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Arthrocentesis in Internal Derangements of the Temporomandibular Joint- A Clinical Study

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Abstract
Aim: *To evaluate whether arthrocentesis, as a treatment modality, is effective in restoring the form, function, and in reducing pain in the Temporomandibular joint (TMJ).*
Materials and Methods: *Fifteen patients with complaints of sudden, persistent, limited mouth opening and pain stemming from the TMJ were subjected to arthrocentesis. Two 20 G needles were inserted into the superior compartment of the TMJ and 100ml of Ringer's lactate (RL) was used as the irrigant. The maximum mouth opening and lateral movements were measured. Pain was assessed using a Visual Analog Scale (VAS) of 100 points. All measurements were made prior to the procedure, immediately after and six months later.*
Results: *The maximum mouth opening was 25.9± 4.4mm pre operatively which increased to 39± 7.1mm immediately post operatively and to 42.8±7.7mm after a period of six months. This amounts to 52.5% increase immediately post operatively and 65.25% after six months, the percentage increase being 8.53%. The significance of the increase was tested using a paired't' test. The 't' values were 5.90 and 10.23 respectively, indicating that the mean increase in the extent of mouth opening was highly significant even at 0.001 level of significance. The arthrocentesis procedure is definitely helpful in restoring the normal range of motion of the mandible. Pain was measured using VAS. 67% of patients had pain relief immediately post operatively and 73% had 100% pain relief after six months.*
Conclusion: *Arthrocentesis is a surgical procedure, with high success rate, minimal complications, and is an essential first surgical step in relief of symptoms, prior to arthroscopy and/ or open joint surgery.*
Keywords: *Temporomandibular Joint Arthrocentesis, TMJ pain, Mouth Opening, Internal derangement of TMJ.*

Introduction

Internal derangements (ID) of the TMJ are a diagnostic and therapeutic challenge for the maxillofacial surgeon. Arthroscopy with lysis and lavage of the superior joint space was a treatment modality employed, with good results, but with surgical risks. It needed advanced inventory and general anaesthesia. Nitzan et al in 1991[1], advised arthrocentesis of the superior joint compartment of the TMJ with Lactated Ringer's solution, for relief of TMJ ID.

The adhesive force generated in the superior joint compartment of the TMJ, leads to decreased lubrication and persistent, severe limitation of

maximal mouth opening and is accompanied with severe pain[1]. During arthrocentesis the physical action of lysis and lavage of the superior joint space, rather than disc repositioning is believed to be responsible for the relief of symptoms[2].

In this study the maximum mouth opening, extent of lateral movement and pain were measured before and after the procedure and after a gap of six months. The results suggest that arthrocentesis is highly effective in re-establishing normal mouth opening, and in relieving pain, for a follow up period of six months

Patients, Materials and Methods

The patients reporting to the department of OMFS, Government Dental College, Thiruvananthapuram, during the period 2003-2004, with symptoms of TMJ ID were chosen as the study sample for this prospective observational study. All patients were informed of the procedure, risks involved, and informed consent was obtained. The patients included were those with sudden, persistent limited mouth opening and associated pain, without history of macro trauma. Fifteen patients, fifteen TM joints, 13 of them females and two males were selected for the treatment. The symptoms had been present from two weeks to twenty six months. The age of the patients was distributed between eighteen to forty years.

TMJ evaluation - The presence and duration of symptoms were recorded in a questionnaire. Joint sounds, clenching or grinding of teeth were evaluated. Pain was assessed using a Visual Analog Scale (VAS). Maximal mouth opening was measured as the distance between the incisal edges of the upper and lower central incisors. The lateral and protrusive movements were measured as the distance between the upper and lower incisors, during those movements. Joint noises were recorded as none, early or late clicks and crepitus. The criteria for inclusion were persistent, sudden, limited mouth opening of less than 30 mm, clearly originating in the TMJ. Limitation was associated with impeded lateral movement towards the unaffected side, as well as deviation to the affected side, during opening and protrusive movements. All the patients had proven refractory to conservative therapy- rest, medication, bite raising appliances, physiotherapy and manipulation of the joint.

Technique of Arthrocentesis- The procedure of arthrocentesis was performed under an auriculotemporal nerve block with 2% lignocaine. The patient is seated at a 45 degree angle with the head turned towards the unaffected side. The points of needle insertion are marked on the skin according to the technique suggested by Mc Cain[3], for the performance of arthroscopy. A line is drawn from the middle of the tragus of the ear to the outer canthus of the eye. The first entrance point is located along the cantho tragal line, 10 mm anterior and 2 mm inferior, and the second one is placed 10 mm anterior to the first point and 10 mm inferior to the imaginary line. These markings indicate the articular fossa and the eminence of the TMJ respectively.

A 20 gauge (G) needle is inserted into the superior compartment at the first entry point and a syringe loaded with Ringer's Lactate solution (RL) is attached and lavage is initiated. As the superior joint space gets filled up a bounce back effect is obtained. Another 20 G needle is inserted at the second point of entry, for exit of the lavage fluid. The lavage is done with around 100ml of RL. The patient is encouraged to open and close the mouth and to do side to side movements at regular intervals during the procedure. The lavage fluid enters through the first portal and exits through the second. The extent of mouth opening, lateral movements, and intensity of pain or the relief obtained is measured. Analgesics were prescribed (NSAID), to be ingested only as rescue medication. Physiotherapy consisted of opening and side to side movements and protrusion of the mandible, for a period of two weeks. No dietary restriction was placed. Reviews were done at the end of one week and at the sixth month.

Results

The effect of arthrocentesis on TMJ ID was studied in fifteen patients. The side of the joint, the extent of mouth opening and pain were measured prior to the procedure, immediately after the procedure and six months after the procedure. Joint sounds were also measured respectively. The tabulation is presented in table 1.

The extent of mouth opening pre operatively was 25+_4.4 mm which increased to 39.5+_7.1 mm immediately post operatively and to 42.8+_7.7 mm after six months. The increase was 52.5% immediately post operatively and 65.25% after six months, an increase of 8.53%---Figure1

The significance of the increase in the extent of mouth opening was tested by a paired‘t’ test. The computed‘t’ values for fourteen degrees of freedom were 5.90 and 10.23 respectively, indicating that the mean increase in the extent of mouth opening was highly significant even at 0.001 level of significance. So, the arthrocentesis procedure has definitely helped the restoration of normal range of motion of the mandible.

The present study also evaluated the reduction of pain post operatively using a visual analog scale (VAS). Measurements were made pre operatively, immediate post operatively and after six months. After arthrocentesis 67% of the patients had complete relief of pain. On follow up after six months 73% of patients had 100% pain relief. This reduction was statistically significant as evidenced from the‘t’ values. Two patients who complained of 50% pain relief were relieved of painto the extent of 85% and 90%, while one patient was relieved of pain by 20% only. This one patient did not have improvement in mouth opening either. Values are presented in table 2.

Statistical negative correlation was found between maximal mouth opening (x) and pain relief (y). The linear regression relationship was established between these two variables as y=126.449-2.849x with a significant correlation co-efficient of -0.7951 immediately after the operation. y=104.949-2.273x with a significant correlation of -0.8506 in the follow up study after six months. However at the preoperative stage these two variables were uncorrelated (r=0.0189).The summary statistics on the variables are presented in table3.

Comparison of clinical findings, Table 1

Patient no.	Side	Maximum mouth opening in mm			Joint sounds	
		Pre op	Post op.	6m	Pre-op	Post-op
1	Lt	23	46	45	Yes	No
2	Lt	35	47	57	No	No
3	Lt	31	41	45	Yes	No
4	Rt	25	45	45	Yes	No
5	Rt	28	40	40	Yes	No
6	Rt	30	42	45	Yes	No
7	Lt	20	30	40	No	No
8	Lt	20	20	20	Yes	Yes
9	Lt	23	46	46	Yes	No
10	Lt	29	35	38	Yes	No
11	Rt	26	37	40	Yes	No
12	Rt	28	44	48	Yes	No
13	Rt	27	39	45	No	No
14	Lt	22	40	44	Yes	No
15	Rt	21	40	44	Yes	Yes

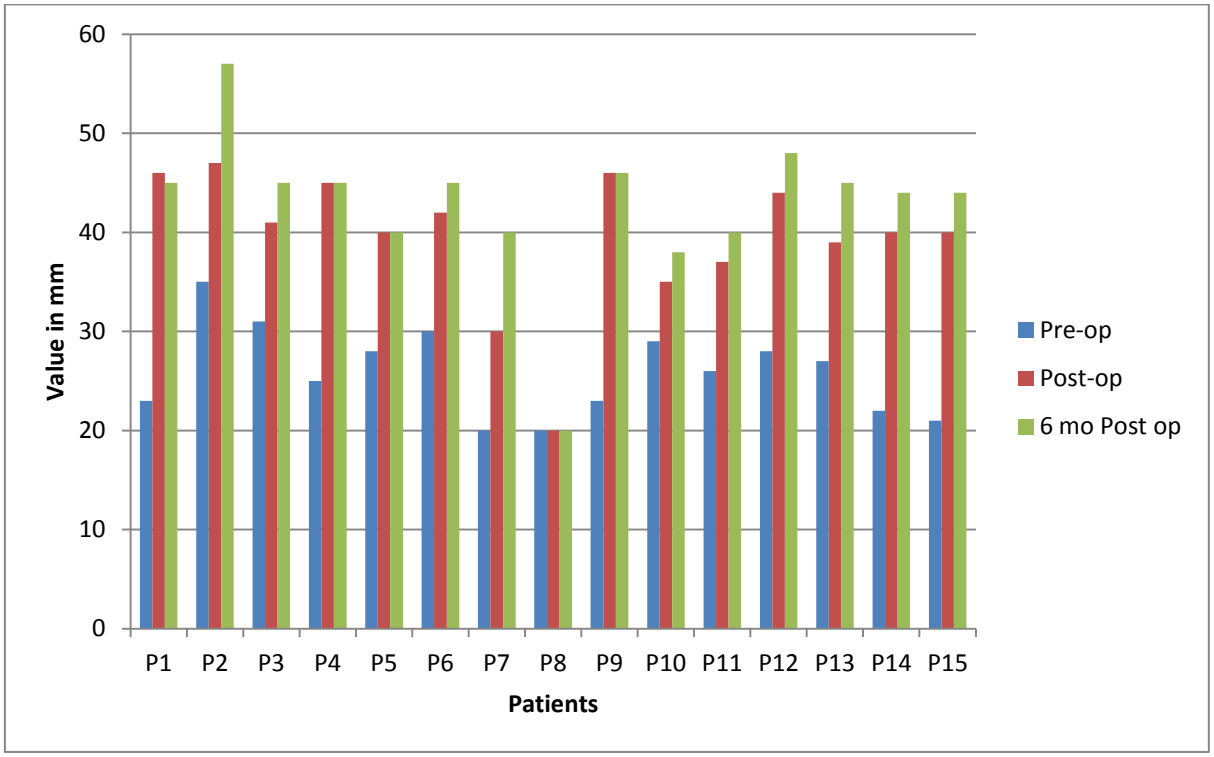
VAS values for Pain, Table 2

Patient no.	Pain pre operatively	Pain post op	6month follow up
1	100	0	0
2	90	0	0
3	100	0	0
4	80	0	10
5	90	20	0
6	70	0	0
7	100	10	0
8	100	80	80
9	90	0	0
10	70	50	10
11	100	50	15
12	90	0	0
13	50	0	0
14	100	0	0
15	20	0	0

Summary statistics on the variables studied, Table 3

Sl.no	Variables	Mean	Standard error	Coefficient of variants (%)	Range
1	Age(in years)	29.1	7.3	24.26	18-40
2	Duration of limitation of mouth opening(in months)	6.7	8.1	117.33	0.5-26
3	Extent of maximum mouth opening(in mm) Pre-operatively	25.9	4.4	16.45	20-35
4	Extent of maximum mouth opening (in mm)- Immediately post operatively	39.5	7.1	1.73	20-47
5	Extent of mouth opening (in mm)- 6 months after arthrocentesis	42.8	7.7	17.4	20-48
6	Extent of pain (%)-pre operatively	83.3	22.9	26.5	20-100
7	Extent of pain (%) – Immediate post operatively	0	---	---	0-80
8	Extent of pain (%)- After six months	0	---	---	0-80

Comparison of maximum mouth opening, Figure 1



Discussion

Arthrocentesis is the procedure of aspirating fluid from a joint space using a needle followed by injection of a therapeutic substance[4] Interest in arthrocentesis for the TMJ was generated indirectly through the success of arthroscopic lysis and lavage, in the treatment of limited mandibular movement due to closed lock[5,] Nitzan et al[5] observed that arthroscopic lysis and lavage of the superior joint space of patients who had limited mouth opening, gave best results in the non-reducing or closed lock group.

In our series of fifteen patients, all had a sudden inability to open the mouth widely (acute closed lock), and severe pain in the joint. They were treated with arthrocentesis, with good results. There was immediate improvement in mouth opening and pain was relieved. These results were sustained for the entire period of six month follow up.

Nitzan and Dolwick[6] proposed that sudden, severe, limited mouth opening is not caused by abnormal disc shape or position, but is rather a result of restricted gliding on forward translation

of the disc to the fossa, due to a reversible effect such as a vacuum and/ or a change in synovial fluid consistency. The joint becomes stuck by a suction cup effect resulting in sudden severe limitation of mouth opening. The immediate improvement in mouth opening, seen in our study, suggests that the reversal of the adhesive forces is the possible cause of correction of the closed lock of the TMJ.

William A Carvajal[7] did a long term evaluation of TMJ arthrocentesis and concluded that arthrocentesis can produce long term relief of pain and dysfunction in patients with ID of the TMJ. 89% of his patients were pain free or had only mild pain for an average of four years post operatively, and 88% had no or only a minimal amount of dysfunction. Even though our study was conducted for only six months, and long term evaluation is warranted, the result of 62.25% increase in maximum mouth opening, and 100% pain relief in 73% of patients, after six months, is in line with the observation of other authors.

William A Carvajal[7] observed that arthrocentesis should be the initial procedure in the surgical algorithm for treating most patients with TMJ ID. Our study strongly supports this opinion.

In Nitzan's[1] study of 17 patients, with a follow up of 14 months, a success rate of 91% was seen. In our study of six months a success of 100% was seen in 73% of patients.

Dimitroulis et al[8] in their study, and follow up of 21 months, obtained an increase in maximum mouth opening of 17.7 mm. Our result of 16.9 mm compares favourably with his and of others.

Porter[9] proposed that hyper vascularity is associated with inflammation and that inflammation and its mediators cause pain. Therefore, if lysis and lavage by arthrocentesis decreases inflammation, pain should decrease and result in increased jaw mobility. This is the inference that we correlated in our study with a result of 65.25% improvement in mouth opening and 100% relief of pain in 73% of patients

In our study we have followed the technique described by Nitzan at al[1], which, in addition to bringing fluid under pressure, allows massive lavage of the joint space, the needles serving as entrance and exit ports. The points of needle insertion are marked on the skin according to the landmarks suggested by Mc Cain[3] for arthroscopy. Murakami et al[10] and Segami[11] used one needle to pump fluid into the upper compartment of the TMJ to increase the hydraulic pressure within the joint. The amount of Ringer's lactate used in our study was 100ml, as advocated by Zardenata et al[12]. They had observed that this amount had reduced the protein concentration in a volume dependent manner, with a reported therapeutic volume of 100ml. With a quantity of 100ml of RL we could get a result of 65.25% increase in mouth opening and 100% relief of pain, in 73% of patients.

In our study steroids were not used, neither bite raising appliances post arthrocentesis. This was contrary to what Nitzan[1], Kirk L Fridrich[13], Barry B Kendall[4] and William A Carvajal[2] had used in their studies. We had avoided the use of corticosteroids intra articularly, so as to preserve the specificity of the lavage agent, i.e. RL, in achieving the objectives.

The complications seen were extravasation of fluid into the surrounding tissues and transient facial nerve palsy, due to the action of local anaesthetics, and swelling due to perfusion of RL during the procedure. We did not encounter hematoma formation or infection, as experienced by others. In cases where arthrocentesis failed, it was due to our inability to enter the upper compartment due to the conical anatomical shape of the condyle as well as distorted anatomy, as seen in X-ray film.

Conclusion

Our study attempted to evaluate the effectiveness of arthrocentesis on TMJ ID. A follow up of six months was done. The results suggest that arthrocentesis can produce good relief of pain and dysfunction in patients with TMJ ID. Although no control group was observed, who got medical management alone, the high rate of relief of pain

and increased mouth opening, suggests its effectiveness. 73% of patients had 100% pain relief and 65.25% had sustained improvement in maximum mouth opening, for a period of six months.

The reason for closed lock of the TMJ-namely adhesive forces in the upper compartment, were washed away by the lavage, thereby releasing the disc and allowing its mobility. Pain was controlled due to the wash out of the mediators of inflammation.

A volume of 100ml of RL was sufficient to obtain a good lavage, as demonstrated by the increased mobility and decreased pain in the TMJ.

To conclude, arthrocentesis is an surgical procedure, with high success rate, minimal complications, and an essential first surgical step prior to arthroscopy and/ or open joint surgery.

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