

Comparison of Mean Decrease in Mouth Opening by Autologous Blood Injection in Superior Joint Space with and Without Pericapsular Tissue in Treatment of Chronic Recurrent Temporomandibular Joint Dislocation

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Abstract

Objective: To compare the average mouth opening reduction caused by autologous blood injection in the superior joint space with and without pericapsular tissue in the management of chronic recurrent TMJ dislocation.

Methodology: The study was conducted in Oral and Maxillofacial Surgery Department / Dental Section, Aziz Fatima Hospital (AFMDC) Faisalabad, from April 2021 to April 2022. In total 152 patients were randomly split into two equal groups. The auriculotemporal nerve was numbed with local anesthetic. An 18-gauge needle was placed into SJS at this point utilizing a single needle method. After instructing the patients to open their mouths as wide as possible, the width in between incisal borders of the lower and the upper incisors was determined. In addition, 3cc of blood were taken from the antecubital fossa of the patients and injected in a syringe. Group B got autologous blood injections to the SJS and the pericapsular tissues, while Group A received ABI into the superior joint space only.

Results: The mean age of group A was 32.24 ± 8.94 years and group B was 31.38 ± 8.34 years. The gender distribution was also similar in both groups (P -value > 0.05) with female dominance having (55.26%) females in group A and (59.21%) in group B. Post injection comparison of mouth opening showed that group B patients had a significantly (P -value < 0.05) less mean value (44.53 ± 2.46 mm) of mouth opening as compared to (46.04 ± 2.27 mm) among patients in group A. The decrease in mouth opening showed that group B patients had significantly (P -value < 0.05) higher decrease in mouth opening with a mean value of (5.35 ± 1.46 mm) as compared to (3.40 ± 1.01 mm) in group A.

Conclusions: The use of autologous blood injection as a treatment for TMJ dislocation in individuals with persistent recurrent dislocation was discovered to be a convenient, safe, and economical method. The ABI in TMJ with PT demonstrated a considerably greater rate of success in terms of the reduction in jaw opening.

Key words: Autologous Blood Injection, Mouth Opening, Superior Joint Space, Pericapsular Tissue, Temporomandibular Joint Dislocation

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Introduction

Dislocation of the temporomandibular joint (TMJ) is a disease that is frequently observed in clinical practice, and it is particularly prevalent in patients undergoing

emergency surgery. When the condyle becomes stuck in front of a bony protrusion known as the articular eminence and is unable to move back into position, the TMJ dislocates. Laughing and yawning are common daily actions that might lead to chronic recurring TMJ

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dislocation. It could also happen during medical treatments that call for prolonged mouth opening, such dental work or general anaesthetic operations. The pathophysiology of TMJ dislocation involves a number of variables, such as restrictions on the muscles and capsular ligaments during chewing, an unusually large eminence, muscular spasms, trauma, and atypical chewing motions.^{1,2}

The condylar head of the mandible may occasionally shift anterior to the articular eminence while the mouth is open normally, but it always stays inside the joint capsule. This condition is referred to as dislocation and can be acute, chronic, or recurring. Temporomandibular joint (TMJ) recurrent dislocation may occasionally self-reduce or may require expert assistance. The inability to shut the mouth after it has opened widely is a defining feature of this disorder. This is referred to as a subluxation when it is self-reducible or self-reducing. In contrast, luxation or dislocation is a disorder that needs expert assistance to put the joint back in its proper place.^{3,4}

The most crucial component that stabilizes the joint and is supported by the lateral ligaments is the joint capsule. The anatomy of the squamotympanic fissure, articular eminence, zygomatic arch, and condyle all significantly affect how far the condyle head is displaced from the glenoid fossa.⁵ The key determinants of dislocation type and direction are those mentioned above. The pathophysiology and management of temporomandibular joint dislocation are greatly influenced by the performance of the masticatory muscles, age, teeth, aetiology, and duration of the dislocation.⁶ The result of TMJ dislocation, particularly chronic recurring and chronic prolonged cases, depends on the patient's cooperation and a comprehensive examination, treatment planning, and management.⁷

Various surgical and non-surgical approaches have been discussed in the literature for the treatment of chronic reoccurring TMJ dislocation. Limiting mandibular movements, employing sclerosing agents, administering local anesthetics, injecting Botulinum Toxin into the mastication muscle, and injecting autologous blood are examples of non-surgical or conservative treatments (ABI). While eminectomy surgery is thought to be the gold standard in the treatment of recurrent TMJ dislocation and has a success rate of 85% or above.^{8,9}

In 1973, Schulz made the first disclosure of autologous blood injection to treat recurrent TMJ dislocation. The usefulness of autologous blood injection in a frail person unable to undergo surgery was first documented in 2003 by Takahashi et al. in Japan. The total success rate for autologous blood injections is reported to be around 80%.¹⁰ Autologous blood injection may be a viable alternative to surgery for people who are ineligible for surgical procedures or who have recurrent TMJ dislocation. Two groups were compared in a study in which group A received autologous blood injection only in superior joint space and in other group ABI was injected in superior joint space along with pericapsular tissue and it was observed that group B had significantly better outcome (80% vs 60%) on the basis of mean value of decrease in mouth opening.¹¹

Autologous blood injection is a simple alternative to other traditional methods for the treatment of persistent recurring TMJ dislocation. There are relatively few studies indicating an ABI-related reduction in mouth opening in SJS patients who are receiving PT or not. This present study has been planned to investigate the effect of autologous blood injection in superior joint space along with pericapsular tissue and in superior joint space only, on reduction in mouth opening.

Material and Methods

After receiving permission from the hospital ethical committee, this randomized controlled trial study was carried out. All the patients visiting to the Oral and Maxillofacial Surgery Department / Dental Section, Aziz Fatima Hospital (AFMDC) Faisalabad, were enrolled for the study. The study period lasted from April 2021 to April 2022, or roughly one year. Prior to including them in the study, patients of both sexes with ages ranging from 18 to 65 years were chosen as the study sample.

In total, 152 patients were chosen for the study, with 76 participants in each group. The WHO sample size calculator was used to determine the sample size, with a level of significance of 10%, and a power of 80%, population proportions (efficacy on the basis of mean decrease in mouth opening) of 60% in ABI in SJS only group and 80% in ABI in SJS and PT group.¹¹

With the help of secured envelopes, all the patients were divided into two subgroups of equal size at random using the lottery method. Using a non-probability consecutive sampling strategy, the patients were

recruited. Group A only received autologous blood injections (ABI) into the superior joint area. While group B received ABI injection in both SJS and pericapsular tissues.

Patients between the ages of 15 and 60 were included if they had either bilateral or unilateral recurrent dislocation of TMJ. Patients presenting with history of dislocation, or having inflammatory TMJ disease like tuberculous arthritis, rheumatoid arthritis, or having tumor or lesion in TMJ and patients with systemic illnesses including insufficiency of fibrinogen and platelet function issues were excluded from the study.

The auriculotemporal nerve was numbed with local anesthetic while the skin covering the TMJ was cleaned with an antiseptic solution. The articular fossa was situated 2 mm below the tragal-canthal line and 10 mm prior to the ear's tragus. An 18-gauge needle was placed into SJS at this point utilizing a single needle method. With the patient's mouth open, 4 mL of saline solution was pumped into the joint space. The patient was instructed to repeatedly close and open their mouths so that the fluid could be removed using the same injection needle. After instructing the patients to open their mouth as wide as possible, the width in between incisal borders of the lower and the upper incisors was determined. Additionally, 3ml of blood was drawn from the patients' antecubital fossa and placed in a syringe. In group A, the patients received bilateral injections of 2 ml of autologous blood using an 18-gauge single needle approach in SJS. In group B, an additional 1 ml of blood was injected into the PT after the needle had been aspirated outward for 1 cm.

After the injection process was finished, the patients were told to stick to a soft diet for a week and to wear an elastic headband for the next 24 hours. Each patient in the research received five days of antibiotic and analgesic coverage. After three months, all the patients were contacted for follow-up appointments for clinical examinations, digital lateral double TMJ radiographs, and assessment of the reduction in mouth opening. All this information along with demographic information was recorded on a predesigned performa.

Whole the acquired data was input and examined through SPSS v. 25. The means and standard deviation of the qualitative data as well as the frequencies and percentages of the qualitative data were reported. Means were compared using an independent sample t-

test, while qualitative variables were compared using a Chi-square test. P-values ≤ 0.05 were classified as significant.

Results

A total of 152 patients with TMJ were enrolled in this randomized controlled trial study, and they were split into two subgroups of 76 patients each. The superior joint space (SJS) was the sole area of the patients in group A that got autologous blood injections, whereas group B received injections into both the SJS and the pericapsular tissues. The mean age of group A was 32.24 ± 8.94 years with highest number (56.58%) of patient in 25-35 years age interval followed by (17.11%) in 15-25 years age range. The mean age of group B was not statistically (P-value > 0.05) different from group A, with a value of 31.38 ± 8.34 years having maximum number (55.26%) of patients in age interval of 25-35 years and 19.74% in age interval of 15-25 years. The gender distribution was also similar in both groups (P-value > 0.05) with female dominance having (55.26%) females in group A and (59.21%) in group B. The distribution of normal weight and obese patients also showed no statistically significant (P-value > 0.05) difference in both groups as shown in table I.

Characteristic	Group A	Group B	P-value
Age of the patients			
Mean \pm SD	32.24 \pm 8.94	31.38 \pm 8.34	0.495
Age of the patients			
15-25	13 (17.11%)	15 (19.74%)	0.912
25-35	43 (56.58%)	42 (55.26%)	
35-45	11 (14.47%)	13 (17.11%)	
45-55	7 (9.21%)	5 (6.58%)	
> 55	2 (2.63%)	1 (1.32%)	
Gender			
Male	34 (44.74%)	31 (40.79%)	0.663
Female	42 (55.26%)	45 (59.21%)	
Distribution of Body weight			
Normal weight	43 (56.58%)	33 (43.42%)	0.105
Obese	33 (43.42%)	43 (56.58%)	

The comparison of mouth opening in both groups showed that there was no significant difference in mean mouth opening at baseline with mean values of 48.11 ± 2.22 mm in group A and 48.52 ± 2.11 mm in group B. In both the groups majority (57.89% vs. 67.11%) of the patients presented with mouth opening ranging from 48-52 mm. Post injection comparison of mouth opening showed that group B patients had a significantly (P-value < 0.05) less mean value (44.53 ± 2.46 mm) of

mouth opening as compared to (46.04 ± 2.27 mm) among patients in group A. The decrease in mouth opening showed that group B patients had significantly (P-value < 0.05) higher decrease in mouth opening with a mean value of (5.35 ± 1.46 mm) as compared to (3.40 ± 1.01 mm) in group A. The distribution of mouth opening showed that majority (86.84%) of the patient in group A had a decrease in mouth opening of 2-5 mm and in group B, most of the patients (61.84%) had a decrease in mouth opening of 5-8 mm as elaborated in table II.

Table II: Comparison of Mouth Opening between both groups.			
Characteristic	Group A	Group B	P-value
Mouth opening at baseline			
Mean ± SD	48.11 ± 2.22	48.52 ± 2.11	0.245
43-48 mm	32 (42.11%)	25 (32.89%)	0.241
48-52 mm	44 (57.89%)	51 (67.11%)	
Mouth opening Post injection			
Mean ± SD	46.04 ± 2.27	44.53 ± 2.46	0.000
40-45	24 (31.58%)	45 (59.21%)	0.245
45-50	52 (68.42%)	31 (40.79%)	
Decrease in mouth opening			
Mean ± SD	3.40 ± 1.01	5.35 ± 1.46	0.000
2-5	66 (86.84%)	29 (38.16%)	0.000
5-8	10 (13.16%)	47 (61.84%)	

Discussion

TMJ dislocation that is chronically recurring requires surgical or non-surgical treatment. An easy and deemed non-invasive method for treating recurrent TMJ dislocation is autologous blood injection. The use of a sclerosing agent is one effective non-surgical therapeutic option that has been documented; nevertheless, various adverse effects, including facial nerve injury, have been recorded.¹² Another reported therapy approach is the use of Botox, which has fewer negative effects. In 1973, Schulz administered intermaxillary fixation for 4 weeks after injecting autologous blood twice weekly for 3 weeks into the damaged TMJ to treat 16 patients. Out of these 10 patients remained symptoms free after one year follow up. In another similar study in which 19 patients of recurrent TMJ dislocation were managed with autologous blood injection and it was observed that 17 patients were symptom free after 18 months follow up. Recent researches have concluded that autologous blood injections can be used as first line treatment for the patients of recurrent dislocation of TMJ.¹³

The rationale behind the TMJ injection of autologous blood is based on the pathophysiology of bleeding in the

region around the TMJ brought on by condylar trauma or TMJ surgery that may produce fibrous or bony ankylosis. The TMJ area may benefit from blood injection as a basis for the development of fibrous tissue. According to the findings of a study, with a one-year follow-up period, a higher success rate of 80% was recorded in autologous blood injection into both SJS and PT group than their individual injection into SJS alone (60%). Furthermore, patients in group B experienced a higher average drop in the maximum mouth opening (5.3 ± 2.1 mm) than (3.6 ± 1.5 mm) in patients of group A.^{14,15}

The results of this present study are also in very much agreement with these results. According to which it was observed that group B patients had a significantly (P-value < 0.05) less mean value (44.53 ± 2.46 mm) of mouth opening as compared to (46.04 ± 2.27 mm) among patients in group A. The decrease in mouth opening showed that group B patients had significantly (P-value < 0.05) higher decrease in mouth opening with a mean value of (5.35 ± 1.46 mm) as compared to (3.40 ± 1.01 mm) in group A.

ABI has been the preferred method of therapy for chronic recurring TMJ dislocation for the past three decades. ABI is believed to be more beneficial because to the procedure simplicity and less procedural complexity. According to research, there are several distinct forms of TMJ dislocations. The study also covered the anatomical characteristics that predispose individuals to dislocation, and it concluded that conservative treatments should be used before invasive surgery.¹⁶

According to several studies, treating chronic TMJ dislocation with ABI of TMJ is a straightforward, safe, and economical procedure. ABI offers advantages over other nonsurgical and surgical methods in that it may be repeated, does not need tissue dissection, and has less complications following surgery.¹⁷

The statement could provide an explanation for the relatively low success rate of ABI. The possibility of the autologous blood getting into the wrong spot is there in ABI since the needle is advanced blindly. A needle insertion could harm the tissues close to the joint and result in bleeding inside and around it. Some studies have shown even higher success rate with ultrasound guided ABI insertion in patients with chronic recurrent TMJ dislocations.¹⁸ In a research by Gagnani SP et al.,

it was discovered that when ABI was carried out in SJS and PT with ultrasound guidance, a high success rate (95%) was seen. This is due to ultrasound guiding, which reduces the danger of incorrect ABI insertion because the advancement of the needle can be actively seen during injection into the joint cavity.¹⁹

Conclusion

The use of autologous blood injection as a treatment for Temporomandibular Joint dislocation in individuals with persistent recurrent dislocation was discovered to be a convenient, safe, and economical method. With the benefits of being reproducible, not needing tissue dissection, and having less post-operative problems, the ABI in TMJ with PT demonstrated a considerably greater rate of success in terms of the reduction in jaw opening. Patients with recurrent, chronic temporomandibular joint dislocation must be encouraged to have autologous blood injections into the peri-capsular tissue and superior joint area.

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