. Patients aged 16 to 65 years with TMJ disc displacement, characterized by pain (VAS >3) and restricted mouth opening (<20 mm) for more than one month, were included after providing written informed consent. Exclusion criteria were hypersensitivity to pregabalin, prior TMJ surgery, connective tissue or metabolic disorders (e.g., diabetes, hypertension), and pregnancy. Sixty patients were randomly assigned to two groups: Group A received pregabalin 75 mg twice daily for four weeks, while Group B underwent arthrocentesis. MMO was recorded at baseline and after one month.

Results: Among 60 enrolled patients, 30 were male and 30 female. Most participants (78.3%) were aged 21–40 years, and 68.3% had symptoms for less than 12 months. No significant differences in baseline demographics were observed between groups ($p > 0.05$). The mean improvement in MMO was significantly higher in the arthrocentesis group (8.98 mm) than in the pregabalin group (5.25 mm) ($p < 0.001$). The improvement was particularly significant among younger patients, both genders, and those with symptom duration under 12 months ($p < 0.001$).

Conclusion: Arthrocentesis resulted in significantly greater improvement in maximal mouth opening compared to pregabalin, especially in younger patients and those with recent-onset TMJ disorders.

Keywords: Temporomandibular Joint Disorders, Arthrocentesis, Pharmacological Therapy, Maximal Mouth Opening.

Introduction

The temporomandibular joints (TMJs) are the two synovial joints responsible for articulation between mandible and skull.[1] An intermediate fibrocartilaginous disc separates the joint space into upper and lower parts and helps in the normal function of TMJ.[2] It is approximately 70% water by weight. Injury or degeneration of this fibrocartilaginous disc results in various TMJ disorders.[3] According to an American Academy of Orofacial Pain the TMJ disorder are a set of conditions including the masticatory muscles, the TMJ, and the connected structures.[4] TMJ disorders are the most prevalent reason of orofacial pain of non-dental origin.[5] The etiological factors that lead to TMJ disorders can be occlusal, psychological, hormonal, macro trauma, parafunctions, joint hypermobility, and hereditary.[6]

The most common presentation is pain, followed by restricted mandibular movements, and noises that include crepitus and clicking.[6,7] Six different types of intra-articular TMJ disorders have been reported. These include disc displacement (DD) having reduction and intermittent locking, subluxation and degenerative joint disease.[8] Among these, disc displacement with reduction (DDWR) accounts for 41% of the clinically diagnosed cases[9] with 33% being the asymptomatic.[9] In these patients, the articular disc is displaced relative to the condyle when the mouth is closed, but returns to its normal position between the condyle and the articular tubercle when the mouth is open.[4,10]

The aim of managing TMJ disorders is to eliminate or reduce pain and joint sounds and to restore normal joint function. Treatment includes both pharmacological and interventional approaches.[11] Pharmacological treatments are often the first line of treatment to manage pain and inflammation. These include non-steroidal anti-inflammatory medicines, muscle relaxants, and analgesics. In some cases, neuromodulators such as pregabalin, are used to address nerve pain or associated anxiety.

The current study was executed to compare the mean change in MMO, following treatment with arthrocentesis versus pharmacological therapy using a neuromodulator in patients with TMJ disc displacement disorders. The rationale was to fill the knowledge gap and variations in literature regarding the effectiveness of the proposed treatment options, in patients

with disc displacement disorders. No local study has been conducted so far that can help oral and maxillofacial surgeons to individualize treatments for their patients. The study shall gather evidence from local settings to improve the practice and benefit patients in terms of complications, effectiveness, cost, and quality of life.

Methodology

This clinical experimental study was done at Oral & Maxillofacial Surgery OMFS) Department; LMDC i.e. Lahore Medical and Dental College, Lahore. The study was completed in Six months after the approval of synopsis [June 20, 2024 till December 20, 2024]. The sample size was calculated based on previous study and it turned out as 60 (30 cases in each group) was calculated with 95% confidence interval, 80% power of study, and taking mean change in Mouth opening after pharmacological therapy vs arthrocentesis as 1.94± 0.6 vs 0.63 ± 0.14mm, respectively.[12] Data was collected using purposive-sampling was used.

The study included both male and female participants aged between 16 and 65 years who presented with TMJ disc displacement disorders, characterized by pain (Visual Analog Scale score >3) in the muscles attached to the TMJ and a reduction in mouth opening to less than 20 mm during TMJ movement for a duration of more than one month. Individuals were excluded if they had a known hypersensitivity to Pregabalin or related compounds, a history of TMJ surgery, any diagnosed connective tissue disorder, metabolic disorders requiring regular medication such as diabetes mellitus or hypertension, or if they were pregnant.

Data collection procedure

After taking approval for Study protocol from the Ethical Committee at Lahore Medical & Dental College [FD/462/23], A total of 60 patients fulfilling selection criteria were included in this study through OPD of the Oral and Maxillofacial Surgery Department. Informed consent was taken from each patient before intervention. MMO was defined as the largest distance incisal edge of mandibular central incisor to incisal edge of maxillary central incisor after mouth is fully opened as wide as possible without pain or as inter incisal distance plus the overbite. It was labeled as (T-0) at the start of study and the sample population was distributed randomly and equally between two groups with help of lottery method. After randomization in group A, patients received pregabalin 75mg per orum, twice daily for 4 weeks. Whereas in group B, patients underwent arthrocentesis (a procedure during which the jaw is washed with normal saline and steroid, by introduction of the needle and injection of saline to fill the joint space and establish the flow of saline solution and steroid). MMO was measured again 1 month after the intervention, labeled as T-1. Data was recorded on Pro forma and change in MMO was calculated & labeled as T-C.

Data analysis

Data was analyzed by the SPSS software (version 26.0). Normality of the data was checked using Kolmogorov Smirnov test. Quantitative variables like age, duration of TMJ disorder, pre and post treatment MMO were presented in the form of mean ± SD where data was normal, and median (interquartile range) where data was not normal. Qualitative variables such as age groups, and gender were presented in the form of frequency and percentage, and were compared using Chi-square test. MMO change was calculated, and both the groups were compared for mean change in MMO, by using independent sample T-test if data was normal or Mann-Whitney U test in case of non-normally distributed data. P value (≤ 0.05) was considered as significant. Data was stratified for age, gender, duration of TMJ disc disorder and laterality. Post stratification, independent sample t-test was applied to compare mean change in MMO and p-value of ≤ 0.05 was considered significant.

Results

The comparison between the two study groups, each comprising of 30 patients, showed no significant differences based on age, gender, or duration of disease, as shown in table 1. In the 21–40 years age group, 83.3% of Arthrocentesis patients and 73.3% of Pharmacological therapy patients were represented, while in the 41–52 years group, 16.7% and 26.7%, respectively, were represented. Regarding gender, 46.7% of Arthrocentesis patients were male, compared to 53.3% of Pharmacological therapy patients, with 53.3% and 46.7% being female in each group. For disease duration, 60.0% of Arthrocentesis patients had a disease duration of less

Table1. Comparison of Age Groups, Gender and Duration of Disease in Both Groups

		Study groups		**p-value***
		Arthrocentesis n=30 (%)	**Pharmacological therapy (n=30)**	
Age groups (years)	21–40	25 (83.3)	22 (73.3)	0.347
	41–52	5 (16.7)	8 (26.7)	
Gender	Female	16 (53.30)	14 (46.7)	0.606
	Male	14 (46.70)	16 (53.3)	
Duration of disease (months)	<12	18 (60.0)	23 (76.7)	0.165

n = number of patients; *None of the p-value was significant as p-value > 0.05.

than 12 months, compared to 76.7% in the Pharmacological therapy group, with 40.0% and 23.3% having a disease duration of 12 months or more, respectively. The p-values for all comparisons indicated that these differences were not statistically significant (Table 1).

The Table 2 indicates significant differences between the Arthrocentesis and Pharmacological therapy groups in various terms. While the median age (31 years) and duration of disease (9 months vs. 7 months) were similar between the groups (p-values of 0.694 and 0.145, respectively), the CMMO showed a significant difference overall, with the Arthrocentesis group achieving a higher mean (8.98 mm) compared to the Pharmacological therapy group (5.25 mm) and a p-value of <0.001. This difference was most pronounced in younger patients (21-40 years), males, females, and those with a disease duration of less than 12 months, p <0.001 each.

Table 2A shows the baseline comparison of age, disease duration, and improvement in mouth opening between the two groups. Only the change in maximum mouth opening (CMMO) showed a statistically significant difference.

Table 2A. Main Comparison Between Arthrocentesis and Pharmacological Therapy

Variable	Arthrocentesis (n = 30)	Pharmacological Theapy (n = 30)	p-value	Test Used
Age (years), Median (IQR)	31 (11.75)	31 (14.25)	0.694	Mann-Whitney U test
Duration of Disease (months), Median (IQR)	9 (8.0)	7 (6.75)	0.145	Mann-Whitney U test
CMMO (mm), Mean ± SD	8.98 ± 2.82	5.25 ± 1.73	<0.001	Independent sample t-test

Table 2B presents subgroup comparisons showing significantly greater improvements in change in MMO in the arthrocentesis group across younger age groups, both genders, and shorter disease duration. The numbers in brackets indicate the percentages.

Table 2B. Subgroup Analysis of Change in Maximal Mouth Opening

Subgroup	Arthrocentesis Mean ± SD	Pharmacological Therapy Mean ± SD	p-value	Test Used
Age 21–40 years	9.29 ± 2.73	4.86 ± 1.64	<0.001	Independent sample t-test
Age 41–52 years	6.88 ± 2.59	5.73 ± 1.95	0.377	Independent sample t-test
Male	9.43 ± 3.61	5.65 ± 1.35	0.001	Independent sample t-test
Female	8.41 ± 1.88	4.44 ± 1.93	<0.001	Independent sample t-test
Disease <12 months	7.97 ± 2.04	5.35 ± 1.76	<0.001	Independent sample t-test
Disease ≥12 months	10.25 ± 3.32	4.23 ± 1.39	<0.001	Independent sample t-test

Discussion

This study was done to compare effectiveness of arthrocentesis with pharmacological therapy in improving maximal mouth opening in patients with TMJ disorders. There were no significant variations (p-value >0.05) in age, gender, or disease duration in both groups (Table-1). However, mean change in MMO was significantly more in Arthrocentesis group (8.98 mm) compared to pregabalin group (5.25 mm). This difference was most notable in younger patients (21-40 years), both males and females, and those with a disease duration of less than 12 months (p <0.001, each). (Table-1, Table 2A, 2B).

Interventional treatments are considered when pharmacological approaches are insufficient or when there is a need for more targeted intervention. Arthrocentesis, a minimally invasive procedure that comprises of the lavage of joint to remove inflammatory mediators, is commonly used for TMJ inflammation and to improve joint function. A study conducted by Kim et al. in 2019 compared the effects of pharmacological therapy with arthrocentesis and showed that the mean mouth opening of 24.1 ± 5.6mm increased to 42.7 ± 4mm after arthrocentesis. However, no substantial variation was seen after pharmacological intervention. [13] Another study showed the mean mouth opening of 29.89±4.8 increased to 31.83mm ± 5.41 after non-surgical treatment using pharmacological treatment. Additionally, MMO increased from 31.2 ± 7.03 to 31.83 ± 7.1 in arthrocentesis group.[12]

Temporomandibular joint disorders are prevalent worldwide with a prevalence of approximately 31%.14 Various treatment modalities have been used to manage these disorders and improve the quality of life of the patients. However, there is dearth of local data on the outcomes of the commonly used treatment options. So, this study was designed to compare the effectiveness of arthrocentesis and pregabalin in treating TMJ disorders with a focus on MMO as a primary outcome.

The results demonstrated that both treatments had a positive impact on improving MMO. However, better results were observed in arthrocentesis group. (Table 2A, 2B). As seen in the results, arthrocentesis showed a marked improvement in MMO across the study groups ($p<0.01$). (Table 2) This outcome is consistent with previous research suggesting that arthrocentesis can relieve negative pressure on the TMJ disc, reduce adhesion, and minimize surface friction, leading to improved joint mobility and reduced pain.[15-17] A meta-analysis reported that arthrocentesis resulted in a significant reduction in pain at 1 month compared to conservative therapy. However, no significant difference was observed in MMO between two groups.[15]

Another study performed by Rajput et al. in 2022 revealed that arthrocentesis was more effective for pain relief and increasing maximum mouth opening, while PRP was more effective in reducing joint noise and jaw deviation.[18] These findings supported arthrocentesis as an effective treatment for TMJ disorders. The significant improvement in MMO is mainly attributed to the mechanical effect of joint lavage, which improves disc displacement and restores normal jaw movement. Similar to our study, Kumar et al. compared the effectiveness of duloxetine, arthrocentesis, and their combination in treating TMJ disorders in 45 patients. Arthrocentesis group showed significantly greater pain relief and mouth opening improvements in comparison with Group who received duloxetine (30 mg twice daily). Whereas maximum pain relief and mouth opening improvements was observed in group who received both treatments.[19]

A systematic review of seven RCTs with 6-month follow-up showed that arthrocentesis led to a statistically greater increase in mouth opening (1.12 mm) and borderline improvement in pain reduction compared to conservative therapy. However, these differences were not considered clinically significant.[20] However, Demir et al. performed a retrospective study in 2023 and assessed the effectiveness of arthrocentesis in improving MMO and reducing pain in intra-articular TMD cases. Arthrocentesis significantly improved MMO and decreased VAS scores across all groups ($p < 0.05$). Adjunctive treatments, including splints, medication, and physiotherapy, showed no additional benefit ($p > 0.05$). Arthrocentesis alone was effective in managing TMD-related pain and dysfunction.[21]

Moreover, another recent systemic review reported that all included cohorts showed improved mouth opening, but significant pain reduction occurred only with arthrocentesis alone or combined with intra-articular injectable. Injectable alone were ineffective for pain relief.[22] In contrast, neuromodulators such as pregabalin appears to provide moderate relief in reducing pain and improving jaw function, but it does not achieve the same level of improvement in MMO as arthrocentesis.[13]

Limitations

The short duration of the follow-up in this study limits the ability to assess the long-term efficacy and complications of arthrocentesis compared to pharmacological therapy. Future studies with longer follow-up periods and a more comprehensive evaluation of other functional aspects of TMJ are necessary to understand the full impact of these treatments over time.

Conclusion

Overall, while pregabalin offers pain relief, arthrocentesis improves maximal mouth opening and addresses the underlying structural issues associated with temporomandibular joint disorders. The findings highlight the choice of specific treatment based on the severity and type of disorders of this joint. It also suggests that arthrocentesis should be considered for patients with more advanced joint dysfunction. Further long-term studies are required to confirm these results and explore the optimal combination of treatments.

Authors' Contributions: AA contributed to data collection, abstract writing, and critical analysis; AS supervised the study and provided critical input during the analysis phase; FA participated in data analysis and helped finalize the discussion; AMR assisted in topic selection and critical analysis; ZA served as the corresponding author, contributed to abstract writing, and helped in manuscript finalization; AAH contributed to data collection and discussion writing.

Conflict of Interest: None

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