

# Efficiency of Arthrocentesis with Hyaluronic Acid in TMJ Disc Derangement

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## ABSTRACT

**Objective:** The objective of this research was to determine if arthrocentesis for Temporomandibular Joint (TMJ) issues, with or without hyaluronic acid, is an effective treatment.

**Study Design:** A Prospective study

**Place and Duration:** This study was carried out at the Sardar Begum Dental College from January 2022 to June, 2022.

**Methods:** This research included 40 individuals of both sexes with TMJ disc problems. After informed written consent, patients' age, sex, side, and effusion type were examined. Evenly separate patients into two groups. Group I got arthrocentesis in 20 cases and group II got hyaluronic acid in 20 cases. Standard two-needle arthrocentesis was used. Maximum mouth opening, pain reduction, and complications were compared between both groups. Data was analyzed using SPSS 18.0.

**Results:** Pre-treatment, MMO in group I was  $29.7 \pm 11.37$  mm while in group II maximum mouth opening was  $30.4 \pm 11.61$  mm. Post treatment, we found that in group I MMO was  $43.9 \pm 7.43$  mm and in group II  $45.6 \pm 23.62$  mm but did not found any significantly difference after 1.5 years of follow up  $40.6 \pm 16.28$  in group I and  $42.7 \pm 4.17$  mm in group II. Using VAS, pain scores were reduced  $1.3 \pm 6.87$  in group I and  $0.5 \pm 2.3$  in group II, with p value 0.001 after treatment.

**Conclusion:** In this research, we found that arthrocentesis was a successful and safe approach for treating disc derangement in the temporomandibular joint (as measured by an increase in MMO and a decrease in pain score), with arthrocentesis utilizing hyaluronic acid showing marginally improved outcomes.

**Keywords:** Arthrocentesis, Pain score, Temporomandibular Joint disc, MMO

## INTRODUCTION

The most frequent form of complex (TMJ) illness is disc dislocation without visible reduction (DDWOR), which affects 35.7% of the population. In this condition, pain and restricted mouth opening are the most prominent clinical features [2] because the disc remains anteriorly displaced in relation to the condyle. Initial treatment for DDWOR should focus on reversible and conservative methods (medications, occlusion devices, and therapy) [3, 4].

Arthrocentesis is a minimally invasive combined surgery that can help patients with TMJ issues in a variety of ways, including relief from pain, expansion of the space between the teeth (maximal interincisal distance), resolution of joint effusion, and improvement in oral wellness quality of life [5]. The procedure involves discreetly disinfecting the upper chamber of the TMJ. Irrigation with a hydrostatic fluid created by washing dilutes the localized algogenic substances and frees this identical joint disc by eliminating adhesions established among its surface and the mandible infundibulum [6,7].

If you're having trouble with your jaw joint (TMJ), you can choose between surgery and non-surgical treatments. Conservative therapies include masticatory muscle massage, analgesics, thermotherapy, and laser therapy, as well as rehabilitative exercises and isometrics. Arthrocentesis and arthroscopy are examples of minimally invasive surgical procedures that can be performed either openly or through a small incision. [8]

TMJ arthroscopic lysate and lavage results have been shown to be useful in assessing joint disease. Though the disc itself may be manipulated, some surgeons attribute arthroscopy's long-term success to the physical lavage and lysing procedures that follow. Condylar shaving, severe condylectomy, disc replacement, and repair have become less common as a result. [9]

TMD is a term used to describe disorders of a temporomandibular joints (TMJs), mastication muscles, and occlusion that cause pain, limited movement, muscle tenderness, and periodic joint sounds in the jaw. [10] There are both nonsurgical and surgical methods used to treat TMDs. Initially, nonsurgical treatment should be attempted, and only if it fails should surgery be considered; [11,12] nevertheless, there are

significant dangers connected with operating in this area. TMJ arthrocentesis has become a popular method for treating TMDs. Arthrocentesis is the practice of saline flush of the TMJ without envisioning the joint utilizing sterile needles and irrigants to reduce pain by removing pro-inflammatory cytokines from the joint or to boost mandible movement by removing intra-articular scar tissue using hydrostatic fluid from irrigated agriculture of the TMJ's second chamber. Patients that have not improved with less invasive methods may benefit from arthrocentesis. [13]

Arthrocentesis is a therapy method that has been around for around 30 years. It is frequently used in combination with other therapies such as intra-articular painkillers [14], steroids [15], and platelet-rich plasma [15]. Some of the benefits of arthrocentesis may be elucidated by combining a clinical analysis with MRI and a research of the effect of arthroscopy on the DDWOR, as suggested by the aforementioned literature. Arthrocentesis was found to be successful in addressing TMJ difficulties, both with and without the inclusion of hyaluronic acid. This was the case regardless of whether or not hyaluronic acid was present.

## MATERIAL AND METHODS

This prospective study was conducted at the Sardar Begum Dental College from January, 2022 to June, 2022 and comprised of 40 patients. After informed written consent, patients' age, sex, side, and effusion type were examined. Patients having a history of clavicular fracture or TMJ trauma, as well as those with a history of previous TMJ surgery, were not included.

Participants ranged in age from 18 to 55 years old. Data was collected from patients' medical records, including prior physical examination findings, demographic information, and MRI and CBCT findings. An impartial radiologist, who was not involved in the patient care in any way, examined the MRI findings in line with predefined criteria. We initially examined the disc's relationship to the femoral head at 12 o'clock and looked for any indications of a degenerative disc disease before evaluating the condition of the joint (AD). The biconcave disc shape and any variations in ring size and thickness that would indicate deformity were analyzed. It was determined to divide disc dynamics into two groups: those with motion and those without (i.e., "stuck" in closed or "open"

configurations). Condylar deformities, including flatness, subchondral sclerosis, surface deformities, erosion, and osteophytes, were shown to be characteristic with osteoarthritis (OA). The joint effusion (JE) diagnosis was confirmed or disproved. T2-weighted imaging revealed increased signal strength around the joint region in JE. Oedema in the bone marrow was characterized by a decrease in signal intensity (hypo intense) on T1-weighted and an increase in signal intensity (hyper intense) on T2-weighted images.

The patients were randomly assigned to one of two groups. Arthrocentesis and lavage were used on group I, while hyaluronic acid was also injected into group II with arthrocentesis. In every instance, we performed arthrocentesis using the same basic two-needle technique. At first, patients in a dental chair were told to move their heads to the unaffected side. Disposable cap secured with Micropore® tape so that just the TMJ was seen. Using the surgical site marker, a straight line was drawn from the tragus to the eye's corner (canthal-tragus distance). Anteriorly, at a distance of 20 mm, and inferiorly, at a distance of 10 mm, two sites were recommended for needle insertion: one 10 mm anteriorly and one 2 mm posterior aspect below the cantho-tragal line. A chlorhexidine solution of 2 percent was applied liberally to the pre-auricular and middle ear areas of the face. The posterior deep temporal and mesenteric nerves were numbed after an auriculotemporal nerve block with 1.8 mL of 2% lidocaineHCl without vasoconstrictor (one or two tubes). Since analgesia lessened distress and suffering, sedation was unnecessary. The condyle of the TMJ was instructed to be lowered and advanced by having the patient open his mouth widely. Right about this is when you'll want to put in your first needle (40x1.2 mm, 18G). Needles were inserted anteriorly, superiorly, then medially to reach the mandibular fossa. A needle was used to inject 0.9% saline into the joint to hydrate it. We stitched the add-ons together using a needle that measured 100 cm. The next needle, which was also placed into a 20G flexible clear catheter that was 60 centimetres in length, had the same size as the first. The other end of the catheter is a suction tip.

Two 60-mL syringes were used to inject the 0.9% saline solution, and two cannulas were used to withdraw the 200-mL volume. Not a single other substance was present in the injected fluid. Because the cannula of the second needle was blocked for ten seconds, the hydraulic fluid in the TMJ increased. The person's vertical and range of motion may be examined intra-operatively after lateral jaw movement loosened any adhesions. Following the removal of the second needle, a solution of HA (1,000-2,000 kDa) was administered into the affected joint. Once the needle was removed, gauze was applied to the wounds and left in place for one hour. Hyaluronic acid was applied in the same manner in group II. Full data analysis was performed in SPSS version 18.0.

**RESULTS**

Among all cases, 26 (65%) patients were males and 14 (35%) were females.(figure 1)

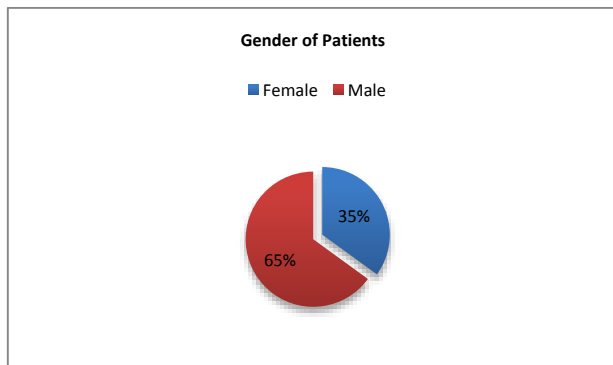


Figure-1: Included patients with gender distribution

Group I had mean age 31.8±4.32 years with mean BMI 21.11±8.41 kg/m<sup>2</sup>and in group II mean age were 30.8±6.62 yearsand had mean BMI 23.1±12.19 kg/m<sup>2</sup>.Frequency of effusion in upper compartments was higher among both groups. Most common side of TMJ was right among all cases.(table 1)

Table-1: History of patients

Variables	Group I	Group II
Mean age (years)	31.8±4.32	30.8±6.62
Mean BMI (kg/m <sup>2</sup> )	21.11±8.41	23.1±12.19
Effusion		
Upper Compartment	15(75%)	17 (85%)
Both compartments	5 (25%)	3 (15%)
Side of TMJ		
Right	11 (55%)	12 (60%)
Left	9 (45%)	8 (40%)

Pre-treatment, MMO in group I was 29.7±11.37 mm while in group II maximum mouth opening was 30.4±11.61 mm. Post treatment, we found that in group I MMO was 43.9±7.43 mm and in group II 45.6±23.62 mm but did not found any significantly difference after 1.5 years of follow up 40.6±16.28 in group I and 42.7±4.17 mm in group II.(table 2)

Table-2: Pre/post-treatmentoutcomes of MMO

Variables	Group I	Group II
Maximum Mouth Opening (mm)		
Pre-treatment	29.7±11.37	30.4±11.61
Post-treatment	43.9±7.43	45.6±23.62
After 1.5 years (MMO)		
Maximum Mouth Open	40.6±16.28	42.7±4.17

Using VAS, pain scores were reduced 1.3±6.87 in group I and 0.5±2.3 in group II, with p value 0.001 after treatment.(table 3)

Table-3: Presentation of pain score in both groups

Variables	Arthrocentesis H.Acid	Arthrocentesis
Pain score (VAS)		
Pre-treatment	10.6±1.15	10.9±3.12
Post- treatment	1.3±6.87	0.5±2.3

While the success rates for both groups were high, the complication rates in Group I were significantly higher than those in Group II (4 in Group I versus 1 in Group II) and the patient satisfaction rates were significantly higher in Group II (18 out of 20 cases, 16 out of 20 cases).(table 4)

Table-4: Outcomes related to satisfaction and complications

Variables	Arthrocentesis H.Acid	Arthrocentesis
Complications		
Yes	4 (20%)	1 (5%)
No	16 (80%)	19 (95%)
Satisfaction		
Yes	18 (90%)	16 (80%)
No	2 (10%)	4 (20%)

**DISCUSSION**

Only two of the numerous responses to differences in articular stresses are changes to the structure of affected joints, such as cartilage degradation and osseous deflections in a joint. During inflammatory TMJ illnesses, mediators like cytokines may cause a reorganization of the extracellular matrix in the joint tissues, disrupting the usual cell connections and opening the way for enzymatic breakdown. The activation of zinc-containing enzymes like collagenases and metalloproteinases (MMPs) might play a role in this. Matrix degradation by macromolecules leads to inflammation, which then in turn triggers the release of matrix metalloproteinases (MMPs) into the synovial fluid, where they can cause further damage to This accelerates the degeneration of healthy tissues and the spread of illness. The most common symptom of TMJ disorder is pain [16], and the sooner a patient seeks therapy, the better the outcomes. In recent years,

arthrocentesis has been shown to be more successful than other pain treatments [17], and its price has been found to be higher than that of conservative methods [18].

Despite clinical data suggesting that a change in disc position is the primary cause of TMJ pain or dysfunction, this theory has not gained widespread acceptance. Instead of joint pressure, it is possible that changes in the biochemical components of synovial fluid (failure to lubricate) are to blame for TMJ clicking and derangement (negative intra-articular pressure). [19]

In our study 26 (65%) patients were males and 14 (35%) were females. These results agreed with those of earlier studies.[20] Frequency of effusion in upper compartments was higher among all cases. Most common side of TMJ was right among all cases. Our findings are consistent with those of a previous study[21] on effusions, which are large accumulations of synovial fluid around a joint (DD). This study's findings [22] suggest that monitoring the location of the effusion might help patients with degenerative disc degeneration (DD) anticipate better treatment outcomes. Although there is evidence connecting effusion to DD, this association does not prove that effusion causes DD.

Pre-treatment, MMO in group I was 29.7±11.37 mm while in group II maximum mouth opening was 30.4±11.61 mm. Post treatment, we found that in group I MMO was 43.9±7.43 mm and in group II 45.6±23.62 mm but did not find any significantly difference after 1.5 years of follow up 40.6±16.28 in group I and 42.7±4.17 mm in group II. Previous study presented same results to our study.[23] Hyaluronic acid reduced the severity of postoperative pain for patients. Biocompatible material is used in the irrigation process, which is thought to alleviate pain by clearing out damaged joint tissue and allogeneic chemicals (mainly inflammatory mediators). Appropriate usage of arthrocentesis is crucial to attaining beneficial outcomes since it helps lower the levels of these mediators. Maintaining the ideal needle location and reducing painful central nervous activation may be facilitated by adequate pain management during arthrocentesis. Patients may feel more at ease and confident in their abilities to move their mouths as advised during arthrocentesis if this is done. Anesthetic blocks were effective for reducing pain and increasing patients' MMO, while hyaluronic acid showed much greater benefits.[24]

In the immediate aftermath of the arthrocentesis surgery, HA was given. It's possible that this factored into the positive results of the research. According to the authors, when arthrocentesis is coupled with HA, the results are better than when either procedure is used separately. It is believed that HA is important for the maintenance of early outcomes over time, whereas saline solution is primarily responsible for the primary impact following surgery in humans. [25]

In our study, the success rates for both groups were high, the complication rates in Group I were significantly higher than those in Group II (4 in Group I versus 1 in Group II) and the patient satisfaction rates were significantly higher in Group II (18 out of 20 cases, 16 out of 20 cases). While getting an arthrocentesis done, you can have transient facial paralysis from the local anaesthetic and/or the swelling of the surrounding tissue. Finally, arthrocentesis has the added benefit of reducing the need for pain medication. [26] Because of its persistent nature, it is essential to emphasise that poor behaviours and posture are its root causes. Both the effectiveness of treatment and the patient's quality of life benefit from patient education and close clinical monitoring..

## CONCLUSION

In this research, we found that arthrocentesis was a successful and safe approach for treating disc derangement in the temporomandibular joint (as measured by an increase in MMO and a decrease in pain score), with arthrocentesis utilizing hyaluronic acid showing marginally improved outcomes.

## REFERENCES

- Lazarin RD, Previdelli IT, Silva RD, Iwaki LC, Grossmann E, Filho LI. Correlation of gender and age with magnetic resonance imaging findings in patients with arthrogenous temporomandibular disorders: a cross-sectional study. *Int J Oral Maxillofac Surg*. 2016; 45:1222–1228. PMID:27197784
- Ahmad M, Hollender L, Anderson Q, Kartha K, Ohrbach R, Truelove EL, et al. Research diagnostic criteria for temporomandibular disorders (RDC/TMD): development of image analysis criteria and examiner reliability for image analysis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2009; 107:844–60. PMID:19464658
- Young AL. Internal derangements of the temporomandibular joint: a review of the anatomy, diagnosis, and management. *J Indian Prosthodont Soc*. 2015; 15:2–7. PMID:26929478
- Chandrashekar VK, Kenchappa U, Chinnannavar SN, Singh S. Arthrocentesis a minimally invasive method for TMJ disc disorders—A prospective study. *J Clin Diagn Res*. 2015; 9:59–62.
- Nitzan DW. Arthrocentesis-incentives for using this minimally invasive approach for temporomandibular disorders. *Oral Maxillofac Surg Clin North Am*. 2006; 18:311–328. PMID:18088835
- Tatli U, Benlidayi ME, Ekren O, Salimov F. Comparison of the effectiveness of three different treatment methods for temporomandibular joint disc displacement without reduction. *Int J Oral Maxillofac Surg*. 2017;46(5):603–609. PMID:28222947
- Tuz HH, Baslarli O, Adiloglu S, Gokturk T, Meral SE. Comparison of local and general anaesthesia for arthrocentesis of the temporomandibular joint. *Br J Oral Maxillofac Surg*. 2016; 54:946–949. PMID:27435500
- V. Machoň and D. Hirjak, *ManuálMiniinvazivníLéčbyČelistníhoKloubu*, Stoma Team, 2009.
- M. F. Dolwick, "Intra-articular disc displacement—part I: its questionable role in temporomandibular joint pathology," *Journal of Oral and Maxillofacial Surgery*, vol. 53, no. 9, pp. 1069–1072, 1995
- Manfredini D, Guarda-Nardini L, Winocur E, Piccotti F, Ahlberg J, Lobbezoo F, et al Research diagnostic criteria for temporomandibular disorders: A systematic review of axis I epidemiologic findings *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2011;112:453–62
- Dimitroulis G. Temporomandibular disorders: A clinical update *BMJ*. 1998;317:190–4
- Wright EF, North SL. Management and treatment of temporomandibular disorders: A clinical perspective *J Man Manip Ther*. 2009;17:247–54
- Diraçoğlu D, Saral IB, Keklik B, Kurt H, Emekli U, Özçakar L, et al Arthrocentesis versus nonsurgical methods in the treatment of temporomandibular disc displacement without reduction *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2009;108:3–8
- Barkin S, Weinberg S. Internal derangements of the temporomandibular joint: The role of arthroscopic surgery and arthrocentesis *J Can Dent Assoc*. 2000;66:199–203
- Davoudi A, Khaki H, Mohammadi I, Daneshmand M, Tamizifar A, Bigdelou M, et al. Is arthrocentesis of temporomandibular joint with corticosteroids beneficial? A systematic review. *Med Oral Patol Oral Cir Bucal*. 2018;23(3):e367–e375
- Young AL. Internal derangements of the temporomandibular joint: a review of the anatomy, diagnosis, and management. *J Indian Prosthodont Soc*. 2015; 15:2–7. PMID:26929478
- Bouchard C, Goulet JP, El-Ouazzani M, Turgeon AF. Temporomandibular Lavage Versus Nonsurgical Treatments for Temporomandibular Disorders: A Systematic Review and Meta-Analysis. *J Oral Maxillofac Surg*. 2017;75(7):1352–1362. PMID:28132759
- Vos LM, Stegenga B, Stant AD, Quik EH, Huddleston Slater JJ. Cost Effectiveness of Arthrocentesis Compared to Conservative Therapy for Arthralgia of the Temporomandibular Joint: A Randomized Controlled Trial. *J Oral Facial Pain Headache*. 2018;32(2):198–207. PMID:29466475
- C. Alpaslan, A. Bilgihan, G. H. Alpaslan, B. Güner, M. ÖzgürYis, and D. Erbaş, "Effect of arthrocentesis and sodium hyaluronate injection on nitrite, nitrate, and thiobarbituric acid-reactive substance levels in the synovial fluid," *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics*, vol. 89, no. 6, pp. 686–690, 2000.
- Ozdamar SM, Alev B, Yarat A. The impact of arthrocentesis with and without hyaluronic acid injection in the prognosis and synovial fluid myeloperoxidase levels of patients with painful symptomatic internal derangement of temporomandibular joint: a randomised controlled clinical trial. *J Oral Rehabil*. 2017 Feb;44(2):73-80.
- A. Sipahi et al. Comparative study in patients with symptomatic internal derangements of the temporomandibular joint: analgesic outcomes of arthrocentesis with or without intra-articular morphine and tramadol. *Br J Oral Maxillofac Surg*.(2015)
- F. Liu et al.Epidemiology, diagnosis, and treatment of temporomandibular disorders.*Dent Clin N Am* (2013)23.
- Davoudi A, Khaki H, Mohammadi I, Daneshmand M, Tamizifar A, Bigdelou M, et al. Is arthrocentesis of temporomandibular joint with corticosteroids beneficial? A systematic review. *Med Oral Patol Oral Cir Bucal*. 2018;23(3):e367–e375. PMID:29680840
- Gurung T, Singh RK, Mohammad S, Pal US, Mahdi AA, Kumar M. Efficacy of arthrocentesis versus arthrocentesis with sodium hyaluronate in temporomandibular joint osteoarthritis: A comparison. *Natl J Maxillofac Surg*. 2017;8(1):41–9.
- ZUHAIR MEHDI, MAIMOONA SIDDIQI, USMAN UL HAQ, FATIMA KHATTAK, ADAM KHAN DANISH, HAMZA HASSAN. Arthrocentesis in Temporomandibular Joint disc Derangement Patients, with and without Hyaluronic Acid, A Clinical Trial. *P J M H S Vol. 16, No. 04, APR 2022*
- Grossmann E, Poluha RL, Iwaki LCV, Santana RG, Iwaki Filho L (2019) The use of arthrocentesis in patients with temporomandibular joint disc displacement without reduction. *PLoS ONE* 14(2): e0212307.