Is there a role for arthrocentesis in recapturing the displaced disc in patients with closed lock of the temporomandibular joint?

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Objective. The aim of this study was to evaluate the effectiveness of arthrocentesis in releasing acute and chronic closed lock of the temporomandibular joint, improving function, reducing pain and recapturing the displaced disc.

Study design. We performed arthrocentesis and mandibular manipulation (MM) as an initial treatment in 33 patients (unilateral involvement) with a variable duration of closed lock and magnetic resonance imaging (MRI) evidence of anterior disc displacement without reduction (ADDWR). Duration of locking ranged from 1 week to 2 years. After the procedure, soft diet, physiotherapy, and an interocclusal appliance (IA) were prescribed. Postoperative MRI images were obtained at 1 month. A clinical examination with analysis of maximal mouth opening (MMO), a visual analog scale (VAS), and a self-administered questionnaire were used for evaluation of pain, jaw dysfunction, and activities of daily living (ADL). The follow-up period was 1 year.

Results. At 1-year follow-up, MMO had increased significantly from a mean of 24.7 ± 5.9 mm to 39.6 ± 6.2 mm (P < .05). Functional improvement was associated with a significant reduction in VAS (from 6.2 ± 2.3 to 2.8 ± 3.4), pain (from 11.7 ± 7.1 to 4 ± 3.8), dysfunction (from 8.6 ± 4.9 to 3.2 ± 2.8), and ADL scores (from 13.9 ± 12 to 4.4 ± 5), with P < .05. The overall success rate was 72.7%; it was higher in acute patients (87.5%) than in chronic patients (68.0%). The disc was recaptured (the disc was interposed between the condyle and the eminence on closed and open MRI images) in 3 cases in which the duration of locking was less than 1 month (acute patients).

Conclusions. The results indicate that arthrocentesis, in association with MM and IA, could be effective in improving function and reducing pain in patients with closed lock. Better results were obtained in terms of MMO, VAS, and questionnaire scores in acute closed lock cases than in chronic ones. Recapturing the anteriorly displaced disc is possible only in patients with acute closed lock. (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2008;105:274-80)

Closed lock of the temporomandibular joint (TMJ) is considered a consequence of a nonreducing deformed disc acting as an obstacle to the sliding condylar head. Clinical signs of this condition are restriction of translatory movements, absence of clicking, deviation in opening the mouth toward the affected side, limitation in lateral movement toward the contralateral side, and restriction in protrusive movements, with the mandible shifting toward the affected side. Pain is present on palpation and during opening movements.

Traditionally, on magnetic resonance imaging (MRI) closed lock appears as an anterior disc displacement without reduction (ADDWR).

Nitzan et al. proposed the “anchored disc phenomenon” as etiology for closed lock, suggesting to consider it as an independent entity from a nonreducible anteriorly displaced disc. The particular MRI appear-
The presence of this entity is a disc fixed to the glenoid fossa (static or stuck disc).

Arthrocentesis and hydraulic distension of the TMJ has been described as an effective modality in decreasing joint pain and increasing the range of mouth opening in patients with closed lock of the TMJ.\(^5\)\(^-\)\(^7\) Success rates for TMJ arthrocentesis in closed lock, as reported in literature, have varied from 70\% to 95\%\(^4\)\(^-\)\(^7\)\(^-\)\(^9\)

But could this simple lavage of the upper joint compartment help to reposition the disc into its normal position?

Studies comparing the pre- and postoperative imaging status of patients treated with arthroscopic lysis and lavage have demonstrated that the improvement of disc position was rare but possible.\(^10\)\(^-\)\(^13\)

The literature reveals controversy about disc position after arthrocentesis. Some authors assessed the presence of modifications in terms of disc position after hydraulic distension\(^6\) and after arthrocentesis\(^14\) by clinical examination. Other authors\(^15\),\(^16\) evaluated disc position from MRI before and after arthrocentesis and hydraulic distension. They failed to detect any change in the preoperative MRI diagnoses of disc position. More recently, some MRI studies showed the possibility of changes in disc position after treatment with arthrocentesis.\(^17\),\(^18\)

The aim of the present study was to evaluate the effectiveness of arthrocentesis, in conjunction with mandibular manipulation, in improving function, reducing pain, and recapturing TMJ disc in patients affected by acute or chronic closed lock caused by ADDWR.

METHODS

Thirty-three patients with unilateral TMJ involvement were included in this study. Two men and 31 women aged 21 to 73 years (mean 41.8 years) presenting limited mouth opening and joint pain were examined clinically and with MRI. On clinical examination, MMO ranged from 12 to 30 mm (mean 24.7 mm), opening of the mouth was associated with deviation of the mandibular midline toward the affected side, contralateral movements were limited, ipsilateral movements were normal, and protrusive movements were restricted, with the mandible shifting toward the affected side. Pain was present on palpation and during opening movements. On palpation, there was evidence of hypomobility of the affected joint. Based on these examinations, a diagnosis of closed lock was made in all of the patients. Duration of symptoms ranged from 1 week to 2 years (mean 34 weeks). In 8 patients out of 33, the duration of locking was less than 4 weeks (acute closed lock). In the other 25 patients duration of locking exceeded 4 weeks (chronic closed lock). On MRI examination, all of the patients presented ADDWR.

The patients completed a questionnaire, proposed by Murakami et al. in 2000,\(^19\) consisting of a visual analog scale (VAS) for pain, 8 specific questions on pain, 5 on jaw dysfunction, and 18 on activities of daily living (ADL).

All of the acute patients were initially treated with mandibular manipulation attempting unsuccessfully to release the closed lock.

Arthrocentesis of the superior joint compartment was performed in all of the patients under local anesthesia using the technique described by Nitzan et al.\(^7\) For the auriculotemporal nerve block, 0.3 to 0.5 mL anesthetic solution was injected; 3.5 mL anesthetic solution was injected into the upper joint compartment as well. The skin was then penetrated with a 19-gauge needle at the articular fossa followed by the injection of 3 mL Ringer solution to distend the joint space, pumping it in and out repeatedly. Another 19-gauge needle was inserted into the distended compartment in the area of the articular eminence, and the superior joint space was irrigated with 200 mL Ringer solution, allowing a free flow through the first needle (Fig. 1).

On termination of procedure, 1 mL commercially available sodium hyaluronate was injected into the superior compartment. Then mandibular manipulation was performed attempting to recapture the displaced
The thumb of the hand of the operator was placed on the last mandibular molar on the affected side and the mandible was gripped and pulled downward and forward. The other hand was placed on the temporal region on the same side to stabilize the patient’s head during the manipulative maneuver. The patient was also instructed to protrude, laterotrude, and open the mouth during the maneuver. Finally, the mandible was moved posteriorly to return the condyle to the glenoid fossa. Postoperatively, soft diet, nonsteroidal antiinflammatory drugs, physiotherapy, and an interocclusal appliance, to be inserted daily as long as possible, were prescribed. At 1-month follow-up, an MRI postoperative study was done in all of the patients without the interocclusal appliance in place.

The patients were evaluated by the questionnaire and by clinical examination at 1, 3, 6, and 12 months postoperatively. The preoperative and 1-year postoperative MMO and questionnaire scores were compared and tested statistically with the Student $t$ test.

According to Murakami et al., to determine the success rate 3 criteria were used: degree of arthralgia, mouth opening, and ability to eat a normal diet. Arthralgia, evaluated from responses on the VAS and pain score, had to be absent or mild (VAS less than 2 points out of a maximum of 10; pain score less than 4 out of 32); mouth opening had to be more than 38 mm; and dietary evaluation was undertaken from the ADL scores about chewing, swallowing, and eating soft and hard foods (less than 4 out of a maximum of 16). When the 3 criteria were met, the result was evaluated as “excellent.” If two items met the criteria for success and the third did not but had improved compared with the preoperative value, the result was evaluated as “good.” Other conditions were assessed as “poor.”

**RESULTS**

As Table I shows, according to our success criteria 18 patients were assessed as “excellent,” 6 as “good,” and 9 as “poor.”

![Fig. 2. A 38-year-old patient. Preoperative maximal mouth opening measured with a ruler.](image)

The success rate was 72.7%. After arthrocentesis, the average VAS of pain decreased from 6.2 to 2.8. The average pain score decreased from 11.7 to 4.0. Jaw dysfunction score decreased from 8.6 to 3.2. The ADL score improved from 13.9 to 4.4. The average MMO increased from 24.7 to 39.6 (Table II).

In the 8 acute patients, the success rate was higher (87.5%) than the success rate in the chronic patients (68.0%).

By Student $t$ test, these data represented a statistically significant reduction in pain scores and showed significant improvement in MMO, jaw dysfunction, and ADL scores.
After the procedure in 5 patients of the acute group, we clinically suspected that disc repositioning had occurred. All of them, immediately after the operation, had shown a straight and significantly increase in jaw opening. The 1-month postoperative MRI study revealed a normal disc position in open and closed mouth (with location of the posterior band of the disc at the superior, or 12-o’clock position, relative to the condyle in closed mouth and with interposition of the disc between the condyle and the articular eminence in open mouth) in 3 patients of them. An MRI was done in the same 3 patients at the 1-year follow-up confirming the stability of the results (Figs. 2-7). We did not clinically suspect disc recapture in any patients of the chronic group. The MRIs obtained at 1 month confirmed our suspicion of no recapture of the disc in all the chronic patients.

**DISCUSSION**

In his critical review, Dimitroulis\(^{20}\) recently asserted that acute-onset closed lock could be effectively managed with arthrocentesis, whereas chronic closed lock could be effectively managed with arthroscopy.

First, we had to establish what “acute” closed lock means. The literature shows controversy about the duration of acute closed lock. Ness\(^{21}\) defined as acute a closed lock whose symptoms last for less than 4 months, Hosaka et al.\(^{8}\) affirmed that arthrocentesis is an...
effective treatment technique for acute closed lock, according to their study on patients with average locking duration of 5.6 months. Murakami et al.9 presented unsuccessful outcomes after arthrocentesis in patients with a locking duration longer than 7 months, concluding that the procedure is indicated for acute closed lock patients.

In our study we considered as “acute” closed lock a limited mouth opening (less than 30 mm) of short duration (less than 4 weeks) caused by an ADDWR.

In an earlier description of the procedure, Nitzan et al.7 performed arthrocentesis in patients with locking ranging from 2 months to 5 years. In these patients the locking had suddenly occurred and the limitation in mouth opening was persistent.

Arthrocentesis was recommended by Nitzan et al.3,4 to release the closed lock caused by the disc fixed to the glenoid fossa (static or stuck disc), namely, the anchored disc phenomenon. It works as an impediment to the normal translation of the condyle during mouth opening. This condition was diagnosed by Rao et al.22 with MRI in 1993 and popularized by Nitzan and Marmar in 1997,3 who reported a success rate of 90% after treatment with arthrocentesis. However, a study is needed with MRI evidence of the return to normal articular physiology and normal disc position after arthrocentesis23 in fixed disc cases.

The present study included patients affected by anterior disc displacement without reduction by MRI evidence. In terms of etiology, none of our patients showed MRI signs of a fixed disc. In our overall experience we diagnosed a fixed disc less frequently than ADDWR, as reported by Rao et al.22

Our original question regarded the possibility of recapturing the displaced disc and not only releasing the clinical symptoms of the closed lock; the release of the symptoms is a phenomenon that can be achieved independently from the disc recapture.11,12

In their study, Murakami et al.6 concluded that recapturing the disc with arthrocentesis and mandibular manipulation was possible. The author confirmed the success in recapturing the displaced disc in 9 of 10 patients only by clinical examination through palpation...
of enough rotation of the mandibular condyle without pain, and through the finding of straight and significantly increased jaw opening. After the follow-up of 6 months, 7 of the 9 patients had no recurrence of the closed lock.

Reporting their experience, Frost et al. assessed that frequently a joint with closed lock and no noise will be converted to a joint with opening and closing sounds consistent with disc displacement with reduction after arthrocentesis.

In both studies, no evidence of the recapture or modification in terms of disc position was demonstrated by MRI.

In contrast, Emshoff et al. studied patients with MRI but found no change in the prevalence rates of the types of internal derangement after the treatment, demonstrating that arthrocentesis is a valuable procedure for alleviating or eliminating pain and dysfunction and reestablishing MMO rather than realtering disc position or shape.

In a recent article Emshoff et al. disproved their earlier statements, demonstrating that changes in disc position are possible after arthrocentesis but without significant difference between pre- and post-treatment MRI diagnosis. These results are consistent with those reported by Ohnuki et al. In their study, 1 out of 9 joints (11.1%) affected by ADDWR and treated with arthrocentesis showed anterior disc dislocation with reduction on postoperative MRI. There was no significant difference in the rates of joints that showed ADDWR between pre- and post-treatment MRI. They did not state if these changes occurred in acute closed lock cases or in chronic ones. Besides the statistical significance that is important for the scientific validity of a study, we have to wonder which conditions favor the disc recapture.

While treating ADDWR, we observed that the disc could be “recaptured” and replaced in its normal position. To reach this goal it is important to include mandibular manipulation. Mandibular manipulation alone has shown a low success rate in recapturing the disc but in the past it was successful when associated with arthrocentesis.

We speculate on this factor: Distension of the capsule, pumping, and increase of the viscosity by injection of sodium hyaluronate allow mandibular manipulation to restore the dynamic of the disc-condyle complex; splint therapy results helpful to maintain this goal.

The present results suggest that arthrocentesis is an effective surgical way to treat TMJ closed lock. Patients with short-term closed lock showed a higher success rate in increasing MMO and reducing pain than patients with long-term closed lock. In 3 acute patients, repositioning of the displaced disc was achieved through arthrocentesis and confirmed by MRI. Therefore, as reported in the literature, duration of locking influences the outcomes.

As this study demonstrates, the repositioning of the displaced disc is possible, but it depends on the duration of closed lock. This is probably the consequence of the fact that with time the retrodiscal tissue tends to become less elastic and more fibrous, which causes the reduction to occur later in the trajectory of translation. In other words, with time, reduction is achieved with more and more difficulty. The reason why disc recapture can be reached in acute patients is based on this hypothesis.

CONCLUSIONS

In conclusion, we can affirm that replacing the disc in a normal position is possible with the combined approach of arthrocentesis, mandibular manipulation, and interocclusal appliance, but only in acute patients. However, disc recapturing is not essential to obtain good function and a relief of pain in patients with closed lock.

REFERENCES


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