



# Arthrocentesis for internal derangement - Two-needle technique

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## Abstract

**Background:** The aim of this study is to investigate the efficacy of arthrocentesis with two needles and to compare it with arthrocentesis with one needle in the treatment of temporomandibular joint (TMJ) internal derangements.

**Methods:** Fifty patients aged between 16 and 60 years comprised the study material in the department. The patient's complaints were limited mouth opening and TMJ pain. The patients were randomly allocated into two groups, in one group two-needle technique was used, and in other groups single needle was used for arthrocentesis. The procedure was performed under all aseptic conditions. Clinical evaluation of the patients was done before the procedure, at 1 week, and 6 months after the procedure. Intensity of TMJ pain and maximal mouth opening were recorded at each follow-up visit.

**Results:** There was a significant improvement in mouth opening and reduction in pain scores in the post-operative period with *P* value of (0.001); however, the addition of other needles did not improve the total outcome of the procedure.

**Conclusion:** The two-needle technique does not improve the results compared to single needle technique.

**Keywords:** Arthrocentesis, double needle, internal derangement, single needle, temporomandibular joint.

## Introduction

Temporomandibular joint disorders though not life-threatening are one of the most misdiagnosed and mistreated disorders affecting about 9% of the Western population in the medical practice. Painful temporomandibular joint (TMJ) not only affects the daily routine and personality of the patients but also leads to poor personal image. The term internal derangement was introduced by Hey in 1814 as a general orthopedic term for a localized mechanical fault in a joint which later on was used more specifically to describe displacement of the TMJ disc.<sup>[1]</sup> According to the consensus meeting held by the International Association of Oral and Maxillofacial Surgeons in Buenos Aires in 1992

regarding TMJ surgery," Internal derangement is defined as a localized mechanical fault of the joint which interferes with its smooth action".<sup>[2]</sup> The arthrocentesis signifies the lavage of the upper joint compartment using physiological saline or Hartmann's solution (ringer lactate) using needles for inflow and outflow.<sup>[3]</sup> The joint lavage can be performed either under low pressure using an elevated infusion bag or under sufficient pressure using a syringe. This technique was first introduced at the beginning of the 1990s and derives directly from TMJ arthroscopy, based on the hypothesis that the most effective successful component of TMJ arthroscopy is lavage and is a minimally invasive procedure to recapture the disc with the elimination of painful mediators by flushing out the

painful chemicals.<sup>[4]</sup> Arthrocentesis, as originally proposed used a technique involving the use of two needles that were inserted into the superior joint space at certain points, these points are termed as the McCains points and were marked on a line drawn from the middle of the tragus to the lateral canthus. The entry points were marked along this canthotragal line. The first point corresponding to the glenoid fossa was marked 10 mm from the midtragus and 2 mm below the line and the second point corresponding to articular eminence was marked 10 mm from the first point and 10 mm below the line.<sup>[5]</sup> The simple flushing action in the joint may eliminate or decrease biochemical mediators contributing to inflammation and pain. Single needle technique for both fluid injection and ejection has been described and has given promising results in less time. It is based on the rationale that pumping saline injection into the superior joint compartment with the patient in an open mouth position provides enough pressure to release joint adhesences and to allow fluid outflow when the patient closes their mouth, but there is no evidence of the superiority of one technique over the other. By and large, there is very little literature available on the effectiveness of single needle versus double needle or vice versa.

## Materials and Methods

This study was approved by the ethical committee of approval no. 2019-omfs-DC-23, and written informed consent was obtained from all patients. This prospective clinical study was conducted on 50 patients with TMJ internal derangement after magnetic resource imaging (MRI) and clinical co-correlation at our institution from June 2019 to January 2022. The patients selected were randomly distributed into two groups after all non-surgical measures were exhausted. Patients with degenerative joint diseases causing TMJ dysfunction including osteoarthritis, rheumatoid arthritis, and gout were excluded from the study. Previously treated joints were also excluded. A total of 50 patients with TMJ internal derangement after diagnosis with clinical/MRI studies, with failed conservative management, were included in this study. Of the 50 patients, 25 patients were treated

with two-needle arthrocentesis and the other 25 patients with one-needle arthrocentesis after random allocation into either group. Arthrocentesis was performed in the superior joint space under aseptic precautions; the points of needle insertion were marked on the skin according to the method suggested by McCain and Hossameldin. A Holmlund–Helsing line was drawn from the middle of the tragus to the outer canthus. Entry points were marked along this canthotragal line. The first point corresponding to the glenoid fossa was marked 10 mm from the midtragus and 2 mm below the line, and a second point corresponding to the articular eminence was marked 10 mm from the first point and 10 mm below the line. 2 mL of 2% lignocaine was injected to anesthetize the auricular branch of the auriculotemporal nerve. The patients were asked to open their mouth widely and the mandible was held in the protruded position. A 19-gauge needle was then introduced at the first point, and 2 mL of Ringer lactate was injected through this needle to distend the joint space. Another 19-gauge needle was then inserted at the second point to establish a free flow of the solution through the joint space. A syringe filled with Ringer's lactate was injected under pressure into the superior joint space through the first needle; the second needle provided the outflow for Ringer's lactate. In the one-needle technique, only one point 10/2 mm was utilized for the arthrocentesis. A total of 100 mL solution was used to lavage the superior joint space and the needles were removed. The jaw was gently manipulated in the vertical, protrusive, and lateral excursions to mobilize the disc. Pre-operative and post-operative clinical assessments were performed by a single clinician for signs and symptoms of TMJ disorders which were pain, mouth opening, joint noises, and jaw deviation. The Visual Analog Scale (VAS 0–10) was used for pain, mouth opening was measured as the maximum interincisal distance in millimeters. The assessment was done for all the parameters preoperatively, and postoperatively on day 1, 1 week, and 6 months. All results are reported as mean and standard deviation, and a  $P < 0.005$  was considered significant (SPSS 15; SPSS Inc., Chicago, IL, USA).

## Results

Patient ages ranged from 16 to 46 years ( $n = 50$ ). The mean patient age was  $27.96 \pm 10.034$  years, and 36 patients were females. Both the groups were subjected to arthrocentesis, in two needle group the mouth opening improved significantly from 26.14 mm to 38.92 mm with  $P < 0.001$  (Table 1) with a significant drop in pain from 6.92 to 1 (Table 2) on a VAS scale at 6 monthly time period follow up with  $P < 0.001$  which indicates a significant improvement in symptoms. In single needle group mouth opening increased from 27.17 mm to 38.19 mm with pain VAS scores dropping from 6.49 to 0.46 with a statistically significant difference from pre-operative value; however, the intergroup comparison between two-needle versus single-needle did not show any statistically significant results as  $P$  values at follow up ranged always  $>0.01$  at 1 week and 6 months follow up in the intergroup comparison.

## Discussion

The MRI and clinical pictures vary in co-relation with respect to internal derangement; however, there is agreement as regards the severity of the displacement and clinical features of internal derangement making it an altered disc and condyle relationship disorder. The negative intra-articular pressure producing stuck disc phenomenon is believed to be caused by a variety of biochemical substances, altered constituents of the synovial fluid,

and failure of lubrication leading to clicking and TMJ derangement.<sup>[2,6,7]</sup> Nitizan demonstrated that arthrocentesis produced significant improvement in incisal opening and reduction of pain in patients with persistent and severe closed lock.<sup>[8]</sup> The lavage of the upper joint space removes inflammatory mediators, promoting mandibular mobility and reducing pain by removing intra-articular adhesions. The elimination of negative pressure within the joint, recapitulates disc and fossa space, thereby improving mobility, with the elimination of obstruction due to displaced disc.<sup>[9-12]</sup> The goal of arthrocentesis under sufficient pressure is to remove joint adhesions and improve joint mobility with a significant reduction in pain.<sup>[13]</sup> In our study mean pre-operative pain Visual Analog Scale (VAS) score was  $6.94 \pm 1.650$ , and the mean pre-operative mean vascular occlusion (MVO) was  $27.14 \pm 3.696$  mm. There was statistically significant improvement at every follow-up. At the 6-month post-operative follow-up after arthrocentesis, the mean pain VAS scale was  $0.43 \pm 1.174$  with a mean difference of 6.07 from the pre-operative value. The MVO was  $36.92 \pm 3.392$  mm with a mean difference of 10.78 mm from pre-operative opening value. The pronounced inflammatory processes associated with alterations in the constituents of the synovial fluid may be attributed to the more profound outcome. Pain and maximum mouth opening and dysfunction are interrelated. The severe pain leads to more restricted mouth opening. The present study also evaluated the contribution of age, VAS pain level, and MVO to TMJ arthrocentesis outcomes. In the present study age, VAS pain level, and MVO

**Table 1:** Mouth opening in single versus double needle

Clinical parameter	Pre-operative	Post-operative 1 week	Post-operative 6 month	Significance
Pain (two needle)	26.14	37.68	38.92	$P < 0.001$
Pain (single needle)	27.17	37.64	38.19	$P < 0.001$
$P$ -value		$>0.01$	$>0.01$	

**Table 2:** Comparison of pain on VAS scale of single needle versus double needle arthrocentesis

Time interval	Pre-operative	1 month	6 month	Comparison
Pain (two needle)	6.92	2.6	1.0	$P < 0.001$
Pain mean (single needle)	6.49	2.3	0.46	$P < 0.001$
$P$ -value		$>0.01$	$>0.01$	

were associated with TMJ pain and MVO. The inflammatory processes in the synovium, capsule, or retrodiscal tissues are the underlying mechanisms for TMJ pain as per arthroscopic studies.<sup>[14-19]</sup> Arthrocentesis is an accepted therapeutic protocol to correct the dysfunctional state by washing away inflammatory products and promoting joint lubrication.<sup>[1,8]</sup> The joints with pronounced inflammatory components and those with a less pronounced inflammatory component influence the arthrocentesis outcomes.<sup>[7,20,21]</sup> The present study compares the effectiveness and tolerability of the two-needle technique in the internal derangement of TMJ with that of a single-needle entry. The single needle adopted one needle for both the saline injection and ejection utilizing the pumping efficacy of the joint on the manipulation. The higher intra-articular pressure during saline inflow helps in breaking adhesion, and is traumatic than the two-needle entry, due to the insertion of a single needle within the superior joint compartment.<sup>[10]</sup> A short-term trial gave encouraging findings concerning the clinical effectiveness of the single-needle approach,<sup>[22]</sup> but needs further elucidation. The single-needle technique showed to be equally effective as the classical two-needle technique, but it was advantageous in terms of tolerability due to one prick. This may be explained by the fact that the reduced trauma due to the positioning of one needle instead of two needles, the second needle counteracts the higher potentially discomforting, intra-articular pressure exerted by the single needle technique with respect to the inflow–outflow circuit.<sup>[23-25]</sup> The immediate post-operative swelling was encountered in a majority of patients due to extravasation of fluid, but the swelling subsided overnight in all the cases without treatment. Transient facial paralysis results in the inability to close the eyelids but resolves on its own.<sup>[26]</sup> The double-needle technique or the single-puncture method, is a clinically dependable treatment in significantly decreasing pain and increasing the maximum width of mouth opening in TMJ internal derangement but the superiority of one over another is yet to be elucidated except for ease and less trauma in a single needle.<sup>[27]</sup>

## Conclusion

Arthrocentesis is a simple and minimally invasive procedure to treat internal derangement, with less intraoperative and post-operative complications. Lavage of TMJ joint space not only improves mobility but reduces pain scores; however, the two-needle technique does not improve the results compared to single needle technique.

## Conflict of Interest

None.

## Funding

Nil.

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