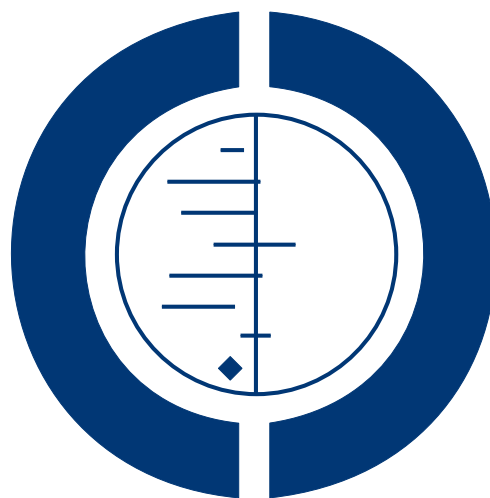


Arthrocentesis and lavage for treating temporomandibular joint disorders (Review)

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[Intervention Review]

Arthrocentesis and lavage for treating temporomandibular joint disorders

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Editorial group: Cochrane Oral Health Group.

Publication status and date: New, published in Issue 4, 2009.

Review content assessed as up-to-date: 3 August 2009.

Citation: Guo C, Shi Z, Revington P. Arthrocentesis and lavage for treating temporomandibular joint disorders. *Cochrane Database of Systematic Reviews* 2009, Issue 4. Art. No.: CD004973. DOI: 10.1002/14651858.CD004973.pub2.

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ABSTRACT

Background

Temporomandibular joint disorders are important oral health problems, reducing the quality of life of sufferers. It has been estimated that approximately 20% to 30% of the adult population will experience temporomandibular joint dysfunction. Arthrocentesis and lavage has been used to treat temporomandibular joint disorders for about 10 years, but the clinical effectiveness of the therapy has not been summarized in the form of a systematic review.

Objectives

To assess the effectiveness and complications of arthrocentesis and lavage for the treatment of temporomandibular joint disorders compared with controlled interventions.

Search strategy

The Cochrane Oral Health Group's Trials Register (to August 2009), CENTRAL (*The Cochrane Library* 2009, Issue 3), MEDLINE (1950 to August 2009), EMBASE (1980 to August 2009), OpenSIGLE (to August 2009), CBMdisc (1981 to 2007 (in Chinese)) and Chinese Medical Library were searched. All the Chinese professional journals in the oral health field were handsearched and conference proceedings consulted. There was no language restriction.

Selection criteria

All randomised controlled trials (RCTs) (including quasi-randomised clinical trials) aiming to test the therapeutic effects of arthrocentesis and lavage for treating temporomandibular joint disorders.

Data collection and analysis

Two review authors independently extracted data, and three review authors independently assessed the risk of bias of included trials. The first authors of the selected articles were contacted for additional information.

Main results

Two trials, at unclear to high risk of bias, were included in the review. The two trials, including 81 patients with temporomandibular joint disorders, compared arthrocentesis with arthroscopy. No statistically significant difference was found between the interventions in terms of pain. However, a statistically significant difference in favour of arthroscopy was found in maximum incisal opening (MIO) (weighted mean difference of -5.28 (95% confidence interval (CI) -7.10 to -3.46)).

Mild and transient adverse reactions such as discomfort or pain at the injection site were reported in both groups. No data about quality of life were reported.

Authors' conclusions

There is insufficient, consistent evidence to either support or refute the use of arthrocentesis and lavage for treating patients with temporomandibular joint disorders. Further high quality RCTs of arthrocentesis need to be conducted before firm conclusions with regard to its effectiveness can be drawn.

PLAIN LANGUAGE SUMMARY

Arthrocentesis and lavage for treating temporomandibular joint disorders

When the joint between the lower jaw and the base of the skull is not working well, the signs and symptoms such as movement problems, noises (clicking or grating), muscle spasms or pain could take place. It is so-called temporomandibular joint disorders. A range of treatment options for treating temporomandibular joint disorders are available such as arthrocentesis and arthroscopy. The review found that there is not enough evidence to judge whether arthrocentesis is more helpful for people with temporomandibular joint disorders than arthroscopy. Reported side effects were mild and transient.

BACKGROUND

Temporomandibular joint disorders are important oral health problems. It has been estimated that approximately 20% to 30% of the adult population will experience temporomandibular joint dysfunction (Swift 1998). The common signs and symptoms include facial and jaw pain which can be aggravated by jaw movements, temporomandibular joint noises (clicking or crepitus), and restriction of mandibular movements. The arthrographic examinations often show the displacements of the discs from their normal location and ill-remodeling or osteoarthritic changes on the articular portion of the temporal bone or condyloid heads. According to the symptoms and examinations, temporomandibular joint disorders have been classified into three categories: inflammatory disease such as synovitis, internal derangement (ID) and osteoarthritis (OA) (Xuchen M 2000). Although temporomandibular joint disorders do not threaten the patients' lives, they can severely reduce their quality of life.

There have been many remedies to treat temporomandibular joint disorders. Generally, non-surgical methods are used to treat tem-

poromandibular joint disorders initially, e.g. physical therapy, occlusal appliance therapy, drug therapies (including intra-articular injections), diet alteration, life style adaptation, etc. However, few of the conservative managements have gained well-pleasing curative effects. Should these methods prove unsuccessful for a patient, they are sometimes followed by surgical interventions such as meniscectomy, disc repositioning, and condylotomy (Barkin 2000). Those surgical procedures are aggressive and invasive and may even lead to more serious symptoms. It has been the goal of the clinicians to identify and implement the least invasive and most predictable treatments. Arthrocentesis of the temporomandibular joint seems to meet the requirements as a minimally invasive procedure.

Temporomandibular joint (TMJ) arthrocentesis refers to lavage of the upper joint space, hydraulic pressure and manipulation to release adhesions or the 'anchored disc phenomenon' and improve motion (Nitzan 1991). It was first used to treat acute closed lock by Nitzan et al (Nitzan 1991). Their study established that

the treatment decreased pain, increased maximal incisal opening, and at follow-up it showed prolonged relief of symptoms (Trieger 1999). Through arthrocentesis the microscopic tissue debris resulting from the breakdown of the articular surfaces and the pain mediators such as the enzymes and prostaglandins can be washed out, and normal lubricating properties of synovial membrane can also be stimulated. Today TMJ arthrocentesis is not only used in the treatment of acute closed lock but in various other temporomandibular joint disorders as well (Alpaslan 2001), such as chronic closed lock, chronic anterior displaced disc with reduction, and degenerative joint disease. The procedure can be completed under local anaesthesia, and is of low expense, minimally invasive and with minimal complications. Temporomandibular joint arthroscopy is another kind of mini-invasive therapy for treating temporomandibular joint disorders, which is usually carried out under general anaesthesia with nasa-trachea intubation, using a lateral approach. Only one cannula is introduced 1 cm anterior to the tragus and 2 mm below a line from tragus to external canthus. Through this cannula, an arthroscope of 1.8 mm diameter and a 0 offset is introduced. The cannula is equipped with a double connection to allow saline in- and outflow. Through arthroscopy, the joint can be explored, adhesions can be bluntly released, cut, treated with laser, and the disc can also be released. Compared with arthroscopy, arthrocentesis is relatively easier and less expensive.

At present there have been many clinical studies reporting the results of series of temporomandibular joint disorders patients treated with arthrocentesis and they are uniformly effective (Frost 1992; Hosaka 1996; Ness 1996; Nitzan 1994; Nitzan 1997). Arthrocentesis appears to have filled the clinical void between failed non-surgical treatment and open arthrotomy. In the past decade, arthrocentesis has been used with increasing frequency to treat TMJ internal derangement that failed to improve following a reasonable course of non-surgical therapy (Barkin 2000). But the clinical effectiveness of the procedure has not been summarized in the form of a systematic review. It is very necessary to perform a systematic review to analytically assess the treatment effects and adverse reactions of arthrocentesis and lavage. This will assist clinicians and patients in making more informative decisions about the suitability of this treatment modality for temporomandibular joint disorders.

OBJECTIVES

To assess the effectiveness and complications of arthrocentesis and lavage for the treatment of temporomandibular joint disorders.

METHODS

Criteria for considering studies for this review

Types of studies

All randomised controlled trials (RCTs) (including quasi-randomised clinical trials) aiming to test the therapeutic effects of arthrocentesis and lavage for treating temporomandibular joint disorders.

Types of participants

All adult patients with temporomandibular joint disorders, who were older than 18 years old, regardless of their race, gender, profession, or resident locations. The diagnostic criteria used in the primary studies to determine temporomandibular joint disorders were recorded, but based on the combination of patients' history, clinical and radiological findings of the temporomandibular joint. Those diagnoses such as synovitis, disc displacement with or without reduction, degenerative pathology or osteoarthritis of the temporomandibular joint were included and were to be subjected to subgroup analyses.

Types of interventions

The treatment group was arthrocentesis and lavage for temporomandibular joint disorders. The control group(s) may have received any other therapies for temporomandibular joint disorders (e.g. arthroscopy, physiotherapy, splint therapy, psychological interventions, oral medication) or no treatment/placebo.

Types of outcome measures

The following outcome variables should have been evaluated in the short term (less than 3 months) and the long term (equal or greater than 3 months).

The primary outcomes focused on clinical symptoms, namely the relief of pain in the temporomandibular joint and masticatory muscles. Other clinically important outcomes were also recorded (e.g. headaches, joint sounds/crepitus).

Secondary outcomes included.

- Subjective assessments by the patients, such as pain on face and jaw, clicking of the joints and dysfunction.
- Clinical examination by the observers, such as maximum interincisal opening, quantitative measurements of lateral movement and protrusion, tenderness on palpation of the temporomandibular joint and masticatory muscles, and determination of joint sounds during movement.
- Biochemical or physical indicators.
- Quantitative measurements of life quality.
- Adverse events.

Search methods for identification of studies

For the identification of studies included or considered for this review, detailed search strategies were developed for each database searched. These were based on the search strategy developed for MEDLINE, revised appropriately for each database to take account of differences in controlled vocabulary and syntax rules. There was no language restriction. Effort was made to translate non-English articles into English for inclusion. The following databases were searched:

- The Cochrane Oral Health Group's Trials Register (to August 2009) ([Appendix 1](#))
- The Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2009, Issue 3) ([Appendix 2](#))
- MEDLINE (OVID) (1950 to August 2009) ([Appendix 3](#))
- EMBASE (OVID) (1980 to August 2009) ([Appendix 4](#))
- OpenSIGLE (to August 2009) ([Appendix 5](#))
- Chinese literature databases such as the Chinese Biomedical Literature Database (CBMdisc) (1981 to 2007, in Chinese) and Chinese Medical Library produced by the Chinese Cochrane Center.

The search strategy for MEDLINE ([Appendix 3](#)) combined the subject search with the Cochrane Highly Sensitive Search Strategy (CHSSS) for identifying randomised controlled trials in MEDLINE: sensitivity maximising version (2008 revision) as referenced in Chapter 6.4.11.1 and detailed in box 6.4.c of the *Cochrane Handbook for Systematic Reviews of Interventions* version 5.0.1 (updated September 2008) ([Higgins 2008](#)).

All databases were searched by the Trials Search Co-ordinator of the Cochrane Oral Health Group apart from CBMdisc which was searched by one review author (Chunlan Guo (CG)). CBMdisc is published by the Information Institute of the Chinese Academy of Medical Sciences, including medical data indexed from over 900 medical journals, proceedings, etc. from 1981 onwards.

Handsearching

The reference lists of the included articles were checked manually to identify any additional studies. Because the earliest reports on temporomandibular joint arthrocentesis were published in 1991, *Experta Medica* and those relevant journals locally available, not currently covered by the Cochrane Oral Health Group's handsearching programme such as Chinese dental or oral or stomatological journals, were manually searched from 1991 to 2007. The key words 'arthrocentesis and lavage' and 'temporomandibular joint' were used as screening words.

The following is the list of the handsearched journals:

Chinese Journal of Stomatology (1991 to 2007)
Journal of Stomatology (1991 to 2007)
West China Journal of Stomatology (1991 to 2007)
Journal of Practical Stomatology (1991 to 2007)
Journal of Clinical Stomatology (1991 to 2007)

Journal of Comprehensive Stomatology (1991 to 2007)
Journal of Modern Stomatology (1991 to 2007)
Chinese Journal of Conservative Dentistry (1991 to 2007)
Journal of Maxillofacial Surgery (1991 to 2007)
Shanghai Journal of Stomatology (1991 to 2007)
Chinese Journal of Dental Materials and Devices (1991 to 2007)
Beijing Journal of Stomatology (1993 to 2007)
Chinese Journal of Dental Prevention and Treatment (1993 to 2007)
Chinese Journal of Orthodontics (1994 to 2007)
Chinese Journal of Implantology (1996 to 2007).

Unpublished literature

The proceedings of conferences regarding dental, oral and maxillofacial surgery in Chinese from 1990 were manually searched. The key words 'arthrocentesis and lavage' and 'temporomandibular joint' were used as screening words.

The first authors of the selected articles and abstracts were contacted by letter to ask if they had or they knew of additional published or unpublished materials relating to arthrocentesis and lavage for temporomandibular joint disorders.

Data collection and analysis

Study selection

Initially, the titles and abstracts of identified studies were screened independently by two review authors (Chunlan Guo (CG) and Zongdao Shi (ZS)) to judge whether the studies fulfilled the inclusion criteria. The full texts of potentially relevant articles were retrieved for evaluation. Any disagreements were resolved by discussion between the review authors, with referral to a third review author (Peter Revington (PR)) when necessary. Reasons for excluding studies at this stage were recorded in the [Characteristics of excluded studies](#) table.

Data extraction

Two review authors (CG and ZS) extracted data independently and in duplicate using a predesigned, standardized data extraction form. For each trial, bibliographic data, details on the setting, characteristics of the study population, baseline characteristics and outcome measures were recorded. Disagreements were resolved by discussion with referral to a third review author (PR) when necessary. Authors of the trials were contacted for clarification or missing information.

The outcome variables could be defined in two categories: symptoms reflecting subjective feeling and judgement by the patients, and clinical signs reflecting objective judgement by the observers. Where possible, effects on single items of symptoms such as pain,

noise of the joints or clinical signs such as mouth opening, tenderness of the temporomandibular joint or masticatory muscles were to be recorded.

Assessment of the risk of bias in the included studies

Two review authors (CG and ZS) independently assessed each included study. Any disagreement was discussed and where necessary a third review author (PR) was consulted to achieve consensus. The quality of eligible trials was assessed according to the following criteria:

- generation of random sequence
- concealed allocation of treatment
- blinding of participants/caregivers/outcome assessors (where appropriate)
- extent of drop outs/exclusions (trials using an intention-to-treat analysis were to be noted)
- free of selective reporting.

A description of the quality items was tabulated for each included trial, along with a judgement of 'Yes' indicating low risk of bias, 'No' indicating high risk of bias, and 'Unclear' indicating either lack of information or uncertainty over the potential for bias, as described in the *Cochrane Handbook for Systematic Reviews of Interventions* 5.0.1 (Higgins 2008).

A summary assessment of the risk of bias for the primary outcome (across domains) across studies was undertaken (Higgins 2008). Within a study, a summary assessment of low risk of bias was given when there was a low risk of bias for all key domains, unclear risk of bias when there was an unclear risk of bias for one or more key domains, and high risk of bias when there was a high risk of bias for one or more key domains. Across studies, a summary assessment was rated as low risk of bias when most information is from studies at low risk of bias, unclear risk of bias when most information is from studies at low or unclear risk of bias, and high risk of bias when the proportion of information is from studies at high risk of bias sufficient to affect the interpretation of the results.

Data analysis

For dichotomous outcomes, the estimates of effect of an intervention were expressed as risk ratios together with 95% confidence intervals. For continuous outcomes, mean differences and standard deviations were presented. For studies making similar comparisons, pooling of data was to be undertaken using a random-effects model. Forest plots were used to illustrate the treatment effects.

The significance of any discrepancies in the estimates of the treatment effects from the different trials was to be assessed by means of Cochran's test for heterogeneity and the I^2 statistic. Any identified heterogeneity was to be investigated.

Sensitivity analysis and assessment of publication bias were planned, however there were insufficient studies to do this.

RESULTS

Description of studies

See: [Characteristics of included studies](#); [Characteristics of excluded studies](#).

Of the 23 potentially eligible trials, only two randomised controlled trials (RCTs) on temporomandibular joint disorders met the inclusion criteria (Fridrich 1996; Goudot 2000). Details of the 20 excluded studies are presented in the [Characteristics of excluded studies](#) table. A further study is awaiting classification (Onder ME 2009).

Details of the two included studies are presented in the [Characteristics of included studies](#) table. According to the characteristics of the interventions, only one comparison could be defined: Arthrocentesis versus arthroscopy.

The two included studies (Fridrich 1996; Goudot 2000) examined the treatment of temporomandibular joint disorders (TMD), including anterior disc displacement with reduction (ADDR) and anterior disc displacement without reduction (ADDWR). The two studies had specific inclusion and exclusion criteria. All the included TMD patients had previously received conservative therapies, but the symptoms and/or clinical signs of TMD did not improve. Both studies were conducted following serious ethical considerations, and consent was obtained before allocation to treatment.

Fridrich 1996: A randomised, arthroscopy-controlled trial carried out in 19 patients with temporomandibular joint internal derangement (10 unilateral, 9 bilateral). The diagnoses were subdivided into two groups: anterior disc displacement with reduction and anterior disc displacement without reduction. Patients were randomly divided into two groups: 11 (17 sides) on arthroscopy, and 8 (11 sides) on arthrocentesis. After arthroscopy or arthrocentesis were carried out, 6 mg betamethasone was infused into the superior joint space. The outcomes measured were visual analogue scales of pain, dietary alteration and subjective intensity of joint noise, maximum incisal mouth opening, and successful scores. The patients were followed up from 6 to 24 months (mean 12.9 months).

Goudot 2000: A randomised, arthroscopy-controlled trial conducted in 62 patients with intracapsular temporomandibular joint disorders, whose symptoms were not relieved after conservative treatments such as occlusal release, physiotherapy, and psychological support. Through magnetic resonance images (MRI), the diagnoses were subdivided into two groups: anterior disc displacement with reduction and anterior disc displacement without reduction. The patients were randomly divided into two groups: 33 on arthroscopy, and 29 on arthrocentesis. After the two kinds of lavage, no other intervention was performed. Visual analogue scales of pain and improvement of mouth opening were the variables for the outcome comparisons. Treatment results were evaluated after 1 year.

Risk of bias in included studies

A summary of the risk of bias assessment is presented in [Figure 1](#). Both trials described the allocation to treatment groups as randomised, however, neither study provided details regarding the generation of the random sequence or allocation concealment. Given the interventions being studied, it would not have been feasible to have blinded the participants or carers to the treatment group. It may have been feasible to have undertaken some of the clinical assessment blinded to treatment group, but this is not reported in either study. As much of the outcome assessment was patient reported, blinding has not been used in the assessment of risk of bias in the individual studies.

Figure 1. Methodological quality summary: review authors' judgements about each methodological quality item for each included study.

	Adequate sequence generation?	Allocation concealment?	Incomplete outcome data addressed?	Free of selective reporting?
Fridrich 1996	?	?	-	?
Goudot 2000	?	?	+	?

With regard to incomplete data, in the trial by [Fridrich 1996](#), there were 13/19 participants available for analysis at 12 months and only 4/19 at 24 months. The reasons for incomplete follow-up are not explained. In the trial by [Goudot 2000](#), all randomised participants are included in the analysis.

Effects of interventions

Arthrocentesis versus arthroscopy

Individual symptoms

In the study by [Fridrich 1996](#) preoperative and postoperative (at longest follow-up for each patient (range 6 months to 24 months)) mean visual analogue scale (VAS) scores for pain level, joint noises, mobility and diet are compared. The authors report significant improvement for both groups in terms of change in mean VAS score. Data on individual VAS scores are not available for further analysis.

In the study by [Goudot 2000](#), the results of treatment were evalu-

ated after 1 year. Pain scores were measured with VAS. No statistically significant difference was seen in pain scores at 24 months (mean difference -1.00 (95% confidence interval (CI) -2.12 to 0.12)) (Analysis 1.1). Three postoperative pain groups were defined: no change, improved, healed. Data for 'improved' and 'healed' were combined within the trial results. The rate of improvement of symptoms in the arthroscopy group was 78.8% (26 of 33 subjects) postoperatively compared to 86.2% (25 of 29 subjects) in the arthrocentesis group. Again, this difference was not statistically significant (risk ratio 1.09 (95% CI 0.87 to 1.38)) (Analysis 1.2).

Both trials presented data on maximum incisal opening (MIO). Again, there was variation in the duration of follow-up in the trial by Fridrich 1996 (6 to 24 months). Goudot 2000 data on MIO is for 12-month follow-up. Both trials report a statistically significant difference in favour of arthroscopy. Pooling of the trials showed a weighted mean difference of -5.28 (95% CI -7.10 to -3.46) in favour of arthroscopy (Analysis 1.3).

Compound outcomes

Fridrich 1996 presents an overall success rate, combining pain and MIO scores. An unsuccessful outcome was classified as a statistically significant improvement in both pain and MIO. In the arthroscopy group, 82% (9 of 11 participants) was classed as success compared to 75% (6 of 8 participants) in the arthrocentesis group. This difference was not statistically significant (risk ratio 0.92 (95% CI 0.56 to 1.49)) (Analysis 1.4).

Adverse reactions

Only one of the included studies (Goudot 2000) reported adverse reactions. In the arthroscopy group, one patient presented with transient frontal palsy (during 3 months). One patient developed cervico-facial oedema requiring prolonged intubation of 12 hours. In the arthrocentesis group, two severe bradycardias were observed. The asystole outcome was favourable after injection of Isoprenaline for one patient. The other patient recovered spontaneously when lavage stopped. The number of patients withdrawing due to adverse reactions of arthrocentesis was not clear.

To date, no randomised controlled trials in this area report the temporomandibular joint tenderness, muscular tenderness, deviation of the mandible, maximum bite force, or quality of life.

DISCUSSION

Nitzan DW 1991 first used arthrocentesis to treat disc displacement with reduction of the temporomandibular joint in 1991. Since then, arthrocentesis has been used to treat temporomandibular joint disorders gradually in recent years, because of its minimal invasion and easy manipulation. At the same time, more and

more researchers have undertaken many kinds of studies to assess the true effects of arthrocentesis for treating temporomandibular joint disorders. Although the results of many of the studies seemed good, it is still very important to judge whether the published data provide strong evidence to justify the therapeutic effect of arthrocentesis for temporomandibular joint disorders through the methods of evidence-based medicine. This systematic review aims to answer this question.

Through our extensive electronic and handsearching, only two published randomised controlled trials (RCTs) were found (Fridrich 1996; Goudot 2000). Most of the other published articles were descriptive studies without control (Characteristics of excluded studies). The two RCTs compared the therapeutic effects between arthrocentesis and arthroscopy to treat temporomandibular joint disorders. Neither study was deemed to be at low risk of bias.

Many symptoms of temporomandibular joint disorders are 'soft' variables, and not able to be quantitatively expressed. The authors of the included studies managed to use quantitative methods to estimate the size of the therapeutic effects, such as visual analogue scale (for scoring pain, severity of the symptoms, impairment of the function) and maximum incisal opening (MIO). However, Fridrich 1996 also used synthesized/compound clinical variables (including pain and MIO). Such compound scores might cause some problems in interpretation, with the readers not able to estimate which of the items had changed following the interventions.

No statistically significant difference was found between arthrocentesis and arthroscopy on subjective pain relief. With regard to postoperative MIO, both trials report a statistically significant difference in favour of arthroscopy, with a combined weighted mean difference of -5.28 (95% confidence interval -7.10 to -3.46). The explanation may be that the pain-related chemical mediators in the synovial fluids of the temporomandibular joints, such as bradykinin, interleukin-6, and protein, etc could both be purged and decreased after the lavage during arthrocentesis or arthroscopy.

In conclusion, we have to emphasize that the included studies both had small sample sizes and were exposed to methodological flaws which could weaken the validity of the results. One could not be sure whether the remission of symptoms and clinical signs was a true outcome, because it might be due to a fluctuation of disease or simply due to co-interventions. More well designed randomised controlled trials with large sample sizes and appropriate, patient focused outcomes, need to be undertaken to evaluate the true results of arthrocentesis for treating temporomandibular joint disorders. According to all the related literature, most of the complications of arthrocentesis were mild and transient, such as transient swelling and pain. Although arthroscopy enables additional diagnoses to be made including perforation or synovitis, since arthrocentesis can be processed under local anaesthesia, the treatment effect of arthrocentesis corresponds to that of arthroscopy, the treatment

cost of arthrocentesis is lower than that of arthroscopy, and the method of arthrocentesis is easy to master, it could be supposed that arthrocentesis should be extended more and more, especially in developing areas.

AUTHORS' CONCLUSIONS

Implications for practice

This review suggests the effects of arthrocentesis and lavage of temporomandibular joints for temporomandibular joint disorders might be in the same level with that of arthroscopy, but currently the results are unstable. The reported adverse reactions of arthrocentesis are mild and transient. It is recommended that arthrocentesis and lavage only be used as an alternative for patients with temporomandibular joint disorders within the constraints of a well designed randomised controlled trial (RCT).

Implications for research

The included studies provided positive but weak evidence for using arthrocentesis to treat temporomandibular joint disorders. Some methodological flaws and incomplete reporting were the main factors influencing validity and reproducibility of the conclusion. Most of the studies on arthrocentesis were descriptive studies without control. Therefore more RCTs, especially multicentre trials of sufficient sample size, using important patient focused outcome variables, including life quality, are needed to establish its true therapeutic effects.

ACKNOWLEDGEMENTS

The review authors would like to thank Luisa Fernandez Mauleffinch (Managing Editor), Philip Riley (Administrator), Anne Littlewood (Trials Search Co-ordinator), Anne-Marie Glenny (Contact Editor) and the Cochrane Oral Health Group for their assistance in preparing the review, providing literature searches and revising the protocol and this review text.

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- * Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Fridrich 1996

Methods	RCT; no detailed description on randomisation; blinding not feasible; follow-up at 1 week and 1, 2, 3, 4, 12 and 26 months.
Participants	19 female participants, unresponsive to non-surgical treatment, with anterior disc displacement with reduction on opening (ADDR) or anterior disc displacement without reduction on opening (ADDWR). Arthrocentesis: ADDR 3 patients (5 joints), ADDWR 5 patients (6 joints). Arthroscopy: ADDR 4 patients (7 joints), ADDWR 7 patients (10 joints). Mean age: 31 years (range 15 to 56 years).
Interventions	Group 1. Arthrocentesis with 120 ml lactated Ringer's solution and 6 mg betamethasone for superior joint space (n = 8). Group 2. Arthroscopy with lactated Ringer's solution and 6 mg betamethasone for superior joint space (n = 11).
Outcomes	Maximum incisal opening, clicking, VAS for pain, jaw function.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "...were randomized to one of two surgical groups..."
Allocation concealment?	Unclear	Comment: insufficient information.
Incomplete outcome data addressed? All outcomes	No	Comment: data regarding reasons for variation in follow-up not provided. Only 4/19 participants available at 24-month follow-up.
Free of selective reporting?	Unclear	Comment: insufficient information.

Goudot 2000

Methods	RCT; no detailed description on randomisation; blinding not feasible; follow-up 24 months.
Participants	62 temporomandibular joint disorders participants, unresponsive to systemic, non-surgical treatment over a 6-month period. 75% of participants female.

Goudot 2000 (Continued)

	Mean age: 38 years (range 16 to 72 years).	
Interventions	Group 1. Arthrocentesis with 100-150 ml saline solution and jaw movement training (n = 29). Group 2. Arthroscopy with lactated Ringer's solution (n = 33).	
Outcomes	Mouth opening, VAS for pain.	
Notes		
<i>Risk of bias</i>		
Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "The choice of technique was randomized...".
Allocation concealment?	Unclear	Comment: insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	Comment: no drop outs reported.
Free of selective reporting?	Unclear	Comment: insufficient information.

RCT = randomised controlled trial.

VAS = visual analogue scale.

Characteristics of excluded studies [ordered by study ID]

Alpaslan 2008	Evaluates the use of splints following arthrocentesis.
Alpaslan C 2000	Evaluates the effect of arthrocentesis and sodium hyaluronate (SH) for temporomandibular disorders. The interventions are arthrocentesis with SH and arthrocentesis without SH.
Alpaslan GH 2001	Evaluates the effect of arthrocentesis and sodium hyaluronate (SH) for temporomandibular disorders. The interventions are arthrocentesis with SH and arthrocentesis without SH.
Deng 2004	Descriptive study, no control.
Emshoff 2000	Descriptive study, no control.
Emshoff R 2000	Descriptive study, no control.

(Continued)

Han 1999	Descriptive study, no control.
Han 2003	CCT, no randomisation.
Jiao 2004	Descriptive study, no control.
Kaneyama 2004	Descriptive study, no control.
Nitzan DW 1991	Descriptive study, no control.
Prager 2007	Evaluates the effect of buprenorphine after arthrocentesis for temporomandibular disorders. The interventions are arthrocentesis with buprenorphine and arthrocentesis without buprenorphine.
Sanroman 2004	CCT, no randomisation.
Trieger N 1999	Descriptive study, no control.
Wang 2003	Descriptive study, no control.
Zha 2003	Descriptive study, no control.
Zhang 2001	CCT, no randomisation.
Zhang 2003	Descriptive study , no control.
Zheng 2004	CCT, no randomisation.
Zhong 2004	Descriptive study, no control.

CCT = controlled clinical trial.

DATA AND ANALYSES

Comparison 1. Arthrocentesis versus arthroscopy



Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Pain (VAS)	1	62	Mean Difference (IV, Random, 95% CI)	1.00 [-2.12, 0.12]
2 Improvement in pain	1		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
3 Maximum mouth opening	2		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
4 Overall success (compound score)	1	19	Risk Ratio (M-H, Random, 95% CI)	0.92 [0.56, 1.49]

Analysis 1.1. Comparison 1 Arthrocentesis versus arthroscopy, Outcome 1 Pain (VAS).

Review: Arthrocentesis and lavage for treating temporomandibular joint disorders

Comparison: 1 Arthrocentesis versus arthroscopy

Outcome: 1 Pain (VAS)

Study or subgroup	Arthrocentesis		Arthroscopy		Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
	N	Mean(SD)	N	Mean(SD)			
Goudot 2000	29	0.9 (2.1)	33	1.9 (2.4)		100.0 %	-1.00 [-2.12, 0.12]
Total (95% CI)	29		33			100.0 %	-1.00 [-2.12, 0.12]

Heterogeneity: not applicable
Test for overall effect: Z = 1.75 (P = 0.080)

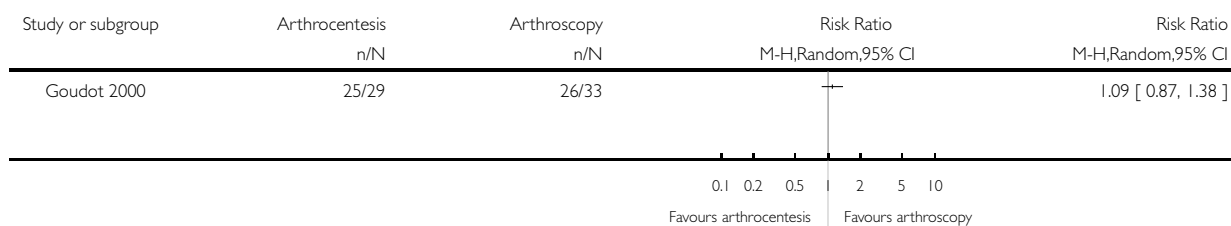
-100 -50 0 50 100
Favours arthrocentesis Favours arthroscopy

Analysis 1.2. Comparison 1 Arthrocentesis versus arthroscopy, Outcome 2 Improvement in pain.

Review: Arthrocentesis and lavage for treating temporomandibular joint disorders

Comparison: 1 Arthrocentesis versus arthroscopy

Outcome: 2 Improvement in pain

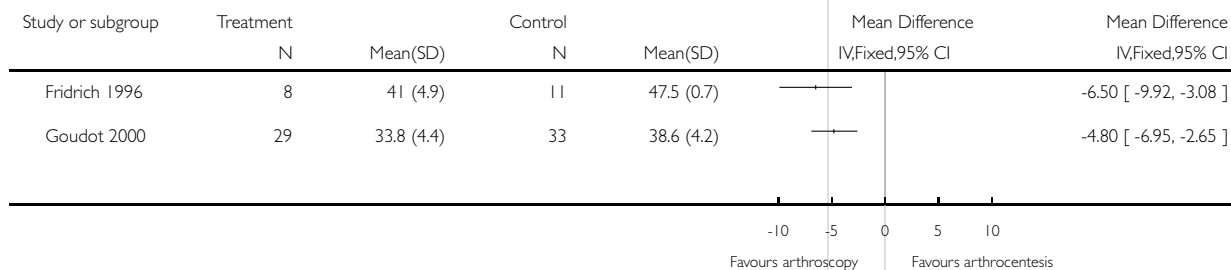


Analysis 1.3. Comparison 1 Arthrocentesis versus arthroscopy, Outcome 3 Maximum mouth opening.

Review: Arthrocentesis and lavage for treating temporomandibular joint disorders

Comparison: 1 Arthrocentesis versus arthroscopy

Outcome: 3 Maximum mouth opening

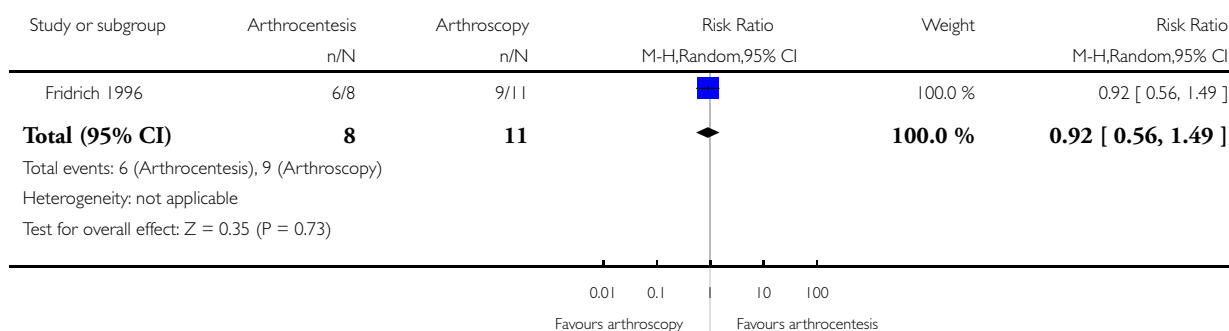


Analysis 1.4. Comparison 1 Arthrocentesis versus arthroscopy, Outcome 4 Overall success (compound score).

Review: Arthrocentesis and lavage for treating temporomandibular joint disorders

Comparison: 1 Arthrocentesis versus arthroscopy

Outcome: 4 Overall success (compound score)



APPENDICES

Appendix 1. Cochrane Oral Health Group's Trials Register search strategy

((“temporomandibular joint*” or “temporo-mandibular joint*” or “temporo mandibular joint*” or craniomandibular or craniomandibular or “cranio mandibular” or “myofascial pain” or tmd or cmd or tmj) AND (arthrocent* or lavage* or irrigation*))

Appendix 2. CENTRAL search strategy

- #1 MeSH descriptor Temporomandibular Joint explode all trees
- #2 MeSH descriptor Temporomandibular Joint Disorders explode all trees
- #3 MeSH descriptor Myofascial Pain Syndromes explode all trees
- #4 MeSH descriptor Craniomandibular Disorders explode all trees
- #5 MeSH descriptor Joint Diseases explode all trees
- #6 (temporomandibular* in All Text or “temporo mandibular*” in All Text or temporo-mandibular* in All Text)
- #7 (craniomandibular* in All Text or cranio-mandibular* in All Text or “cranio mandibular*” in All Text)
- #8 (tmd in Title, Abstract or Keywords or tmj in Title, Abstract or Keywords or cmd in Title, Abstract or Keywords)
- #9 (#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8)
- #10 arthrocent* in All Text
- #11 lavage* in All Text
- #12 MeSH descriptor Irrigation this term only
- #13 irrigation* in All Text
- #14 (#10 or #11 or #12 or #13)
- #15 (#9 and #14)

Appendix 3. MEDLINE via OVID search strategy

The following subject search was combined with the Cochrane Highly Sensitive Search Strategy (CHSS) for identifying randomised controlled trials in MEDLINE: sensitivity maximising version (2008 revision) as referenced in Chapter 6.4.11.1 and detailed in box 6.4.c of the *Cochrane Handbook for Systematic Reviews of Interventions* version 5.0.1 (updated September 2008):

1. exp Temporomandibular joint/
2. exp Temporomandibular joint disorders/
3. exp Myofascial pain syndromes/
4. exp Craniomandibular disorders/
5. exp Joint diseases/
6. (temporomandibular\$ or temporo-mandibular\$ or “temporo mandibular\$”).mp.
7. (craniomandibular\$ or cranio-mandibular\$ or “cranio mandibular\$”).mp.
8. (cmd or tmd or tmj).ti,ab.
9. or/1-8
10. Irrigation/
11. arthrocent\$.mp.
12. lavage\$.mp.
13. irrigation.mp.
14. “joint aspiration\$”.mp.
15. or/10-14
16. 9 and 15

Appendix 4. EMBASE via OVID search strategy

1. exp Temporomandibular joint/
2. exp Temporomandibular joint disorders/
3. exp Myofascial pain syndromes/
4. exp Craniomandibular disorders/
5. exp Joint diseases/
6. (temporomandibular\$ or temporo-mandibular\$ or “temporo mandibular\$”).mp.
7. (craniomandibular\$ or cranio-mandibular\$ or “cranio mandibular\$”).mp.
8. (cmd or tmd or tmj).ti,ab.
9. or/1-8
10. arthrocent\$.mp.
11. lavage\$.mp.
12. irrigation.mp.
13. Joint Aspiration/
14. “joint aspiration\$”.mp.
15. or/10-14
16. 9 and 15

The above subject search was combined with a search filter for isolating randomised controlled trials:

1. random\$.ti,ab.
2. factorial\$.ti,ab.
3. (crossover\$ or cross over\$ or cross-over\$).ti,ab.
4. placebo\$.ti,ab.
5. (doubl\$ adj blind\$).ti,ab.
6. (singl\$ adj blind\$).ti,ab.
7. assign\$.ti,ab.
8. allocat\$.ti,ab.
9. volunteer\$.ti,ab.
10. CROSSOVER PROCEDURE.sh.
11. DOUBLE-BLIND PROCEDURE.sh.
12. RANDOMIZED CONTROLLED TRIAL.sh.

13. SINGLE BLIND PROCEDURE.sh.
14. or/1-13
15. ANIMAL/ or NONHUMAN/ or ANIMAL EXPERIMENT/
16. HUMAN/
17. 16 and 15
18. 15 not 17
19. 14 not 18

Appendix 5. OpenSIGLE search terms

temporomandibular and arthrocentesis
temporo-mandibular and arthrocentesis
“temporo mandibular” and arthrocentesis
craniomandibular and arthrocentesis
cranio-mandibular and arthrocentesis
“cranio mandibular” and arthrocentesis
temporomandibular and lavage
temporo-mandibular and lavage
“temporo mandibular” and lavage
craniomandibular and lavage
cranio-mandibular and lavage
“cranio mandibular” and lavage

HISTORY

Protocol first published: Issue 4, 2004

Review first published: Issue 4, 2009

CONTRIBUTIONS OF AUTHORS

Chunlan Guo: Initiation of the systematic review, writing the protocol, searching various electronic databases and handsearching Chinese professional journals, contacting the first authors of the included articles, collecting and evaluating the included data, completing the meta-analysis, writing and revising the systematic review.

Zongdao Shi: Helped with handsearching the Chinese professional journals, extracting data from the included articles, evaluating and scoring the quality of the included articles.

Peter Revington: Helped with reviewing the protocol and review, evaluating and scoring quality of the included articles.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- Chinese Cochrane Center, China.
- West China College of Stomatology, Sichuan University, China.

External sources

- Project of Development of Systematic Review supported by Chinese Medical Board of New York (Grant: 98-680), USA.
- Cochrane Oral Health Group, UK.

INDEX TERMS

Medical Subject Headings (MeSH)

Arthroscopy [methods]; Irrigation [methods]; Manipulation, Orthopedic [methods]; Randomized Controlled Trials as Topic; Temporomandibular Joint Disorders [*therapy]; Tissue Adhesions [therapy]

MeSH check words

Adult; Humans