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Comparison of Arthroscopy and Arthrocentesis in the Management of Internal Derangement in TMJ Disorders: A Systematic Review

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Abstract

The aim of the systematic review is to shed some light on comparison of Arthroscopy and arthrocentesis in the management of internal derangement in temporomandibular joint (TMJ) disorders. A comprehensive electronic search was conducted with no date or language constraints. Human research, such as randomized or quasi-randomized controlled trials, controlled clinical trials, and retrospective studies comparing arthrocentesis and arthroscopy in the treatment of internal derangements in TMJ disorders, was included in this study. After considering the exclusion and inclusion criteria, seven studies were being included in the systematic review. Because all trials employed the same scale, the weighted mean difference (WMD) was used to compute the Maximum inter-incisal opening (MIO) (in millimeters) and pain in the continuous data (by visual analog scale). The improvement in MIO following arthroscopy was greater than that following arthrocentesis. The difference in pain reduction between arthroscopy and arthrocentesis patients was statistically significant (fixed: WMD = 0.42, 95% CI: 0.54–0.30; *P* = 0.00001). When compared to arthrocentesis, arthroscopy lysis and lavage were shown to be more effective in improving MIO and lowering pain.

Keywords: Arthrocentesis, Arthroscopy, Internal derangement, Maximum inter inter-incisal opening

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Introduction

Internal Derangement is one of the most frequent types of Temporomandibular Joint Disorder (TMD) (ID). It has been claimed that 80% of TMD patients have some sort of temporomandibular joint ID (TMJ).[1] ID is an intra-articular condition, in which the natural relationship of the TMJ's articular disk to the articular eminence and condyle is disrupted, while the joint is at rest or in use. TMJ problems such as anchored disk phenomena, disk displacement with reduction, painful click, and closed lock are all classified as TMJ ID. Patients with TMJ ID frequently report of discomfort, joint noises, and difficulty opening their mouth. The majority of people with ID may be effectively managed without surgery.[2] Pharmacotherapy, TMJ splints, and physical therapy are examples of non-surgical treatments. Patients who do not respond to nonsurgical treatment may need more invasive treatments such as arthrocentesis or arthroscopy.

According to Farrar, up to 25% of the population has an internal derangement, which is normally addressed with non-surgical approaches first.[3] The articular disk was shown to be displaced in 35% of asymptomatic participants in recent investigations using magnetic resonance imaging (MRI).[4]

Ohnishi used arthroscopy to perform the first TMJ lavage.[5] As a result, it was discovered that visualization of the joint was not required to achieve the therapy goals; hence, arthrocentesis alone has been employed in the treatment of this problem as a variant of TMJ arthroscopic lavage.[6]

The name "arthrocentesis" comes from the Greek words "arthros" and "kenesis," which mean "joint" and "irrigation," respectively. Nitzan, Dolwick, and Martinez were the first to report TMJ arthrocentesis in 1991. It is a very simple, minimally invasive, and extremely effective method that is now frequently utilized in the treatment and diagnosis of numerous internal derangements.[7] TMJ arthroscopy has been shown to be beneficial in the treatment of TMJ diseases by a number of authors (TMD).[8] In contrast, there are few reports on the success of arthrocentesis in the literature.[7,9]

Reduced pain and better range of motion have been reported as success rates after TMJ arthroscopy ranging from 79% to 93%. Furthermore, when using arthrocentesis for anterior disk displacement without reduction, success rates of up to 91% have been documented.

According to certain research, both arthrocentesis and arthroscopic lavage result in a considerable reduction in pain and an increase in the maximum mouth opening when followed up on.[10,11] Although arthroscopy had superior results in terms of functional outcomes, there is no difference in the degree of pain management between the two methods. As a result, arthrocentesis is highly suggested for the treatment of pain in patients with painful clicking in the TMJ that does not respond to non-invasive medical care since it is technically easier to conduct than arthroscopic lavage.[12]

Till date, there is very limited information researched so far in relation to comparison of the arthroscopy and arthrocentesis in functional benefit and pain relief in internal derangements in TMJ disorders. Here, we present a systematic review that shed some light on comparison of arthroscopy and arthrocentesis in the

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management of internal derangement in TMJ disorders.

Materials and Methods

Eligibility Criteria

Human research, such as randomized or quasi-randomized controlled trials (RCTs), controlled clinical trials (CCTs), and retrospective studies comparing arthrocentesis and arthroscopy in the treatment of internal derangements in TMJ disorders, was included in this study. Any randomized controlled trial comparing arthroscopy and arthrocentesis in the therapy of internal derangement in terms of pain and jaw function (Maximum inter-incisal opening [MIO], excursive motions, and protrusive movements) was also included in the study. The analysis comprised human trials, RCTs, CCTs, and retrospective investigations.

Case reports, technical reports, animal experiments, *in vitro* studies, review articles, and uncontrolled research were all omitted.

Search Methods and Sites for Collection of Data

PubMed, the Cochrane Database of Systematic Reviews, the Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE, MEDLINE, CINAH, and the Electronic Journal Center were used to conduct a complete electronic search with no date or language constraints. "TMJ arthrocentesis" AND/OR "TMJ arthroscopy" AND "TMJ internal derangement," "TMJ intra-articular disorders," "TMJ lavage," "TMJ lysis," and "TMJ locking" were used as search phrases.

Additional papers were found by scanning the reference lists of the indicated research and pertinent reviews on the issue. In addition, internet databases giving information on ongoing clinical trials (https://clinicaltrials.gov; http://www.centerwatch.com/clinicaltrials; http://www.clinicalconnection.com) were searched.

Collection of Data

All research collected from databases were thoroughly reviewed for eligibility by the author. Authors, year of publication, study design, number of patients, gender (male/female), mean age in years, follow-up period, anesthesia, intra-articular injection, lavage (pressure/volume), duration of the problem, pain on visual analog scale (VAS) scale, preoperative and postoperative MIO, and success rate were all extracted from the included studies in the final analysis. For any missing data, the authors were contacted.

Outcomes Assessment

Because all trials employed the same scale, the weighted mean difference (WMD) was used to compute the MIO (in millimeters) and pain in the continuous data (by VAS). The author utilized the final value rather than the change in scores in trials that provided both the baseline and final averages with standard deviations.

Results

Selection of the Studies

Figure 1 depicts the study selection procedure. There were 690 records returned from the computerized search. Four hundred duplicate articles were eliminated after an initial screening of titles and abstracts. Two hundred and ten of the remaining 290 studies were eliminated, because they were unrelated to the issue. The full-text of the remaining 80 publications was evaluated, and 73 were eliminated, because they did not match the inclusion requirements. As a result, the review included a total of seven publications.[13-19]

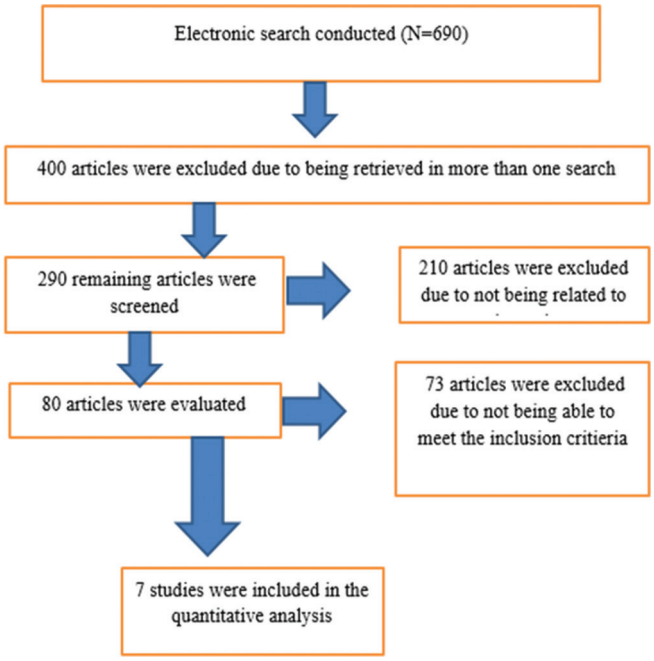

Figure 1: Flow chart of the selection process in the systematic review

Description of the Studies Included

Tables 1 and 2 detail the features of the studies considered. Two RCTs,[14,15] two CCTs,[13,16] and two retrospective investigations[17,18] and one prospective study[19] were included in the study. In all, 311 individuals were included in the seven investigations, with 162 undergoing arthroscopy and 149 undergoing arthrocentesis. All of the participants in the studies had previously tried and failed conservative nonsurgical therapy. In three studies,[14-16] the follow-up time was 1–2 years, whereas in the other investigations, it ranged from 1 month to 6 months.[13,17-19]

The synovial membrane and fossa were examined during the arthroscopies for adhesions and disk perforations. The top compartment was cleaned and swept with a blunt probe to remove any adhesion that might cause the disk to become restricted. Other than that, nothing was done. Arthrocentesis was performed under local anesthetic using two needles placed into the upper compartment, as described by Nitzan *et al*.[7] In two studies, the intra-articular injection material was lactated ringer's solution or saline, with sodium hyaluronate added.

MIO

The MIO was examined in all of the studies (311 patients; 162 in the arthroscopy group and 149 in the arthrocentesis group) during time periods ranging from 1 month to 2 years. The improvement in MIO following arthroscopy was greater than that following arthrocentesis. The difference between the two groups was statistically significant (fixed: WMD 1.84 mm, 95% CI 2.91–0.76; $P = 0.000$). The results favored arthroscopy (fixed: WMD = 5.25 mm,

Table 1: Description of the parameters in the studies comparing arthrocentesis and arthroscopy included in review

Authors and year	*Study design*	*No of patients*		*Gender*	*Mean age*	*Follow up*	*IA injection*	*Lavage*	*Duration of problem*	*Diagnostic problem*
		AC group I	*AS group II*							
Murakami *et al*. (1995)	CCT prospective study	20	25	Group 1: 17 females, 3 males Group II: 23 females, 2 males	Group I: 32.7 Group II: 31.2	6 months	NA	Group I: 2 needle Group II: dual port	Group I: 6.85 months Group II: 5.64 months	Closed lock problem
Fridrich *et al*. (1996)	RCT prospective study	8	11	Group I and II: 19 females	Group I: 28.5 Group II: 33	Till 26 months	Group I and II: ringer lactate solution with steroid	Group I : 2 needle Group II: dual port	NR	Anterior disk replacement with or without reduction
Goudot *et al*. (2000)	RCT prospective	29	33	Group I and II: 46 females and 16 males	Group I and II: 38	1 year	Group I and II: Ringer lactate solution	Group I : 2 needle Group II: cannula with 2 needles	NR	Anterior disk replacement with or without reduction
Hobeich *et al*. (2007)	Retrospective study	25	32	Group I and II: 12 males and 45 females	Group I and II: 16–54 years	18–28 months	Group I and II: ringer lactate solution and sodium hyaluronate	NR	1–2 years	Anterior disk replacement without reduction
Tan and Krishnaswamy (2012)	CCT prospective study	11	9	Group I: 8 males and 3 females Group II: 7 females and 2 males	Group I: 16 to 40 years Group II: 20–63 years	1 month	Group I and II: Saline	Group I: 2 needle Group II: 2 needles with cannula	1 month to 6 years	Painful click and closed click
Xu *et al*. (2013)	Retrospective study	41	37	Group I: 30 females and 11 males Group II: 29 females and 8 males	Group I: 34–39 Group II: 30–73 years	3 months	Group I and II: Ringer lactate solution and sodium hyaluronate	Group I: 2 needles Group II: two cannulas	NR	Anterior disk displacement
Rajpoot *et al*. (2021)	Prospective study	15	15	Group I and II: 8 males and 22 females	Group I and II: 34.6 years	6 months	Group I: Ringer lactate solution Group II: Ringer lactate solution	NA	NA	Anterior disk displacement with or without reduction

GROUP I: Arthrocentesis group, Group II: Arthroscopy group

Table 2: Quantitative analysis of mean pain score and maximum inter-incisal opening

Authors	*Pain (VAS)*				*MIO (mm)*			
	Arthrocentesis		*Arthroscopy*		*Arthorocentesis*		*Arthroscopy*	
	Pre op	*Post op*	*Pre op*	*Post op*	*Pre op*	*Post op*	*Pre op*	*Post op*
Murakami *et al*.	5.7	2.4	4.8	3.0	30.6	42.5	27.5	42.1
Fridrich *et al*.	6.45	1.7	6.6	2.3	33	41	30	47.5
Goudot *et al*.	5.6	0.9	5.7	1.9	29.43	33.8	29.0	38.6
Hobeich *et al*.	5.75	2.55	5.71	2.32	31.75	41.60	32.07	40.68
Tan and Krishnaswamy	6.67	2.11	6	3.5	26.56	39.56	30.25	36.88
Xu *et al*.	5.32	0.73	6.08	2.21	25.9	35.7	24.2	37.1
Rajpoot *et al*.	NA	72.43%	NA	77.66%	NA	24.73%	NA	65.41%

VAS: Visual analog scale, MIO: Maximum inter-incisal opening

95% confidence interval: 7.11–3.44; $P = 0.00001$).

Pain

A VAS was used in all of the experiments to evaluate pain (311 patients; 162 in the arthroscopy group and 149 in the arthrocentesis group). The difference in pain reduction between arthroscopy and arthrocentesis patients was statistically significant (fixed: WMD = 0.42, 95% CI: 0.54–0.30; $P = 0.00001$). The findings supported arthroscopy (fixed: WMD = 0.56, 95% CI: 0.71–0.41, $P = 0.00001$).

Risk of Bias with in Studies

Concerning the quality assessment of the studies, the risk of bias is shown in Tables 3 and 4.

Discussion

The characterization of a successful surgical result in the treatment of TMD is still a work in progress. In this investigation, a favorable outcome in treating internal TMJ derangement was based on two clinical parameters: MIO and pain.

The use of lavage in conjunction with arthrolysis has demonstrated to be quite effective in the treatment of TMD. Even in patients with late stages of degeneration and dysfunction, this therapy has been demonstrated to relieve discomfort and enhance joint mobility.[7,20] Lavage and arthrolysis can be done in two ways: arthrocentesis and arthroscopic lavage.

Several studies have compared the two procedures and found differences in prognosis, complications, and long-term results.[13,14,16] The analysis demonstrated a statistically significant difference in favor of arthroscopy in terms of MIO and pain in this study. The effectiveness of arthroscopy in alleviating negative pressure on the disk, loosening adhesions, distending or enlarging the constricted joint space, lowering surface friction, and changing the viscosity of the synovial fluid may be linked to these effects.[20,21]

In terms of pain, arthroscopy had a substantial benefit over arthrocentesis ($P = 0.00001$). This might be because arthroscopic lavage, which uses a bigger diameter portal with high pressure, allows for more thorough clearance of inflammatory mediators, leading in a greater decrease in pain.[18]

Because Nitzan believes that the lavage, rather than the surgical equipment, accounts for a large part of the effectiveness of surgical arthroscopy in the treatment of severe closed lock, the success rates with arthrocentesis are comparable to those with arthroscopic lysis or lavage.[6]

In situations of chronic closed lock, however, Sanders believes that intracapsular lysis using probes between the disk and fossa is required to loosen superior compartment adhesions.[8] In terms of age and length of the condition, the present study's author feels that the chronicity of joint problems, as well as older age, may be poor predictors of the result of both treatments.

Although the results of this study showed that arthroscopy outperformed arthrocentesis in terms of improving jaw function and reducing pain, arthroscopy has a number of drawbacks: It requires general anesthesia and the use of an operating room, it is more invasive, has a higher rate of post-operative morbidity, is more expensive, and has a higher risk of complications. While arthroscopy has been associated with serious complications such as arterio-venous fistula, facial, trigeminal, and auditory nerve injury, otitis media, perforation of the glenoid fossa, extradural hematoma, broken instruments in the joint, and perforation of the tympanic membrane and middle ear resulting in deafness,[13,15] arthrocentesis has only been associated with one case of an extradural hematoma. These benefits reinforce the argument that arthrocentesis should be the first surgical therapy of choice for internal derangements that do not respond to medicinal treatment.[22]

Selection of eligible patients is critical since every surgical treatment carries a risk of morbidity, especially in patients with

Table 3: List of studies excluded with the reason for exclusion

S. No	*Authors and years*	*Reason for exclusion*
1.	Murakami *et al*. (2002)	Review article
2.	Ahmed *et al*. (2012)	Prospective outcome of consort cases of arthroscopy and arthrocentesis
3.	Belasy *et al*. (2007)	Review article
4.	Tozoglu *et al*. (2011)	Review article
5.	Al-Moraissi *et al*. (2015)	Systematic review

Table 4: Risk of bias assessment

Author	*Clearly stated aim*	*Inclusion of consecutive patients*	*Prospective data collection*	*Endpoints appropriate to study aims*	*Unbiased assessments of study endpoints*	*Follow up period appropriate to study aim*	*Less than 5% lost to follow up*	*Prospective calculation of sample size*	*Adequate control group*	*Contemporary groups*	*Baseline equivalence of groups*	*Adequate statistical analysis*	*Total minors score*
Murakami *et al.*	1	2	2	1	2	2	2	0	2	NA	1	NA	15/24
Fridrich *et al.*	2	2	1	2	2	2	2	0	NA	2	NA	2	17/24
Goudot *et al.*	2	2	2	2	2	2	2	0	NA	NA	NA	NA	14/24
Hobeich *et al.*	2	1	2	2	2	2	2	0	NA	NA	NA	NA	13/24
Tan and Krishnaswamy	2	2	2	2	2	2	2	0	2	NA	NA	NA	16/24
Xu *et al.*	2	2	2	2	2	2	2	0	NA	NA	2	2	18/24
Rajpoot *et al.*	1	2	2	2	2	2	2	0	NA	NA	NA	0	13/24

extremely limited mouth opening who may require sophisticated anesthetic airway procedures requiring fibreoptic intubation. A trial injection of local anesthesia into the afflicted joint can occasionally rule out those who would be better off with medical treatment.[23]

Some believe MRI to be a valuable technique for studying the TMJ, although even in the greatest hands, disk abnormalities can be misdiagnosed or overdiagnosed. The location of the disk on MRI is unrelated to treatment results or symptoms, and MRI has little therapeutic value, is expensive, and delays active care. In patients who do not respond to conservative therapy, the authors consider arthrocentesis and arthroscopy to be the major investigative and therapeutic methods.[24]

Conclusion

When compared to arthrocentesis, arthroscopy lysis and lavage were shown to be more effective in improving MIO and lowering pain. Furthermore, the two procedures had similar rates of postoperative problems. However, due to a lack of slightly elevated studies in the high-impact, peer-reviewed literature, the current systematic analysis is incomplete, and more better-designed studies are needed to answer this important question before final conclusions can be drawn about the true comparative outcomes of TMJ arthrocentesis versus TMJ arthroscopy.

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