



Temporomandibular joint arthrocentesis and lavage for the treatment of closed lock: a follow-up study

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SUMMARY. *Objectives:* Temporomandibular joint (TMJ) arthrocentesis and lavage, first described in the North American literature in 1991, is a simplified method used for the treatment of severe, limited mouth opening. The purpose of this study is to evaluate the efficacy of this technique as a treatment for closed lock of the TMJ.

Design: Forty-six patients with persistent closed lock of the TMJ of acute onset were treated by TMJ arthrocentesis and lavage with manipulation in an out-patient setting. Clinical data was collected in the form of visual analogue scales for pain and chewing ability, and measurements of maximum mandibular opening before and after treatment.

Results: On follow-up ranging from 6 to 30 months, jaw opening and mandibular function had significantly improved ($p < 0.001$), and pain had substantially decreased in all but one patient as a result of this procedure.

Conclusion: TMJ arthrocentesis and lavage is recommended as a simple alternative to more invasive TMJ procedures as an effective technique for the treatment of acute persistent closed lock of the TMJ.

INTRODUCTION

In the past, the treatment for closed lock of the temporomandibular joint that did not respond to conservative measures was surgical recontouring and repositioning of the disc.¹ With the introduction of arthroscopy for the temporomandibular joint (TMJ), simple lysis and lavage and the use of hydraulic pressure in the upper joint space were found to be highly effective in re-establishing normal maximal mandibular opening (MMO) in joints with closed lock.^{2–5} The success of such treatment cast doubt as to the true mechanism of closed lock in that it did not support the idea of changes in disc shape or location as being the main cause.⁶

Instead, it was proposed that closed lock was a result of reversible restriction in gliding movements of the disc caused by its adherence to the fossa. Such adherence may arise from a number of possibilities. A vacuum effect or alteration in synovial fluid consistency are just a few plausible causes that may create the environment for a suction effect of the disc to the fossa, restricting gliding movements and therefore resulting in limited mouth opening.⁶

The technique of TMJ arthrocentesis and lavage was first described as a simple means of releasing the 'stuck' disc from the fossa by simple irrigation of the superior joint space under local anaesthesia on an outpatient basis.⁵ The purpose of this paper is to present clinical data relating to the efficacy of this technique for the treatment of closed lock of the TMJ.

TECHNIQUE FOR TMJ ARTHROCENTESIS AND LAVAGE

The ear and preauricular skin over the TMJ are prepared with topical antiseptic solution, and the area is isolated with sterile drapes. Two points are then marked over the articular fossa and eminence, 1 and 2 cm in front of the tragus along the canthal-tragus line, similar to the entry points used for arthroscopic procedures.³ The auriculotemporal nerve is blocked with about 2 ml of local anaesthetic, and a 20-gauge needle is then introduced into the superior joint space at the glenoid fossa (posterior mark). Approximately 2 ml of Hartmann's (Ringer's lactate) solution is then injected to distend the superior joint space. A second 20-gauge needle is inserted into the distended compartment in the area of the articular eminence to establish a free flow of the solution through the superior joint space. A syringe filled with Hartmann's solution is then connected to one of the needles, and fluid is injected into the superior joint space (Figs 1 & 2). The second needle provides an outflow for the solution which is collected in a kidney dish. A total of 50–100 ml of solution is used to lavage the superior joint space, during which time the outlet needle is momentarily blocked with finger pressure two or three times to help distend and break up the joint adhesions. At some institutions, 1 ml of 0.5% betamethasone valerate is injected into the joint space at the end of the lavage before the final needle is removed. Once the needles are removed the patient's jaw is gently manipulated by the clinician in the vertical, protrusive



Fig. 1 – Demonstrates the two 20-gauge needles inserted into the superior joint space of the temporomandibular joint corresponding to the puncture sites used for arthroscopy.

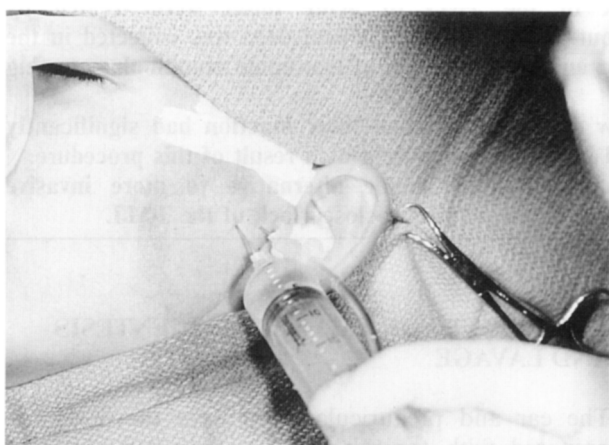


Fig. 2 – Shows a 20 ml syringe filled with Ringer's lactate solution which is being injected into the superior joint space. The second needle acts as an outlet valve allowing free flow of fluid through the superior joint compartment (i.e. lavage). The outlet needle is connected to plastic tubing which permits the collection of the irrigation fluid in a receiving dish some distance away from the operative site.

and lateral excursions to help further free up the disc. All patients are given post-operative instructions and pain relief medication is prescribed. A course of physiotherapy is commenced immediately post-operatively to promote and maintain an improved range of mandibular movement whilst the patient continues additional non-surgical treatment for TMD such as medication and/or occlusal splint therapy.

MATERIALS AND METHODS

As a follow-up survey to the original study,⁵ 46 patients (44 females, 2 males) with acute and persistent closed lock of the temporomandibular joint were treated with arthrocentesis and lavage with manipulation. The age range of this group of patients was 25–39 years (average 32.5), and the duration of the presenting symptoms ranged from 1 month to 7 years (mean 13 months). Patients selected for this study were those who presented with the chief complaint

of sudden and persistent limited mouth opening which was often, but not always, associated with pain arising in the affected TMJ. The criteria used for inclusion into this study was maximum mouth opening (MMO) of less than 30 mm of sudden onset and which persisted inspite of conservative measures such as manipulation of joint, physiotherapy, medications and bite appliance therapy. All the patients were diagnosed, treated and followed-up by the third author in his private practice in Monterey, Mexico. Each patient underwent TMJ arthrocentesis, lavage and manipulation as described on an outpatient basis. In all, 60 joints were treated by this technique.

Prior to each procedure, baseline data in the form of MMO and two visual analogue scales (VAS) relating to the degree of pain and mandibular dysfunction (chewing) were collected. The data was again collected immediately after the procedure and on subsequent follow-up in order to gauge the effectiveness of this technique as described previously. MMO was measured as the distance in millimetres between the incisal edges of the central incisors at maximum pain free mouth opening. One VAS (VAS I), ranging from 0 to 15, was used to assess the level of pain experienced by the patient, and the second VAS (VAS II), ranging from 0 to 15, was used to document the level of disturbed jaw function (ie: chewing ability). Zero (0) on each VAS was taken to mean no pain (VAS I) or no impairment of chewing ability (VAS II), and 15 was the most intense pain imaginable (VAS I) or total inability to chew (VAS II).

All the patients were then followed-up from between 6 and 30 months (mean 21 months) after the TMJ arthrocentesis, lavage and manipulation. Intracapsular steroids were not used in the present group of patients.

RESULTS

Prior to arthrocentesis and lavage the average MMO was $24.6 \text{ mm} \pm 5.2 \text{ mm}$. Following TMJ arthrocentesis and lavage the average MMO was $42.3 \text{ mm} \pm 6.1 \text{ mm}$ at an average follow-up period of 21 months (Table 1). This represented a significant increase ($P < 0.001$) in MMO following arthrocentesis and lavage in the order of 17.7 mm.

On the VAS I, the average pain score prior to TMJ arthrocentesis and lavage was 8.8 ± 2.0 . On subsequent follow-up, the average pain score was 2.2 ± 0.6 . This represented a significant reduction in pain ($P < 0.001$) as a result of TMJ arthrocentesis and lavage (Table 1).

With the VAS II, the average score for mandibular dysfunction was 10.0 ± 2.1 prior to TMJ arthrocentesis and lavage. On follow-up, the average score was 2.7 ± 2.0 (Table 1). Again, this represented a significant improvement in jaw function and chewing ability ($P < 0.001$) as a result of TMJ arthrocentesis and lavage. There was one patient who failed to demonstrate any significant improvement after the arthrocentesis and lavage.

Table 1 – Results of the present study of TMJ arthrocentesis and lavage with manipulation undertaken at Monterey in Mexico

Centre	Number of patients	Follow-up (months)	MMO (mm)		Degree of pain (0–15)		Degree of dysfunction (0–15)	
			Before	After	Before	After	Before	After
Mexico (Present Study)	46	6 to 30	24.6 ± 5.2	42.3 ± 6.1	8.8 ± 2	2.2 ± 0.6	10 ± 2.1	2.7 ± 2

DISCUSSION

Since it was first published in 1991,⁵ the technique of TMJ arthrocentesis and lavage with manipulation has gained widespread acceptance, particularly in North America, as a simple and effective technique for the treatment of acute persistent closed lock of the TMJ that is refractory to more conservative measures. The idea of TMJ arthrocentesis and lavage was first borne out of the successful use of TMJ arthroscopy not only as a diagnostic tool, but also as a therapeutic technique resulting in remarkable improvement in pain, jaw opening and function in selected patients through the simple process of lavaging the superior joint space.^{2–4}

Based on the observations of successful outcome of arthroscopic lavage and lysis, an alternative theory for the mechanism of closed lock in the TMJ was first proposed by Nitzan and Dolwick.⁶ The theory stipulates that sudden severe limited mouth opening is not caused by abnormal disc shape or position, but rather is the result of restricted gliding or forward translation of the condyle caused by the adherence of the disc to the fossa due to a reversible effect such as a vacuum, or possibly a yet to be determined change in synovial fluid consistency. Such events may occur as a result of sustained pressure applied to the joint as may be the case for patients who brux or clench their teeth. Effectively, the joint becomes 'stuck' by a suction cup effect resulting in sudden severe limitation of mouth opening. This theory would serve to explain why acute persistent closed lock would successfully respond to simple treatment such as arthrocentesis, pressure injection and lysis and lavage of the superior joint space.

As a result of these observations, a simplified technique of lavaging the superior joint space was devised, and the results of the preliminary clinical trials were initially published, together with the first description of the technique by Nitzan et al in 1991. In the first clinical trial⁵ 17 patients were involved in the study, 10 of which were from the Hadassah-Hebrew University in Jerusalem, Israel, and seven were from the University of Florida in Gainesville, USA. The study was performed on patients in two independent institutions by independent clinicians, and the results were remarkably similar (see Table 2). With an average follow-up of 9 months, the mean improvement in MMO as a result of TMJ arthrocentesis and lavage with manipulation was in the order of 18.6 mm (19.5 in the Israeli group and 14.6 mm in the U.S. group). This compares favourably with the present study from another inde-

pendent institution which demonstrated a mean MMO improvement of 17.7 mm over a longer average follow-up period of 21 months in a larger group of 46 patients (Table 1). It is also strikingly evident that the degree of improvement in both pain and jaw function amongst the three independent centres based on the two visual analogue scales (VAS I and VAS II, for pain and dysfunction respectively) is indeed very similar (Tables 1 & 2). The results of this present larger study (Table 1) has confirmed the findings of the initial clinical trials⁵ (Table 2) that TMJ arthrocentesis and lavage with manipulation is an effective technique for the treatment of acute persistent closed lock of the TMJ in terms of significantly improving maximum mouth opening and jaw function, and reducing pain.

In addition to the effective treatment of acute closed lock, it has also been suggested that TMJ arthrocentesis and lavage may further be useful for the management of osteoarthritis, early rheumatoid arthritis and acute intracapsular trauma with haemarthrosis of the TMJ. Clinical trials for the latter conditions have yet to be undertaken, so at present the effectiveness of this technique for the abovementioned conditions is at best only speculative. The use of intracapsular medications such as steroids and hyaluronic acid has yet to be proven of any additional benefit, but steroids are routinely used at the University of Florida. The amount of Ringer's lactate solution used to lavage the joint is somewhat of an arbitrary amount of between 50–100 ml with no minimum or maximum amounts having been proven to be within therapeutic range. Intravenous sedation is commonly employed as an adjunctive measure for patient comfort, but local anaesthesia alone may be sufficient.

Complications of TMJ arthrocentesis and lavage, although not recorded in this study, have been observed in non-study group patients. These include extravasation of fluid into surrounding tissues, haematoma with potential for infection although no infection has ever been experienced by the authors, and a broken catheter tip occurring in another institution that used catheters rather than needles to penetrate the joint capsule.

In the few cases where TMJ arthrocentesis and lavage fails to achieve the desired outcome, a number of factors should be considered. Firstly, appropriate case selection is important, as this technique appears to be effective only for specific conditions. Secondly, even when the indications for this procedure are apparent, other associated factors such as muscle spasm must be brought under control prior to the

Table 2 – Results of TMJ arthrocentesis lavage with manipulation undertaken at two independent centres as first published by Nitzan et al⁵

Centre	Number of patients	Follow-up (months)	MMO (mm)		Degree of pain (0–15)		Degree of dysfunction (0–15)	
			Before	After	Before	After	Before	After
USA	7	6 to 12	26.8 ± 4.3	41.4 ± 6.6	8.8 ± 2.3	2.4 ± 0.9	10 ± 2.3	2.9 ± 2.2
Israel	10	4 to 14	22.7 ± 5.5	42.2 ± 3.6	8.8 ± 2.8	2.3 ± 3.5	10.2 ± 1.7	1.7 ± 3.6

patient undergoing the TMJ arthrocentesis and lavage. And lastly, there will be cases where arthroscopy or open joint surgery is indicated but the clinician is unsure, so TMJ arthrocentesis and lavage may be used as a simple interim measure that may help to confirm the need for a more invasive procedure.

In the immediate postoperative phase, the patient may experience some tenderness and swelling over the treated TMJ. There may also be a slight change in the bite, and on occasions, a minor hearing impairment, all of which resolve completely in a few days. A soft diet is recommended for the first few days, however active jaw opening exercises are encouraged immediately upon completion of the procedure. TMJ arthrocentesis and lavage with manipulation is a simple, less invasive and less expensive technique with low morbidity that should be considered as an effective and efficient alternative to more invasive surgical procedures of the TMJ in a selected group of patients.

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INVITED COMMENT

This is an interesting paper suggesting that arthrocentesis is an effective treatment of closed lock of the temporomandibular joint. While this may be true, it is a pity that the trial was not done in a controlled way, either comparing with another method, or with another method together with no treatment. Placebo effects in the treatment of TMJ disorders are well known. Also, the trial was not blind; in other words, the same clinician examined the patient, administered the treatment and assessed its effects. In this situation, the patient may wish to please and even the most honest of clinicians is susceptible to bias. Additionally, other treatments were continued, either splint or drug therapy, and there is no indication as to how the commencement of that treatment coincided with the arthrocentesis. It is notable that all patients had physiotherapy after arthrocentesis, and there has been no attempt to assess which of the treatments were responsible for the success. The findings therefore do not carry much authority on this basis alone.

There are many unsatisfactory aspects of the method too. The visual analogue scale is a reputable method for assessing pain and is recognised as such by most authorities, but it is a pity that the authors have deviated from the accepted form¹ by increasing the length of the assessment line. The results from those scales and measurements of mouth opening, are impressive but there is no indication as to a protocol for measuring the various parameters. It would have been nice to know when the measurements were taken in relation to the commencement of treatment, and whether the improvement was sustained. All we are given to believe is that the patients had less pain, better function and better mouth opening at some time after the treatment started. Also we do not know the site of the pain being measured; all we do know is that 'muscle spasm must be brought under control prior to the patient undergoing TMJ arthrocentesis and lavage.' It is assumed therefore, but not stated, that the pain which improved was not of muscle origin. However, was it headache, which is so susceptible to the placebo effect? We do not know.

The criticism of this paper is intense but the message should not be lost. It is quite possible that

the success of arthroscopy is due largely to arthrocentesis of the temporomandibular joint, and arthrocentesis is in the capability of all clinicians without expensive hardware; it is a relatively simple treatment to undertake on an outpatient basis. Before it becomes a first-line minimally invasive therapy however, a proper controlled study does need to be undertaken. All treatments do have complications and the complications alluded to in this paper must be born in mind before subjecting a patient to an unproven method.

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