Efficacy of Autologous Blood Injection for Treatment of Chronic Recurrent Temporo-mandibular Joint Dislocation

Original Article

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ABSTRACT

Background: Many non-surgical and surgical procedures have been used to treat patients with chronic recurrent temporomandibular joint dislocation (CRTMJD). Autologous blood injection (ABI) represents a promising approach.
Aim of the work: To evaluate the effectiveness and safety of ABI in the treatment of patients with CRTMJD.
Patients and Methods: This prospective comparative study involved patients with CRTMJD who were treated by arthrocentesis and ABI with those treated with arthrocentesis alone between January 2017 and January 2020. Analysis of clinical presentation, diagnosis, close observation of patients has been carried out.
Results: 140 patients were included in this study, 87 were males and 53 were females. Their ages ranged between 16 to 82 years. They were randomly divided into two groups of 70 each. Group-1 received arthrocentesis followed by ABI and Group-2 received arthrocentesis alone. In group-1, only one ABI was required and was successful in 63 patients and re-injection was required in 7 patients. None of the patients need surgery due to re-injection failure.
Conclusion: Positive results on this modality were observed, some questions are still noted about the effect of blood injection on the articular cartilage and on the development of fibrous or bony ankylosis.

Key Words: Autologous blood injection, chronic recurrent temporomandibular joint dislocation, maximum mouth opening, pain.

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INTRODUCTION

Temporomandibular joint dislocation is the dislodgement of the mandibular condylar head from its anatomical position in the glenoid fossa to become anterior to the articular eminence during mouth opening. It represents 3% of all reported dislocated joints in the body[1] and can be partial (subluxation) or complete (luxation), bilateral or unilateral, acute, chronic protracted, or chronic recurrent.[2].

Many non-surgical and surgical options can be used to treat patients with chronic recurrent temporomandibular joint dislocation (CRTMJD)[3].

Non-surgical (or conservative) options include limits on mandibular movements (in conjunction with soft diet and muscle relaxants), application of local anesthetics, botulinum toxin injection into the muscles of mastication, injection of sclerosing agents (intraarticular or extracapsular), and autologous blood injection (ABI) into the temporomandibular joint[4]. When the non-surgical modalities are not effective in the care of a patient with CRTMJD, surgical treatment may be considered. Surgical options include capsular plication, articular eminence augmentation or reduction, temporalis tendon scarification, lateral pterygoid myotomy and condylectomy[5].

Although ABI is a promising approach for treatment of patients with CRTMJD, it is still not popular among surgeons due to unclear reasons[6].

The goal of this article is to evaluate the effectiveness and safety of ABI in the treatment of patients with CRTMJD.

PATIENTS AND METHODS:

A prospective study was performed at the Maxillofacial the institutions of the authors. The study included patients with CRTMJD who were treated from January 2017 to January 2020. Patients were randomly divided into two groups. An open source randomization software was used for this purpose. Group-1 received arthrocentesis followed by ABI and Group-2 received arthrocentesis alone.

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Arthrocentesis is not a treatment for CRTMJD. The study was designed to specifically study the effect of Autologous blood injection (ABI) only. Since the arthrocentesis was required to be done before the ABI, it was done on the control group also. Without this arthrocentesis, it would be difficult to determine that the result obtained in the study group was due to ABI or arthrocentesis. Once the arthrocentesis is done in the control group, this bias is eliminated, and the study results become more reliable.

Selection criteria

Patients with clinical and radiological bilateral CRTMJD who presented to our departments and were voluntarily willing to be enrolled in the study and signed an informed written consent.

Exclusion criteria

The patients with bleeding disorders, pregnancy, bony pathology of TMJ, allergy to local anesthetic and those on narcotics or anti depressants were excluded. Patients with previous intervention on the TMJ and those who refused to sign the written informed consent were also excluded.

Ethical clearance

This study was approved by the institutional review board and ethics committee and conducted in accordance with the declaration of Helsinki. All cases signed an informed written consent.

Patient evaluation:

All cases were subjected to history taking, physical examination and routine investigations. Their pre-operative mouth opening was measured between the maxillary and mandibular incisor edges (Figure 1: A). A digital panorama Pan TMJ view in open and closed positions was obtained for all patients (Figure 1: E). The diagnosis of CRTMJD was based on the clinical and radiographic evaluation with the condylar head palpated outside the glenoid fossa and panoramic findings showed the condylar heads outside the glenoid fossa during mouth opening.

Technique:

1. Arthrocentesis was done in all patients. Group-1 received arthrocentesis and ABI in the superior joint space (SJS) and the peri-capsular extrarticular tissues (PT). Group-2 subjected to arthrocentesis alone without ABI.

2. The procedures were performed under local anesthesia using 2% lignocaine hydrochloride with adrenaline 1:200000, with the patient in a supine position. After sterilization, we massaged the face for 5 minutes in a circular way and local anesthesia injection was applied to the auriculotemporal nerve on both sides.

3. Technique of arthrocentesis: Planning of the objective site was finished utilizing sterile precautionary measures. Cotton soaked with saline was utilized to plug the outside ear meatuses reciprocally. A trago-canthal line was drawn from the midregion of the tragus to the external canthus of the eye. The two points of needle penetration were designated over the skin of the involved TMJ as point A and point B. Point A was the posterior passage point, distinguished along the tragus-canthal line, arranged 10mm from the center of the tragus and 2mm beneath the line. The point B was the anterior passage point, and it was set 10mm farther along the tragus-canthal line and 10mm underneath it. This was trailed by the infusion of local anesthesia via the auriculotemporal nerve block. An 18-guage needle was then inserted into the upper joint compartment of the TMJ auricular fossa (via the posterior passage point), trailed by the infusion of 2-3ml of Ringer's Lactate for stretching the joint space. Another 18-guage needle was inserted in point B for the liquid to come out from the TMJ compartment. Ringer's Lactate was then passed via one of the needles with enough strain to guarantee the free progression of 200ml solution during 15-20min period which was accomplished by the other needle over the joint. During the exercise, ordinary mouth opening movements controlled by the patient were endeavored, till the entire solution was used. In ABI group, the 18-gauge needle at the point A was kept in place to be used for ABI, while the needle at point B was removed. In the control group, both needles were removed.

4. Technique of ABI: six mL of blood were withdrawn from the cubital vein of the patient and 2 mL were injected by first needle at point A, into the articular fossa. The needle was then withdrawn outward for 1 cm and an additional 1 mL of blood was injected around pericapsular tissue. On the opposite side the same procedure was carried out. We put an elastic bandage for one week, with instruction to the patients that the mouth opening would not be more than 2 fingers. Anti-inflammatory analgesics were administered for 3 days (Figure 1: B and C).

Follow-up and data variables record:

Follow-up was performed regularly, and the patients were evaluated for post-operative pain by using a Visual Analogue Scale (VAS) at the 2nd day, and the postoperative maximum mouth opening at 2 months (figure 1: D). Patients were also evaluated clinically for frequency of the number of dislocations and occurrence of TMJ sounds. Also, the patient satisfaction was recorded at 2 months using a VAS. Radiographically, they were evaluated for the evidence that the condyle is situated in the glenoid fossa during full mouth opening by using a digital panorama Pan TMJ view (Figure 1: F). Other outcomes of the procedure were evaluated including complications recurrence, infection and failure of the treatment.

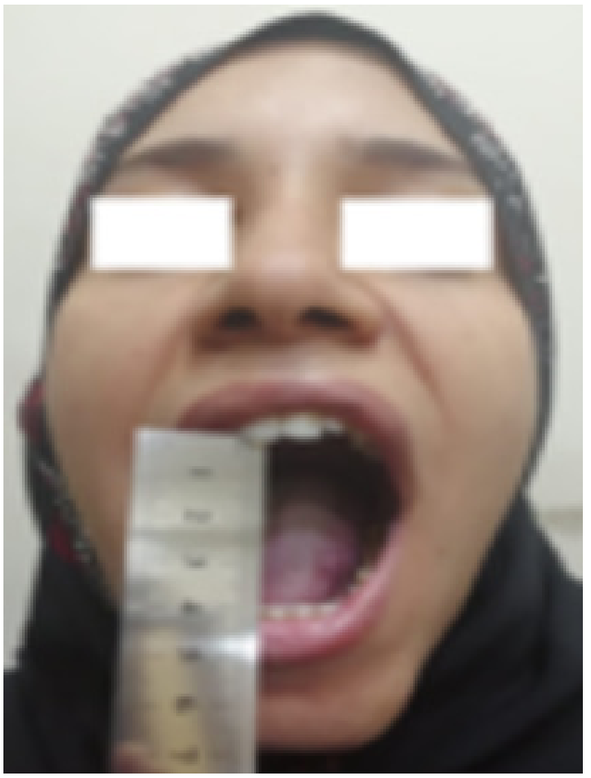
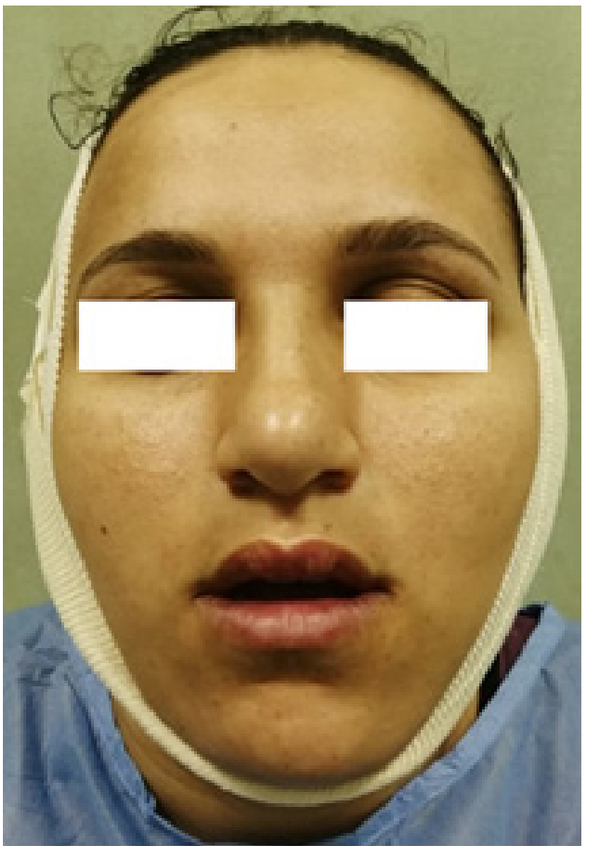
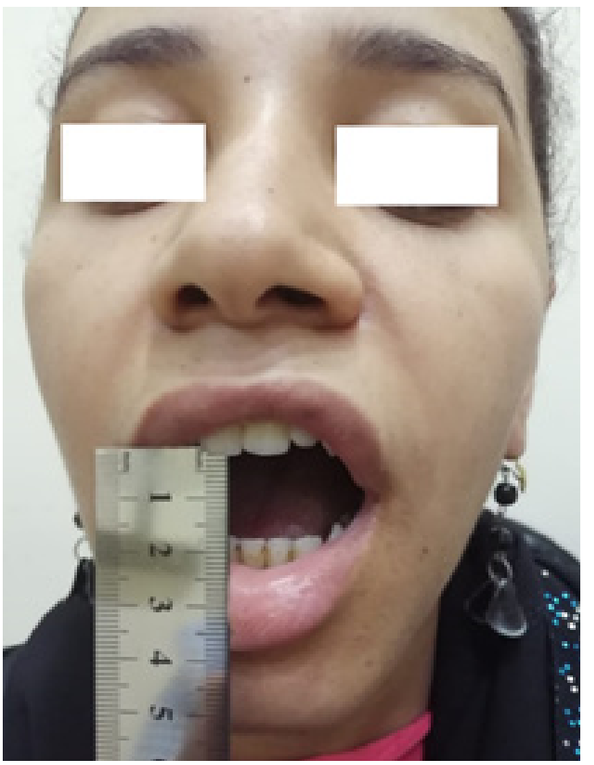


Figure (1): 27 years old female patient with chronic recurrent temporo-mandibular joint dislocation treated with arthrocentesis and autologous blood injection.
A: Maximum mouth opening before autologus blood inection)

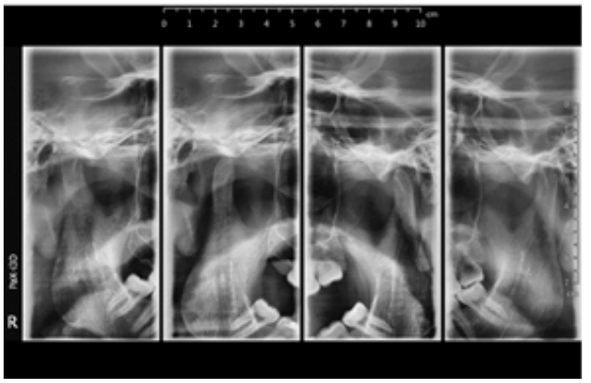
B: Trago-canthal line and site of autologous blood injection (1 cm anterior to the tragus and then 2 mm downward).



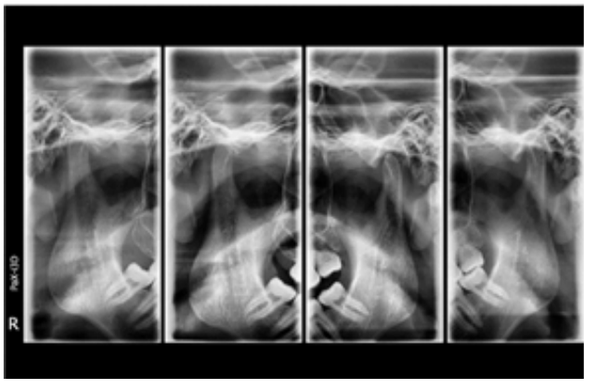
C: Post-injection elastic bandage.



D: Maximum mouth opening one year after autologus blood inection.



E: Digital panorama, Pan TMJ view before autologous blood injection.



F: Digital panorama, Pan TMJ view one year after autologous blood injection.

Statistical analysis:

The statistical analysis was done by SPSS software version 16, using Student's t-test for independent means. The confidence interval was set as 95%, and result was said to be significant for $p \leq 0.05$.

RESULTS:

This study included 140 patients (84 (60%) females and 56 (40%) males) with an age ranging from 29 to 65 years. They were randomly divided into two groups by an open source randomization software. Group-1 received arthrocentesis followed by ABI and Group-2 received arthrocentesis alone. The average age was 46.62±8.49 years (Mean ± Standard Deviation) in group-1, with the age ranging from 29 years to 65 years. The average age for group-2 was 49.27±6.33 years, with the age ranging from 33 years to 59 years. In group-1, 45 were females (62.3%) and 25 were males (35.7%). In group-2, 39 were females (55.7%) and 31 were males (44.3%). Shapiro-Wilk test was used to test the normality in the preoperative mouth opening values in both the groups. For group-1, the p-value was 0.068 and W was 0.966. for group-2, the p-value was 0.083 and W was 0.969. Both were in the 95% critical value accepted range: [0.9654:1.0000]. Hence both the groups showed a normal distribution curve, potentially Symmetrical and Mesokurtic.

For group-1, the average mouth opening (millimetres) pre-operatively was 46.66±3.72 and post operatively was 39.74±2.50. The mean reduction in mouth opening from the pre-operative to post-operative was 6.85±4.01. The average post-operative pain was 1.98±0.81 on the second day. 38.57% of the patients showed postoperative sounds on TMJ auscultation. The average number of recurrent episodes were 0.25±0.43. The average patient satisfaction score on a VAS scale was 8.02±1.04 (Table-1).

For group-2, the average mouth opening pre-operatively was 44.34±3.95 and post operatively was 40±4.02. The mean reduction in mouth opening from the pre-operative to post-operative was 4.34±0.73. The average post-operative pain was 1.98±0.81 on the second day. 38.57% of the group-1 and 48.67% patients showed postoperative sounds on TMJ auscultation. The average number of recurrent episodes were 0.4±0.54. The average patient satisfaction score on a VAS scale was 7.15±0.80 (Table-1).

Upon statistical analysis by using Student's t-test, it was found that the result was highly significant for the reduction in mouth opening ($p=0.001$) and patient satisfaction ($p=0.001$). The result was significant for post-operative pain scores ($p=0.04$) and post-operative recurrent episodes ($p=0.04$). The result was not significant for postoperative TMJ sounds ($p=0.43$) (Table-2).

In general, all group-1 patients well tolerated ABI during either the injection or the post-injection follow-up period, without any major complications. The postoperative pain was tolerable in all cases and was experienced only for few days post-injection. It was easily managed by prescribing nonsteroidal anti-inflammatory drugs.

ABI was successful in all 70 (100%) patients. None developed a complication during the procedure. During the follow up period 7 (10%) patients developed a complication (recurrence of dislocation). Re-injection was performed in in the second and third weeks after the first injection. This was done for the whole 7 patients and follow up was done up to one-year. After the second injection, patients had successful results and required no more interventions. Regarding those patients who required subsequent blood injection, the authors used the data obtained at the same time as all the other patients to maintain uniformity of the results. The authors chose to ignore the improvements after the subsequent injections.

Table 1: Data obtained from the study

Group	Variable	Mean	Standard deviation	Maximum value	Minimum value
G-1	Age (years)	46.62	8.49	65	29
	Pre-operative mouth opening (mm)	46.66	3.72	56	40
	Post-operative mouth opening (mm)	39.74	2.5	45	35
	Reduction in mouth opening (mm)	6.94	3.86	19	2
	Post-operative pain (VAS score)	1.98	0.81	4	1
	Positive TMJ sounds (%)	38.57	0.48	Not applicable	
	Post-operative dislocation episodes	0.25	0.43	1	0
	Patient satisfaction (VAS Score)	8.02	1.04	9	6
G-2	Age (years)	49.27	6.33	59	33
	Pre-operative mouth opening (mm)	44.34	3.95	55	35
	Post-operative mouth opening (mm)	40	4.02	51	30
	Reduction in mouth opening (mm)	4.34	0.73	10	3
	Post-operative pain (VAS score)	2.21	0.79	4	1
	Positive TMJ sounds (%)	40	0.48	Not Applicable	
	Post-operative dislocation episodes	0.4	0.54	2	0
	Patient satisfaction (VAS Score)	7.15	0.80	9	6

Table 2: Statistical analysis

Parameter	*p-value*	t-value	Significance
Post-operative mouth opening	0.001	5.11	Highly significant
Post-operative pain (VAS score)	0.04	-1.66	Significant
Post-operative Positive TMJ sounds	0.43	-0.17	Not Significant
Patient satisfaction (VAS Score)	0.001	5.50	Highly significant
Recurrent episodes	0.04	-1.69	Significant
95% confidence interval (Statistically significant if $p \leq 0.05$)			

DISCUSSION

In 1964, Brachmann first reported ABI to the TMJ, which successfully treated 60 patients with repeated dislocations. Also, in 1973, Schultz reported treatment of 16 patients suffering from CTMJD by ABI[7]. In our study, 70 patients with CTMJD underwent ABI. Jacobi Hermanns *et al*.[8] focused on their experience of 19 patients being treated. His treatment involved ABI only once, accompanied by 2 weeks of rmaxillo-mandibular fixation. Post-operatively, 17 cases were free of symptoms, with a drop in average opening of the mouth[9].

In our study, none of the ABI patients showed complications and all of them tolerated the procedure well. They also gave a significantly higher satisfaction score postoperatively. This is in accordance with a previous study by Hasson and Nahlieli.[10], documented their experience in the treatment of RTMJD in patients with ABI . They confirmed that all their patients were feeling well without any complications after the injection. Only one woman, who had previously undergone bilateral eminectomy, reported one episode of unilateral condyle subluxation 18 months after the procedure. Similar results were also obtained byVaredi *et al*.[7] In our study, ABI was successful in all 70 patients. During the follow up period, 7 patients developed recurrence of dislocation, and reinjection was carried out for all of them. On follow up, they got successful results and required no further intervention.

Machon *et al*. documented their experience with ABI technique in 2009[11]. For the 25 cases who participated in their study, 9 cases experienced re-dislocation after one week, and one patient after four weeks. Reinjection was performed for all of them. Of these ten cases, five reported re-dislocation on follow-up. For the third time, the remaining five were treated but tended to dislocate, and were recommended for open TMJ surgery[7].

In our study, no patients needed open surgery due to failure of re-injection. In Hegab's[12] analysis, patients accepted uncomplicated blood injections. Hegab[12] concluded that ABI is an efficient procedure for treatment of CTMJD, and multiple injections will prevent recurrence after undertaking this technique.

He also indicated that the combination of ABI and maxilla-mandibular fixation yielded the best outcomes and he recommended this combination and when ABI failed. He expected that maxillo mandibular fixation can help shape mature fibrous tissue as an adjunctive to ABI since excessive opening of the mouth may disrupt the integrity of the fibrosis, which results in recurrent dislocation[13].

Our study showed that there was no significant improvement in joint noise in both groups. Also, there was significant reduction in post-operative pain following ABI than with no ABI. This is also in accordance with other studies by Machon *et al*, 2009. In Daif's study, all patients underwent artherocentesis of TMJ before ABI and he divided the patients in tow group, one group the injection was in superior joint space only and the second group was in superior joint space and in extra articular tissue[14]. Daif encouraged that ABI to the superior joint space and the pericapsular tissue for treatment of patients with CRTMJD, as it showed better clinical and radiographic results than its injection only into the superior joint space[13,14].

CONCLUSION

The present study showed successful results of ABI. Positive results with this modality were achieved. Further studies with long term follow-up and a larger sample size are required for future investigations.

CONFLICT OF INTEREST

There are no conflicts of interest.

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