

Evaluation of effect of arthrocentesis in treatment of temporomandibular joint dysfunction

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ABSTRACT

Introduction: Each of the temporomandibular joints (TMJs) with its masticatory system and associated components play a crucial role in mandibular function and distributing stresses created during different daily tasks. The structural abnormalities of TMJ, dysfunction of associated masticatory system along with derangement of intra articular disc are among the common temporomandibular disorders.

Objective: To determine the mean change in maximal mouth opening with arthrocentesis in temporomandibular dysfunction.

Materials and Methods: This quasi-experimental study was carried out at Department of Oral and Maxillofacial Surgery, Jinnah Hospital Lahore, Pakistan from December 2020 to June 2021. Using the non-probability purposive sampling, a total of 60 patients were enrolled in the study. The demographic details and informed consent were recorded. After the procedure, patients were followed up for one month and their maximum mouth opening was checked postoperatively, and the change was calculated.

Results: Patients ranged between 15-55 years of age with mean age of 33.9 ± 8.8 years. There were 25 males (41.7%) while females were 35 (58.3%). Stratification with regards to age, gender and duration of symptoms was carried out. Comparison of change in preoperative (18.28 ± 4.84 mm) and postoperative maximal mouth opening (35.53 ± 4.18 mm) was recorded ($p < 0.001$). Mean change in maximal mouth opening was found to be 17.25 ± 4.08 mm.

Conclusion: Temporomandibular joint arthrocentesis has been proven and determined to be exceptionally effective and least invasive technique to achieve increased mean change in maximal mouth opening in temporomandibular joint dysfunction (TMJD).

Keywords: Arthrocentesis; Maximal Mouth Opening; Temporomandibular Joint Dysfunction.

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INTRODUCTION

A broad range of functional as well as pathological abnormalities involving the masticatory system and temporomandibular joint are grouped under the term temporomandibular joint dysfunction which includes limitation of mouth opening and

movement of jaw, deviation of jaw, joint noise with function, temporomandibular joint pain, generalized myofascial pain, and pain in muscles of mastication.^{1,2}

The etiology of temporomandibular joint dysfunction (TMJD) is multidimensional which includes neurobiological, biomechanical, neuromuscular and biopsychosocial factors.³ It is estimated that prevalence of temporomandibular dysfunction in general population can reach up to 75%.⁴ Internal derangement of TMJ is among the most frequent forms of Temporomandibular Joint Dysfunction (TMJD). TMJD symptoms are more prevalent in women than men.⁵ In contemporary society, the rise in psychological stress has led to temporomandibular joint disorders (TMJD) becoming a frequent and common reason for seeking medical assistance. Treating TMJD presents a therapeutic challenge due to the increasing number of patients affected by this condition.^{6,7}

Many non-surgical and surgical treatment modalities of TMJ dysfunction are suggested to treat TMJ dysfunction.⁸ One of them is arthrocentesis which is a minimally invasive technique.⁹ It has good patient acceptance because of its safety and is simple to perform. It is highly effective in reducing pain and discomfort, as well as increasing mouth opening. Therefore, it should be considered for patients who do not respond to non-surgical treatments.¹⁰ Ringer solution and normal saline are normally used for lavaging temporomandibular joint.¹¹

The most frequent direction for disc displacement is anteriorly or in anteromedial/anterolateral direction. In this condition, the posterior laminar band of the articular disc prolapses and is displaced anteriorly from its neutral position between the condylar head and the fossa. Consequently, the condylar head rather than its neutral position in center of disc, closes on the retro discal tissue (posterior bilaminar zone). This way the disc with its thin central zone is positioned inferior and anterior to articular eminence. According to literature the direction of disc displacement, medially or laterally has also been reported.¹²⁻¹⁴

As per literature, arthrocentesis has demonstrated improvement in maximum mouth opening i.e., from 31.64 ± 1.07 mm to 39.56 ± 0.88 mm (change = 7.92 ± 0.19 mm).¹⁵

The rationale of this study was to evaluate the effects of arthrocentesis on mouth opening in patients of temporomandibular dysfunction in terms of change in maximal mouth opening after treatment.

MATERIALS AND METHODS

This quasi-experimental study was conducted at Oral and Maxillofacial Surgery Department, Jinnah Hospital Lahore from December 2020 to June 2021 after taking approval from the Institutional Ethical Review Board. Using non-probability purposive sampling, a sample of 60 patients was calculated for this study by GPower 3.1 using values of pre- and post-maximal mouth opening taking 95% confidence level, $p \leq 0.05$.¹⁶ The patients of TMJD (anterior disc displacement with reduction) were included after satisfying the following inclusion and exclusion criteria. Patients between 15 to 55 years of age, non-responsive to two months of conservative treatment for temporomandibular disorders were enrolled in this study. Patients with any TMJ pathology, Trauma, infective and reactive diseases were excluded.

After getting written informed consent from all patients, their demographic details were recorded. Baseline investigations (complete blood count, coagulation profile) were done for surgical procedure. Maximal mouth opening (MMO) was measured in mm via sterile measuring scale from incisal edge of maxillary central incisor to incisal edge of mandibular central incisors preoperatively and then postoperatively after one month duration. Change in maximal mouth opening was calculated by subtracting preoperative maximum mouth opening from post operative maximum mouth opening.¹⁷ All patients were treated under local anesthesia by the same consultant having 4 years' experience in oral surgery. To have ease of access and approach, the head of patient was turned to the contralateral direction and a moist cotton was used to block the external auditory meatus. The McCain method was used to mark the insertion point of needle. A line was drawn from the outer canthus of eye to the middle of tragus. A point for posterior needle entry was marked 10 mm anterior and 2 mm below from the middle of tragus on the canthotragal line indicating the maximum concavity of glenoid fossa. While the anterior point for needle entrance was marked 20 mm anterior and 10 mm below this line highlighting the position of articular eminence. To block and anesthetize the auriculotemporal nerve and surrounding area, 2 ml of local

anesthetic solution was used. Then for insertion at the posterior mark, into superior joint space, an 18-gauge needle was used, and normal saline (about 2ml) was injected to distend the superior joint space. Another 18-gauge needle was used for introduction into distended compartment in the anterior mark. This allowed the solution to flow freely through the superior joint space.^{17,18}

Then a normal saline filled syringe was connected to one of the needles to inject the fluid into superior joint space. The outflowing solution from the second needle was collected in kidney tray. The joint space was lavaged with at least 100 ml of saline solution. The needles were then removed, and the patient's jaw was gently manipulated in vertical, lateral, and protrusive excursions to further free the disc and break the adhesions.^{17,18}

Post-operative analgesics (Flurbiprofen 100mg IV×BID) for 3 days was given. Oral hygiene was maintained by 0.2% chlorhexidine mouth wash rinses, twice daily. Patients were followed up for a period of one month. Post-operative maximal mouth opening was checked via sterile scale by the different consultant having 4 years' experience in oral and maxillofacial surgery department after one month to avoid bias. Change in maximal mouth opening was calculated by subtracting preoperative maximum mouth opening from post operative maximum mouth opening.

Collected data was analyzed using SPSS v20.0. Quantitative variables such as age, duration of symptoms, maximal mouth opening preoperatively and post-operatively and change in mouth opening was presented as means/standard deviations. Data regarding "gender" (qualitative variable) was shown as frequencies and percentages. Significant change in maximal mouth opening was checked by using paired sample t-test. Data were stratified for age, duration of symptoms and gender. Post-stratification change in maximal mouth opening was checked by using paired sample t-test. A value of $p \leq 0.05$ was considered as statistically significant.

RESULTS

A total of 60 patients were enrolled in the current study. Age ranged between 15-55 years with a mean age of 33.9 ± 8.8 years. The preoperative and postoperative maximum mouth opening was recorded in two age groups, demonstrating statistically significant change (Table 1). There were 25 males (41.7%) and 35 (58.3%) females. The maximum mouth opening, pre and postoperatively, based on gender distribution was also noted (Table 2).

Table 1: Comparison of maximum mouth opening with age of patients

Age group (15-35 Years)			
Mouth opening	n	Mean	S.D.
Preoperative maximal mouth opening (mm)	35	18.00	5.03
Postoperative maximal mouth opening (mm)	35	35.83	4.06
<i>p</i> value	<i>p</i> <0.001		
Age group (36-55 Years)			
Preoperative maximal mouth opening (mm)	25	18.68	4.64
Postoperative maximal mouth opening (mm)	25	35.12	4.38
<i>p</i> value	<i>p</i> <0.001		

Table 2: Comparison of maximum mouth opening with gender

Males			
Mouth opening	n	Mean	S.D.
Preoperative maximal mouth opening (mm)	25	18.72	4.97
Postoperative maximal mouth opening (mm)	25	35.64	3.79
p value	p<0.001		
Females			
Preoperative maximal mouth opening (mm)	35	17.97	4.79
Postoperative maximal mouth opening (mm)	35	35.46	4.48
p value	p<0.001		

Mean duration of symptoms was 9.1 ± 5.1 months in patients (having symptoms less than or more than 10 months). Comparison of change in patients' preoperative and postoperative maximal mouth opening with regard to

duration of symptoms was recorded (Table 3). The mean change as well as comparison of pre- and postoperative change in maximal mouth opening of all patients participating in this study is shown in Table 4.

Table 3: Comparison of maximum mouth opening with duration of symptoms

≤ 10 months			
Mouth opening	n	Mean	S.D.
Preoperative maximal mouth opening (mm)	41	17.83	4.58
Postoperative maximal mouth opening (mm)	41	35.07	4.04
<i>p</i> value	<i>p</i> <0.001		
≥ 11 months			
Preoperative maximal mouth opening (mm)	19	19.26	5.37
Postoperative maximal mouth opening (mm)	19	36.53	4.41
<i>p</i> value	<i>p</i> <0.001		

Table 4: Comparison of change in preoperative and postoperative maximal mouth opening

Mouth opening	n	Mean	S.D.
Preoperative maximal mouth opening (mm)	60	18.28	4.84
Postoperative maximal mouth opening (mm)	60	35.53	4.18
Difference from preop to postop	17.25±4.08mm		
p value	p<0.001		

DISCUSSION

Arthrocentesis is a promising minimally invasive treatment modality for improvement in limited mouth opening resulting from TMJ disorders. This study provides insight to remarkable increase in mouth opening compared to preoperative limited maximum mouth opening following arthrocentesis.

In this study the mean age (33.9 years) is comparable to the mean age (32.46 years) in other studies evaluating outcomes of arthrocentesis.^{17,18} Literature provides supporting evidence relating TMDs with high levels of stress and anxiety in this age group²⁴. However, in contrast to this study a mean age of 38.65 ± 17.59 years and 44.60 ± 17.11 mm was also reported.^{10,23}

The present study showed female gender predilection with female-to-male ratio of 1.4:1. Similar results showing high prevalence of TMDs in female patients has been documented by other authors.^{17,25} This high association of TMD with female population has been related to hormonal factors (particularly estrogen), increased stress levels and low pain threshold level in females.²⁵

Current study revealed that a remarkable improvement was noticed postoperatively in patients who initially reported limited mouth opening (18.28 ± 4.84 vs 35.53 ± 4.18 mm) and with reduction in pain. Comparable to our study, average post operative mouth opening of 37.5 ± 4.03 mm after arthrocentesis was reported in another study with a mean change in maximal mouth opening of 17.25 ± 4.08 mm.¹⁸ The increase in mouth

opening observed in this study was comparable to that demonstrated by De Riu et al. in their study on consecutive patients (n=30) with TMJ dysfunction.¹ They demonstrated that patient with temporomandibular dysfunction when treated with arthrocentesis, resulted in increase in maximal mouth opening i.e. from 25.3±5.5mm to 43.8±5.6mm (change=18.5±0.1mm).¹

In contrast to present study, Nitzan et al. revealed change of mouth opening from 31.64±1.07mm to 39.56±0.88mm, thus an improvement of only 7.92±0.19mm was reported.¹⁵ This might be due to enrollment of patients in their study with advanced stage of TMJ internal derangement. Shilpa et al. also showed inconsistent findings with our results. In their study, the increase in mean maximum mouth opening was 13.20±0.9mm and the mean maximum opening increased from 34.5 mm before arthrocentesis to 46.5 mm after the procedure.²⁰ Another study reported a significant increase in mean maximal mouth opening after arthrocentesis, from 29.8 mm preoperatively to 41.9 mm post-operatively, with a mean change of 12.1 ± 3.0 mm.²¹ Similarly, Park et al. reported improvement in maximal mouth

opening after arthrocentesis i.e. from 22.41±3.41mm to 35.60±2.51mm (change=13.20±0.9mm).¹³ The findings of above mentioned studies were inconsistent with our study which may be due to differences in expertise of surgeons performing the procedure.

LIMITATIONS

Although, this study presented remarkable improvement in mouth opening but faced limitations including anatomical variations in temporomandibular joint and blind insertion of needles in the joint without IR (interventional radiology) guidance.

CONCLUSION

Temporomandibular joint arthrocentesis has been proven to be exceptionally effective, promising, simple and least invasive technique among the surgical interventions done to achieve increased mean change in maximal mouth opening in temporomandibular dysfunction.

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