TMJ arthrocentesis for acute closed lock: Retrospecive analysis of 40 consecutive cases

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الهدف من هذه الدراسة تقييم النتائج الطويلة الأمد للبزل المفصلي في علاج مظاهر تحدد حركة المفصل الفكي الصدغي والتي ينتج عنها اعاقة في حركة الفك السفلي.
تشمل الدراسة ٦٢ مريضاً فجأة أصيبوا بإعاقة في مقدار فتح الفم ناتج عن المفصل الفكي الصدغي وتم تحليل ذلك بشكل استعراضي.
وتألفت مجموعة الدراسة من ٤٠ مريضاً متسلسلاً مع ٦٤ لديهم مشاكل بالمفصل الفكي الصدغي . تم معالجة هؤلاء بواسطة البزل المفصلي ، جميع المرضى صنف مستوى الألم لديهم بمقياس متناظر وتم ملء المعلومات عن ألم الفك : سوء وظيفة الفك ، والحياة اليومية للمريض تم قياسها بواسطة أسئلة ذاتية قبل العلاج وبعد ٦ ، ١٢ ، ٢٤ ، ٣٦ شهراً بعد العلاج . تم قياس مسافة فتحة الفم بين القواطع في وضعيات مختلفة ، الاختلاف بين مقدار فتحة الفم بعد العلاج وقبل العلاج تم تحليلها إحصائياً وتم حساب نسبة النجاح طبقاً لقواعد النجاح ، نسبة النجاح كانت ٩٥٪ بعد ٣٦ شهراً من المتابعة . كل علامات ما بعد العلاج أظهرت تحسناً ملحوظاً.
يعتبر البزل المفصلي الأسلوب العلاجي المفضل لحالات الإعاقة في حركة المفصل الفكي الصدغي وللحالات المختارة بعناية.

The aim of the study was to evaluate the long-term results of arthrocentesis in the management of anchored disc phenomenon with its resultant limitation of jaw movement.The study involving 62 patients with suddenly occurring severe and persistent limited mouth opening originating from TMJ were retrospectively analyzed. The study group consisted of 40 consecutive patients with 64 involved TMJs. These were treated by arthrocentesis. All patients rated their pain level on visual analogue scale and filled information on jaw pain, jaw dysfunction and daily living activity scores on a self-questionnaire pre-operatively and at 6, 12, 24, and 36 months post-operatively. The interincisal opening was measured on each setting. Pre-operative and post-operative differences were analyzed statistically and the success rate was calculated according to the success criteria. The success rate was 95% at 36 months follow-up. All post-operative scores showed marked improvements. Arthrocentesis is considered to be the treatment modality of choice for acute closed lock cases of temporomandibular joint in carefully selected cases.

Introduction

Internal derangement of the temporomandibular joint (TMJ) is a progressive disorder which usually starts with clicking associated with normal mouth opening (anterior disc displacement with reduction), to a stage where clicking gradually ceases but restricted mouth opening ensues (closed lock).[1] This was attributed to a nonreducible anteriorly displaced articular disc acting as an obstacle to the gliding condyle. A turning point occurred in 1997, when Nitzan described another category that resulted in limitation of mouth opening, namely, the anchored disc phenomenon (ADP).[2] This disorder causes the disc to stick tightly to the fossa thus preventing the gliding movement of the condyle. ADP is a condition which previously was mistakenly called disc displacement without reduction[2,3] but display some distinctive characteristics inconsistent with the natural history of internal derangement. It is characterized by sudden onset of severe and persistent closed lock with radiological evidence of a lack of condylar sliding. The maximum mouth opening ranges from 13 to 28 mm and absence of a history of clicking is a prerequisite for the disorder. In 1991, Nitzan *et al*[1] were the first to describe arthrocentesis of temporomandibular joint as a treatment concept for severe closed lock symptoms. This treatment rationale was based on two treatment modalities; namely pumping manipulation procedure[2] and the arthroscopic lysis and lavage.[3,4] Irrigating the superior joint space will result in the creation of the hydraulic pressure, which will release the displaced disc and thereby re-establish normal maximal mouth opening. Arthrocentesis has proved to be a minimally invasive treatment modality, relatively safe, repeatable and it can be done on outpatients under local anesthesia which significantly revert the mouth opening to a normal range. It is an effective method for the re-establishment of normal disc-condyle-fossa relationship. ADP has a unique clinical signs and symptoms but its exaggerated response to such simple treatment have led to the conclusion that the pathology of this disorder of severe limitation is incompatible with the displaced and deformed disc as associated with internal derangement. There have been several studies to evaluate the treatment outcome following arthrocentesis of TMJ.[5,6,7] This

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study retrospectively evaluated the long term treatment outcome of this procedure and determined the efficacy of this procedure for patients with acute closed lock symptoms of TMJ.

Materials and Methods

The study involved 62 patients (53 females and 9 males; age range 16 to 50 years; mean, 28.9410.51) who were referred to the Department of Oral & Maxillofacial Surgery, Salmaniya Medical Complex, Bahrain from September 1995 to June 1998. These patients presented with suddenly occurring severe and persistent limited mouth opening originating from the TMJ, not associated with macrotrauma, and which didn't respond to noninvasive treatment for at least three months. The condition was reported to have started from 3 weeks to 12 months (mean, 11.43 $\pm$ 8.35 months) prior to presentation to the clinic. Majority of the patients complained of limitation of mouth opening with frequently preauricular pain upon forced mouth opening (Fig. 1). Most could not recall incidents that might have caused the restriction in mouth opening. TMJ evaluation was recorded on a questionnaire by the patient and the examiner. All patients received conventional nonsurgical treatment prior to arthrocentesis namely: medical therapy of non-steroidal anti-inflammatory drugs and muscle relaxants for 1-2 weeks, mandibular manipulation and fabrication of anterior repositioning splint for 3-4 months. Patients who responded to any nonsurgical treatment modality were excluded from the study. Patients who had previous history of clicking were not included in the study. The nonsurgical group consisted of 17 female and 5 male patients with 26 joints involvement, their mean age 28.7 years and locking duration was 8.75 months. These patients were excluded from the study group. The study group consisted of 40 patients with involvement of 64 TMJs (36 females and 4 males). Clinical examination consisted of evaluating maximal mouth opening (MMO), measured by the distance between the incisal edges of the upper and lower incisors in millimeters (mm); determining lateral and protrusive mandibular movements and determining the presence of joint noise on palpation. This was rated as none, early or late clicking or crepitus. The criteria for inclusion in the study were sudden, persistent disability, but not necessarily painful, limited MMO of 25mm evidently originating in the TMJ, restricted lateral movement toward the unaffected joint, deviation of the mandible toward the affected side on mouth opening and on protrusive movements. There should be exacerbated pressure in the affected joint on forced mouth opening and no radiographic evidence of osseous changes. All patients had plain open and closed mouth radiographs for the TMJ (Fig. 2) as well as MR imaging (Fig. 3) prior to arthrocentesis to confirm

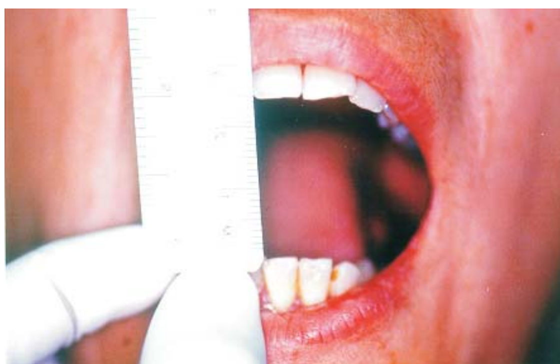

Fig. 1. A 23 year-old female patient had a persistent reduction of mouth opening for 8 months not proceeded by clicking.

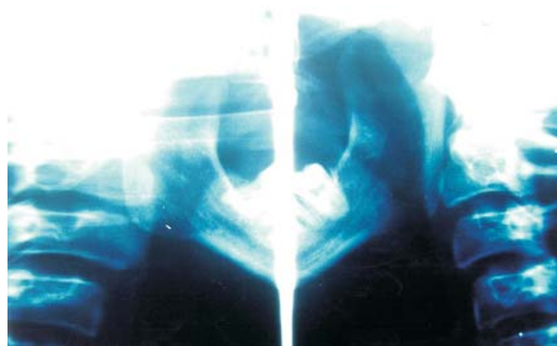

Fig. 2. Plain TMJ views on closed and open mouth position showing reduced condylar movement.

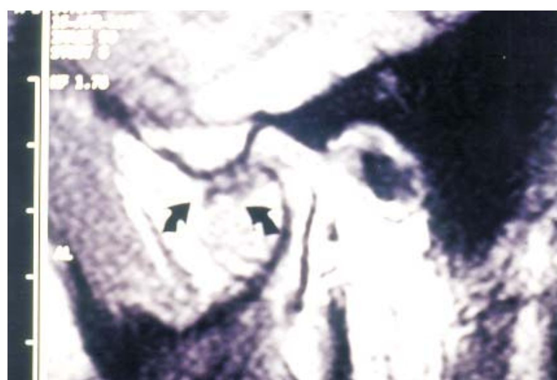

Fig. 3. MR imaging of TMJ showing the disc stuck to the articular eminence impeding condylar movement.

meniscus position and any joint pathology. The arthrocentesis procedure was performed as described by Nitzan.[1] The procedure was undertaken by marking two points over the skin of the affected joint indicating the articular fossa and the eminence. The auriculotemporal nerve was blocked by the injection of local anesthesia. The superior joint space at the articular fossa was entered using 19-gauge needle. The superior joint space was insufflated by the injection of 2-3 ml of Ringer's lactate solution. The area of the articular fossa was entered similarly with another 19-gauge needle to establish a free flow of fluid through the superior joint space. The Ringer's lactate solution was continuously injected into the joint using 10cc hypodermic syringe for 15-20 minutes (Fig. 4). The

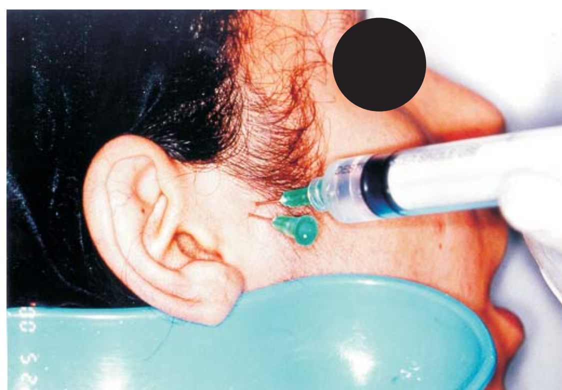

Fig. 4. TMJ arthrocentesis procedure.

patients were asked to manipulate their joints by opening and closing their mouth. The procedure was terminated upon the establishment of normal MMO. Post-operative medication consisted of non-steroidal anti-inflammatory medication and diazepam tablet 10 mg as necessary for two weeks in association with the wear of the interocclusal appliance for 4-6 weeks. All patients had physiotherapy following the procedure to maintain their range of jaw motion (Fig. 5).

All patients were examined before treatment and at 6 months, 12 months, 24 months and 36 months after the procedure in the outpatient clinic. Patients rated their pain level on a visual analogue scale (VAS) and filled information on jaw pain, jaw dysfunction and daily living activity (DLA) scores on a self-questionnaire (Table 1). The interincisal jaw opening was scaled with a metric ruler. One of the authors (GD) carried out the examination.

The criteria for success used in this study are the disappearance of or reduction of arthralgia,

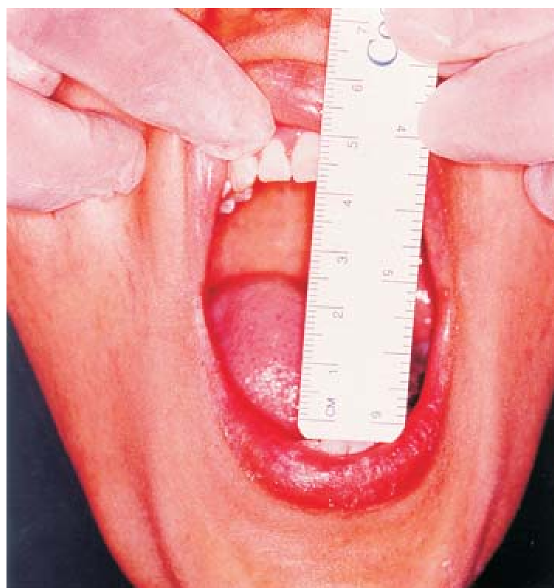

Fig. 5. Maximum mouth opening 36 months following arthrocentesis.

Table 1. Pre- and post-operative data.

	No.	VAS	Pain score	Jaw dysfu-nction	Jaw opening (mm)	Daily activity
Pre-operative	40	5.7±0.5	6.9±1.1	7.2±4.0	13.1±3.6	8.9±8.5
3 months	40	3.2±2.0	4.5±3.9	5.3±3.4	31±3.6	7.4±6.5
6 months	40	1.2±1.5	2.3±2.1	3.0±2.1	42±5.0	1.7±1.9
12 months	40	1.0±1.1	1.0±1.1	2.1±1.7	42±5.0	1.5±1.7
24 months	40	0.9±1.0	0.9±1.0	1.7±1.3	42.3±1.3	1.3±1.5
36 months	40	0.6±0.9	0.6±0.9	1.5±2.1	43.7±4.0	1.0±1.3

MMO of 38 mm with lateral and protrusive movements of 5 mm, disappearance of the locking symptoms as well as eating of normal diet. Evaluation of pain was done on the basis of both VAS measure (mild pain scored less than 2 and 10 points being maximum) and pain score (mild pain scored less than 4 and 32 points being maximum). Dietary evaluation was judged by DLA scores.

The efficacy of the proposed treatment as measured pre-operatively and post-operatively was statistically tested by students t-test (P value 0.05).

Results

There was significant increase in mouth opening following arthrocentesis at 3 months to 36 months ($P < .001$), from a range of 5 to 20 mm

(mean, 13.1 ± 3.6 mm) prior to the procedure to 35 to 50 mm (mean, 42.7±4 mm) 36 months following arthrocentesis. Lateral movement toward the unaffected side improved significantly ($P < 0.0057$), from 2 to 5 mm (mean, 3.75 ± 2.9) to 8 to 12 mm (mean, 10.5 ± 1.0 mm). The mean increase in MMO and lateral movement toward the unaffected side was 18.6 ± 6.8 mm and 6.9 ± 1.4 mm, respectively. Although none of the patients had experienced clicking prior to arthrocentesis, three patients, however, had clicking following arthrocentesis. All post-operative scores showed significant improvement (Table 1). Moreover, the average VAS of pain decreased from 5.7 to 0.6 and the average pain score decreased from 6.9 to 1.1. The jaw dysfunction score decreased from 7.2 to 1.5 and the daily living score improved from 8.9 to 1.0. With student's t-test, these data represented a statistically significant reduction in pain score and also showed significant improvement in jaw function and chewing ability as a result of arthrocentesis treatment. According to our criteria, the success rate was 95% (38 of 40). Two patients continued to have pain and limitation of mouth opening but without joint noise. Both had TMJ arthrotomy and anchor discopexy resulted in improved mouth opening post-operatively. However, the associated pain remained unchanged.

Discussion

Since the earlier report by Nitzan *et al*,[1] arthrocentesis has rapidly become a useful, simple and effective minimally invasive nonsurgical treatment technique for closed lock of TMJ. Nitzan *et al*[1] described a high success rate of 91% in 17 cases. Frost *et al*[8] reviewed 40 treated cases and concluded that the procedure is quite reliable and satisfies both the clinician as well as the patients in cases of acute TMJ locking but frequently results in unsatisfactory outcome in chronic or osteoarthritic cases or particularly in patients with history of TMJ surgery. Nitzan[9] reported also the 3-year long-term outcome of arthrocentesis for 27 patients with painful closed lock TMJ in which a high success rate of 96.5% was revealed. Hosaka *et al*[10] in a preliminary 3 months follow-up study reported 74% success rate with arthrocentesis in patients with persistent closed lock. Murakami *et al*[6] in a 6 months follow-up study reported a 70% success rate. Dimitroulis *et al*[5] reviewed 40 cases after 21 months follow-up with reduced jaw opening and mandibular function and reported significant improvement following arthrocentesis for closed locking of TMJ.

In our study, the success rate of the arthrocentesis for TMJ ADP in 40 consecutive cases was 95% over 3 years. The short- term outcome was 80% (32 patients) but the long- term outcome have improved significantly. Although two of the failed cases underwent arthrotomy at 9 months follow-up, the clinical symptoms gradually improved over the next three years without additional treatment. However, both patients continued to have mild pain in the TMJ region. Regarding the treatment efficacy, the recorded scores of VAS, jaw dysfunction, daily activity and jaw opening degree, indicated continuous improvement at 3 years follow-up when compared to pre-operative data. We hypothesize that proper case selection is crucial to guarantee high success rate. Nitzan *et al*[10] showed that the mean interincisal jaw opening following arthrocentesis superseded arthroscopic surgery due to the formation of intra-articular scarring inflicted upon the TMJ by arthroscopic surgery. Hosaka et al[7] claimed that the treatment efficacy of arthrocentesis was similar to successful conventional non-surgical treatment and arthroscopic surgery as well. Murakami *et al*[6] compared non-surgical treatment with arthrocentesis and arthroscopy. He hypothesized that the clinical efficacy of arthrocentesis might be somewhat inferior to that of arthroscopic surgery. However, the comparison between group differences of the post-operative data of VAS, pain, jaw dysfunction and DLA scores and jaw opening revealed no statistical differences. He concluded that when appropriately applied clinical efficacy of arthrocentesis is favorably comparable to arthroscopic surgery as well as the successful nonsurgical treatment.

Fridrich *et al*[11] in a prospective study assessed arthroscopic lysis and lavage with arthrocentesis (hydraulic distension and lavage). They concluded that both treatments are useful for decreasing patient's pain and increasing functional modality of the mandible. Ness and Crawford[12] retrospectively reviewed 41 patients (62 joints) treated with arthrocentesis over a 2.5 year-period. Their indication included acute (less than 4 months) or chronic limited condylar movement, pain localized to the affected joint or failed TMJ surgery. Sixteen patients completed the study. They reported that five of six acute closed lock

patients had successful treatment and four of nine chronic (4 months to 7 years duration) closed lock patients had improvement. There was poor success in cases of failed TMJ surgery, with neither of the two patients showing improvement.

The treatment mechanism of arthrocentesis is unclear mainly because the cause of the limitation of condylar motion and pathology remain an enigma. Nitzan[13] hypothesized that this restriction is caused by complete lack of disc gliding which is adherent to the posterior slope of the articular eminence. This may result from fibrous adhesions, severe friction between damaged rough surfaces, stickiness directly attributed to an increase in the viscosity of synovial fluid, or possibly a vacuum effect. This is probably produced by parafunction, such as clenching and grinding, blowing, yawning, other oral motor behavior or trauma to the mandible. Thus, the mechanism of treatment consequences are possibly lavage of the pathologic joint fluid, release of adhesions followed by the elimination of the vacuum cup effect in locked joint. Frequently, a joint with acute closed lock and no joint noise will be converted to a joint with reciprocal noise consistent with disc displacement with reduction. The mechanism of pain reduction following arthrocentesis is not clear. It is quite possible that the collective therapeutic effect of muscle relaxant, anti-inflammatory agents, inter-occlusal appliance and physiothera complementary roles. This treatment alone py with its resultant reduction of joint loading playedis beneficial only in 10% of the cases. In contrary, arthroscopic lysis and lavage or arthrocentesis of the upper joint space will result in complete resolution of the problem.[5]

Conclusion

Disc adherence to the articular fossa of TMJ can be released effectively by arthrocentesis. Arthrocentesis is a simple, non-invasive and reproducible procedure which can be undertaken under local anesthesia in the outpatient clinic. It is the treatment modality of choice for locking symptoms of TMJ and results in long-term improvement of normal range of jaw motions. Proper patient selection plays a vital role in the success of this treatment.

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