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# AUTOLOGOUS BLOOD INJECTION VERSUS EMINECTOMY IN MANAGEMENT OF CHRONIC RECURRENT TEMPOROMANDIBULAR JOINT DISLOCATION

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## *ABSTRACT*

**Aim of the study:** This study aims to assess efficacy of autologous blood injection (ABI) versus eminectomy for treating recurrent temporomandibular joint (TMJ) dislocation.

**Patients and Methods:** 20 patients with chronic recurrent dislocation were randomly divided into two groups (10 patients each). Group 1 received autologous blood injection (ABI) to pericapsular tissue (PT) and superior joint space (SJS). While Group 2 performed eminectomy. Clinical data included maximal incisal opening (MIO), joint sounds, pain, episodes of subluxation per week at 1 week, 1, 3, 6, and 12 months. Digital Radiographic imaging was collected at 6 and 12 months.

**Results:** Clinical data analysis showed significant improvements in all parameters comprising episodes of subluxation per week, joint sounds, pain, and maximal incisal opening, initially in both groups. Long term follow-up showed beginning of osteoarthritic changes in group 2 detected by digital radiographic imaging.

**Conclusion:** Both techniques had favorable results concerning TMJ subluxation. However, the injection group had superior results, was more conservative as a technique, and had no side effects.

**KEYWORDS**: Chronic Dislocation, Autologous Blood, Eminectomy

## INTRODUCTION

Recurrent temporomandibular joint (TMJ) dislocation "subluxation" is a chronic condition manifesting when one or both condylar heads are displaced in front of the articular eminence during wide mouth opening.(1)

The inability to temporarily close the mouth from an open position is a defining feature of subluxation; it may be resolved by manual-self manipulation or on its own accord. Such condition is distressing for the patient as it is usually accompanied with pain and inability to carry on normal daily activities.(2)

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TMJ subluxation is due to a combination of factors including masticatory muscles imbalance, especially lateral pterygoid muscles,[3] capsular laxity, variation in anatomy of articular eminence size and steepness of its posterior slope.[4]

Subluxation treatment ranges from conservative to complex surgical intervention, depending on the severity of the disease. Surgical procedures employed include scarification of temporalis tendon,[5] Eminectomy, [6,7,8,9] , and lateral pterygoid myotomy. [10]

Many non-surgical treatments were also pursued with far less complications attributed to surgery and anesthesia. Among the trials for minimally invasive treatment includes muscle rehabilitation [11], botulinum toxin injection to various masticatory muscles, [12] injection of different sclerosing agents, [13,14] Prolotherapy, [15, 16] and autologous blood injection (ABI) which has been gaining popularity as shown by several studies. [17,18]

The present study aims to evaluate the long-term results of autologous blood injection (ABI) versus eminectomy in management of chronic recurrent temporomandibular joint dislocation.

## PATIENTS AND METHODS:

Twenty patients suffering from chronic recurrent dislocation bilaterally were enlisted in this study. Patients presented at Oral and Maxillofacial Surgery department, October 6 University. The condylar head position anterior to the articular eminence at maximal mouth openness was confirmed by bilateral TMJ radiographs, which were taken in addition to a thorough history and clinical examination. Patients with neurologic abnormalities, systemic conditions, and those who had previously been offered intraarticular injections or surgery were excluded. Patients in this trial did not respond to medication, occlusal stent therapy, or muscle rehabilitation, among other conservative treatments.

After being informed about the study program, the patients who were assigned to this trial granted their agreement to continue receiving treatment. Their ages ranged from 18 to 40 years old, with 12 females and 8 males. Maximum interincisal opening, weekly frequency of locking episodes, and pain measured using a visual analogue scale (VAS) were among the data gathered. Two groups of ten patients each were randomly assigned to the patients. The same surgeon carried out each procedure in accordance with protocol.

Patients in Group 1 received 3 mL autologous blood injection in the superior joint space (SJS) together with the pericapsular tissue (PT) while Group 2 performed eminectomy.

### Technique for autologous blood injection Figure (1)

Periauricular skin was disinfected by Betadine surgical scrub solution (Mundi Pharma, UAE). Auriculotemporal nerve block was administered. The articular fossa was determined 1 cm anterior to the tragus and below the canthal tragal line by 2 mm. An 18-gauge needle was inserted into this point and advanced anteromedially through the capsule into the superior joint space, while the patient's mouth was fully opened. TMJ is then flushed with 5 ml saline, and then the patient is asked to open and close the mouth to allow for the backflow of the solution. Three milliliters of blood were withdrawn from antecubital fossa of patients', 2 ml injected in the superior joint space (SJS) and 1 ml injected into the pericapsular tissue (PT).

### Technique for eminectomy Figure (2)

After proper surgical preparation of the patient and draping, surgical procedure was performed under general anesthesia through a preauricular incision. Upon exposure and identification of the articular eminence, height of the eminence was reduced using surgical burs and any sharp borders were smoothened. The extent of eminence reduction was judged according to smooth unobstructed gliding movement of the condylar head and by reproducing functional movements of the mandible. No violation of the tmj capsule occurred during the surgical procedure.

Fig. (1 ) Autologous blood injection.

Fig. (2) Intraoperative photo of eminectomy.

**Postoperative follow-up:**

Both groups were prescribed analgesics and antibiotics for one week. All patients were instructed to restrict to soft diet for one week and to avoid excessive jaw movements. Post operative data collected included maximal incisal opening (MIO), joint sounds, pain (visual analog score), episodes of subluxation per week. Data was collected in 1 week, 1, 3, 6, and 12 months. Digital Radiographic images were collected at 6 and 12 months. Figure (3) This data was statistically analyzed to compare between the two treatment modalities results and their efficacy.

**Statistical Analysis**

By examining the distribution of the data and applying normalcy tests (Kolmogorov-Smirnov and Shapiro-Wilk tests), numerical data were examined for normality. The data on age and maximum inter-incisal opening (MIO) displayed a normal (parametric) distribution, whereas the data on pain levels and the number of weekly subluxation episodes revealed a non-normal (non-parametric) distribution. The mean, standard deviation (SD), and 95% Confidence Interval (95% CI) values were displayed for parametric data. The range and median values were used to display non-parametric data. The Student's t-test was employed to compare the mean age values of the two groups while dealing with parametric data. The mean MIO measurements in the two groups were compared, and the time-varying variations within each group were examined, using the repeated measures ANOVA test. Pairwise comparisons were performed using Bonferroni's post-hoc test where

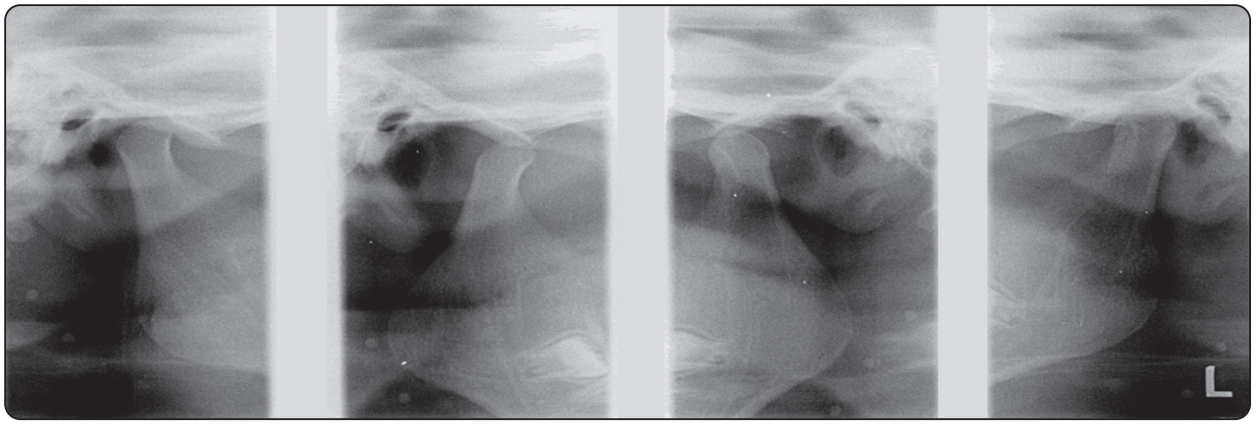


Fig. (3) 12 months postoperative radiograph showing condylar head behind articular eminence after ABI injection

## RESULTS

### Demographic data: Tabe 1

No statistically significant difference between mean age values in the two groups. Additionally, there was no statistically significant distinction between the two groups' gender distributions.

TABLE (1) Mean, standard deviation (SD), frequencies (n), percentages and results of Student's t-test and Fisher's Exact tests for comparisons of demographic data of the two groups

| | Group I (n = 10) | Group II (n = 10) | P-value |
|---|---|---|---|
| Age (Years) | | | |
| Mean (SD) | 26.2 (6.5) | 29.9 (7.1) | 0.243 |
| Gender [n (%)] | | | |
| Male | 4 (40) | 4 (40) | 1 |
| Female | 6 (60) | 6 (60) | |

***: Significant at P ≤ 0.05***

### Maximum inter-incisal opening (MIO in mm) Figure 4

Regarding Group I's modifications over time, MIO changed in a statistically significant way (P-value <0.001, Effect size = 0.899). A statistically significant decrease in MIO was observed both one week after the intervention and one week after the intervention, according to pairwise comparisons between the time periods. The mean MIO did not change in a way that was statistically significant between one and three, three and six, or six and twelve months. A statistically significant decrease in MIO by time was also seen in Group II (P-value <0.001, Effect size = 0.852). Comparing the time periods pair-wise showed that MIO decreased statistically significantly after one week, from one week to one month, and from one month to one month.

Pre-operatively, there was no statistically significant difference between MIO in the two groups (P-value = 0.752, Effect size = 0.006). After one week, one, three, six as well as 12 months, Group I showed statistically significantly lower MIO than Group II (P-value = 0.020, Effect size = 0.265), (P-value = 0.025, Effect size = 0.248), (P-value = 0.035, Effect size = 0.225), (P-value = 0.038, Effect size = 0.219) and (P-value = 0.041, Effect size = 0.211), respectively.

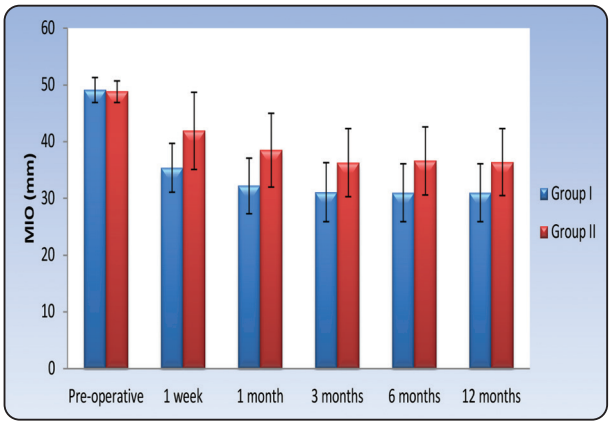


Fig. (4) Bar chart representing mean and standard deviation values for MIO measurements in the two groups

### Weekly episodes number of joint subluxation Figure 5

Regarding the time-dependent changes in Group I, the number of subluxation episodes weekly showed a statistically significant change (P-value <0.001, Effect size = 0.822). The frequency of subluxation incidents each week decreased statistically significantly after one week, from one week to one month, and from one to three months, according to pair-wise comparisons between the time periods. There was no statistically significant difference in the weekly number of subluxation episodes between three and six months, nor between six and twelve months.

The frequency of subluxation episodes per week by time varied statistically significantly in Group II (P-value <0.001, Effect size = 0.901). After one week, pairwise comparisons between the time periods showed no statistically significant difference in the weekly number of subluxation occurrences. The number of subluxation incidents each week decreased statistically significantly from one week

to one month and from one to three months. A non-statistically significant increase in the number of subluxation episodes each week—from three to six, and from six to twelve months—occurred after this.

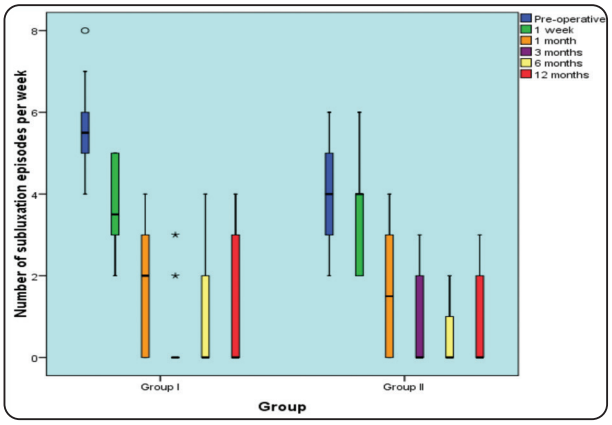


Fig. (5) Box plot representing median and range values for number of subluxation episodes per week in the two groups (Circle and stars represent outliers)

Pre-operatively, Group I showed a statistically significantly higher number of subluxation episodes per week than Group II (P-value = 0.022, Effect size = 1.151). There was no statistically significant difference between number of subluxation episodes per week in the two groups after one week, one month, three, six as well as 12 months (P-value = 0.938, Effect size = 0.034), (P-value = 0.664, Effect size = 0.187), (P-value = 0.654, Effect size = 0.153), (P-value = 0.815, Effect size = 0.085) and (P-value = 0.744, Effect size = 0.119), respectively.

**Pain (VAS) scores Table 2, Figure 6**

Regarding the time-dependent changes in Group I, the pain scores showed a statistically significant change (P-value <0.001, Effect size = 0.744). There was a statistically significant drop in pain levels after one week as well as from one week to one month, according to pairwise comparisons between the time periods. There was no statistically significant difference in pain levels from one to three, three to six, or six to twelve months.

A statistically significant change in pain scores by time was seen in Group II (P-value <0.001, Effect size = 0.674). There was a statistically significant drop in pain levels after one week, from one week to one month, and from one to three months, according to pairwise comparisons between the time periods. Pain scores did not change in a way that was statistically significant between three and six months or between six and twelve months.

TABLE (2) Descriptive statistics and results of Mann-Whitney U test for comparison between pain scores in the two groups and Friedman's test for the changes by time within each group

| Time | Group I (n = 10) | | Group II (n = 10) | | P-value | Effect size (d) |
|---|---|---|---|---|---|---|
| | Median | Range | Median | Range | | |
| Pre-operative | 8.5 $^{A}$ | 6 – 10 | 8 $^{A}$ | 5 – 10 | 0.395 | 0.378 |
| 1 week | 4 $^{B}$ | 0 – 7 | 4.5 $^{B}$ | 0 – 6 | 0.617 | 0.221 |
| 1 month | 0 $^{C}$ | 0 – 5 | 3 $^{C}$ | 0 – 6 | 0.394 | 0.361 |
| 3 months | 0 $^{C}$ | 0 – 5 | 0 $^{D}$ | 0 – 8 | 0.957 | 0.017 |
| 6 months | 0 $^{C}$ | 0 – 8 | 0 $^{D}$ | 0 – 8 | 0.957 | 0.017 |
| 12 months | 0 $^{C}$ | 0 – 8 | 0 $^{D}$ | 0 – 9 | 0.534 | 0.238 |
| P-value (Changes by time) | <0.001* | | <0.001* | | | |
| Effect size (w) | 0.744 | | 0.674 | | | |

***: Significant at P ≤ 0.05, Different superscripts in the same column indicate statistically significant changes by time***

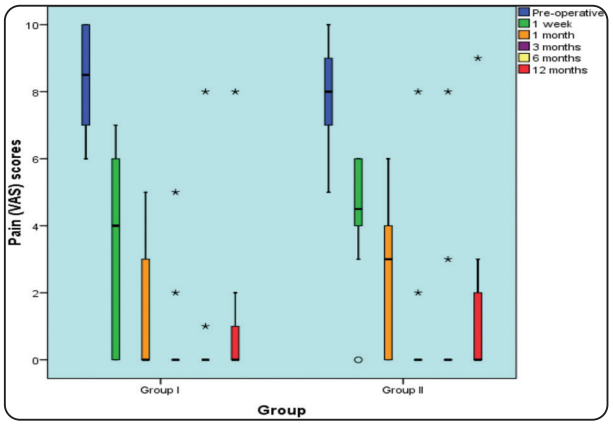


Fig. (6) Box plot representing median and range values for pain scores in the two groups (Circle and stars represent outliers)

Pre-operatively, Group I showed a statistically significantly higher number of subluxation episodes per week than Group II (P-value = 0.022, Effect size = 1.151). There was no statistically significant difference between number of subluxation episodes per week in the two groups after one week, one month, three, six as well as 12 months (P-value = 0.938, Effect size = 0.034), (P-value = 0.664, Effect size = 0.187), (P-value = 0.654, Effect size = 0.153), (P-value = 0.815, Effect size = 0.085) and (P-value = 0.744, Effect size = 0.119), respectively.

**Joint sounds Table 3,**

Regarding the variations over time in Group I, the prevalence of joint sounds changed in a statistically significant way (P-value <0.001, Effect size = 0.584). After one week, the frequency of joint sounds decreased, and after one month, it increased. There was no change in the predominance of joint noises from one to three months, but from three to six months, there was an increase. There was a reduction in the frequency of joint noises between six and twelve months.

A statistically significant variation in the frequency of joint sounds by time was also seen in Group II (P-value <0.001, Effect size = 0.451). Both one week later and one month later, there was a decline in the frequency of joint noises. The frequency of joint sounds increased from one to three months, then decreased from three to six months. The frequency of joint noises did not alter between six and twelve months.

TABLE (3) Descriptive statistics and results of Fisher's Exact test for comparison between joint sounds in the two groups and Friedman's test for the changes by time within each group

| Time | | Group I (n = 10) | | Group II (n = 10) | | P-value | Effect size (OR) |
|---|---|---|---|---|---|---|---|
| | | n | % | n | % | | |
| Pre-operative | | | | | | | |
| | Sounds | 9 | 90 | 10 | 100 | 1 | 2.111 |
| | No sounds | 1 | 10 | 0 | 0 | | |
| 1 week | | | | | | | |
| | Sounds | 0 | 0 | 4 | 40 | 0.087 | 0.375 |
| | No sounds | 10 | 100 | 6 | 60 | | |
| 1 month | | | | | | | |
| | Sounds | 2 | 20 | 2 | 20 | 1 | 1 |
| | No sounds | 8 | 80 | 8 | 80 | | |

| Time | | Group I (n = 10) | | Group II (n = 10) | | P-value | Effect size (OR) |
|---|---|---|---|---|---|---|---|
| | | n | % | n | % | | |
| 3 months | | | | | | | |
| | Sounds | 2 | 20 | 3 | 30 | 1 | 1.714 |
| | No sounds | 8 | 80 | 7 | 70 | | |
| 6 months | | | | | | | |
| | Sounds | 6 | 60 | 2 | 20 | 0.170 | 0.167 |
| | No sounds | 4 | 40 | 8 | 80 | | |
| 12 months | | | | | | | |
| | Sounds | 2 | 20 | 2 | 20 | 1 | 1 |
| | No sounds | 8 | 80 | 8 | 80 | | |
| P-value (Changes by time) | | <0.001* | | <0.001* | | | |
| Effect size (w) | | 0.584 | | 0.451 | | | |

***: Significant at P ≤ 0.05, OR: Odds Ratio***

There was no statistically significant difference between prevalence of joint sounds in the two groups preoperatively, after one week, one month, three, six as well as 12 month (P-value = 1, Effect size = 2.111), (P-value = 0.087, Effect size = 0.375), (P-value = 1, Effect size = 1), (P-value = 1, Effect size = 1.714), (P-value = 0.170, Effect size = 0.167) and (P-value = 1, Effect size = 1), respectively.

## DISCUSSION

The present study asses the efficacy of two different modalities in abating the recurrent painful dislocation episodes.

Eminectomy is one of the oldest surgical options, it aims to remove all bony obstacles hindering the smooth path of the condyle [7,8,9]. Autologous blood was first introduced by Brachmann in 1964 as quoted by Machon et al[17] , as conservative means of treating tmj habitual dislocation. This maneuver depends on the clotting of blood within the joint space which by its turn remodels thus decreasing the excessive forward movement of the condyle. This physiologic concept may be regarded as utilizing autologous blood injection as therapeutic hemarthrosis.

Machon et al in 2009[17] reintroduced the autologous blood injection into the joint with habitual dislocation and successfully treated 80% of their patients. Daif in 2010[18] treated 30 patients with an 80% success rate when injecting both pericapsular tissue and superior joint space. In the present study, the success rate was higher in the group that received the autologous blood injection (80%) when compared to the group that underwent surgical eminectomy (65%). Patients from group 1 had an average decrease of maximal interincisal opening (5.4±2.2mm) higher than group 2 (4.3±1.6mm) which is in accordance with previously published studies.[17,18,19] In both groups 1 and 2 there was a decrease in episodes of subluxation over the period of 12 months, yet worthy to mention, group 1 presented preoperatively with a higher number of subluxation episodes. Both groups showed improvements in post-operative pain and joint sounds with no statistical significance differences between both groups. Long term follow-up showed beginning of osteoarthritic changes in group 2 detected by digital radiographic imaging.

Based on this, we can conclude that autologous blood injection is a safe, more affordable, and effective treatment option for chronic recurrent TMJ dislocation than surgery (eminectomy), which carries a higher risk of postoperative complications which can include infection, edema, and facial nerve injury.

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