

Efficacy of Arthrocentesis with and Without Injection of Sodium Hyaluronate in Treatment of Internal Derangements of Temporomandibular Joint

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ABSTRACT

Background: Efficacy of arthrocentesis with and without injection of sodium hyaluronate in treatment of internal derangements of temporomandibular joint.

Materials and method: 20 patients with internal derangement were randomly selected and divided into 2 groups (10 in each group). GROUP A: Only arthrocentesis was performed. GROUP B: Arthrocentesis plus intra-articular injection of sodium hyaluronate was performed. The effect of treatment was assessed for 1 week and three months by documenting pre-treatment and post-treatment level of pain, mouth opening, lateral jaw movements and by noting presence or absence of clicking and deviation.

Results: Both groups of patients were benefited from the treatment at the 3 month follow up and there was less intensity of pain and improvement in mouth in both group. Our study failed to show a statistically significant difference in post treatment outcome in clicking and deviation on mouth opening between arthrocentesis group and sodium hyaluronate group.

Conclusion: Both techniques increased maximum mouth opening, lateral movements, in reducing TMJ pain. But arthrocentesis with injection of sodium hyaluronate gave better results than arthrocentesis alone.

Keywords: Temporomandibular joint, Arthrocentesis, Sodium hyaluronate.

INTRODUCTION

The prevalence of clinically significant Temporomandibular Joint (TMJ) related jaw pain is 5% of the general population. Approximately 2% of the general population seeks treatment for TMJ-related symptom. TMJ disorders may be the result of occlusal factors, trauma, emotional stress, parafunctional activities, muscular hyperfunction or parafunction, and/or underlying primary or secondary degenerative changes within the joint. It is important to note however that no single causative factor leading to TMJ disorders has been unequivocally demonstrated in scientifically based studies.¹ An internal derangement occurs when

there is a disturbance in the normal anatomic relationship between the disc and condyle that interferes with smooth movement of the joint and causes momentary catching, clicking, popping or locking.²

Both conservative and surgical techniques have been put forward for the treatment of TMJ internal derangement, but only a few of them have gained wide acceptance. The basic attempt has been to replace the disc in its normal position and thereby to provide relief of the symptoms. The turning point in the treatment of TMJ internal derangement was the introduction of TMJ arthroscopy and later of TMJ arthrocentesis. The

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Fig 1a, b, c and d: pre-operative profile, preoperative mouth opening, intra-operative procedure and post-operative mouth opening in Group A patient with only arthrocentesis performed.



Fig 2a, b, c and d: pre-operative profile, preoperative mouth opening, intra-operative procedure and post-operative mouth opening in Group B patient with Arthrocentesis plus intra-articular injection of sodium hyaluronate performed.

Table 1: Pain (VAS Scale).

	ARTHROCENTESIS GROUP Without SH			ARTHROCENTESIS GROUP With SH		
	Average	Stddev	P-Value	Average	Stddev	P-Value
PRE OP	2.6	0.996	0.025	4.4	0.84	0.001
ONE WEEK (POST OP)	2	0		2.4	0.84	
3 MONTHS (POST OP)	1.2	1.03		0.6	0.96	

Table 2: Mouth opening (MM)

	ARTHROCENTESIS GROUP Without SH			ARTHROCENTESIS GROUP With SH		
	Average	StdDev	P-Value	Average	StdDev	P-Value
PRE OP	42.0	2.94	-	34.2	5.45	0.007
ONE WEEK (POST OP)	42	2.94		36.7	4.11	
3 MONTHS (POST OP)	42.0	2.94		39.4	2.54	

Table 3: Right lateral jaw excursion.

	ARTHROCENTESIS GROUP Without SH			ARTHROCENTESIS GROUP With SH		
	Average	StdDev	P-Value	Average	Stddev	P-Value
PRE OP	8	0.94	0.343	7.3	1.25	0.343
ONE WEEK (POST OP)	8.2	0.63		7.4	1.173	
3MONTHS (POST OP)	8.2	0.63		7.4	1.173	

Table 4: Left lateral jaw excursion.

	ARTHROCENTESIS GROUP Without SH			ARTHROCENTESIS GROUP With SH		
	Average	StdDev	P-value	Average	StdDev	P-Value
PRE OP	8.1	0.737	0.678	6.4	1.43	0.05
ONE WEEK (POST OP)	8	0		7	0.94	
3 MONTHS (POST OP)	8	0		7.2	0.78	

simple lavage of the upper joint compartment under local anaesthesia enables the disc to slide and re-establishes a normal range of mouth opening in patients with closed lock. Today TMJ arthrocentesis is not only used in the treatment of acute closed lock but in various other temporomandibular

Table 5: Clicking.

	Without SH Injection			With SH Injection		
	Present	Absent	P-Value	Present	Absent	P-Value
Pre-op	10	0	0.585	8	2	0.350
First Week	9	1		7	3	
Third month	9	1		5	5	

Table 6: Deviation.

	Without SH Injection			With SH Injection		
	Present	Absent	P-Value	Present	Absent	P-Value
Pre-op	6	4	1.000	7	3	0.392
First Week	6	4		5	5	
Third month	6	4		4	6	

disorders as well.³ Intra-articular corticosteroid injection alone or after arthrocentesis provides long-term palliative effects on subjective symptoms and clinical signs of TMJ pain. Unfortunately, intra-articular corticosteroid injection has an unpredictable prognosis and also can cause local side effects on joint tissues. Sodium hyaluronate (SH) has been proposed as an alternative therapeutic agent with similar therapeutic effects. This highly viscous, high molecular substance plays an important role in joint lubrication and protection of the cartilage.³

This study was undertaken to evaluate the efficacy of arthrocentesis with or without sodium hyaluronate (SH) injection in of patients suffering from TMJ internal derangement.

MATERIALS AND METHODS

This is a randomized clinical study conducted on patients visiting Department of Oral and Maxillofacial Surgery, JSS Dental College and Hospital, Mysore .20 patients were evaluated in this study, both male and female patient, aged 16–55, with chief complaints of TMJ pain, joint sound in the TMJ and limited mouth opening. All patients were examined clinically and radiographically. Based on the history and examination of patient a diagnosis of internal derangement was made.

Patients were informed about the procedure, it's possible complication and about the material used. Informed consent was obtained from the patients and arthrocentesis performed under aseptic conditions.

Patients were randomly divided into 2 groups

GROUP A: Only arthrocentesis was performed

GROUP B: Arthrocentesis plus intra-articular injection of sodium hyaluronate was performed

INCLUSION CRITERIA

- Patients with temporomandibular joint internal derangement who did not respond to other non invasive treatment modalities.
- Systemically healthy individuals, both male and female

EXCLUSION CRITERIA:

- Medically contraindicated patient
- Pregnant and lactating women
- Known hypersensitivity to the hyaluronate preparations.

The patient seated at 45° angle on the dental chair with the head turned towards the unaffected side. The points of needle insertion was marked on the skin according to the method suggested by Mc Cain⁴. Entry points are marked along this canthotragal line. 1st point (posterior entrance point) is marked 10 mm from the midtragus and 2 mm below the line. 2nd point (anterior entrance point) is marked 10 mm from the first point and 10 mm below the line. 1st point corresponds to the glenoid fossa and 2nd to the articular eminence. The 2% Lignocaine local anesthetic is injected at the planned entrance points. Patient is asked to open the mouth wide and mandible is held in protruded position.

A 19 gauge needle was then introduced at 1st point. 2 to 3 ml of ringer lactate was injected through this needle to distend the joint space. Another 19 gauge needle was then inserted at the 2nd point to establish a free flow of the solution through the joint space. Around 200 to 300 ml syringe filled with ringer lactate was injected into the superior joint space through the 1st needle and 2nd needle provides an outflow for the ringer lactate. Then 2nd needle was removed and sodium

hyaluronate was injected into the superior joint space at the end of lavage, before the final needle is removed. Postoperatively antibiotics, NSAIDS and muscle relaxants were advised along with physiotherapy.

The effect of treatment was assessed for 1 week and three months by documenting pre-treatment and post-treatment level of pain (VAS score), mouth opening, lateral jaw movements and by noting presence or absence of clicking and deviation.

Statistical Analysis

The data collected were subjected to statistical methods comprising of Descriptive statistics, Paired-Samples t test & Chi-Square Test.

RESULTS

Pain was evaluated by a visual analogue scale (0 to 10) preoperatively and postoperatively noted at 1 week and 3 months. Intensity of pain decreased significantly ($P < 0.05$) in both group (TABLE 1). The reduction in pain was found to be statistically highly significant ($P < 0.0001$) in group B (TABLE 1)

Improvements in mouth opening was evaluated by recording the maximum mouth opening in mm pre-operative and post operatively at 1 week and 3 months. The increase in mouth opening from pre - op to 3rd month was statistically significant ($P < 0.05$) only in the arthrocentesis plus SH group (TABLE 2). Improvements in lateral movements was evaluated by recording right lateral jaw excursion (mm) and left lateral jaw excursion (mm) pre-operative and post operatively at 1 week and 3 months. Lateral movements increased in both this increase was only statistically significant ($P < 0.05$) in the arthrocentesis plus SH group (TABLE 4).

The effect of the treatment for clicking and deviation was decided on the basis of the proportion of improvement at the end of the treatment by noting their presence or absence. No significant association was observed between the groups and the presence of clicking and deviation at any time intervals ($P > 0.05$) (TABLE 5 and TABLE 6).

DISCUSSION

Arthrocentesis is a minimally invasive procedure that may be performed under local anaesthesia, with or without sedation, and its main purpose is to clear the joint of tissue debris, blood, and pain mediators that are believed to be by products of intra-articular inflammation. Although arthrocentesis is used for a variety of TMJ disorders (acute capsulitis or traumatic synovitis), long-term data are available only for its use in the treatment of disk displacement with reduction (Nitzan 1991),⁵ and where the most frequent symptoms of disk displacement with reduction are reduced MMO, pain, and dysfunction. These three findings are related to each other, and improvement in one of them affects the others positively⁵.

There is clinical evidence supporting the existence of disc displacement in TMJ internal derangement. However the recent concept suggests that a change in the position of the disc is not the primary factor in dysfunction and pain of the TMJ. Alterations in joint pressure, various biochemical substances and the constituents of the synovial fluid (and thereby failure of lubrication) may lead to clicking and derangement of the TMJ⁶

Pain associated with temporomandibular disorders may be associated with vasodilation. The release of NO (nitric oxide) and TBA-RS (thiobarbituric acid -reactive substance) may result from mechanical stress and high pressure directed to the upper compartment during clenching and jaw movements, which also play a role in the cause of internal derangements, it has been shown clinically that painful temporomandibular disorders, including disk derangements are associated with highly significant increase in the level of NO in the TMJ synovial fluid⁶. TMJ arthrocentesis is a procedure by which inflammatory mediators causing pain are lavaged from the upper joint space⁶

It has been proposed that intra-articular injection of sodium hyaluronate may decrease inflammatory mediators and may stimulate increased natural hyaluronic acid production by the synovial cells, these anti-inflammatory actions include scavenging of free radicals, inhibition of migration, and reduction of vascular permeability⁶.

Although pain decreased in both groups after treatment, a greater decrease in pain was seen in the arthrocentesis Sodium hyaluronate group throughout the postoperative period. This may be explained by the long-term lubricating effect of sodium hyaluronate, which prevents the onset of inflammatory mediators that are responsible for pain.

In our prospective study on 20 patients with TMJ internal derangement arthrocentesis was performed under high pressure using 200 -300 ml of ringer lactate as irrigation solution followed by sodium hyaluronate injection into the joint in group B patients. A study by Zardeneta et al.⁷ recommended a free flow of 100 ml of ringers solution because denatured haemoglobin and various proteinases were recovered in this fraction. Keneyama et al.⁸ recommended that ideal lavage volume of perfusate for arthrocentesis was 300–400 ml.

The improvement in mouth opening could be because of reduction of pain and high pressure irrigation which helps to release the adhered disc by release of negative pressure, reduction of surface friction and viscosity of synovial fluid⁹ In the immediate postoperative after week and third month follow-up period it was found to be improvement mouth opening. Various studies have demonstrated the use of morphine, fentanyl, bupivacaine, corticosteroids and sodium hyaluronate. They found that both bupivacaine and fentanyl had pain relieving effects for only 8 – 12 hours, saline had no analgesic effect and morphine was most effective, relieving pain for several days or weeks. Although fentanyl is a more potent analgesic than morphine, they thought that because of high lipid solubility, it was more rapidly eliminated from lipid capsule.¹⁰ Intra-articular corticosteroid injection alone or after arthrocentesis provides long-term palliative effects on symptoms and clinical signs of TMJ pain. Unfortunately, intra-articular corticosteroid injection has an unpredictable prognosis and also can cause local side effects on joint tissues.³

Hyaluronate is largely responsible for the viscosity and rheologic properties of normal synovial fluid. Its capacity to function as a molecular sieve is thought to be important both in regulating

the nutrition of articular cartilage and in physical interactions with the macromolecules of the articular surfaces. Hyaluronate is not known to induce damage or to elicit tissue reactions when used as an intra-articular injection¹¹

In the present study, maximal mouth opening and lateral jaw movements increased, and jaw function improved, while intensity of pain reduced and no statistically significant improvement in clicking of TMJ, and deviation on mouth opening both in patients having arthrocentesis only and in those having intra-articular injection of sodium hyaluronate following arthrocentesis. There is clinical evidence supporting the Further longitudinal interventional studies with a larger sample size and a longer follow up period are essential to determine the efficacy of arthrocentesis and sodium hyaluronate after arthrocentesis in the treatment of internal derangement of TMJ.

CONCLUSION

Our study concluded that arthrocentesis is a simple and minimally invasive procedure, with little risk of complications and has shown significant possible benefits in terms of improvements in pain and mouth opening. Clicking and jaw deviation were also reduced. The study is compatible with findings of similar work worldwide. To conclude both techniques increased mouth opening, lateral jaw movements and in reducing pain. but arthrocentesis with injection of sodium hyaluronate gave better results than arthrocentesis alone.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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