



Analysis of the bioelectric potential indicators of muscles based on electromyography of patients with gnathic forms of mesial and distal occlusion

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Abstract

INTRODUCTION. There is an analysis of the bioelectric potential indicators of muscles based on electromyographic study data was conducted in patients with gnathic forms of mesial and distal occlusions before and after combined treatment in this article.

AIM. To analyze the bioelectric potential indicators of muscles in the examination of patients with gnathic forms of mesial and distal occlusion based on electromyographic study data.

MATERIALS AND METHODS. As part of this work, 40 patients at the age of 18 to 44 with gnathic forms of mesial occlusion were examined before and after undergoing orthognathic surgery. A comparative analysis was conducted with data obtained by E.B. Castaño in 2019 from the study of patients with gnathic forms of distal occlusion.

RESULTS. After analyzing electromyographic study during the “Initial Contact of Teeth” test showed that all patients with skeletal forms of mesial occlusion exhibited significantly elevated readings compared to those with distal occlusion, indicating an increased tone in the activity of all muscle groups in the craniofacial region. This condition persists even after the combined treatment. Additionally, lower values were observed in the “Maximum Contact of Teeth” test across both study groups; however, during post-treatment, the muscles experience less strain in patients with skeletal forms of distal occlusion.

CONCLUSIONS. Adult patients aged 18 to 44 years, the study revealed significant differences in the increase of specific indicators both before and after treatment. This indicates considerable muscle overload at all stages of treatment. When treating adult patients with skeletal forms of occlusal anomalies, it is essential to consider electromyographic findings to create conditions for the proper functioning of the dental and jaw system upon completion of treatment and to guide rehabilitation strategies.

Keywords: mesial occlusion, distal occlusion, electromyography, combined treatment

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Сравнительная оценка показателей биопотенциалов мышц по данным электромиографического исследования у пациентов с гнатической формой мезиальной и дистальной окклюзиями

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Резюме

ВВЕДЕНИЕ. В данной статье проведена сравнительная оценка показателей биопотенциалов мышц по данным электромиографического исследования у пациентов с гнатической формой мезиальной и дистальной окклюзиями до и после проведенного комбинированного лечения.

ЦЕЛЬ. Сравнительная оценка показателей биопотенциалов мышц при обследовании пациентов с гнатической формой мезиальной и дистальной окклюзией по данным электромиографического исследования.

МАТЕРИАЛЫ И МЕТОДЫ. В рамках данной работы было обследовано 40 пациентов в возрасте от 18 до 44 лет с гнатической формой мезиальной окклюзии до и после проведением ортогнатических операций. Проведен сравнительный анализ с данными, полученными Е.Б. Кастаньо в 2019 г. по исследованию пациентов с гнатической формой дистальной окклюзии.

РЕЗУЛЬТАТЫ. Анализ электромиографического исследования при пробе «Первичный контакт зубов-антагонистов» показал у всех пациентов скелетных форм мезиальной окклюзии значительно повышенные показатели от дистальной окклюзии, что говорит о повышенном тоне работы всех групп мышц челюстно-лицевой области. Такая же ситуация сохраняется даже после проведенного комбинированного лечения. Также прослеживаются пониженные показатели при пробе «Максимальный контакт зубов-антагонистов» в двух группах исследования, но после проведенного лечения мышцы испытывают меньшую нагрузку у пациентов скелетных форм дистальной окклюзии.

ВЫВОДЫ. У взрослых пациентов 18–44 лет по данным исследования выявлены значимые отличия увеличения отдельных показателей как до, так и после лечения. Это свидетельствует о большой перегруженности мышц на всех этапах лечения. При лечении взрослых пациентов скелетных форм аномалии окклюзии необходимо учитывать показания электромиографии, чтобы создать условия для правильного функционирования зубочелюстной системы по завершению лечения и выбора тактики реабилитации.

Ключевые слова: мезиальная окклюзия, дистальная окклюзия, электромиография, комбинированное лечение

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INTRODUCTION

Gnathic forms of dental arch malocclusion are among the most complex dentoalveolar disorders in terms of diagnostics and treatment planning [1]. Mesial occlusion accounts for up to 17% of all dentofacial anomalies [2], while the reported prevalence of distal occlusion varies from 13 to 27% [3]. In most cases, patients with these types of occlusal abnormalities require combined treatment involving orthognathic surgery, which addresses two primary objectives: achieving proper positioning of skeletal structures and harmonization of the soft-tissue profile [4].

The complexity of treatment planning is determined not only by the presence of morphological alterations, extensively described in the literature [1; 2; 5], but also by functional disorders of the maxillofacial region [3; 6; 7]. Previous studies have comprehensively identified morphometric deviations characteristic of skeletal malocclusions [6; 8] and contributed to the refinement of diagnostic approaches. Various methods for functional assessment of the maxillofacial region have also been proposed [3; 7; 9], including electromyographic evaluation of muscle bioelectric activity. According to multiple authors, unresolved muscular dysfunction during treatment is a key driver of relapse [10–12].

To prevent complications and achieve stable occlusion, it is essential to normalize not only the occlusal relationships but also the functional state of the masticatory muscles. This has created a clear need for detailed assessment of the functional parameters of the maxillofacial region and identification of specific patterns of dysfunction.

AIM

To conduct a comparative assessment of muscle bioelectric activity parameters in patients with the gnathic forms of mesial and distal occlusion based on electromyographic examination data.

MATERIALS AND METHODS

In this study, we examined 40 patients aged 18 to 44 years with the gnathic form of mesial occlusion, both before and after orthognathic surgery. A comparative analysis was performed using data obtained by E.B. Castaño [5] in 2019 on patients with the gnathic form of distal occlusion. The analysis included male and female participants aged 18–44 years who met the following criteria: confirmed diagnosis of a gnathic form of malocclusion; no history of orthodontic treatment; no tooth agenesis or extractions; no crowns or restorations on the occlusal surfaces of posterior teeth; no cleft lip or palate; no systemic diseases; and absence of facial asymmetry (chin deviation less than 2 mm but not exceeding 4 mm).

Electromyographic evaluation of the masticatory and cervical muscles was performed using a computerized electromyograph manufactured by Bioket (Italy). Bioelectric activity was recorded from the following muscles: right and left temporalis, right and left masseter, right and left digastric, and right and left sternocleidomastoid muscles. The mean muscle bioelectric activity was calculated. The examination was conducted exclusively in a seated position. The skin areas designated for electrode placement were cleaned and degreased to ensure secure fixation. Electrodes were positioned parallel to the muscle fibers, using silver chloride sensors. The signal captured from the muscle tissues was transmitted to a personal computer, where specialized software processed the bioelectric activity into a graphical format. Results were evaluated based on three key parameters: amplitude, waveform, and duration (Fig. 1). The examination was conducted in two modes: in the position of initial tooth contact and under maximum voluntary clenching.

In the “initial contact” mode, each study participant was instructed to close the mouth until the upper and lower teeth came into contact, starting from the resting

position with the mandible slightly open. In the “maximum intercuspation” mode, the subject was asked to clench the teeth with maximal force from the position of initial antagonist tooth contact in order to increase the occlusal contact area. Graphical and numerical data obtained from patients with the gnathic form of malocclusion were compared with age-matched normative values for adults aged 18 to 44 years. This analysis enables an assessment of the coordination of antagonist and synergistic muscle activity both before and after treatment, as well as the identification of synchronous or asynchronous movements on the right or left side, thereby determining the preferred chewing side. A comparative evaluation was performed between the examined skeletal mesial pattern and archival reference data for distal occlusion [5].

Statistical processing of the results was carried out using methods of variational statistics with the application of Student's *t*-test. The *t*-test applied to two inde-

pendent samples determines whether there is a significant difference between the mean values of the two groups, provided that the data follow a normal distribution. The significance of the differences is assessed by the *t*-value. If the absolute *t*-value exceeds 2, the differences are considered significant at the level of $p \leq 0.01$.

RESULTS

Before the initiation of treatment (Table 1), the electromyographic parameters demonstrated pronounced intergroup variability. Specifically, patients with mesial occlusion exhibited substantially higher muscular activity, indicating increased baseline tonus. The temporal muscle activity was higher by 52.8% on the right side and by 43.7% on the left. The masseter muscle showed lower values in the mesial group – by 33.7% on the right and by 10% on the left. Activity of the digastric muscle was higher by 15.5% on the right and by 12.1% on the left, while the sternocleidomastoid muscle demonstrated an

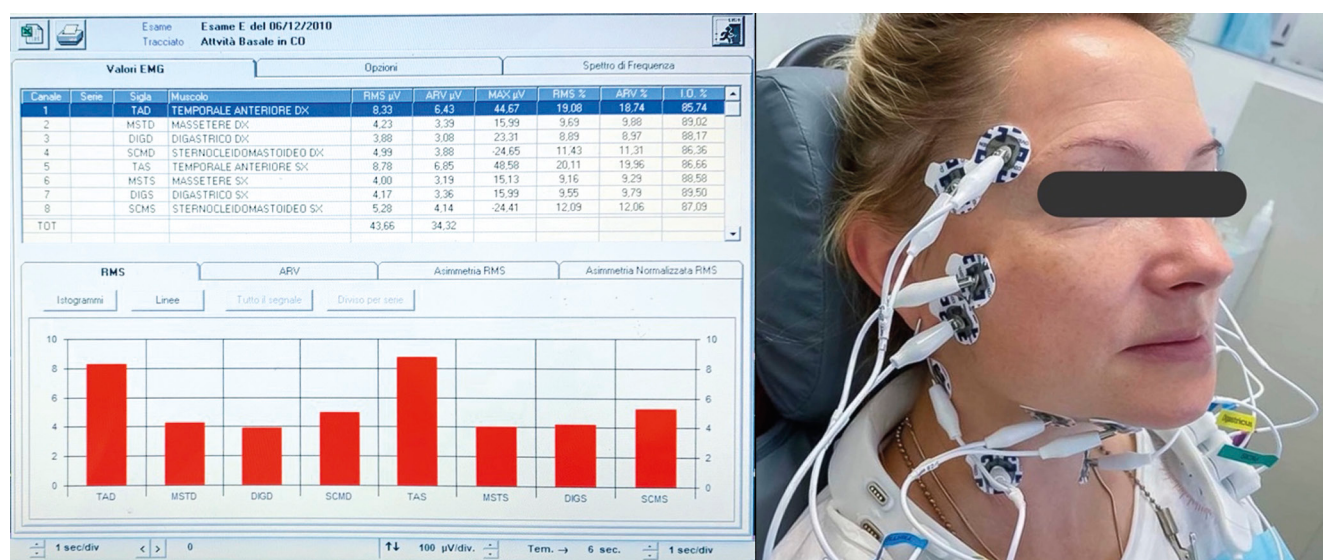


Fig. 1. Electromyographic assessment of the orofacial muscles

Рис. 1. Электромиографическое исследование мышц челюстно-лицевой области

Table 1. Comparative assessment of muscle bio-potential parameters in patients with the gnathic form of mesial and distal occlusion during the “Initial tooth-contact” test prior to treatment, μV

Таблица 1. Сравнительная оценка показателей биопотенциалов мышц у пациентов гнатической формой мезиальной и дистальной окклюзии при пробе «Первичный контакт зубов-антагонистов» до лечения, мкВ

Muscles	Side	Skeletal form of occlusal anomaly before treatment		p-value (significance level)
		Distal	Mesial	
Temporal	Right	7.56 ± 1.17	16.04 ± 2.71	<0.001**
	Left	7.39 ± 0.96	13.14 ± 1.15	<0.001**
Masseter	Right	5.97 ± 0.69	3.96 ± 0.65	<0.001**
	Left	6.19 ± 1.08	5.57 ± 0.82	0.005**
Digastric	Right	3.86 ± 0.59	4.57 ± 0.49	<0.001**
	Left	3.84 ± 0.73	4.37 ± 0.58	<0.001**
Sternocleidomastoid	Right	4.12 ± 0.59	4.19 ± 0.83	0.665
	Left	4.23 ± 0.68	6.41 ± 1.21	<0.001**

Note: ** Differences are statistically significant at $p \leq 0.01$

Примечание: ** Различия достоверны при уровне значимости $p \leq 0,01$

increase of 1.67% on the right and 34% on the left. Statistically significant differences were identified across all evaluated muscles, with moderate significance observed for the left sternocleidomastoid muscle and non-significant differences for the left masseter muscle (Fig. 2).

Assessment of the study group parameters after treatment (Table 2) showed the following changes: temporalis muscle activity increased by 60.2% on the right and

48.3% on the left; masseter muscle activity increased by 52.7% on the right and decreased by 60.9% on the left; digastric muscle activity increased by 31.1% on the right and 12.8% on the left; sternocleidomastoid muscle activity increased by 36.6% on the right and 37.9% on the left. After treatment, statistically significant differences were observed in all evaluated muscles, with moderate significance for the left digastric muscle (Fig. 3).

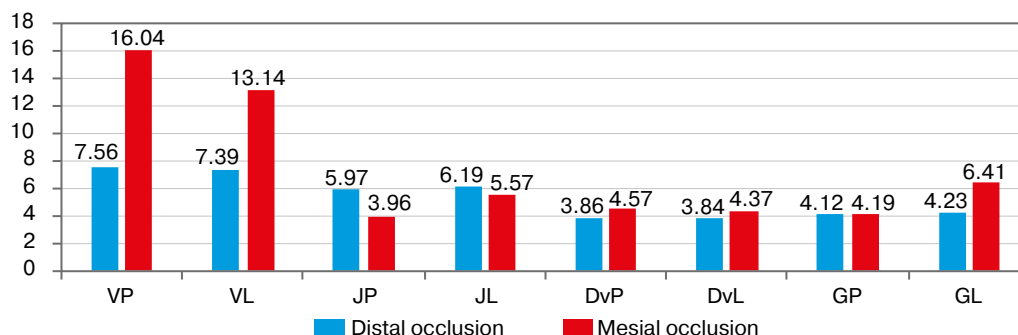


Fig. 2. Comparative assessment of muscle bio-potential indicators in patients with gnathic distal and mesial occlusion prior to treatment during the “Initial antagonistic tooth contact” test

Рис. 2. Сравнительная оценка показателей биопотенциалов мышц у пациентов с гнатической формой дистальной и мезиальной окклюзиями до лечения при пробе «Первичный контакт зубов-антагонистов»

Table 2. Comparative assessment of muscle bio-potential parameters in patients with gnathic distal and mesial occlusion after treatment during the “Initial antagonistic tooth contact” test, μV

Таблица 2. Сравнительная оценка показателей биопотенциалов мышц у пациентов с гнатической формой дистальной и мезиальной окклюзии после лечения при пробе «Первичный контакт зубов-антагонистов», мкВ

Muscles	Side	Skeletal form of occlusal anomaly before treatment		p-value (significance level)
		Distal	Distal	
Temporal	Right	5.26±0.77	13.23±2.08	<0.001**
	Left	5.05±0.82	9.77±1.17	<0.001**
Masseter	Right	3.94±0.54	8.34±1.22	<0.001**
	Left	3.82±0.67	1.49±0.38	<0.001**
Digastric	Right	3.03±0.71	4.40±0.79	<0.001**
	Left	3.35±0.63	3.84±0.70	0.002**
Sternocleidomastoid	Right	3.26±0.77	5.14±0.53	<0.001**
	Left	3.14±0.48	5.06±0.81	<0.001**

Note: ** Differences are statistically significant at $p \leq 0.01$

Примечание: ** Различия достоверны при уровне значимости $p \leq 0,01$

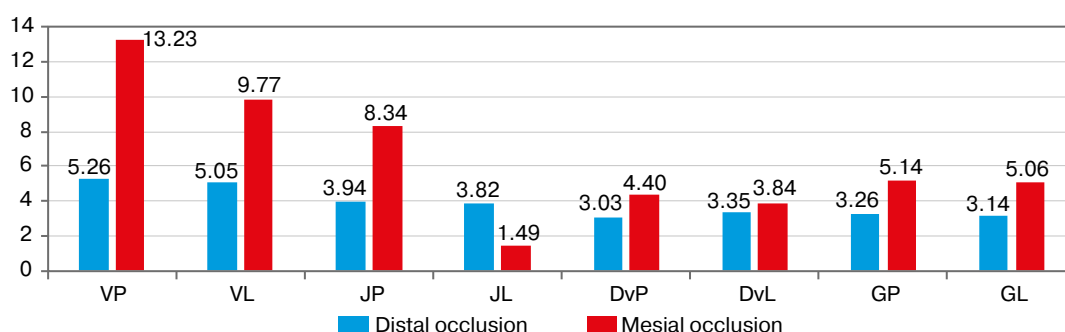


Fig. 3. Comparative assessment of muscle bio-potential parameters in patients with gnathic distal and mesial occlusion after treatment during the “Initial antagonistic tooth contact” test

Рис. 3. Сравнительная оценка показателей биопотенциалов мышц у пациентов с гнатической формой дистальной и мезиальной окклюзии после лечения при пробе «Первичный контакт зубов-антагонистов»

The pre-treatment bio-potential values of all muscles in patients with the gnathic form of mesial occlusion were generally higher by 52.8% compared to those with distal occlusion, with the exception of the masseter muscles, indicating increased baseline muscle tonus in the mesial group (Fig. 4). After treatment, elevated values were also observed – 60.2% higher in the study group relative to distal patients – with a general trend toward decreased bio-potential activity, except in the left masseter muscle (Table 3).

Comparative assessment of electromyographic parameters of the craniofacial muscles during the “Maximum intercuspation” test, based on the data obtained in the study: muscle bio-potential parameters before treatment (Table 4) and after treatment (Table 5).

Pre-treatment data show reduced bio-potential values in all muscle groups except the digastric muscles in the study group with a diagnosis of gnathic mesial occlusion. Specifically, the right temporalis muscle was 35.7% lower and the left temporalis 22.5% lower;

the right masseter muscle was 40.7% lower and the left masseter 26.5% lower; the right digastric muscle was 19.9% higher and the left digastric 42% higher; the right sternocleidomastoid muscle was reduced by 22.2% and the left by 14.2% (Fig. 5). Statistically significant differences were observed across all examined muscles.

Compared with post-treatment results in patients with mesial and distal occlusion, increases in bio-potentials were observed in the left temporalis, right and left digastric, right and left sternocleidomastoid muscles, as well as in the total muscle potential, while decreases were noted in the right temporalis and both masseter muscles, indicating an uneven distribution of muscle load (Fig. 6). The percentage differences were as follows: right temporalis –7.5%, left temporalis +12%; right masseter –33.6%, left masseter –21.5%; right digastric +74.5%, left digastric +59.7%; right sternocleidomastoid +18.6%, left sternocleidomastoid +33.8%. Statistically significant differences were observed in all muscles except the right temporalis.

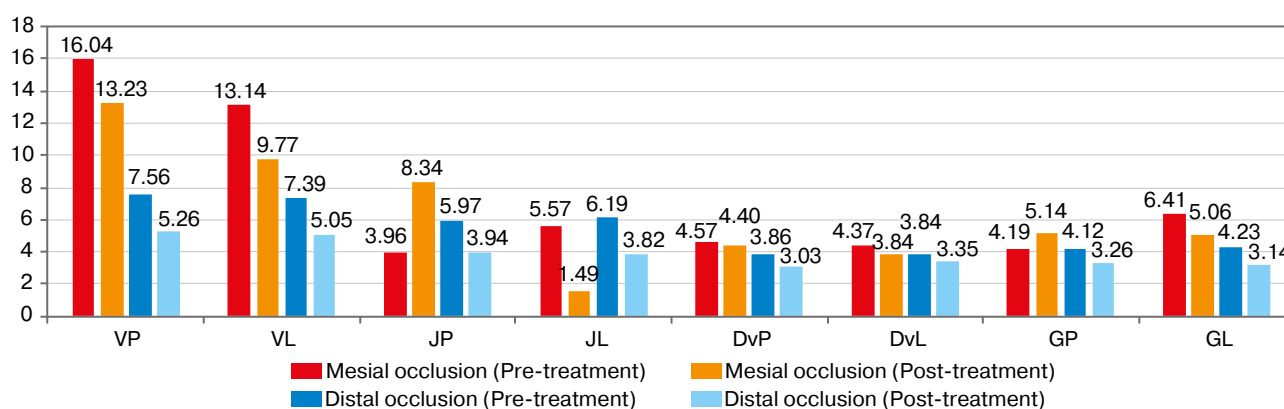


Fig. 4. Comparative assessment of muscle bio-potential parameters in patients with gnathic mesial and distal occlusion before and after treatment during the “Initial antagonistic tooth contact” test

Рис. 4. Сравнительная оценка показателей биопотенциалов мышц у пациентов с гнатической формой мезиальной и дистальной окклюзии до лечения и после при пробе «Первичный контакт зубов-антагонистов»

Table 3. Comparative assessment of muscle bio-potential parameters in patients with gnathic distal and mesial occlusion before and after treatment during the “Initial antagonistic tooth contact” test, μV

Таблица 3. Сравнительная оценка показателей биопотенциалов у пациентов гнатической формы дистальной и мезиальной окклюзии до и после лечения при пробе «Первичный контакт зубов-антагонистов», мкВ

Muscles		Values before		p-value (significance level)	Values after		p-value (significance level)
		Mesial occlusion	Distal occlusion		Mesial occlusion	Distal occlusion	
Temporal	Right	16.04 ± 2.71	7.56 ± 1.17	<0.001**	13.23 ± 2.08	5.26 ± 0.77	<0.001**
	Left	13.14 ± 1.15	7.39 ± 0.96	<0.001**	9.77 ± 1.17	5.05 ± 0.82	<0.001**
Masseter	Right	3.96 ± 0.65	5.97 ± 0.69	<0.001**	8.34 ± 1.22	3.94 ± 0.54	<0.001**
	Left	5.57 ± 0.82	6.19 ± 1.08	0.005**	1.49 ± 0.38	3.82 ± 0.67	<0.001**
Digastric	Right	4.57 ± 0.49	3.86 ± 0.59	<0.001**	4.40 ± 0.79	3.03 ± 0.71	<0.001**
	Left	4.37 ± 0.58	3.84 ± 0.73	<0.001**	3.84 ± 0.70	3.35 ± 0.63	0.002**
Sternocleidomastoid	Right	4.19 ± 0.83	4.12 ± 0.59	0.665	5.14 ± 0.53	3.26 ± 0.77	<0.001**
	Left	6.41 ± 1.21	4.23 ± 0.68	<0.001**	5.06 ± 0.81	3.14 ± 0.48	<0.001**

Note: ** Differences are statistically significant at $p \leq 0.01$

Примечание: ** Различия достоверны при уровне значимости $p \leq 0,01$

Table 4. Comparative assessment of muscle bio-potential parameters in patients with gnathic distal and mesial occlusion before treatment during the “Maximum intercuspation” test, μV

Таблица 4. Сравнительная оценка потенциалов мышц у пациентов с гнатической формой дистальной и мезиальной окклюзии до лечения при пробе «Максимальное смыкание зубов-антагонистов», мкВ

Muscles	Side	Skeletal form of occlusion anomaly before treatment		p-value (significance level)
		Distal occlusion	Mesial occlusion	
Temporal	Right	170.51 $\pm$ 17.93	109.63 $\pm$ 16.40	<0.001**
	Left	149.36 $\pm$ 15.54	115.77 $\pm$ 18.20	<0.001**
Masseter	Right	140.20 $\pm$ 11.98	83.19 $\pm$ 11.60	<0.001**
	Left	142.15 $\pm$ 12.31	104.51 $\pm$ 10.9	<0.001**
Digastric	Right	14.89 $\pm$ 2.07	18.58 $\pm$ 3.09	<0.001**
	Left	14.85 $\pm$ 2.19	25.59 $\pm$ 4.16	<0.001**
Sternocleidomastoid	Right	9.49 $\pm$ 1.44	7.38 $\pm$ 1.10	<0.001**
	Left	10.26 $\pm$ 1.81	8.80 $\pm$ 1.19	<0.001**

Note: ** Differences are statistically significant at $p \leq 0.01$

Примечание: ** Различия достоверны при уровне значимости $p \leq 0,01$

Table 5. Comparative assessment of muscle bio-potential parameters in patients with gnathic distal and mesial occlusion after treatment during the “Maximum intercuspation” test, μV

Таблица 5. Сравнительная оценка потенциалов мышц у пациентов с гнатической формой дистальной и мезиальной окклюзии после лечения при пробе «Максимальное смыкание зубов-антагонистов», мкВ

Muscles	Side	Skeletal form of occlusion anomaly before treatment		p-value (significance level)
		Distal occlusion	Mesial occlusion	
Temporal	Right	145.49 $\pm$ 24.10	134.63 $\pm$ 22.01	0.039*
	Left	137.42 $\pm$ 19.98	156.21 $\pm$ 24.18	<0.001**
Masseter	Right	122.54 $\pm$ 17.99	81.37 $\pm$ 12.30	<0.001**
	Left	116.95 $\pm$ 19.11	91.76 $\pm$ 13.22	<0.001**
Digastric	Right	13.21 $\pm$ 2.34	51.81 $\pm$ 7.62	<0.001**
	Left	16.17 $\pm$ 2.96	40.12 $\pm$ 5.94	<0.001**
Sternocleidomastoid	Right	8.25 $\pm$ 1.18	10.13 $\pm$ 1.71	<0.001**
	Left	9.48 $\pm$ 1.75	14.33 $\pm$ 2.51	<0.001**

Note: ** Differences are statistically significant at $p \leq 0.01$

Примечание: ** Различия достоверны при уровне значимости $p \leq 0,01$

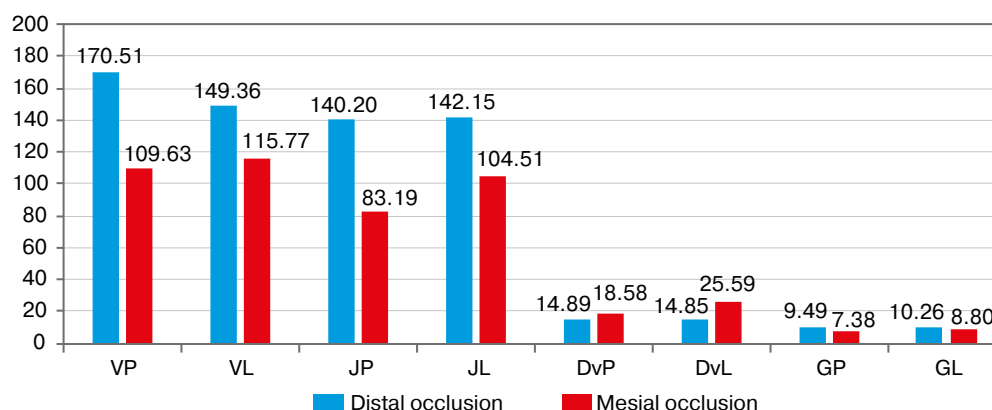


Fig. 5. Comparative assessment of muscle bio-potential parameters in patients with gnathic distal and mesial occlusion before treatment during the “Maximum intercuspation” test

Рис. 5. Сравнительная оценка показателей биопотенциалов мышц у пациентов с гнатической формой дистальной и мезиальной окклюзии до лечения при пробе «Максимальное смыкание зубных рядов»

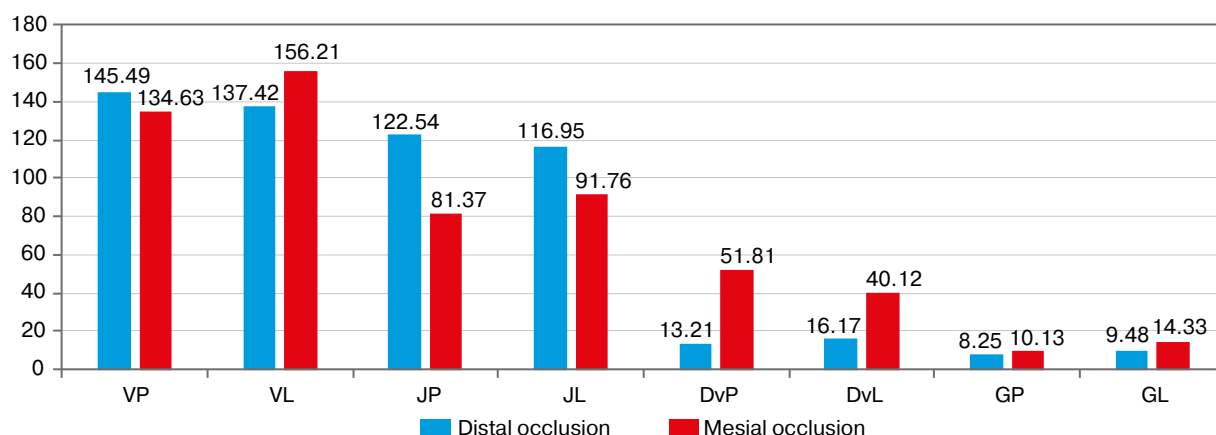


Fig. 6. Comparative assessment of muscle bio-potential parameters in patients with gnathic distal and mesial occlusion after treatment during the “Maximum intercuspation” test

Рис. 6. Сравнительная оценка показателей биопотенциалов мышц у пациентов с гнатической формой дистальной и мезиальной окклюзии после лечения при пробе «Максимальное смыкание зубных рядов»

Table 6. Comparative assessment of muscle bio-potential parameters in patients with gnathic distal and mesial occlusion before and after treatment during the “Maximum intercuspation” test, μV

Таблица 6. Сравнительная оценка показателей биопотенциалов мышц у пациентов гнатической формы дистальной и мезиальной окклюзии до и после лечения при пробе «Максимальный контакт зубов-антагонистов», мкВ

Muscles		Values before		p-value (significance level)	Values after		p-value (significance level)
		Mesial occlusion	Distal occlusion		Mesial occlusion	Distal occlusion	
Temporal	Right	109.63 ± 16.40	170.51 ± 17.93	< 0.001**	134.63 ± 22.01	145.49 ± 24.10	0.039*
	Left	115.77 ± 18.20	149.36 ± 15.54	< 0.001**	156.21 ± 24.18	137.42 ± 19.98	< 0.001**
Masseter	Right	83.19 ± 11.60	140.20 ± 11.98	< 0.001**	81.37 ± 12.30	122.54 ± 17.99	< 0.001**
	Left	104.51 ± 10.90	142.15 ± 12.31	< 0.001**	91.76 ± 13.22	116.95 ± 19.11	< 0.001**
Digastric	Right	18.58 ± 3.09	14.89 ± 2.07	< 0.001**	51.81 ± 7.62	13.21 ± 2.34	< 0.001**
	Left	25.59 ± 4.16	14.85 ± 2.19	< 0.001**	40.12 ± 5.94	16.17 ± 2.96	< 0.001**
Sternocleidomastoid	Right	7.38 ± 1.10	9.49 ± 1.44	< 0.001**	10.13 ± 1.71	8.25 ± 1.18	< 0.001**
	Left	8.80 ± 1.19	10.26 ± 1.81	< 0.001**	14.3 ± 2.51	9.48 ± 1.75	< 0.001**

Note: ** Differences are statistically significant at $p \leq 0.01$

Примечание: ** Различия достоверны при уровне значимости $p \leq 0,01$

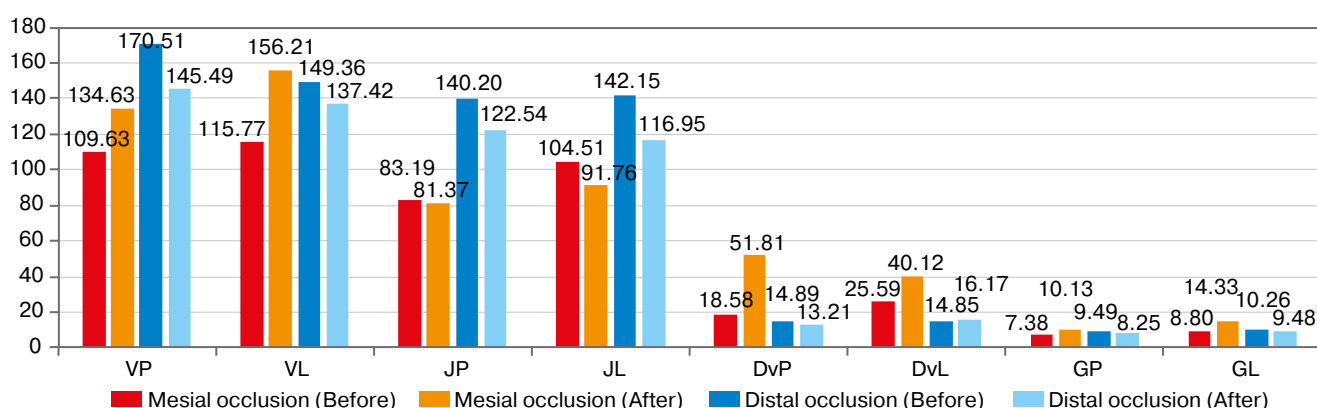


Fig. 7. Comparative assessment of muscle bio-potential parameters in patients with gnathic mesial and distal occlusion before and after treatment during the “Maximum intercuspation” test

Рис. 7. Сравнительная оценка показателей биопотенциалов мышц у пациентов с гнатической формой мезиальной и дистальной окклюзии до лечения и после при пробе «Максимальный контакт зубов-антагонистов»

Comparative assessment of the study group (Table 6) during the investigation demonstrates an increase in muscle bio-potentials after treatment from a state of reduced tonus (Fig. 7). In contrast, patients with distal occlusion showed a decrease in the total sum of muscle potentials.

In the “Maximum intercuspation” test before treatment, patients with the gnathic form of mesial occlusion showed a coordination coefficient (Fig. 8) of 0.76 on the right side, which is 18.3% below the norm, and 0.73 on the left side, 21.5% below the norm. In contrast, patients with distal occlusion had a coordination coefficient of 0.85 on the right side, 8.6% below the norm, and 0.84 on the left side, 9.7% below the norm. Statistical analysis revealed no significant differences, indicating coordinated muscle activity on both the right and left sides (Table 7).

Figure 9 Coordination coefficient in patients with the gnathic form of mesial occlusion after treatment during the “Maximum intercuspation” test: right side 0.55 (40.9% below norm), left side 0.64 (31.2% below norm); in patients with distal occlusion: right side 0.85 (8.6% below norm), left side 0.82 (11.8% below norm). No statistically significant differences were found in the mesial occlusion group.

Table 7. Comparative assessment of the coordination coefficient in patients with the gnathic form of distal and mesial occlusion before treatment during the “Maximum intercuspation” test

Таблица 7. Сравнительная оценка показателей коэффициента координации у пациентов с гнатической формой дистальной и мезиальной окклюзии до лечения при пробе «Максимальное смыкание зубных рядов»

Coordination coefficient	Mesial occlusion	Distal occlusion	p-value (significance level)
γ right	0.76±0.04	0.85±0.02	<0.001**
γ left	0.73±0.03	0.84±0.02	<0.001**

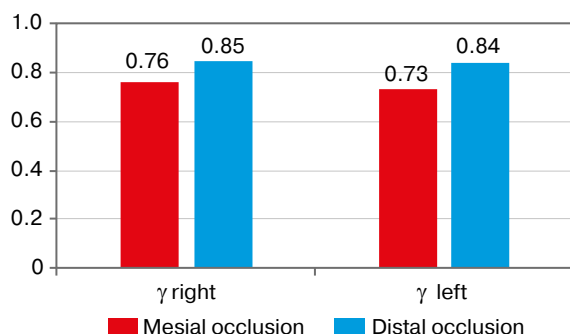


Fig. 8. Comparative assessment of muscle bio-potential values in patients with the gnathic form of mesial occlusion before treatment during the “Maximum intercuspation” test

Рис 8. Сравнительная оценка показателей биопотенциалов мышц у пациентов с гнатической формой мезиальной окклюзии до лечения при пробе «Максимальный контакт зубов-антагонистов»

DISCUSSION

Before treatment, muscle bio-potential values during the “Primary antagonist tooth contact” test were significantly higher in patients with the gnathic form of mesial occlusion, reflecting a more pronounced muscle hypertonicity compared to patients with the gnathic form of distal occlusion. Post-treatment evaluation shows a reduction in values only in the left masseter muscle of the mesial occlusion group, while elevated values persisted in other muscles, indicating sustained increased muscle tone in mesial patients relative to distal patients even after treatment.

During the “Maximum intercuspation” test, comparative assessment demonstrated an increase in muscle bio-potential values in the study group after treatment from a previously reduced tonus state, suggesting improved interproximal contacts and greater muscular involvement in mastication. In contrast, patients with distal skeletal occlusion showed a decrease in the overall sum of potentials, indicating reduced muscular load after treatment. Comparative evaluation of the coordination coefficient before and after treatment during the “Maximum intercuspation” test revealed lower values in patients with the gnathic form of mesial occlusion.

Table 8. Comparative assessment of the coordination coefficient in patients with gnathic forms of distal and mesial occlusion after treatment during the “Maximum intercuspation” test

Таблица 8. Сравнительная оценка показателей коэффициента координации у пациентов с гнатической формой дистальной и мезиальной окклюзии после лечения при пробе «Максимальное смыкание зубных рядов»

Coordination coefficient	Mesial occlusion	Distal occlusion	p-value (significance level)
γ right	0.55±0.05	0.85±0.02	<0.001**
γ left	0.64±0.06	0.82±0.03	<0.001**

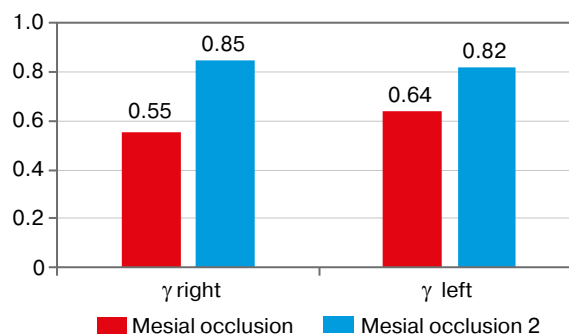


Fig. 9. Comparative assessment of muscle bio-potential values in patients with the gnathic form of mesial occlusion after treatment during the “Maximum intercuspation” test

Рис 9. Сравнительная оценка показателей биопотенциалов мышц у пациентов с гнатической формой мезиальной окклюзии после лечения при пробе «Максимальный контакт зубов-антагонистов»

CONCLUSION

In adult patients aged 18–44, electromyographic analysis revealed significant increases in certain muscle parameters both before and after treatment in patients with mesial skeletal forms, indicating greater muscular overload throughout the treatment process. However, coordination and engagement of the right and left sides were reduced in mesial patients, sug-

gesting more balanced distribution of masticatory load in patients with distal skeletal occlusion both before and after treatment. When treating adult patients with skeletal forms of occlusal anomalies, electromyographic findings should be taken into account to ensure proper functioning of the dentofacial system upon treatment completion and to guide rehabilitation strategies.

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Nailya S. Drobysheva – has made a substantial contribution to the concept of the article, approved the version to be published.

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