Evaluation of the Efficacy of Auriculotemporal Nerve Block in Temporomandibular Disorders

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Aims: To investigate the effectiveness of the auriculotemporal nerve block (ATNB) technique in conjunction with noninvasive therapies for the treatment of disc displacement with reduction (DDWR) or without reduction (DDWOR) in addition to arthralgia of the temporomandibular joint (TMJ). **Methods:** The data of 22 patients diagnosed with DDWR and DDWOR whose clinical conditions did not improve despite noninvasive treatments were analyzed. ATNB was applied to each patient during the first visit and readministered at 1- and 4-week follow-up visits. Pain intensity values (0 to 10 visual analog scale [VAS] scores) were evaluated pre-ATNB and at the 6-month follow-up visit, and the maximal mouth opening values were measured pre-ATNB and at the 1-week, 4-week, and 6-month follow-up visits. **Results:** Noninvasive therapies did not make a significant difference in the outcomes between the initial visit and first administration of ATNB (VAS $P = .913$, MMO $P = .151$). However, there were significant differences in outcomes between pre-ATNB and the 1-week (MMO $P = .000$), 4-week (MMO $P = .000$), and 6-month (VAS $P = .027$, MMO $P = .000$) follow-ups. **Conclusion:** ATNB may be considered as a supportive treatment approach in noninvasive TMJ disorder therapies. *J Oral Facial Pain Headache 2021;35:326–331. doi: 10.11607/ofph.2949*

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Temporomandibular disorders (TMD) are among the most common conditions for which patients seek professional help. An otolaryngologist first described a group of conditions entitled as a syndrome affecting the temporomandibular joint (TMJ) and giving rise to auriculotemporal nerve (ATN) entrapment and otologic symptoms in 1934[1]; however, Costen's proposed etiopathogenesis was controversial, and various labels were used to categorize these conditions. There has been a need for a more comprehensive protocol that can be used in clinical and experimental studies, where the same nomenclature, taxonomy, and criteria can be used among researchers. For this purpose, the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD)[2] protocol, which was reliable and valid for clinical use, was published in 1992. Although the RDC/TMD has become the most widely utilized diagnostic tool, further research has continued to ameliorate the protocol and enhance its diagnostic accuracy. As a result, the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD)[3] protocol was published in 2014, adding new instruments and taxonomy to the RDC/TMD. According to the DC/TMD, TMDs are classified under the headings of TMJ disorders, masticatory muscle disorders, headache, and related structures.[4] The vast majority of TMDs are pain-related and intra-articular disorders.[3] Intra-articular disorders result from the abnormal positional relationship between the articular disc and the mandibular condyle, articular eminence, and articular fossa.[5] Although the articular disc can be displaced in any direction (lateral, posterior, medial, or anterior), it is generally observed to be displaced in the anterior direction.[6] In disc displacement with reduction (DDWR), the displaced disc in the closed-mouth position reduces to the normal relationship during condylar translation and resituates between the condylar head and articular eminence in the open-mouth position. However, in disc displacement without

Table 1 Distribution of Age and Clinical Diagnosis of the Included Patients by Gender

Variables		Age (y), mean ± SD	DDWR	DDWOR
Gender				
Women	16 (72.72)	38.06 ± 15.89	6 (37.5)	10 (62.5)
Men	6 (27.28)	27.17 ± 9.70	3 (50.0)	3 (50.0)
Total	22 (100)	35.09 ± 15.08	9 (40.9)	13 (59.1)

Data are reported as n (%) unless otherwise indicated. DDWR = disc displacement with reduction; DDWOR = disc displacement without reduction.

reduction (DDWOR), the displaced disc does not reduce during condylar translation and remains displaced in the open-mouth position. Studies indicating a link between arthralgia and intra-articular disorders are available in the literature[7–9]; however, the correlation between arthralgia and displaced disc position is still a matter of debate.[10]

The ATN is a branch of the mandibular division (V3) of the trigeminal nerve. The ATN supplies cutaneous sensitivity, especially from the TMJ capsule, and carries parasympathetic nerve fibers.[11] ATN blockage (ATNB) has been used in TMJ arthrocentesis and clinical research, as well as for differential diagnosis of TMD.[12] Thus, it is expected that ATNB will alleviate pain, leading to functional improvement of the TMJ and enabling its nutrition, waste removal, and lubrication.[13]

The purpose of this retrospective study was to evaluate the effectiveness of adjunctive ATNB in increasing the amount of maximal mouth opening (MMO) and in reducing pain scores in patients diagnosed with DDWR or DDWOR in addition to arthralgia according to the DC/TMD and who did not benefit from noninvasive methods but did not want further invasion.

Materials and Methods

Subjects

The records of 410 patients who were referred to the Department of Oral and Maxillofacial Surgery with TMJ disorder symptoms between 2017 and 2019 were reviewed to determine the treatment modalities used and their outcomes. The subjects were then examined and diagnosed according to the Turkish version of the DC/TMD (DC/TMD Axis 1 questionnaire and examination form).[14]

Patients diagnosed with DDWR and DDWOR in addition to arthralgia were included in the study. The medical histories of the patients were investigated, and those with symptoms of diseases possibly related to TMDs (eg, fibromyalgia, hypothyroidism, scleroderma, rheumatoid arthritis), orofacial disorders that might have been responsible for the TMD symptoms (eg, neuralgia, migraine, myositis, trauma, neuropathic pain, infections), complications due to ATNB (eg, temporary facial nerve palsy, hematoma, positive aspiration), and/or history of invasive therapies or TMJ surgeries were excluded.

The study population consisted of 22 patients who volunteered for ATNB from a sample to whom minimally invasive treatments, such as arthrocentesis, arthroscopy, and ATNB, were explained. Pain intensity, MMO, and the self-reported outcome variables of 22 patients who underwent noninvasive therapies (occlusal stabilization splints, behavioral modifications, physical therapy, pharmacotherapy) but did not benefit from them were evaluated.

Prior to the ATNB, written informed consent was obtained from each participant. Each participant was warned about complications of the ATNB before the administration, such as hematoma at the injection site, positive aspiration, and temporary anesthesia of the facial nerve. This study was approved by the Tokat Gaziosmanpasa University Clinical Research Ethics Committee (19-KAEK-198). This study was conducted in accordance with the revised SQUIRE 2.0 (Standards for Quality Improvement Reporting Excellence) statement.[15] The subjects' demographic features and initial diagnostics are shown in Table 1.

Interventions

Noninvasive therapies. All patients received pharmacotherapy consisting of nonsteroidal anti-inflammatory drugs (NSAIDs) and muscle relaxants for up to 3 weeks. For behavioral modifications, patient awareness was obtained by describing the nature of the TMDs and their variation with stressful conditions. Restrictive use, voluntary avoidance, and relaxation measures were also described. Furthermore, moist warm compresses were recommended as an adjunctive measure.

All patients received customized occlusal stabilization splints (Michigan splint) and were instructed to use them for a minimum of 12 hours per day. The patients included in the study continued to use their appliances as recommended in the postinjection phase.

A standard exercise regimen was utilized for all patients, including range of motion exercises for the jaw and isometric strengthening exercises for the masticatory muscles. The former consisted of right and left laterotrusions, active mouth opening, and protrusion. Strengthening exercises were performed with the same four movements against resistance provided by the patient's finger pressure for 8 seconds. The exercises were rehearsed 8 times per session, 3 times a day, for 6 weeks.[16] The same regimen was used in the postinjection phase.

Fig 1 Clinical view indicating the ATNB injection site.

ATNB technique. Articaine hydrochloride (80 mg/2 mL) and epinephrine bitartrate (0.02 mg/2 mL) containing local anesthetic solutions (Maxicaine Fort, VEM) were administered according to the technique described by Donlon et al.[17] After topical anesthesia of the injected site was obtained, the site was prepared and draped in a standard manner. The head and neck of the condyle were detected by palpating the pretragal area. Then, the needle was inserted anterior to the junction of the tragus and the lobule (Fig 1). After 0.5 mL, the solution was subcutaneously infiltrated, and the needle was protruded until it touched the neck of the condyle. Aspiration was performed to avoid intravenous injections, and the remaining solution was injected thereafter. The injections were repeated during follow-up visits at 1 week and 4 weeks.

Outcome Measures

Pain intensity evaluation. The patients were asked to assess the pain intensity (PI) following the examination performed as proposed by the DC/TMD protocol. The pressure applied during the TMJ palpation was standardized by a pressure algometer. The examiner calibrated the finger pressure to 0.5 kg for the lateral pole and 1 kg for the circumference of the lateral pole palpations according to DC/TMD recommendations.

PI was measured using an 11-point visual analog scale (VAS), on which 0 referred to no pain, 5 referred to moderate pain, and 10 referred to excruciating pain. Patients self-evaluated their PI at the initial visit, immediately before anesthetic administration (pre-ATNB), and at the 6-month follow-up visit.

MMO assessment. MMO was measured as the distance between the incisal edges of the maxillary and mandibular right central incisor teeth using a standardized digital caliper. The distances were recorded in millimeters before anesthetic administration and at the 1-week, 4-week, and 6-month follow-up visits.

Self-reported outcomes. At the 6-month follow-up visit, patients were asked to define the treatment as successful or unsuccessful, according to their experience.

Statistical Analysis

The obtained data were analyzed with the SPSS version 25 software (IBM). Kolmogorov-Smirnov test was used to evaluate the data distribution.

Descriptive analyses were carried out to determine the general characteristics of the study groups. Data for continuous variables were in the form of mean ± SD. Data for categorical variables were given as n (%). The normally distributed data were analyzed with an independent-sample *t* test to determine if there was a significant difference between the two independent clinical factors according to the arithmetic mean values.

Independent-sample *t* and paired-sample *t* tests were used for comparing the averages of the quantitative variables (MMO and VAS scores) between the follow-up periods. Cross-tables and chi-square test were used to evaluate the differences between qualitative variables (gender, clinical diagnosis, and success rate). P values $\leq$ .05 were considered significant.

Results

According to the inclusion criteria, 22 patients (16 women, 6 men) with an age range of 18 to 46 years (mean ± SD 35.09 ± 15.08 years) were included in the study. Of the 22 patients, 9 (40.9%) were diagnosed with DDWR, 13 (59.1%) were diagnosed with DDWOR, and all of the patients were diagnosed with arthralgia.

The participants had received pharmacotherapy, occlusal splint therapy, behavioral modification, and physical therapy as first-line management modalities, but no reduction in clinical symptoms was observed. Despite this, the patients refused to undergo invasive therapy. Following the noninvasive therapties, the patients had pain in the TMJ regions and reduced MMO immediately before ATNB administration (Table 2). According to the records of the study population, 16 patients (72.7%) had limited MMO (< 35 mm), 9 patients (40.9%) had joint sounds, and 4 patients (18.18%) had both symptoms following the initial treat-

Table 2 Mean ± SD Pain Scores and Maximal Mouth Opening (MMO) Values Before Auriculotemporal Nerve Block (ATNB)

Variables	Pre-ATNB pain scores (0–10 VAS)	Pre-ATNB MMO (mm)
Gender		
Women	6.80 ± 2.14	27.59 ± 5.61
Men	5.85 ± 1.79	31.59 ± 5.97
Total	6.54 ± 2.06	28.67 ± 5.86

VAS = visual analog scale.

Table 3 Mean VAS Scores Pre- and Post-ATNB (n = 22)

Variables	Minimum pain (VAS)	Maximum pain (VAS)	Mean	SE	SD	*P*
Initial visit VAS	3.30	10.00	7.33	0.36	1.70	
Pre-ATNB VAS	3.00	10.00	6.54	0.43	2.06	.913
Post-ATNB VAS, 6 mo	0.00	5.30	1.73	0.29	1.38	**.027**

ATNB = auriculotemporal nerve block; VAS = visual analog scale (0–10).
Comparisons between variables were analyzed by independent-sample *t* test. Bolded *P* value(s) indicate significance.

Table 4 Pre- and Post-ATNB Maximal Mouth Opening (MMO) Values (mm)

Variables	Minimum MMO	Maximum MMO	Mean	SE	SD	*P*
Initial visit	20.00	38.00	26.95	1.09	5.14	
Pre-ATNB	21.00	40.20	28.67	1.25	5.86	.151
Post-ATNB, 1 wk	27.00	49.00	39.92	1.17	5.53	**.000**
Post-ATNB, 4 wk	27.30	48.00	39.82	1.17	5.52	**.000**
Post-ATNB, 6 mo	27.00	45.30	38.73	1.17	5.51	**.000**

Comparisons between variables were analyzed by independent-sample *t* test. Bolded *P* value(s) indicate significance.

ment. Pain intensity at rest was evaluated with a VAS. It was observed that the VAS scores had significantly decreased at the 6-month follow-up (*P* = .027). The mean pre-ATNB VAS score was 6.54 ± 2.06, which was reduced to 1.73 ± 1.38 at the 6-month follow-up visit (Table 3). Based on the obtained data, the achieved statistical power was calculated as 0.89 by G*Power 3.1,[18] with an alpha value of .05 and effect size of 0.539.

There were significant differences between the pre-ATNB and the 1-week, 4-week, and 6-month follow-up scores (*P* = .000 for all). The pre-ATNB mean MMO value (28.67 mm) increased to 38.73 mm at the 6-month follow-up (Table 4).

The study population data were classified into groups, and the qualitative data (age groups, gender, and clinical diagnosis) were analyzed using chi-square test to determine the satisfaction with the intervention. From the patients' perspective, treatment success did not differ significantly with age group (*P* = .78) or gender (*P* = .65), and patients in both diagnostic groups reported that the treatment method applied was significantly successful (*P* = .034).

Discussion

TMDs are the most common cause of nonodontogenic pain in the orofacial region.[19] It has been reported that the prevalence of TMDs is between 3.7% and 12%.[20] Additionally, 44.2% to 55.6% of TMD patients reportedly have disc displacement and degenerative irregularities.[21–23]

Many clinical studies have investigated various treatment modalities for the treatment of TMJ disorders. However, the best treatment method that provides predictable results based on consistent evidence is still unclear.[24] TMJ disorders cause a decrease in quality of life and loss of function due to symptoms such as pain and limitation of mandibular movement. Contrary to previous views, joint immobilization is not beneficial and worsens symptoms due to muscle contraction, decreased synovial fluid production, and muscle fatigue.[19] Therefore, first-line treatments should focus on alleviating pain and maintaining mandibular movements within normal limits. NSAIDs, physical methods such as heat or cold application, occlusal device treatments, and behavioral modifications are generally used for treating intra-articular TMJ pain. While these reversible treatments effectively treat arthralgia and myalgia, a minority of patients continue to experience localized intracapsular pain.[25] In the current study, which focused on the data obtained from patients presenting with similar complaints, it was observed that the VAS scores decreased by an average of 0.79, and MMO increased by an average of 1.72 mm with noninvasive therapies. However, when noninvasive therapies were promoted with ATNB, a significant increase in MMO and a significant decrease in VAS scores were observed at 6 months.

This progress is anticipated because the noninvasive treatment with adjunctive blockage leads to improved lubrication and the elimination of inflammatory mediators because of the joint's function.[26] Moreover, eradicating pain-induced loss of function with local anesthetic administration was thought to restore joint mobility within normal limits.[27] Despite the limited data available in the literature on the effectiveness of ATNB in TMJ disorders, Nascimento et al reported that a combination of ATNB and physical therapy significantly reduced the patients' pain and improved MMO.[28] However, Yeung et al[29] achieved significant pain reduction in patients with DDWOR with an intra-articular hyaluronic acid injection only through a reduction in active mouth opening. Similarly, in a study by Nicolakis et al,[30] a decrease in active mouth opening was reported in some of the patients with DDWOR treated with physical exercise alone. In the present study, a significant decrease in the VAS scores and a significant increase in active mouth opening were observed with the treatment modality applied. This finding indicates that supportive methods, such as ATNB, may be required to increase the effectiveness of noninvasive therapies in TMJ disorder patients.

Conversely, the authors observed that DDWOR patients reported a higher failure rate at the end of the 6-month follow-up period. Also, a slight reduction in the mean MMO of the study population was noticed, but this reduction was within normal limits. Therefore, it was thought that the application of ATNB with physical therapy did not cause the affected disc to return to its normal position, but that the joint structures could adapt.

Due to the retrospective design of the present study, possible placebo effects could not be excluded. Another limitation is that there was no control group including participants with similar diagnoses without symptoms, and the study groups consisted only of participants in need of treatment. However, it has been reported that only 5% to 10% of TMD patients need treatment, and 40% of patients have spontaneous resolution of their symptoms.[31] Further randomized clinical trials are necessary to compare the efficacy of ATNB and physical therapy to other invasive and noninvasive treatment methods. In addition, there are studies in the literature investigating the efficacy of different anesthetic block techniques, especially in patients diagnosed with chronic myofascial pain, and indicating that these techniques can be prospectively beneficial.[32] Hence, additional studies should also be conducted to evaluate the efficacy of ATNB for other TMDs associated with pain that were not included in this study.

Conclusion

The results of this study suggest significant improvements in MMO and a reduction in pain intensity after ATNB with physical therapy in patients with DDWR and DDWOR with arthralgia. Thus, ATNB may be employed as a noninvasive, low-cost treatment method.

Key Findings

- ATNB may facilitate noninvasive therapies targeting TMJ disorders.
- ATNB can rapidly alleviate the pain associated with internal derangements of the TMJ.
- The ATNB technique has a low rate of complications and is a noninvasive, low-cost treatment modality.

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