Valley International Journals
Open Access Journal
VIJ
New Thinking New Innovation

International journal of medical science and clinical Invention
Volume 1 issue 4 2014 page no.114-128 ISSN: 2348-991X

Efficacy of Arthrocentesis in Temporomandibular Joint Pain Disorders

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ABSTRACT

Background : Disorders of the TMJ are one of the most formidable problems faced by Oral and maxillofacial surgeons today.Patients are offered minimally invasive procedures such as arthrocentesis after the conservative therapies fail. The aimof the present study was to evaluate the efficacy of arthrocentesis in patients suffering from TMJ disorders.

Patient and Methods:

A total of 25 subjects suffering from TMJ pain disorders not responding to conservative treatment were selected and treated by arthrocentesis. The subjects were followed up for a period of 6 months .

Results:

The mean maximal mouth opening and lateral movements improved after the procedure. The mean degree of pain and dysfunction was markedly reduced after arthrocentesis as per the visual analogue scale.

Key Words: Arthrocentesis, Visual analog Scale

INTRODUCTION

Temporomandibular joint (TMJ) pain dysfunction is a therapeutic challenge in the oral and maxillofacial clinic. Although TMJ pain and dysfunction can be

caused by many different etiologic factors like neuromuscular hyperactivity (Bruxism), malocclusion, trauma, disc dislocation and degenerative joint diseases, the presenting symptoms are often similar.. Radiographic and biochemical signs of inflammation were frequently found in the TMJs of the patients who had long-standing pain and tenderness of this joint [1]. These pain disorders describe an abnormal relationship of the articular disc to the mandibular condyle and the articular eminence.

Temporomandibular joint disorders are often treated in a stepwise fashion. Initially, conservative measures should be tried before any interventional procedures are considered. These non invasive measures include soft diet, jaw exercises, non steroidal anti-inflammatory drugs and bite raising appliances [2].

Various invasive therapeutic procedures which can be used in Temporomandibular joint disorders patients are arthrocentesis, arthroscopic lysis and lavage and arthrotomy [3]. The success of arthroscopy has led to the use of arthrocentesis as a simple therapeutic modality with a satisfactory outcome [4].

Both conservative and surgical techniques have been put forward for the treatment of TMD, but only a few of them have gained wide acceptance. The basic attempts have been to replace the disc in its normal position and thereby to provide

relief of the symptoms [5]. Many procedures have been developed to try to alleviate the pain and functional complaints of the patient suffering from TMJ dysfunction[6].

“Arthrocentesis” is recognized increasingly as first line of surgical intervention in patients who do not respond to conservative management. It is traditionally defined as a procedure in which the fluid in a joint cavity is aspirated with a needle and a therapeutic substance in injected. This treatment rationale was based on two treatment modalities

namely pumping manipulation procedure and the arthroscopic lysis and lavage. Irrigating the superior joint space will result in the creation of the hydraulic pressure, which will release the displaced disc and thereby reestablish normal maximal mouth opening [7].

Several authors have conducted studies to detect effectiveness of arthrocentesis in various TMJ disorders. Hence in the light of previous studies, the present study evaluated the effectiveness of arthrocentesis in temporomandibular joint disorder patients.

MATERIAL AND METHODS

The study population was randomly selected from the patients attending the Oral and Maxillofacial Surgery OPD with complaint of pain in temporomandibular joint

25 patients with TMJ pain dysfunction were selected and included in the study. There were 07 males (28%) and 18 (72%) females. Male to female ratio was 1: 2.5. Mean age of the patients was 32.6years (range between 20 to 58 years). The inclusion and exclusion criterion [Table-1] for selecting the patients was as mentioned in the table1.

Table-1

INCLUSION CRITERIA	EXCLUSION CRITERIA
Age group more than 20 years with Temporomandibular joint pain dysfunction of at least one year duration	Extremes of age
Both the sex.	Edentulous patients
Unilateral or bilateral temporomandibular joint pain dysfunction.	Patients with any history of previous invasive procedures on TMJ
Pain, crepitus and clicking in TMJ with limited mouth opening.	Patients with metabolic diseases

METHODOLOGY:

All the patients who fulfilled the inclusion criterion were selected for the study. Informed written consent of the patients was taken. The clinical examination of all the patients was carried out. Chief complaint of the patient was recorded. Past medical history, family history and personal history of all the patients were recorded.

Clinical examination also included the evaluation of the maximal mouth opening (MMO) which was measured by the distance between the incisal edges of the upper and lower central incisors with the help of a metallic scale. Determination of the range of the lateral mandibular movement measured by the distance between the upper and lower midline on lateral movements(LM) by using a scale.

Pain level and dysfunction were determined by the patients self assessment using VAS ranging from 0 to 10.

ASSESSMENT USING VISUAL ANALOG SCALES:

"Pain is an experience", it is usually assessed by eliciting information directly from the patient in clinical settings. Pain or dysfunction is generally assessed through 'subjective' self report measures.

VAS I was used for assessing the level of pain and VAS II was used to assess the disturbance in jaw function[9]. In our study, Visual Analog Scale ranging from 0 to 10 [Fig-1] was used to document the level of pain (VAS I) and disturbed jaw function (VAS II)[Fig-2]. Zero (0) on each VAS was taken to mean no pain

(VAS I) or no impairment in chewing ability (VAS II) and (ten) 10 was most intense pain imaginable (VAS I) or total inability to chew (VAS II).

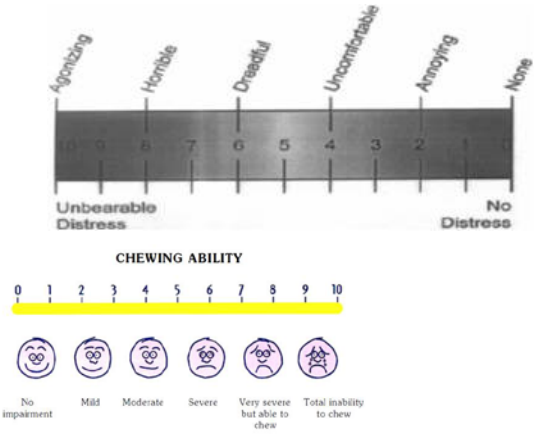


Fig-1. Visual analog scale - I (FOR PAIN) Fig-2. Visual analog scale II (For Dysfunction)

The patients then marked it on the chart along this scale with reference to the closest verbal descriptor. Patients themselves marked on the chart before the procedure and in every follow up visit thereafter using the chart containing the same scales.

After thorough TMJ evaluation and clinical examination, transcranial view was done to evaluate any TMJ internal derangement disorders.

After the clinico-radiological examination the patients were subjected to routine blood investigations, Internationalized ratio (INR), blood sugar estimation and urine examination. All the subjects were evaluated with a pre-anaesthetic check up.

METHOD OF ARTHROCENTESIS

The patients were seated on dental chair at a 45^0 angle, with the head turned to the unaffected side to provide an easy approach to the affected joint. Surgical area was scrubbed and draped aseptically. External auditory meatus was blocked with peanut swab soaked in liquid paraffin.

Two points of needle insertion are marked over the skin of the affected joint indicating the articular fossa and eminence. A line is drawn from the middle of the tragus to the outer canthus (Holmlund's line) [Fig-3]. The posterior entrance point is located along the canthotragal line, 10mm from the middle of the tragus and 2mm below the line. This posterior point is only for pumping the fluid into the upper compartment to increase the hydraulic pressure within the joint. The anterior point of entry is placed 10mm farther along the line and 10mm below it [Fig-4].

Fig-3. Canthotragal line (Holmlund's line) Fig-4. Landmarks depicting anterior and posterior ports

Local anaesthesia (lignocaine 2%with adrenaline 1:80,000) was infiltrated in the affected TMJ to block the auriculotemporal nerve. An 18-gauge needle is inserted into the superior compartment of the anterior articular fossa (posterior point), followed by the injection of 2-3ml of Ringer's Lactate solution to distend the joint space. Another 18-gauge needle is then inserted into the distended compartment (anterior point) in the area of articular eminence to enable a free flow of solution through the superior compartment. Ringer's Lactate solution is then taken in a 50cc syringe and attached to the 18 gauze needle and a sufficient pressure is given to assure the free flow of approximately 100-300ml of solution over 15-20min period [Fig-5]. During the procedure, exact timing of reestablishment of normal mouth opening is determined by having the patient to make the repeated attempts to open the mouth and by performing lateral, protrusive and excursive movements. After performing a thorough lavage of the TMJ the needles are removed.

Fig-5. Free flow of Ringers Lactate solution from the anterior port

Pressure dressing is applied which is removed 24 hrs post-operatively. Signs for any neurological deficits were checked. Postoperative medication consisted of oral antibiotics, analgesics and muscle relaxants for 1week.

Active mouth opening exercises were advised to all the patients two days postoperatively. A course

of physiotherapy was advised to all patients seven days post procedure. Follow up of the patients was regularly done after one week, one month, three months and six months.

RESULTS:

Twenty five selected patients with complaints of pain in the jaws and limited mouth opening were treated with arthrocentesis of the affected side of the temporomandibular joint. The dropout rate of the patients was zero. All patients were regular in their follow up.

The results obtained were tabulated. The pre procedural and post procedural changes were compared using paired 't' test.

OBJECTIVE FINDINGS FOLLOWING TREATMENT

We have carried a paired't' test for MMO before the procedure and at the end of follow up of 6 months. Difference of -10.52 (Before – After) in the average MMO is very highly significant at the end of follow up of period of 6 months. (t = -13.73mm, p= 0.0001) [Table-2]

	N	MEAN	Std Dev	SE Mean
MMO (Before)	25	25.280	3.260	0.652
MMO (Follow Up)	25	35.800	3.674	0.735
Difference	25	-10.520	3.831	0.766

T Value =13.73mm, P Value = 0.0001

TABLE-2 :Paired t-Test and CI: MMO Before, MMO At follow up

The last two rows of the table depict the mean values and the standard deviation. The average values of improvement in maximal mouth opening are also presented [Graph-1].

GRAPH-1: AVERAGE MAXIMUM MOUTH OPENING (mm

We also tested the improvement in lateral movements (LM) towards the unaffected joint which had improved significantly compared to the values before the procedure. Here a difference of -5mm (Before – After) is also very significant statistically (t= -14.64mm and p=0.0001) [Table-3]

	N	MEAN	Std Dev	SE Mean
LM (Before)	25	3.320	1.030	0.206
LM (After)	25	8.320	1.843	0.368
Difference	25	-5.000	1.708	0.342

T-Value = -14.64 **P-Value** = 0.0001

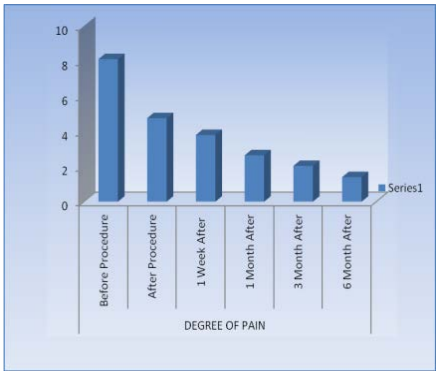
TABLE-3: Paired t-Test and CI: LM Before, LM After 6 months

up)				
Difference	25	6.480	2.347	0.469

T-Value = 13.80 **P-Value** = 0.0001

SUBJECTIVE FINDINGS FOLLOWING TREATMENT

We observed the degree of pain (VAS I) in respect of 25 patients. The observations included the degree of pain pre procedure, immediate post-procedure, 1 week, 1 month, 3 months, 6 months post procedure. Graph 2 presents the average degree of pain experienced by the patient for 6 months time period.



GRAPH-2: DEGREE OF PAIN (VAS I):AVERAGES

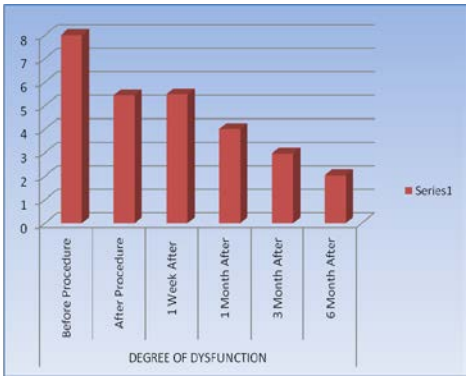
To see if there is significant reduction in degree of pain pre procedure level to post- procedure level at the end of 6 months time period, a paired 't' test has been applied [Table- 4].

	N	MEAN	**Std Dev**	SE Mean
VAS-I (Before)	25	7.880	1.054	0.211
VAS-(Follow	25	1.400	1.633	0.327

TABLE-4: Paired T-Test and CI: VAS-I Before, VAS-I At follow up

The results are similar to the ones obtained with respect to MMO and LM earlier. [Table1,2]. The reduction is as high as 6.4 on VAS I scale and is highly significant (t= 13.80, p= 0.0001).

We presented the readings on degree of dysfunction (VASII) which were self assessed by the patients for the same time periods as in the case of MMO and degree of pain. The results are in complete agreement with results in respect of other three characters. A difference of 5.88 on VAS II scale is also very highly significant (t= 15.84, p= 0.0001) [Table-5]. Degree of dysfunction assessed by the patients was markedly reduced[Graph-3]



GRAPH-3: DEGREE OF DYSFUNCTION (VAS II): AVERAGES

	N	MEAN	Std Dev	SE Mean
VAS-II (Before)	25	7.920	0.909	0.182
VAS II-(Follow up)	25	2.040	1.767	0.353
Difference	25	5.880	1.856	0.371

T-Value = 15.84 **P-Value** = 0.0001

TABLE-5: Paired T-Test and CI: VAS-II Before, VAS-II At Follow up

DISCUSSION

Arthrocentesis has been become familiar for the past one and half decades, but its history dates back many years. The fact that an inflammed joint is potentially harmful was realized by the Aztec Indians, said to be described some five centuries ago by Bernardino De Shagum. Indeed, they were the first to perform therapeutic arthrocentesis, using an unspecified thorn[8].

Murakami et al, were the first to offer a systematic description of TMJ arthrocentesis and found excellent results in releasing closed lock by arthrocentesis lavage and lysis[9]. Internal derangement of the temporomandibular joint generally progresses from the first stage, where there is clicking accompanied by normal maximal mouth opening (MMO) to a stage where clicking gradually decreases concomitantly with varying degrees of restriction in mouth opening (closed lock).

Moses et al in their study confirmed that arthroscopic lysis of TMJ adhesion and lavage within the superior joint space are encouraging[10].

The lavage procedure may be carried out with either Hartmann's solution/ Ringer's lactate or normal saline. These solutions by their composition do not have any difference in their effects if the lavage of TMJ is performed by any of these solutions[11]. The introduction of fluid into the upper joint space is to increase the intra-articular pressure and lavage of the joint space. There is no change in the disc space or its position[12].

Following lavage, many authors have suggested injection of a therapeutic substance. Intra-articular injection of steroids, sodium hylarunoate have been widely used and their effects widely studied in many studies and found to be beneficial [13]. Hence, in this present study, no steroid injections were administered.

The mechanism for the improvement is unclear, because the cause of the limited motion and the pathology remains an enigma. The release of negative pressure on the disc, release of adhesions and reduction in surface friction and viscosity of the synovial fluids are all postulated as possible reasons[8].

In our study the mean gain in MMO is (10.52 mm) and The findings were less to those of Nitzan DW et al[9] (24.1mm to 42.7mm), Dimitroulis G et al (1995)[11] (24.6mm to 42.3mm), Fridreich KL et al (1996)[13] (33mm to 41mm), Hosaka H et al (1996)[14] (30.6mm to 44.5mm), Nitzan DW et al (1997)[15] but still a sufficient increase in mouth opening was achieved. Gain in lateral movements towards the unaffected side is 5mm in our study. The values were little lower than when compared to that of Nitzan DW et al[9] but the values were higher when compared with that of the studies conducted by Nitzan DW et al (2001)[8], who used intra articular injection of steroids. In our study we have used only Ringer's Lactate solution for intra- articular lavage. Similarly the pain and dysfunction decreased significantly ($P<0.001$) following arthrocentesis.

All the patients in our study had a significant relief from pain and dysfunction. None of the patients had to be taken for other surgical procedures within the follow up period.

It was established that, there was a progressive increase in the maximal mouth opening and improvement in lateral movements and progressive decrease in the degree of pain experienced by the patients.

There appears to be a strong female preponderance to temporomandibular disorders. In our study the male:female ratio was 1:2.5. This female preponderance prompted some to suggest that cellular activities in the TMJ may be modulated by sex hormones. Estrogen receptors have been identified in female baboon and human female TMJs but they are absent male TMJs[16]. Estrogen inhibits cartilage synthesis in animal models of osteoarthritis. Estrogen also increases the production of proinflammatory cytokines in uterine tissue and by macrophages.

Prolactin, a hormone responsible for initiating secretion of milk in the post partum period may also exacerbate cartilage and bone

degradation in animal models of inflammatory arthrids[17].

Consequently, estrogen and prolactin may adversely affect the adaptive capacity of articular tissues of the TMJ by inhibiting fibro cartilage synthesis and enhancing cellular matrix degradation. The number of patients in our study is significant to come to conclusion regarding female preponderance.

Lavage may further be useful for the management of osteoarthritis, early rheumatoid arthritis and acute intra capsular trauma with haemarthrosis of the TMJ[11,18].

Extravasated erythrocytes and fibrin deposits may be formed in joints with displaced discs. Lavage could possibly also remove such inflammatory products[19].

In the inflamed TMJs, powerful mediators of inflammation and pain like prostaglandin E_2 and leukotriene B_4 have been identified in significant concentration in the synovial fluid[20].

Arthrocentesis is effective in reducing the inflammatory components in the joint and removing pain mediators allowing the joint's normal movement and expediting perfusion of nutrients and thus allowing some component of repair and adaptation.

Ringer's lactate solution of 100-300 ml is sufficient in removing the inflammatory components[8,21]. In our study we have consistently used 100ml of solution to lavage the joint space.

A comprehensive post-operative rehabilitation programme is necessary following the procedure and significant success has been reported. This restores proper joint function, reduction of pain and prevention of further injury[19].

It should be noted that the same physiotherapy proved useless for these patient prior to arthrocentesis. All the patients included in our study had undergone medicinal treatment, physiotherapy and occlusal splint therapy prior to arthrocentesis with no relief from symptoms. In our study it is noted that physiotherapy following arthrocentesis produced further improvement.

Despite all these efforts, complications have been documented in arthrocentesis. The following complication of TMJ

arthrocentesis and lavage, although rare, may occur.Extravasation of fluid into the surrounding tissues,haematoma with risk for infection,broken instruments,tenderness over the pre auricular region, middle ear effusion, transient facial nerve paralysis[22].

. In our study two patients had extravasation of fluid into surrounding tissue which eventually resolved in two days. Inter occlusal discrepancy was seen in one patient which was transient and was relieved spontaneously at the first follow up.

The ability to complete the procedure with little risk of complications and significant possible benefits make it a first-line option for patients with acute and chronic limitation of motion secondary to intra capsular causes[6].

In terms of cost-versus-benefit analysis, there seems to be little doubt that a procedure performed under a local anaesthetic or light sedation and done with minimal, common armamentarium which is present in any dental office and therefore is the preferred option. Failures may occur in arthrocentesis and this has been attributed to inappropriate case selection. The other thing to be thought about is that whether injection of lubricating agents like sodium hyaluronate will improve the results also awaits further investigation. However some studies show improvement in temporomandibular joint pain and mouth opening after intra articular injections[23].

CONCLUSION

When the surgeon uses to make recommendations to patients regarding a treatment, it must include knowledge of the disease state, the diagnosis, the spectrum of management option, the likelihood of success or improvement with particular technique, and his or her skill with a particular procedure. The cost, invasiveness, potential complications and long-term results with the selected procedure must also be considered. With all other factors otherwise equal, the least invasive procedure is the ideal one. In the case for arthrocentesis, it is not only the least invasive, but also the least expensive, and it has the fewest potential complications and has a proven outcome experience in the management of internal derangement of TMJ.

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