DOI: https://doi.org/10.17816/uds630605
Research Article

Effectiveness of a new method for positioning the lower jaw in patients with partial tooth loss and temporomandibular joint dysfunction

Vahan M. Oromyan, Roman A. Fadeev

North-Western State Medical University named after I.I. Mechnikov, Saint Petersburg, Russia

ABSTRACT

BACKGROUND: Temporomandibular joint (TMJ) dysfunction and partial tooth loss are common conditions among the population. The progression of these conditions and the insufficient effectiveness of diagnostic and treatment methods pose several challenges for modern dentistry. Numerous methods for determining the position of the lower jaw can be employed; however, comprehensive diagnostics are required for patients with these issues. Some diagnostic algorithms and treatment methods are unreliable. Studies have indicated that most treatment errors occur during the determination of the optimal lower jaw position.

AIM: To investigate the effectiveness of the developed method for lower jaw positioning in patients with partial tooth loss and TMJ dysfunction.

MATERIALS AND METHODS: This randomized controlled study enrolled 108 patients diagnosed with partial tooth loss and TMJ dysfunction. Patients were divided into three groups: group 1 underwent lower jaw positioning using transcutaneous electrical nerve stimulation, group 2 using a hydrostatic cap, and group 3 using the developed method. After establishing the lower jaw position, a stabilizing cap was fabricated for the patient to maintain the identified position for 60 days. Subsequently, the examination was repeated using the initial diagnostic algorithm, which included the same investigation methods.

RESULTS: Statistically significant changes were found in the morphofunctional state of the stomatognathic system in patients with partial tooth loss and TMJ dysfunction after applying various methods of lower jaw positioning, i.e., transcutaneous electrical nerve stimulation, hydrostatic cap, and the proposed method ($p < 0.05$). The symptoms diminished in all groups, and the greatest changes were observed in group 3. The analysis of cephalometric data showed a significant reduction in the displacement of the dental midline and sagittal dental distance and an increase in the vertical dental distance after lower jaw positioning. Electromyographic analysis revealed an increase in the symmetry of the temporal and masticatory muscles, torsion index, and masseteric center, particularly in group 3. The obtained data confirm the effectiveness of the proposed method for lower jaw positioning in improving the condition of the stomatognathic system in patients with partial tooth loss and TMJ dysfunction.

CONCLUSION: In comparison with existing methods, the proposed method of mandibular positioning improves the symmetry indices of temporal and masseter muscles, torsion index, and masseteric center to a greater extent, which contributes to the normalization of the TMJ articular gap parameters.

Keywords: temporomandibular joint; partial tooth loss; occlusal disorders; determination of central jaw relationship.

To cite this article
Oromyan VM, Fadeev RA. Effectiveness of a new method for positioning the lower jaw in patients with partial tooth loss and temporomandibular joint dysfunction. *Acta Universitatis Dentistriae et Chirurgiae Maxillofacialis*. 2024;2(1):35–42. DOI: https://doi.org/10.17816/uds630605

Received: 02.04.2024 **Accepted:** 22.04.2024 **Published:** 27.04.2024

DOI: https://doi.org/10.17816/uds630605
Научная статья

Изучение эффективности нового метода позиционирования нижней челюсти у пациентов с частичной потерей зубов и дисфункцией височно-нижнечелюстного сустава

В.М. Оромян, Р.А. Фадеев

Северо-Западный государственный медицинский университет им. И.И. Мечникова, Санкт-Петербург, Россия

АННОТАЦИЯ

Актуальность. Дисфункция височно-нижнечелюстного сустава и частичная потеря зубов являются широко распространенными заболеваниями. Существует множество методов определения положения нижней челюсти, однако для терапии пациентов с указанными проблемами требуется комплексная диагностика. Некоторые диагностические алгоритмы и методы лечения оказываются недостаточно надежными. Исследования показывают, что большинство ошибок при лечении происходят на этапе определения оптимального положения нижней челюсти.

Цель — изучение эффективности методов позиционирования нижней челюсти у пациентов с частичной потерей зубов и дисфункцией височно-нижнечелюстного сустава.

Материалы и методы. Проведено рандомизированное контролируемое исследование 108 пациентов с диагнозом частичная потеря зубов и дисфункция височно-нижнечелюстного сустава. Пациенты были разделены на 3 группы: в 1-й группе проводили позиционирование нижней челюсти по методу транскожной электронейростимуляции, 2-й группе — с использованием гидростатической каппы, в 3-й — по разработанному авторами статьи методу. После определения положения нижней челюсти пациентам изготовили стабилизирующую каппу для удержания выявленной позиции на 60 дней. После этого проводили повторное обследование с использованием исходного диагностического алгоритма, включающего те же методы исследования.

Результаты. Исследование морфофункционального состояния зубочелюстного аппарата пациентов с частичной потерей зубов и дисфункцией височно-нижнечелюстного сустава после применения различных методов позиционирования нижней челюсти (транскожная электронейростимуляция, гидростатическая каппа и разработанный метод) выявило статистически значимые различия ($p < 0,05$). Симптомы уменьшились во всех группах, но наибольшие изменения наблюдались в 3-й группе. Анализ контрольно-диагностических моделей челюстей показал значительное уменьшение смещения межрезцовой линии и сагиттального межрезцового расстояния, а также увеличение вертикального межрезцового расстояния после позиционирования нижней челюсти. В результате анализа электромиограмм отмечено увеличение симметрии височных и жевательных мышц, а также торсионного индекса и массинерционного центра, особенно в 3-й группе. Полученные данные подтверждают эффективность разработанного метода позиционирования нижней челюсти для улучшения состояния зубочелюстного аппарата у пациентов с частичной потерей зубов и дисфункцией височно-нижнечелюстного сустава.

Выводы. Разработанный нами оригинальный метод позиционирования нижней челюсти по сравнению с известными методами в большей степени улучшает показатели симметрии височных и жевательных мышц, торсионного индекса и массинерционного центра, способствует нормализации параметров суставной щели височно-нижнечелюстного сустава.

Ключевые слова: височно-нижнечелюстной сустав; частичная потеря зубов; нарушения окклюзии; определение центрального соотношения челюстей.

Как цитировать

Оромян В.М., Фадеев Р.А. Изучение эффективности нового метода позиционирования нижней челюсти у пациентов с частичной потерей зубов и дисфункцией височно-нижнечелюстного сустава // Университетская стоматология и челюстно-лицевая хирургия. 2024. Т. 2. № 1. С. 35–42. DOI: https://doi.org/10.17816/uds630605

Рукопись получена: 02.04.2024 **Рукопись одобрена:** 22.04.2024 **Опубликована:** 27.04.2024

INTRODUCTION

The prevalence of temporomandibular joint (TMJ) dysfunction in partial tooth loss (PTL) ranges from 35% to 83% [1–3]. The progression of this pathology and the insufficient effectiveness of diagnostic and treatment methods require evaluating the relationship among the extent of occlusion, masticatory muscles, and TMJ [2–5]. Many methods can be employed to determine mandibular positioning, which focus on the occlusal, articular, and muscular components of the dentoalveolar apparatus individually. However, a comprehensive evaluation of all these components using accurate data is needed to select the optimal method of mandibular positioning [5–7]. Some diagnostic algorithms prove to be insufficiently reliable. The use of clinical and paraclinical methods is not always justified, and the assessment of the mandibular position is often ambiguous. In addition, the treatment of TMJ disorders is accompanied by complications, and specific symptoms are not always present, which entails many gnathologic conflicting concepts. The aforementioned circumstances present challenges to the diagnosis and treatment of patients with PTL and TMJ disorders [8]. A review of complications in the treatment of patients with PTL and TMJ dysfunction revealed that the majority of errors occur in the process of determining the position of the mandible [7–9].

This study aimed to investigate the effectiveness of mandibular positioning techniques in patients with PTL and TMJ dysfunction.

MATERIALS AND METHODS

A total of 108 patients, aged 18–64 (mean age, 32 ± 8.5) years, were examined. These patients were diagnosed with PTL (small and medium defects of tooth rows) and TMJ disorders. Of these patients, 35 were male (32.41%) and 73 were female (67.59%). The patients were randomly divided into three groups of 36 patients each. All patients were evaluated for the condition of the dentoalveolar apparatus. The mandibular position in groups 1, 2, and 3 was determined by transcutaneous electroneurostimulation, use of a hydrostatic mouth guard, and the original method, respectively. The proposed method for determining the central position of the mandible involved the patient wearing a hydrostatic mouth guard for 14 days. Subsequently, the mandibular position was recorded using silicone material, and cone-beam computed tomography (CBCT) of the skull was performed with the obtained registrations. To determine the position of the mandibular head, the collected data were loaded into the ARTRO program (Russia), where the mandibular position was analyzed and corrected to achieve normal values of the joint gap width in the sagittal direction. In the identified position, a stabilizing mouth guard was fabricated to hold the mandibular position. The mouth guard was prescribed for 60 days. Thereafter, a second examination was performed using the initial diagnostic algorithm, which included the same examination methods as before the mandibular positioning. The obtained results were statistically processed.

RESULTS

The analysis of control and diagnostic models (CDM) of the jaws showed similar changes in the comparison groups, including displacement of the interincisal line to the right or left, changes in the sagittal inter-incisor and vertical distance (Table 1). All parameters were not statistically significantly different between the groups ($p > 0.05$).

After mandibular positioning, statistically significant differences were observed in the change of the jaw position in the sagittal, transversal, and vertical directions ($p < 0.05$). The analysis demonstrated significant

Table 1. Control and diagnostic models of the jaws of patients with partial tooth loss and temporomandibular joint dysfunction

Таблица 1. Результаты анализа контрольно-диагностических моделей челюстей пациентов с частичной потерей зубов и дисфункцией височно-нижнечелюстного сустава

Indices	Groups			*p*
	Group 1 (*M* ± *S*)	Group 2 (*M* ± *S*)	Group 3 (*M* ± *S*)	
Interincisal line, jaw displacement to the right, mm	3.17 ± 0.13	3.07 ± 0.34	3.13 ± 0.12	0.2151
Interincisal line, jaw displacement to the left, mm	2.96 ± 0.11	3.02 ± 0.14	2.97 ± 0.08	0.0848
Sagittal interincisal distance, mm	2.80 ± 0.33	2.78 ± 0.19	2.77 ± 0.20	0.5207
Vertical distance, mm	11.74 ± 0.58	11.72 ± 0.63	11.68 ± 0.21	0.4569

DOI: https://doi.org/10.17816/uds630605

differences in the interincisal line displacement to the right or left, sagittal interincisal distance, and vertical distance before and after mandibular positioning in the three study groups (Table 2).

Each group exhibited a decrease in the displacement of the interincisal line to the right. The most pronounced decrease was observed in group 3 (68.5%), followed by groups 2 (53.5%) and 1 (20.2%). A similar pattern was observed in the displacement of the interincisal line to the left, with the greatest change in group 3 (56.0%), followed by groups 2 (47.5%) and group 1 (14.2%). The sagittal interincisal distance decreased significantly in all groups, with the greatest reduction in group 3 (66.9%), followed by groups 1 (54.4%) and 2 (9.3%). In contrast, the vertical interdental distance increased in each group, with the greatest increase in group 3 (48.8%), followed by groups 1 (46.1%) and 2 (39.4%). The results indicate significant changes in the inter-incisor displacement after mandibular positioning, with group 3 exhibiting the most pronounced changes.

Analysis of electromyogram (EMG) parameters in all 108 patients revealed asymmetry of bioelectrical activity of temporal (mean, 58.14% ± 10.48%) and masticatory (mean, 60.14% ± 8.89%) muscles and torsional index (mean, 58.84% ± 9.02%) and mass-inertial center (mean, 57.26% ± 9.1%).

Before mandibular positioning, the symmetry of temporal muscle function was 55.94% ± 7.18% in group 1, 61.06% ± 11.40% in group 2, and 57.42% ± 11.84% in group 3 (Table 3). Similarly, the symmetry indices of masticatory muscle performance before mandibular positioning were 59.64% ± 8.61%, 63.11% ± 8.70%, and 57.67% ± 9.35% in groups 1, 2, and 3, respectively. The torsional index values before mandibular positioning were 59.03% ± 7.56%, 57.75% ± 8.47%, and 59.75% ± 11.02% in groups 1, 2, and 3, respectively. The masticatory center values before mandibular positioning were 57.47% ± 10.56%, 57.39% ± 8.80%, and 56.92% ± 7.93% in groups 1, 2, and 3, respectively. The analysis of EMG data revealed that the values before mandibular positioning were not statistically significantly different among the three groups ($p > 0.05$).

After mandibular positioning, the symmetry indices of temporal muscles averaged 91.11%, 83.61%, and 97.22% in groups 1, 2, and 3, respectively (Table 4). The indices of masticatory muscle symmetry after mandibular positioning were 88.94%, 86.61%, and 96.81% in groups 1, 2, and 3, respectively. The average torsion indices after

Table 2. Dynamics of the quantitative indicators before and after mandibular positioning by study groups

Таблица 2. Анализ динамики количественных показателей до и после позиционирования нижней челюсти по группам исследования

Indices	Groups					
	Group 1 (before)	Group 1 (after)	Group 2 (before)	Group 2 (after)	Group 3 (before)	Group 3 (after)
Interincisal line, jaw displacement to the right, mm	3.17 ± 0.13	2.53 ± 0.09	3.07 ± 0.34	1.43 ± 0.16	3.13 ± 0.12	0.98 ± 0.11
Interincisal line, jaw displacement to the left, mm	2.96 ± 0.11	2.54 ± 0.04	3.02 ± 0.14	1.59 ± 0.13	2.97 ± 0.08	1.31 ± 0.20
Sagittal interincisal distance, mm	2.80 ± 0.33	1.28 ± 0.19	2.78 ± 0.19	2.52 ± 0.10	2.77 ± 0.20	0.92 ± 0.15
Vertical distance, mm	11.74 ± 0.58	17.15 ± 0.28	11.7 ± 0.63	16.34 ± 0.25	11.68 ± 0.21	17.38 ± 0.51
p	<0.05		<0.05		<0.05	

Table 3. Electromyographic parameters of patients with partial tooth loss and temporomandibular joint dysfunction

Таблица 3. Результаты анализа электромиографических показателей пациентов с частичной потерей зубов и дисфункцией височно-нижнечелюстного сустава

Indices	Groups			*p*
	Group 1	Group 2	Group 3	
Temporal muscle symmetry, %	55.94 ± 7.18	61.06 ± 11.40	57.42 ± 11.84	0.1402
Masticatory muscle symmetry, %	59.64 ± 8.61	63.11 ± 8.70	57.67 ± 9.35	0.0539
Torsional index, %	59.03 ± 7.56	57.75 ± 8.47	59.75 ± 11.02	0.7176
Mass-inertial center, %	57.47 ± 10.56	57.39 ± 8.80	56.92 ± 7.93	0.9720

DOI: https://doi.org/10.17816/uds630605

mandibular positioning were 87.75%, 95.28%, and 96.42% in groups 1, 2, and 3, respectively. The average mass-inertial center values after mandibular positioning were 85.22%, 82.39%, and 95.75% in groups 1, 2, and 3, respectively.

Torsion index values demonstrated a notable increase, particularly 48.7%, 65%, and 61.4% in groups 1, 2, and 3, respectively. The analysis of mass-inertial center values revealed a 48.1% increase in group 1, 43.6% in group 2, and 68.2% in group 3.

The analysis of EMG parameters revealed a significant improvement in temporal muscle symmetry in group 1 from 55.94% ± 7.18% to 91.11% ± 2.82% ($p < 0.05$), masticatory symmetry from 59. 64% ± 8.61% to 88.94% ± 3.49% ($p < 0.05$), torsion index from 59.03% ± 7.56% to 87.75% ± 2.87% ($p < 0.05$), and masticatory center from 57.47% ± 10.56% to 85.22% ± 2.02% ($p < 0.05$). Group 2 also showed a significant improvement in temporal muscle symmetry from 61.06% ± 11.40% to 83.61% ± 3.20% (p < 0.05), masticatory symmetry from 63.11% ± 8.70% to 86.61% ± 3.08% ($p < 0.05$), torsion index from 57.75% ± 8.47% to 95.28% ± 3.91% ($p < 0.05$), and mass-inertial center from 57.39% ± 8.80% to 82.39% ± 4.59% ($p < 0.05$). In group 3, significant improvements were noted in temporal muscle symmetry from 57.42% ± 11.84% to 97.22% ± 2.14% ($p < 0.05$), masticatory symmetry from 57.67% ± 9.35% to 96.81% ± 2.34% ($p < 0.05$), torsion index from 59.75% ± 11.02% to 96.42% ± 3.25% ($p < 0.05$), and mass-inertial center from 56.92% ± 7.93% to 95.75% ± 3.08% ($p < 0.05$).

In the analysis of the right and left TMJ CBCTs, all 108 (100%) patients had deviations from normal values of the joint gap parameters. The width of the joint gap varied in different parts of the right TMJ before mandibular positioning (Table 5). For example, the average widths of the joint gap in the upper TMJ were 1.9, 1.84, and 1.96 mm in groups 1, 2, and 3, respectively. Similarly, the width of the joint gap in other sections (anterior, posterior, medial, and lateral) differed among the groups. However, no significant differences ($p > 0.05$) in data for all right TMJ sections were found among the groups.

Table 6 shows that before mandibular positioning, the joint gap width varied in different parts of the TMJ on the left side. However, no significant differences were found among the groups ($p > 0.05$).

The analysis of the right and left TMJ CBCT performed after mandibular repositioning in patients with PTL and TMJ dysfunction revealed significant differences in the data obtained before and after mandibular repositioning ($p < 0.05$) (Tables 7 and 8).

Table 4. Dynamics of the quantitative indicators of electromyograms before and after mandibular positioning by study groups

Таблица 4. Анализ динамики количественных показателей электромиограмм до и после позиционирования нижней челюсти по группам исследования

Indices	Groups					
	Group 1 (before)	Group 1 (after)	Group 2 (before)	Group 2 (after)	Group 3 (before)	Group 3 (after)
Temporal muscle symmetry, %	55.94 ± 7.1	91.11 ± 2.8	61.06 ± 11.4	83.61 ± 3.2	57.42 ± 11.8	97.22 ± 2.1
Masticatory muscle symmetry, %	59.64 ± 8.6	88.94 ± 3.4	63.11 ± 8.7	86.61 ± 3	57.67 ± 9.3	96.81 ± 2.3
Torsional index, %	59.03 ± 7.5	87.75 ± 2.8	57.75 ± 8.4	95.28 ± 3.9	59.75 ± 11	96.42 ± 3.2
Mass-inertial center, %	57.4 ± 10.5	85.22 ± 2	57.39 ± 8.8	82.39 ± 4.5	56.92 ± 7.9	95.75 ± 3
p	<0.05		<0.05		<0.05	

Table 5. Cone-beam computed tomogram data of the temporomandibular joint on the right side of patients with partial tooth loss and temporomandibular joint dysfunction

Таблица 5. Результаты анализа конусно-лучевых компьютерных томограмм височно-нижнечелюстного сустава справа пациентов с частичной потерей зубов и дисфункцией височно-нижнечелюстного сустава

Indices	Groups			*p*
	Group 1 ($n = 36$) $M \pm S$	Group 2 ($n = 36$) $M \pm S$	Group 3 ($n = 36$) $M \pm S$	
Upper joint gap, mm	1.92 ± 0.16	1.84 ± 0.13	1.94 ± 0.06	0.1724
Anterior joint gap, mm	3.96 ± 0.31	4.22 ± 0.21	4.04 ± 0.07	0.1823
Posterior joint gap, mm	1.10 ± 0.09	1.09 ± 0.08	1.06 ± 0.02	0.1057
Medial joint gap, mm	3.46 ± 0.73	3.56 ± 0.43	3.46 ± 0.06	0.6668
Lateral joint gap, mm	1.11 ± 0.11	1.15 ± 0.11	1.08 ± 0.14	0.4933

Thus, when comparing the data obtained before and after mandibular positioning in all groups, the joint gap widths changed in all parts of the right and left TMJ and were statistically significantly different among the study groups ($p < 0.05$).

DISCUSSION

This study of the morphofunctional state of the dentoalveolar apparatus of patients with PTL and TMJD dysfunction before and after mandibular positioning by

Table 6. Cone-beam computed tomogram data of the temporomandibular joint on the left side of patients with partial tooth loss and temporomandibular joint dysfunction

Таблица 6. Результаты анализа конусно-лучевых компьютерных томограмм височно-нижнечелюстного сустава слева пациентов с частичной потерей зубов и дисфункцией височно-нижнечелюстного сустава

Indices	Groups			*p* (*df* = 2)
	Group 1 (*n* = 36) *M* ± *S*	Group 2 (*n* = 36) *M* ± *S*	Group 3 (*n* = 36) *M* ± *S*	
Upper joint gap, mm	1.72 ± 0.12	1.68 ± 0.11	1.70 ± 0.02	0.4975
Anterior joint gap, mm	3.79 ± 0.20	3.78 ± 0.19	3.84 ± 0.11	0.8138
Posterior joint gap, mm	1.1 ± 0.10	1.11 ± 0.09	1.06 ± 0.15	0.7945
Medial joint gap, mm	3.46 ± 0.59	3.56 ± 0.60	3.42 ± 0.36	0.6858
Lateral joint gap, mm	1.11 ± 0.11	1.14 ± 0.10	1.11 ± 0.03	0.3827

Table 7. Dynamics of the quantitative indices of cone-beam computed tomograms of the temporomandibular joint on the right side before and after mandibular positioning by study groups

Таблица 7. Анализ динамики количественных показателей конусно-лучевых компьютерных томограмм височно-нижнечелюстного сустава справа до и после позиционирования нижней челюсти по группам исследования

Indices	Groups					
	Group 1 (before)	Group 1 (after)	Group 2 (before)	Group 2 (after)	Group 3 (before)	Group 3 (after)
Upper joint gap, mm	1.90 ± 0.16	2.72 ± 0.25	1.85 ± 0.16	2.58 ± 0.12	1.89 ± 0.24	2.81 ± 0.12
Anterior joint gap, mm	4.03 ± 0.38	2.71 ± 0.24	4.14 ± 0.34	2.92 ± 0.05	4.02 ± 0.12	1.98 ± 0.11
Posterior joint gap, mm	1.11 ± 0.10	1.95 ± 0.09	1.10 ± 0.09	1.74 ± 0.08	1.05 ± 0.05	1.96 ± 0.02
Medial joint gap, mm	3.54 ± 0.59	2.85 ± 0.15	3.61 ± 0.62	2.41 ± 0.05	3.46 ± 0.17	2.42 ± 0.04
Lateral joint gap, mm	1.13 ± 0.11	1.65 ± 0.22	1.15 ± 0.11	2.11 ± 0.07	1.15 ± 0.21	2.08 ± 0.10
p	<0.05		<0.05		<0.05	

Table 8. Dynamics of the quantitative indices of cone-beam computed tomograms of the temporomandibular joint on the left side before and after mandibular positioning by study groups

Таблица 8. Анализ динамики количественных показателей конусно-лучевых компьютерных томограмм височно-нижнечелюстного сустава слева до и после позиционирования нижней челюсти по группам исследования

Indices	Groups					
	Group 1 (before)	Group 1 (after)	Group 2 (before)	Group 2 (after)	Group 3 (before)	Group 3 (after)
Upper joint gap, mm	1.72 ± 0.12	2.80 ± 0.20	1.69 ± 0.11	2.85 ± 0.30	1.70 ± 0.02	2.79 ± 0.09
Anterior joint gap, mm	3.79 ± 0.20	2.81 ± 0.09	3.78 ± 0.19	2.96 ± 0.12	3.84 ± 0.11	2.04 ± 0.09
Posterior joint gap, mm	1.1 ± 0.10	2.38 ± 0.20	1.11 ± 0.09	1.68 ± 0.07	1.06 ± 0.15	2.00 ± 0.11
Medial joint gap, mm	3.54 ± 0.59	2.88 ± 0.27	3.56 ± 0.60	2.53 ± 0.03	3.42 ± 0.36	2.49 ± 0.05
Lateral joint gap, mm	1.13 ± 0.11	1.74 ± 0.07	1.14 ± 0.10	1.99 ± 0.05	1.11 ± 0.03	2.00 ± 0.04
p	<0.05		<0.05		<0.05	

various methods, such as transcutaneous electrical nerve stimulation, hydrostatic mouth guard, and proposed mandibular positioning method, revealed statistically significant changes. After mandibular repositioning, the symptoms decreased in all groups; however, the most significant changes were observed between groups 2 and 3. Analysis of jaw CDM after mandibular positioning showed the greatest reduction in interdental line shift to the right in group 3 (68.5%), followed by groups 2 (53.5%) and 1 (20.2%). Leftward displacement decreased in each group, with the greatest change in group 3 (56.0%), followed by groups 2 (47.5%) and 1 (14.2%). Sagittal interdental distance decreased significantly in groups 3 (66.9%), 1 (54.4%), and 2 (9.3%). Vertical interdental distance increased with the greatest increase in group 3 (48.8%), followed by groups 1 (46.1%) and 2 (39.4%). These results indicate significant changes in the interdental line after mandibular positioning, particularly in group 3. Analysis of the EMG parameters before and after mandibular positioning showed a significant increase in the symmetry of the temporal and masticatory muscles in group 1 by 62.9% and 49.1%, respectively ($p < 0.05$). In group 2, temporal muscle symmetry increased by 36.9% and masticatory symmetry by 37.2%. The torsion index and mass-inertial center increased by 65% and 43.6%, respectively. The greatest increase in temporal muscle symmetry index (69.3%) was observed in group 3, and the dynamic parameters of masticatory muscle symmetry increased by 67.9%. The torsion index and mass-inertial center increased by 61.4% and 68.2%, respectively. Thus, the greatest improvements in EMG indices were observed in group 3. The comparison of CDM data before and after mandibular positioning in the three groups also showed the greatest changes in group 3. These results emphasize the differences in the effectiveness of mandibular positioning methods in patients with PTL and TMJ dysfunction. The most pronounced symptom reduction was observed in group 3.

CONCLUSIONS

1. Patients with PTL and TMJ dysfunction have displaced interincisal line (mean, 3.0 ± 0.15 mm), increased sagittal interincisal distance (mean, 2.78 ± 0.24 mm), asymmetry of the bioelectrical activity of the temporal muscles (mean, 58.14% ± 10.48%) and masticatory muscles (mean, 60.14% ± 8.89%), pronounced asymmetry of the torsion index (mean, 58.84 ± 9.02%) and mass-inertial center (mean, 57.26% ± 9.1%), and deviation from normal values of the joint gap width in all TMJ sections both right and left.

2. The analysis of the results of different methods of mandibular positioning, including transcutaneous electroneurostimulation, use of a hydrostatic mouth guard, and proposed jaw position determination method, revealed positive dynamics in electromyographic indices, morphological parameters of the TMJ, and jaw position ratio in each group.

3. The proposed mandibular positioning method considers the muscular and articular parameters of the dentoalveolar apparatus in patients with PTL and TMJ dysfunction, improves the symmetry in temporal (97.22% ± 2.14%) and masticatory (96.81% ± 2.34%) muscles, torsion index (96.42% ± 3.25%), and mass-inertial center (95.75% ± 3.08%). It also helps normalize the width of the joint gap in all parts of the TMJ.

ADDITIONAL INFORMATION

Authors' contribution. All the authors made a significant contribution to the preparation of the article, read and approved the final version before publication. Personal contribution of each author: V.M. Oromyan — performance of the main volume of theoretical and practical research, analysis and registration of results; R.A. Fadeev — development, analysis and systematization of theoretical and practical results, consultation during the research.

Funding source. The authors claim that there is no external funding when writing the article.

Competing interests. The authors declare the absence of obvious and potential conflicts of interest related to the publication of this article.

Ethics approval. The material of the article demonstrates the results of clinical observation, does not contain research materials.

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AUTHORS' INFO

***Vahan M. Oromyan,** assistant; Department of Orthopedic Dentistry, Orthodontics and Gnathology; North-Western State Medical University named after I.I. Mechnikov; address: Kirochnaya st., 41, St. Petersburg, 191015, Russia; ORCID: 0009-0002-0366-303X; eLibrary SPIN: 2078-9155; e-mail: oromjan@mail.ru
Roman A. Fadeev, MD, Dr. Sci. (Med), Professor; ORCID: 0000-0003-3467-4479; Scopus Authors ID: 6503892124; eLibrary SPIN: 4556-5177; e-mail: sobol.rf@yandex.ru

ОБ АВТОРАХ

***Ваган Мнацаканович Оромян,** ассистент кафедры ортопедической стоматологии, ортодонтии и гнатологии; ФГБОУ ВО СЗГМУ им. И.И. Мечникова; адрес: ул. Кирочная, д. 41 Санкт-Петербург, 191015, Россия; ORCID: 0009-0002-0366-303X; eLibrary SPIN: 2078-9155; e-mail: oromjan@mail.ru
Роман Александрович Фадеев, д-р мед. наук, профессор; ORCID: 0000-0003-3467-4479; Scopus Authors ID: 6503892124; eLibrary SPIN: 4556-5177; e-mail: sobol.rf@yandex.ru

* Corresponding author / Автор, ответственный за переписку