https://doi.org/10.36377/ET-0080

The significance of kinesiotaping in the rehabilitation of patients after orthognathic surgery

Roman I. Slabkovsky ✉, **Nailya S. Drobysheva**, **Anna B. Slabkovskaya**
Russian University of Medicine, Moscow, Russian Federation
✉ bazananna88@gmail.com

Abstract
INTRODUCTION. Orthognathic surgery aims to restore the anatomical shape, spatial position of the mandible, and normalize its functions, thereby improving facial aesthetics and patients' quality of life. However, the postoperative period is often accompanied by complications such as edema, pain syndrome, decreased sensitivity, and soft tissue induration. Currently, there is a lack of systematic data on early postoperative recovery, highlighting the need for new rehabilitation methods.Kinesiotaping has proven to be an effective non-pharmacological technique that reduces edema and hematomas, regulates the tone of masticatory muscles, improves microcirculation, and accelerates rehabilitation. Its mechanism of action is based on the stimulation of skin and fascial receptors, promoting pain relief and muscle function recovery. This study aims to assess the effectiveness of kinesiotaping in patients undergoing orthognathic surgery.
AIM. To analyze the effects of kinesiotaping on the rehabilitation process of orthodontic patients after orthognathic surgery.
MATERIALS AND METHODS. The study included 20 patients who underwent unilateral kinesiotaping (left side) in the postoperative period. To assess postoperative edema severity, facial symmetry was analyzed using frontal photographs, measuring facial width indices at various anatomical landmarks (Fr-Fl, Zyl-Zyr, Nml-Nmr, Ncl-Ncr, Gol-Gor) on the 1st, 2nd, and 7th postoperative days.Functional diagnostics of the maxillofacial muscles included myotonometry and electromyography (EMG). Myotonometry measured the tone of the masticatory muscles at rest and during maximal voluntary contraction, comparing the results with normative values. EMG analyzed the bioelectrical activity of the temporal, masseter, suprahyoid, and sternocleidomastoid muscles. The assessment was conducted using ARV (Averaged Rectified Value) and RMS (Root Mean Square) parameters at rest and during maximum occlusion.
RESULTS. Maximum edema was observed on the 2nd postoperative day, but it was less pronounced in the kinesiotaping group: a 20% reduction in the nasal wings area and a 17% reduction in the lower face. By the 7th day, edema decreased more significantly on the taped side. Myotonometry showed a preoperative difference in masticatory muscle tone of 11.9% between the sides. After kinesiotaping, tone normalization was faster – reducing the difference by 64.1% compared to 7.1%. EMG analysis revealed that on the 7th postoperative day, bioelectrical activity in untaped muscles exceeded normal values (masseter: +83.8%, temporal: +112%). On the taped side, EMG readings were closer to normal, and by the 21st day, they had fully stabilized. Kinesiotaping effectively reduces postoperative edema, normalizes muscle tone and bioelectrical activity, and accelerates rehabilitation.
CONCLUSIONS. In the early postoperative period, kinesiotaping using a fascial technique without pressure alleviates pain, restores muscle function, and facilitates the resumption of orthodontic treatment, ultimately reducing overall rehabilitation time.

Keywords: rehabilitation, orthognathic surgery, combined treatment

Article info: received – 07.10.2024; revised – 03.12.2024; accepted – 29.12.2024

Conflict of interest: The authors report no conflict of interest.

Acknowledgements: There are no funding and individual acknowledgments to declare.

For citation: Slabkovsky R.I., Drobysheva N.S., Slabkovskaya A.B. The significance of kinesiotaping in the rehabilitation of patients after orthognathic surgery. *Endodontics Today.* 2025;23(1):158–169. https://doi.org/10.36377/ET-0080

Значение кинезиотейпирования в реабилитации пациентов после ортогнатической операции

Р.И. Слабковский ✉, **Н.С. Дробышева**, **А.Б. Слабковская**
Российский университет медицины, г. Москва, Российская Федерация
✉ bazananna88@gmail.com

Резюме
ВВЕДЕНИЕ. Ортогнатическая хирургия направлена на восстановление анатомической формы, пространственного положения нижней челюсти и нормализацию ее функций, что улучшает эстетику лица и качество жизни пациентов. Однако послеоперационный период сопровождается рядом осложнений, включая отеки, болевой синдром, снижение чувствительности и уплотнение мягких тканей.

В настоящее время существует недостаток систематизированных данных о раннем послеоперационном восстановлении пациентов, что обуславливает необходимость поиска новых реабилитационных методик. Кинезиотейпирование зарекомендовало себя как эффективный немедикаментозный метод, способствующий уменьшению отеков и гематом, регуляции тонуса жевательных мышц, улучшению микроциркуляции и ускорению реабилитации. Его применение основано на механизме стимуляции рецепторов кожи и фасций, что способствует обезболиванию и восстановлению мышечной функции. В связи с этим исследование направлено на оценку эффективности кинезиотейпирования у пациентов после ортогнатической операции.

ЦЕЛЬ. Анализ действия кинезиотейпов в процессе реабилитации ортодонтических пациентов после ортогнатической операции.

МАТЕРИАЛЫ И МЕТОДЫ. В исследование включены 20 пациентов, которым проводилось одностороннее кинезиотейпирование (левая сторона) в послеоперационный период.

Для оценки выраженности послеоперационного отека анализировали симметричность лица по фотографиям анфас, измеряя индексы полуширины лица в различных анатомических ориентирах (Fr-Fl, Zyl-Zyr, Nml-Nmr, Ncl-Ncr, Gol-Gor) на 1-е, 2-е и 7-е сутки после операции.

Функциональная диагностика мышц челюстно-лицевой области включала миотонометрию и электромиографию. Миотонометрия определяла тонус жевательных мышц в покое и при максимальном волевом сжатии с последующим сравнением полученных данных с нормативами. Электромиография анализировала биоэлектрическую активность височных, жевательных, надподъязычных и грудино-ключично-сосцевидных мышц. Оценка проводилась по показателям ARV (усредненное выпрямленное значение) и RMS (среднеквадратичное значение сигнала) в покое и при максимальном смыкании зубных рядов.

РЕЗУЛЬТАТЫ ИССЛЕДОВАНИЯ. Максимальный отек отмечен на 2-е сутки после операции, но в группе с кинезиотейпированием он был менее выражен: в области крыльев носа (на 20%) и нижней части лица (на 17%). К 7-м суткам отек уменьшился значительнее на стороне тейпирования. Миотонометрия показала, что разница в тонусе жевательных мышц между сторонами до операции составляла 11,9%. После тейпирования тонус нормализовался быстрее – снижение разницы на 64,1% против 7,1%. Электромиография выявила, что на 7-е сутки биопотенциал мышц без тейпирования превышал норму (жевательные – на 83,8%, височные – на 112%). На стороне тейпирования показатели были ближе к норме, а к 21 дню полностью стабилизировались. Кинезиотейпирование эффективно снижает отек, нормализует тонус и биоэлектрическую активность жевательных мышц, ускоряя реабилитацию.

ВЫВОДЫ. В раннем послеоперационном периоде кинезиотейпирование с фасциальной техникой без давления снижает боль, восстанавливает мышечную функцию и ускоряет возобновление ортодонтического лечения, сокращая общие сроки реабилитации.

Ключевые слова: реабилитация, ортогнатическая хирургия, комбинированное лечение

Информация о статье: поступила – 07.10.2024; исправлена – 03.12.2024; принята – 29.12.2024

Конфликт интересов: авторы сообщают об отсутствии конфликта интересов.

Благодарности: финансирование и индивидуальные благодарности для декларирования отсутствуют.

Для цитирования: Слабковский Р.И., Дробышева Н.С., Слабковская А.Б. Значение кинезиотейпирования в реабилитации пациентов после ортогнатической операции. *Эндодонтия Today.* 2025;23(1):158–169. https://doi.org/10.36377/ET-0080

INTRODUCTION

Ensuring optimal conditions for full rehabilitation in the postoperative period remains a pressing issue at all stages of combined treatment for jaw anomalies. The primary postoperative complaints of patients are progressive edema, followed by reduced sensitivity and soft tissue induration. While these conditions typically resolve within a few months, complications may arise, and many patients require a faster recovery due to various social factors.

This study examined 20 patients with jaw anomalies who underwent unilateral kinesiotaping in the postoperative period. Diagnostic methods were used to assess facial symmetry, masticatory muscle tone, and bioelectrical activity of the maxillofacial muscles. A comparative analysis demonstrated that, in the early postoperative period, kinesiotaping can be recommended using the fascial correction technique without pressure, which involves shifting the skin over the fascia. This technique facilitates pain relief, restores muscle function, accelerates the resumption of orthodontic treatment, and ultimately shortens the overall treatment duration.

Surgical treatment of patients with jaw deformities is a critical and complex task. Restoring the anatomical shape and proper spatial position of the mandible, normalizing its functions, ensuring harmonious development of the facial skeleton, and prosthetic rehabilitation contribute to improved mastication, speech, and facial aesthetics [1–3].

Rehabilitation after orthognathic surgery involves addressing multiple postoperative complications, including nausea, edema, pain relief, discomfort reduction, and the restoration of oral function, normal daily activity, and lifestyle. However, there is limited systematic medical documentation on the condition of patients during the first few weeks or months post-surgery, as well as on the time required for recovery and return to normal life [4–8].

In recent years, increasing patient demands have led dental specialists to focus on the need for accelerated rehabilitation methods. A new approach to postoperative recovery emphasizes that pharmacological interventions alone may not always yield the desired therapeutic effect and may sometimes cause adverse side

effects (toxicity, allergies) due to frequent use. Consequently, interest has grown in non-pharmacological therapies such as physiotherapy, reflexotherapy, manual therapy, and massage [9–13]. Despite continuous advancements in rehabilitation techniques, challenges persist in optimizing recovery strategies, necessitating the exploration of new approaches for more effective patient management.

Recently, kinesiotaping has been introduced in dentistry as a method to reduce edema and hematomas, regulate muscle function by modifying muscle tone, enhance kinesthesia, and, consequently, accelerate rehabilitation. Pain reduction through kinesiotaping is achieved via two primary mechanisms: activation of afferent signaling through thick myelinated fibers and improved microcirculation in connective tissues. Kinesiotape stimulates tactile and baroreceptors, sending afferent signals to the dorsal horn of the spinal cord, thereby reducing pain while enhancing tissue microcirculation [14].

The elastic properties of kinesiotapes closely resemble those of the skin. Their mechanism of action extends beyond muscle movement; they also facilitate venous return and lymphatic drainage. Since lymphatic fluid movement is entirely dependent on muscle activity, any dysfunction in muscle function can contribute to the development of various pathological symptoms. Therefore, greater attention must be given to muscle function restoration to activate and expedite the healing process [15; 16]. If a muscle is injured, lymphatic drainage is impaired, leading to increased pressure on pain receptors, which transmit discomfort signals to the brain (myalgia).

AIM

To analyze the effects of kinesiotaping on the rehabilitation process of orthodontic patients after orthognathic surgery.

MATERIALS AND METHODS

A total of 20 patients were examined, all of whom underwent unilateral kinesiotaping (on the left side) after surgery (Fig. 1).

To assess the severity of postoperative edema, facial symmetry was evaluated using frontal photographs by measuring reference anatomical landmarks on both the left and right sides relative to the midline on the 1st, 2nd, and 7th postoperative days. Symmetry was determined based on facial width indices, including the ratio of hemifacial width at the mid-forehead (Fr and Fl), the zygomatic arches (Zyl-Zyr), the nasal bridge (Nml-Nmr), the nasal wings (Ncl-Ncr), and the mandibular angles (Gol-Gor).

Functional diagnostic methods, including myotonometry and electromyography (EMG) of the maxillofacial muscles, were used to assess muscle function. Myotonometry determined the compliance of the masticatory muscle motor zone to indentation by an electromyotonometer probe, which was interpreted as muscle tone. The examination was conducted three times: at physiological rest of the mandible (relaxed muscle tone) and during maximum voluntary contraction (contracted muscle tone). The results were analyzed by comparing differences between the right and left sides and with normative values established by T.V. Lisova [17].

Electromyography was performed to assess the bioelectrical activity of the maxillofacial muscles. The study analyzed biopotentials (BP) in muscles involved in mandibular elevation, including the anterior parts of the right and left temporal muscles (Tp and Tl) and the right and left masseter muscles (Mp and Ml). Additionally, muscles involved in mandibular depression, such as the right and left suprahyoid muscles (Shp and Shl), were examined, along with the cervical muscles responsible for maintaining head position and stabilizing the mandible at rest–specifically, the right and left sternocleidomastoid muscles (Scp and Scl).

A **B**

Fig. 1. Unilateral kinesiotaping after orthognathic surgery: *A* – frontal view, *B* – profile view

Рис. 1. Одностороннее тейпирование ортогнатической операции: *A* – анфас, *B* – профиль

For EMG assessment, patients performed functional tests, including the mandibular resting position and maximum occlusion. The amplitude of biopotentials (BP) was analyzed using two numerical calculation systems: ARV (Averaged Rectified Value, μV), calculated as the mean rectified signal over a given time period, and RMS (Root Mean Square, μV), representing the root mean square value of the signal.

RESULTS

The analysis of facial width dynamics on the 1st, 2nd, and 7th postoperative days revealed a significant increase in facial edema on the 2nd day after surgery.

Facial symmetry assessment (Table 1) showed that edema was symmetrically distributed on the 1st postoperative day. However, by the 2nd day, after kinesiotape application, significant differences were observed between the right and left sides, with reduced swelling on the taped side–by 20% in the nasal wings area and by 17% in the lower face region (Fig. 2). By the 7th day, edema reduction was more pronounced on the taped side, particularly in the nasal bridge (by 20%), mandibular angles (by 7%), and zygomatic region (by 6%).

Thus, the use of kinesiotaping in the postoperative period helps to prevent abrupt changes in facial configuration caused by postoperative edema.

Myotonometry of the masticatory muscles was performed before and on the 21st day after orthognathic surgery. The significance of differences in muscle tone between the right and left sides was analyzed using the student's t-test for independent samples, while changes in muscle tone before and after treatment were assessed using the student's t-test for paired samples.

The analysis of Δ (difference) between myotonometry values at rest and during maximum contraction revealed statistically significant differences between the right and left sides both before and after surgery.

Before treatment (Table 2), Δ on the left side (taped side) was 37.00 ± 1.14 myoton, while on the right side it was 42.00 ± 1.17 myoton, which was 11.9% lower on the taped side. Compared to normative values, the left side deviated by 206.3%, and the right side by 258.7%.

After treatment, Δ on the left side decreased to 14.00 ± 1.09 myoton, while on the right side it remained at 39.00 ± 1.15 myoton, showing a 64.1% reduction on the taped side.

On the left side, values deviated from normal by 15.9%, while on the right side, the deviation was 233.0% (Table 3). After surgery, despite the extended study period (21 days), significant asymmetry persisted, with a trend toward normalization on the taped side (Table 4).

Before treatment, myotonometry values were nearly symmetrical between the right and left sides but significantly exceeded normal values. Comparison of masticatory muscle tone before and after surgery revealed a 62.2% reduction in Δ on the taped side and a 7.1% reduction on the non-taped side (Fig. 3).

Table 1. Anthropometric Indices of Facial Width on the 1st, 2nd, and 7th Postoperative Days

Таблица 1. Антропометрические индексы ширины лица на 1, 2 и 7-е сутки после операции

Day	Index				
	F_r – n-sn / F_l – n-sn	Zy_r – n-sn / Zy_l – n-sn	Go_r – n-sn / Go_l – n-sn	Nm_r – n-sn / Nm_l – n-sn	Nc_r – n-sn / Nc_l – n-sn
1	1.03	1.03	0.94	1.00	1.09
2	1.14	1.03	1.17	1.00	1.20
7	1.00	1.06	1.07	1.25	1.00

A **B** **C**

Fig. 2. Frontal view of the patient's face after orthognathic surgery with kinesiotaping on the 1st (*A*), 2nd (*B*), and 7th (*C*) postoperative days

Рис. 2. Лицо пациентки анфас после ортогнатической операции с использованием кинезиотейпов на 1-е (*A*), 2-е (*B*) и 7-е (*C*) сутки

Table 2. Analysis of Differences in Masticatory Muscle Tone Before Surgery

Таблица 2. Анализ различий тонуса жевательных мышц до операции

Test	Side of Examination	
	left	right
At rest	107.00 ± 1.68	103.00 ± 1.57
	$p < 0.001$**	
During Maximum Contraction	144.00 ± 1.76	145.00 ± 1.77
	$p > 0.05$	
Δ	37.00 ± 1.14	42.00 ± 1.17
	$p < 0.001$**	
N	12.08 ± 1.12	11.71 ± 1.48

Note: * Differences are statistically significant at $p < 0.05$; ** Differences are statistically significant at $p < 0.001$.

Примечания: * Различия достоверны на уровне значимости $p < 0,05$; ** Различия достоверны на уровне значимости $p < 0,001$.

Table 3. Analysis of Differences in Masticatory Muscle Tone on the 21st Postoperative Day

Таблица 3. Анализ различий тонуса жевательных мышц на 21-й день после операции

Test	Side of Examination	
	left (with kinesiotaping)	right
At rest	135.00 ± 1.71	120.00 ± 1,.63
	$p < 0.05$*	
During Maximum Contraction	149.00 ± 1.78	159.00 ± 1.89
	$p < 0.001$**	
Δ	14.00 ± 1.09	39.00 ± 1.15
	$p < 0.001$**	
N	12.08 ± 1.12	11.71 ± 1.48

Note: * Differences are statistically significant at $p < 0.05$; ** Differences are statistically significant at $p < 0.001$.

Примечания: * Различия достоверны на уровне значимости $p < 0,05$; ** Различия достоверны на уровне значимости $p < 0,001$.

Table 4. Analysis of Differences in Masticatory Muscle Tone on the 21st Postoperative Day

Таблица 4. Анализ различий тонуса жевательных мышц на 21-й день после операции

Test	Time and side					
	left (with kinesiotaping)		P Before and After (Left Side)	right		P Before and After (Right Side)
	before	after		before	after	
At rest	107.00 ± 1.68	135.00 ± 1.71	<0.001**	103.00 ± 1.57	120.00 ± 1.63	<0.001**
During Maximum Contraction	144.00 ± 1.76	149.00 ± 1.78	<0.001**	145.00 ± 1.77	159.00 ± 1.89	<0.001**
Δ	37.00 ± 1.14	14.00 ± 1.09	<0.001**	42.00 ± 1.17	39.00 ± 1.15	<0.001**
N	12.08 ± 1.12			11.71 ± 1.48		

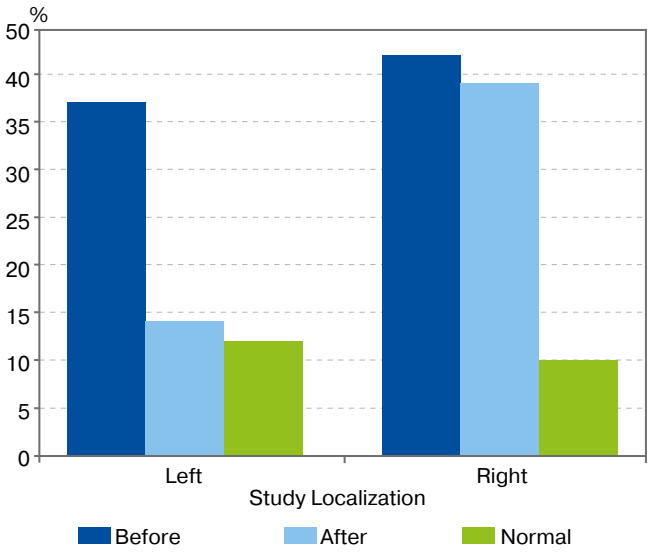

Fig. 3. Comparative Analysis of Masticatory Muscle Tone Before and After Orthognathic Surgery with Normative Values

Рис. 3. Сравнительная характеристика тонуса жевательных мышц до, после ортогнатической операции с нормальными значениями

During electromyographic examination of the maxillofacial muscles in patients with left-sided kinesiotaping, the biopotential at the "Mandibular Resting Position" test on the 7th postoperative day significantly exceeded normal values ($p < 0.001$).

The biopotential of the right-side muscles showed a substantial increase compared to normative values: masseter muscles by 83.8%, temporal muscles by 112.0%, suprahyoid muscle group by 94.0%, sternocleidomastoid muscles by 68.9% (Fig. 4).

The biopotential of the left-side muscles also showed a statistically significant difference from normative values, though the magnitude of these differences was 3 to 6 times lower (Fig. 5).

Masseter muscles (left) exceeded the norm by 16.4%, Temporal muscles (left) by 63.8%, Suprahyoid muscle group (left) by 33.0%, Sternocleidomastoid muscle (left) by 71.4%.

All EMG parameters at rest between the right and left sides with kinesiotape fixation on the 7th postoperative day showed significant differences ($p < 0.001$). The EMG values on the right side exceeded those on the left by: 25.5% for the temporal muscles; 51.6% for the masseter muscles; 69.7% for the suprahyoid muscle group; 8.7% for the sternocleidomastoid muscles (Table 5, Fig. 6).

On the 21st postoperative day, the biopotential of the left-side muscles no longer showed a statistically significant difference from normative values. Masseter muscles (left) exceeded the norm by 2.3%, Temporal muscles (left) by 0.4%, Suprahyoid muscle group (left) by 6.9%, Sternocleidomastoid muscle (left) by 5.6% (Table 6).

However, all EMG parameters at rest between the right and left sides remained significantly different ($p < 0.001$) on the 21st postoperative day. The biopotential of the right-side maxillofacial muscles continued to exceed normative values ($p < 0.001$), with the following deviations: masseter muscles (right) by 45.3%, temporal muscles (right) by 29.3%, suprahyoid muscle group (right) by 37.4%, sternocleidomastoid muscles (right) by 19.8%.

Additionally, the right-side EMG values exceeded the left-side values by: 24.8% for the temporal muscles, 36.8% for the masseter muscles, 48.7% for the suprahyoid muscle group, 25.1% for the sternocleidomastoid muscles (Fig. 7, 8).

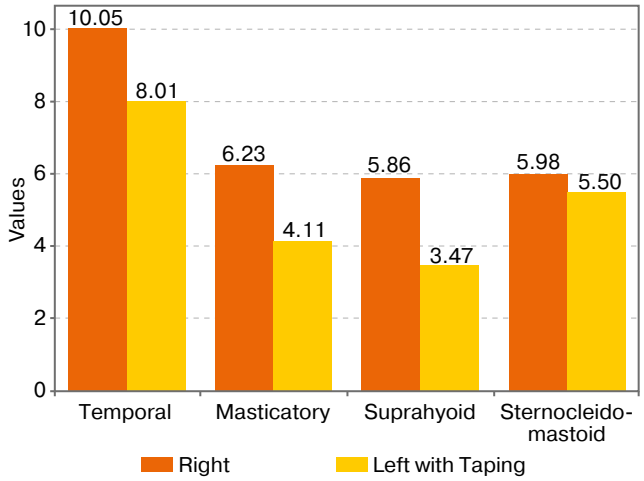

Fig. 4. Significant Differences in EMG Parameters for the "Mandibular Resting Position" Test Between the Right and Left Sides with Kinesiotape Fixation on the 7th Postoperative Day

Рис. 4. Значимые различия между показателями ЭМГ при пробе «состояние относительного покоя нижней челюсти» справа и слева с фиксацией тейпов на 7-й день после операции

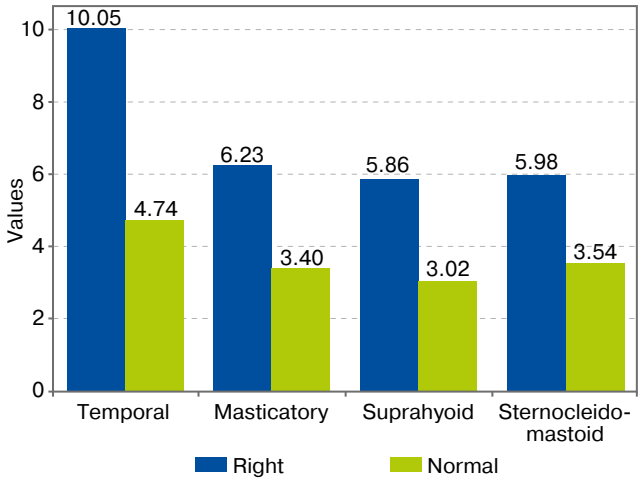

Fig. 5. Significant Differences in EMG Parameters for the "Mandibular Resting Position" Test on the Right Side on the 7th Postoperative Day Compared to Normative Values

Рис. 5. Значимые различия показателей ЭМГ при пробе «состояние относительного покоя нижней челюсти» справа на 7-й день после операции от нормы

Table 5. Analysis of Differences in Electromyography (EMG) Parameters for the "Mandibular Resting Position" Test on the 7th Postoperative Day Compared to Normative Values with Unilateral Kinesiotaping

Таблица 5. Анализ различий между показателями электромиографии при пробе «состояние относительного покоя нижней челюсти» на 7-й день после операции с нормативными значениями при одностороннем тейпировании

Muscles	Side	Values	*p*-value (T-Test for independent samples) between right and left sides	Norma	*p*-value (T-Test for independent samples) between measured values and norm
Temporal	right	10.05±1.30	<0.001**	4.74±0.30	<0.001**
	left T	8.01±0.30		4.89±0.20	<0.001**
Masseter	right	6.23±0.40	<0.001**	3.40±0.10	<0.001**
	left T	4.11±0.35		3.53±0.10	<0.001**
Suprahyoid	right	5.86±0.51	<0.001**	3.02±0.20	<0.001**
	left T	3.47±0.28		2.61±0.20	<0.001**
Sternocleidomastoid	right	5.98±0.19	>0.05	3.54±0.10	<0.001**
	left T	5.50±0.21		3.21±0.10	<0.001**

Note: ** Differences are statistically significant at $p < 0.01$.

Примечания: ** Различия значимы на уровне p <0,01.

Thus, the comparison of the effects of kinesiotaping on muscle biopotentials during the "Mandibular Resting Position" test revealed the following (Fig. 9):

– significantly lower and more normalized biopotential values on the taped side;

– greatest impact of kinesiotaping on the masseter muscles;

– minimal impact on the sternocleidomastoid muscles;

– normalization of EMG parameters on the taped side by the 21st postoperative day.

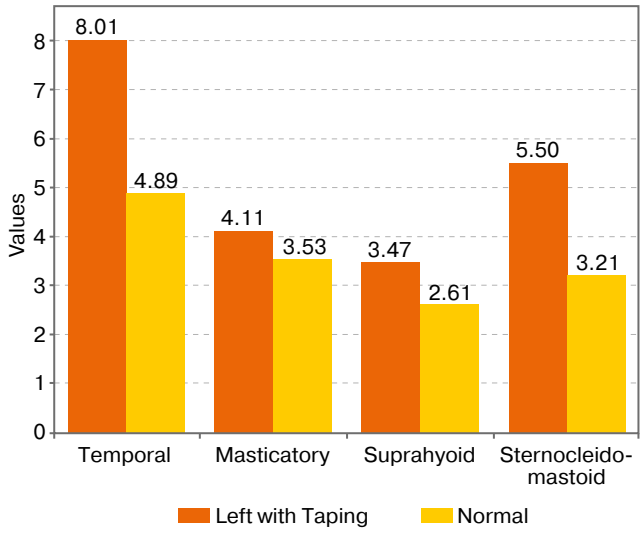

Fig. 6. Significant Differences in EMG Parameters for the "Mandibular Resting Position" Test on the Left Side with Kinesiotaping on the 7th Postoperative Day Compared to Normative Values

Рис. 6. Значимые различия показателей ЭМГ при пробе «состояние относительного покоя нижней челюсти» слева с тейпами на 7-й день после операции от нормы

The biopotential of the maxillofacial muscles during the "Maximum Teeth Clenching" test on the 7th postoperative day was significantly lower than normal ($p < 0.001$).

The biopotential of the right-side muscles showed substantial deviations from normative values: masseter muscles by 90.0%, temporal muscles by 93.2%, suprahyoid muscle group by 63.6%, sternocleidomastoid muscles by 46.2%.

The biopotential of the left-side muscles also significantly differed from normative values, but the deviations were 1.5 to 2 times less pronounced: masseter muscles (left) by 87.7%, temporal muscles (left) by 76.3%, suprahyoid muscle group (left) by 56.7%, sternocleidomastoid muscle (left) by 24.7%.

All EMG parameters during the "Maximum Teeth Clenching" test showed significant differences between the right and left sides on the 7th postoperative day ($p < 0.001$). The right-side EMG values were lower than the left-side values by: 241.4% for the temporal muscles, 20.1% for the masseter muscles, 16.2% for the suprahyoid muscle group, 21.2% for the sternocleidomastoid muscles (Fig. 10–12, Table 7).

On the 21st postoperative day, during the "Maximum Teeth Clenching" test, the biopotentials of the right masticatory muscles (decreased by 58.7%) and right temporal muscles (decreased by 48.2%) showed statistically significant differences from the normative values. The EMG parameters of the suprahyoid muscle group (decreased by 7.7%) and the sternocleidomastoid muscles (decreased by 8.4%) did not exhibit statistically significant differences.

The biopotentials of the left masticatory and temporal muscles also demonstrated statistically significant differences from the norm. The left masticatory muscles had a 39.9% lower biopotential than the normative values, while the left temporal muscles showed a 20.3% reduction. Changes in the biopotentials of the suprahyoid muscle group (1.5% lower than the norm) and the sternocleidomastoid muscle (24.7% higher than the norm) were not statistically significant (Table 8, Fig. 13).

Table 6. Analysis of Differences in Electromyography (EMG) Parameters for the "Mandibular Resting Position" Test on the 21st Postoperative Day Compared to Normative Values with Unilateral Kinesiotaping

Таблица 6. Анализ различий между показателями электромиографии при пробе «состояние относительного покоя нижней челюсти» на 21-й день после операции с нормативными значениями при одностороннем тейпировании

Muscles	Side	Values	*p*-value (T-Test for independent samples) between left and right sides	Norma	*p*-value (T-Test for independent samples) between measured values and norm
Temporal	right	6.13±0.54	<0.001**	4.74±0.30	<0.001**
	left T	4.91±0.35		4.89±0.20	>0.05
Masseter	right	4.94±0.49	<0.001**	3.40±0.10	<0.001**
	left T	3.61±0.24		3.53±0.10	>0.05
Suprahyoid	right	4.15±0.35	<0.001**	3.02±0.20	<0.001**
	left T	2.79±0.40		2.61±0.20	>0.05
Sternocleidomastoid	right	4.24±0.32	<0.001**	3.54±0.10	<0.001**
	left T	3.39±0.19		3.21±0.10	>0.05

Note: ** Differences are statistically significant at $p < 0.01$**.

Примечания: ** Различия значимы на уровне $p < 0,01$**.

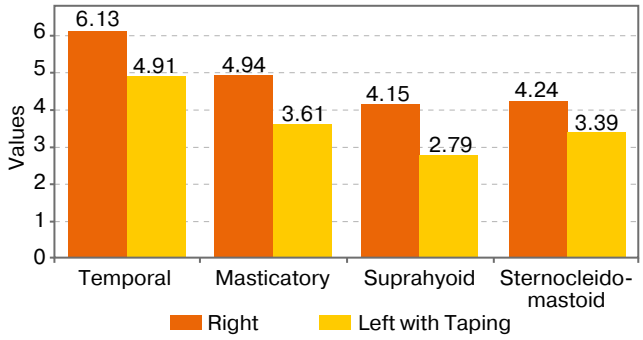

Fig. 7. Significant Differences in EMG Parameters for the "Mandibular Resting Position" Test Between the Right and Left Sides with Kinesiotape Fixation on the 21st Postoperative Day

Рис. 7. Значимые различия между показателями ЭМГ при пробе «состояние относительного покоя нижней челюсти» справа и слева с фиксацией тейпов на 21-й день после операции

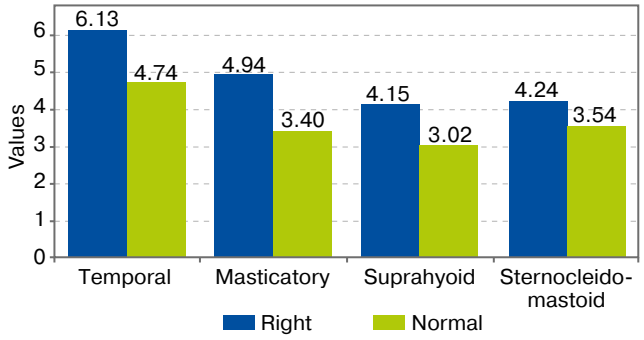

Fig. 8. Significant Differences in EMG Parameters for the "Mandibular Resting Position" Test on the Right Side on the 21st Postoperative Day Compared to Normative Values

Рис. 8. Значимые различия показателей ЭМГ при пробе «состояние относительного покоя нижней челюсти» справа на 21-й день после операции от нормы

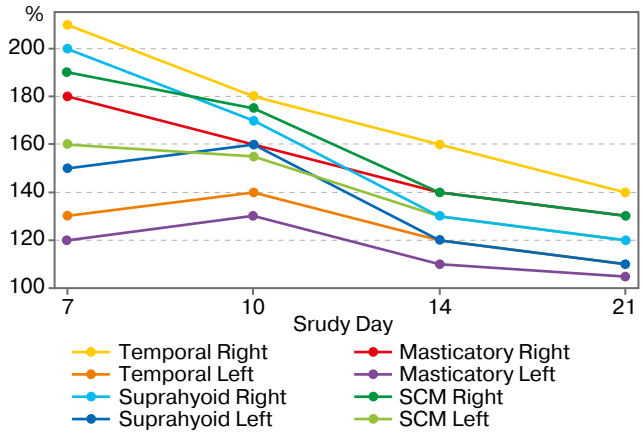

Fig. 9. Dynamics of Muscle Biopotential Changes During the "Mandibular Resting Position" Test in the Group with Left-Sided Kinesiotaping

Рис. 9. Динамика изменения биопотенциала мышц при пробе «состояние относительного покоя нижней челюсти» в группе с левосторонним тейпированием

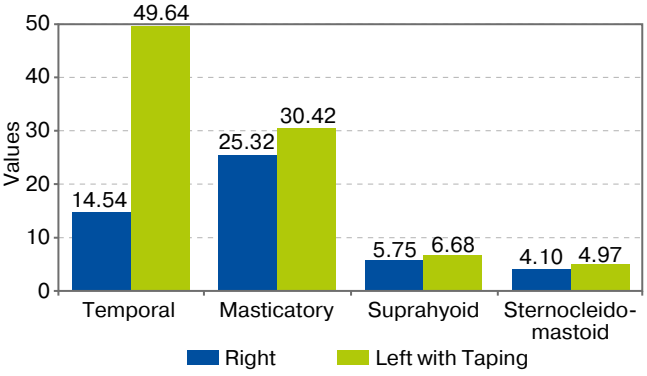

Fig. 10. Significant Differences in EMG Parameters During the "Maximum Teeth Clenching" Test on the Right and Left Sides with Tape Fixation on the 7th Postoperative Day

Рис. 10. Значимые различия между показателями ЭМГ при пробе «максимальное смыкание зубных рядов» справа и слева с фиксацией тейпов на 7-й день после операции

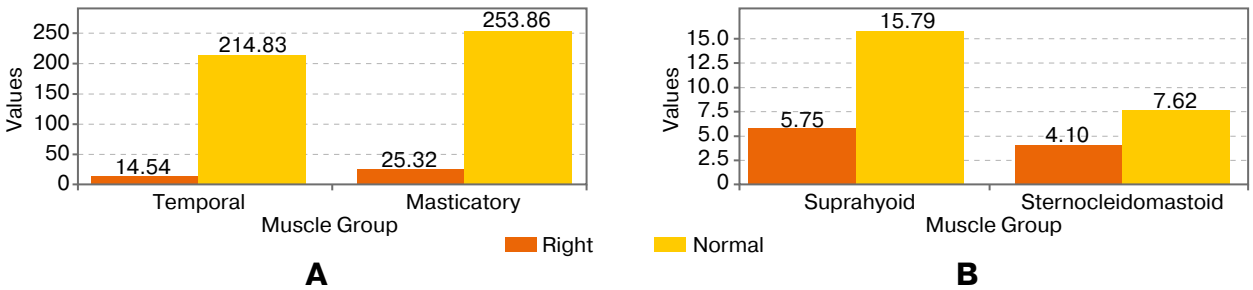

Fig. 11. Significant Differences in EMG Parameters During the "Maximum Teeth Clenching" Test on the Right Side on the 7th Postoperative Day Compared to Normative Values: *A* – Temporal and masticatory muscles; *B* – Suprahyoid and sternocleidomastoid muscles

Рис. 11. Значимые различия показателей ЭМГ при пробе «максимальное смыкание зубных рядов» справа на 7-й день после операции от нормы: *А* – височной и жевательной мышц; *В* – надподъязычной и грудино-ключично-сосцевидной мышц

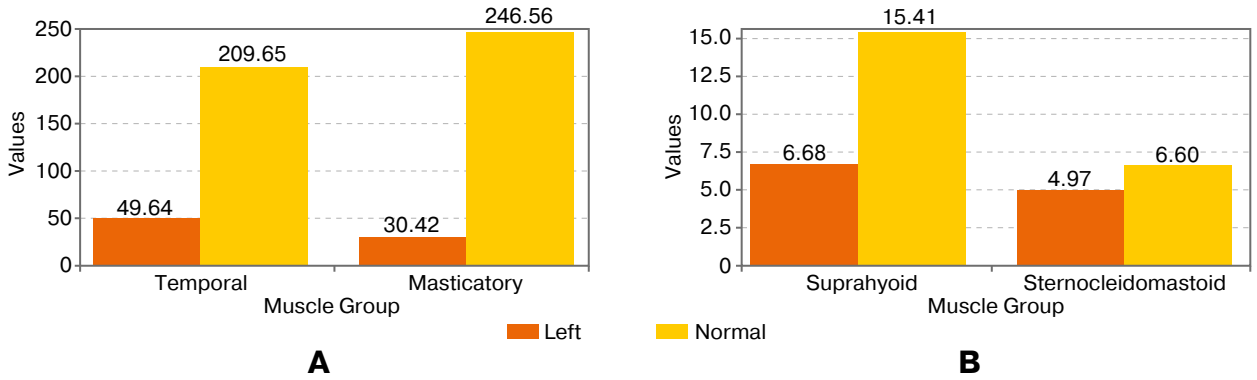

Fig. 12. Significant Differences in EMG Parameters During the "Maximum Teeth Clenching" Test on the Left Side on the 7th Postoperative Day Compared to Normative Values: *A* – Temporal and masticatory muscles; *B* – Suprahyoid and sternocleidomastoid muscles

Рис. 12. Значимые различия показателей ЭМГ при пробе «максимальное смыкание зубных рядов» слева на 7-й день после операции от нормы: *A* – височной и жевательной мышц; *B* – надподъязычной и грудино-ключично-сосцевидной мышц

Table 7. Analysis of Differences in Electromyography (EMG) Parameters During the "Maximum Teeth Clenching" Test on the 7th Postoperative Day Compared to Normative Values Under Unilateral Taping

Таблица 7. Анализ различий между показателями электромиографии при пробе «максимальное смыкание зубных рядов» на 7-й день после операции с нормативными значениями при одностороннем тейпировании

Muscles	Side	Value	*p*-value significance level (T-Test for independent samples) left-right	Norma	*p*-value significance level (T-Test for independent samples) for deviation from the norm
Temporal	right	14.54±1.00	<0.001**	214.83±13.80	<0.001**
	left T	49.64±2.09		209.65±12.75	<0.001**
Masticatory	right	25.32±1.60	<0.001**	253.86±5.60	<0.001**
	left T	30.42±1.40		246.50±5.84	<0.001**
Suprahyoid	right	5.75±0.80	<0.001**	15.79±0.67	<0.001**
	left T	6.68±0.90		15.41±1.40	<0.001**
Sternocleidomastoid	right	4.10±0.41	<0.001**	7.62±0.32	<0.001**
	left T	4.97±0.33		6.60±0.35	<0.001**

Note: ** Differences are significant at $p < 0.01$. **

Примечания: ** Различия значимы на уровне $p < 0,01$. **

Table 8. Analysis of Differences in Electromyography (EMG) Parameters During the "Maximum Teeth Clenching" Test on the 21st Postoperative Day Compared to Normative Values Under Unilateral Taping

Таблица 8. Анализ различий между показателями электромиографии при пробе «максимальное смыкание зубных рядов» на 21-й день после операции с нормативными значениями при одностороннем тейпировании

Muscles	Side	Value	p-value significance level (T-Test for independent samples) left-right	Norma	p-value significance level (T-Test for independent samples) for deviation from the norm
Temporal	right	111.38±7.30	<0.001**	214.83±13.80	<0.001**
	left T	167.06±11.80		209.65±12.75	<0.001**
Masticatory	right	104.96±8.90	<0.001**	253.86±5.60	<0.001**
	left T	148.14±15.30		246.50±5.84	<0.001**
Suprahyoid	right	14.57±3.30	>0.05	15.79±0.67	>0.05
	left T	15.18±1.75		15.41±1.40	>0.05
Sternocleidomastoid	right	6.98±1.00	>0.05	7.62±0.32	>0.05
	left T	7.08±0.55		6.60±0.35	>0.05

Note: Differences are significant at $p < 0.01$**

Примечания: ** Различия значимы на уровне $p < 0,01$**

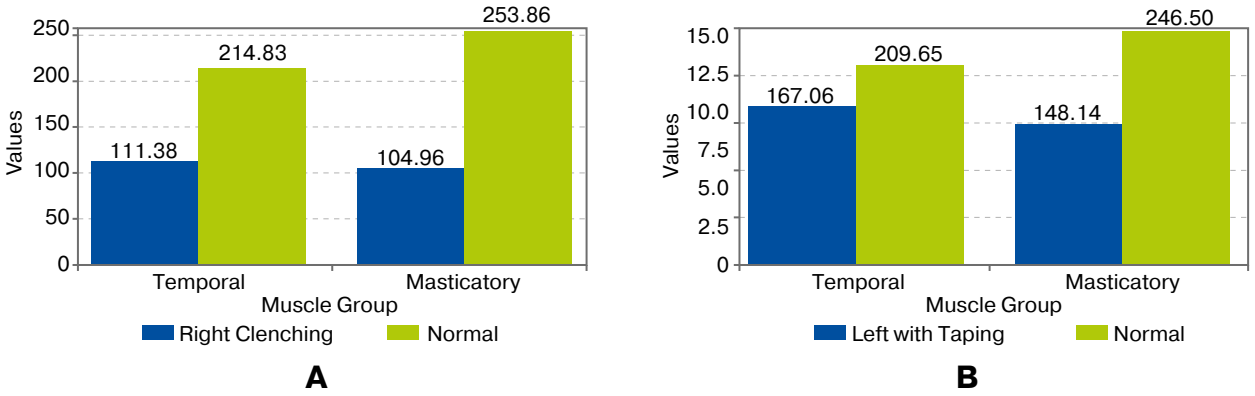

Fig. 13. Significant differences in EMG parameters of muscles during the "Maximum Teeth Clenching" test on the 21st postoperative day compared to the norm: *A* – right side; *B* – left side

Рис. 13. Значимые различия показателей ЭМГ мышц при пробе «максимальное смыкание зубных рядов» на 21-й день после операции от нормы: *A* – справа; *B* – слева

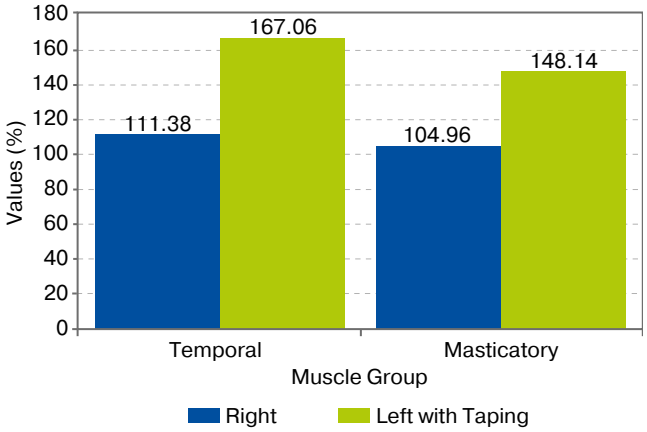

Fig. 14. Significant differences in EMG parameters during the "Maximum Teeth Clenching" test on the right and left sides with tape fixation on the 21st postoperative day

Рис. 14. Значимые различия между показателями ЭМГ при пробе «максимальное смыкание зубных рядов» справа и слева с фиксацией тейпов на 21-й день после операции

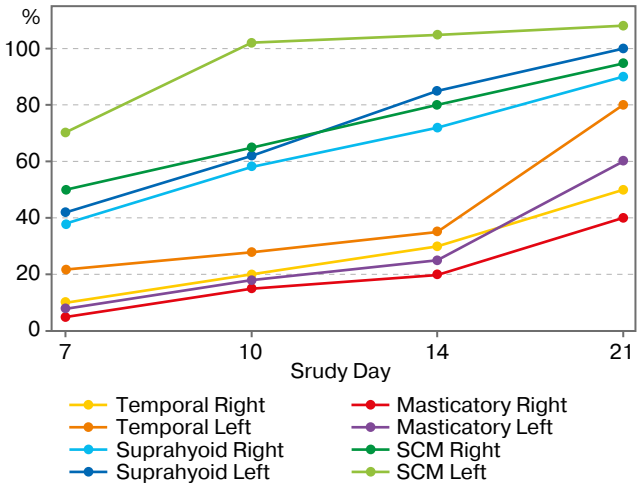

Fig. 15. Dynamics of Muscle Biopotential Changes During Unilateral Taping in the "Maximum Teeth Clenching" Test

Рис. 15. Динамика изменения биопотенциала мышц при одностороннем тейпировании при пробе «максимальное смыкание зубных рядов»

On the 21st postoperative day, EMG parameters of the masticatory and temporal muscles during the "Maximum Teeth Clenching" test showed significant differences between the right and left sides ($p < 0.001$). The EMG values of the temporal muscles on the right side were 50.0% lower than those on the left, while the masticatory muscles exhibited a 41.1% decrease. Differences in the biopotential of the suprahyoid muscle group (4.2%) and the sternocleidomastoid muscles (1.4%) were not statistically significant (Fig. 14).

Thus, the comparison of the effects of kinesiotapes on muscle biopotential during the "Maximum Teeth Clenching" test demonstrated (Fig. 15):

– a decrease in muscle biopotential values in the postoperative period, followed by gradual recovery;

– a significant impact of kinesiotapes on the studied parameters of the masticatory and temporal muscles;

– a less pronounced effect on the suprahyoid muscle groups and sternocleidomastoid muscles.

CONCLUSION

In the early postoperative period, the use of kinesiotapes can be recommended, applying the fascial correction technique without pressure. This technique involves shifting the skin over the fascia, which helps to relieve pain and restore muscle function. As a result, orthodontic treatment can be resumed more quickly after surgery, thereby reducing the overall treatment duration.

REFERENCES / СПИСОК ЛИТЕРАТУРЫ

1. Sysolyatin P.G. Replacement of mandibular defects with preserved allogenic bone in children. *Stomatology*. 1976;55(1):67. (In Russ.)
   Сысолятин П.Г. Замещение дефектов нижней челюсти консервированной аллокостью у детей. *Стоматология.* 1976;55(1):67.
2. Bezrukov V.M., Robustova T.G. (eds) *Guide to Surgical Dentistry and Maxillofacial Surgery*. Vol. 2. 2nd ed. Moscow: Meditsina; 2000. Vol. 2. 488 p. (In Russ.)
   Безруков В.М., Робустова Т.Г. (ред.) *Руководство по хирургической стоматологии и челюстно-лицевой хирургии*. 2-е изд., перераб. и доп. М.: Медицина; 2000. Т. 2. 488 с.
3. Drobyshev A.Y., Kurakin K.A., Latyshev A.V., Lonskaya E.A. Rowing chin osteotomy as part of orthognathic surgery. Review of a clinical case. *Annals of Plastic, Reconstructive and Aesthetic Surgery*. 2017;(4):11–18. (In Russ.)
   Дробышев А.Ю., Куракин К.А., Латышев А.В., Лонская Е.А. Эстетическая значимость гениопластики в комбинированном лечении пациентов с макрогенией. *Анналы пластической, реконструктивной и эстетической хирургии*. 2017;(4):11–18.
4. Slabkovsky R.I., Drobysheva N.S., Slabkovskaya A.B., Drobyshev A.Yu., Medvedev V.E., Uspenskaya M.O. Possibilities of psychological and psychiatric rehabilitation of adult patients after orthognatic surgery. *Clinical Dentistry* (*Russia*). 2021;24(2):65–71. (In Russ.) https://doi.org/10.37988/1811-153X_2021_2_65
   Слабковский Р.И., Дробышева Н.С., Слабковская А.Б., Дробышев А.Ю., Медведев В.Е., Успенская М.О. Возможности психолого-психиатрической реабилитации взрослых пациентов после ортогнатических операций. *Клиническая стоматология*. 2021;24(2):65–71. https://doi.org/10.37988/1811-153X_2021_2_65
5. Lam T., Kiyak H.A., Hohl T., West R.A., McNeill R.W. Recreational and social activities of orthognathic surgery patients. *Am J Orthod*. 1983;83(2):143–152. https://doi.org/10.1016/s0002-9416(83)90300-7
6. Neuwirth B.R., White R.P. Jr, Collins M.L., Phillips C. Recovery following orthognathic surgery and autologous blood transfusion. *Int J Adult Orthodon Orthognath Surg*. 1992;7(4):221–228.
7. Dickerson H.S., White R.P. Jr, McMichael D.L., Turvey T.A., Phillips C., Mohorn D.J. Recovery following orthognathic surgery: mandibular bilateral sagittal split osteotomy and Le Fort I osteotomy. *Int J Adult Orthodon Orthognath Surg*. 1993;8(4):237–243.
8. Murphy T.C. The diary of an orthognathic patient aged 30$^{3/4}$. *J Orthod*. 2005;32(3):169–174. https://doi.org/10.1179/146531205225021051
9. Sergeeva E.M., Neugodov Yu.V., Yakovleva I.Yu. Preoperative preparation and postoperative rehabilitation in “rejuvenating” facial surgeries. In: *Cosmetology 2000. Conference Abstracts Collection*. Moscow; 2000, pp. 44–45. (In Russ.)
   Сергеева Е.М., Неугодов Ю.В., Яковлева И.Ю. Предоперационная подготовка и послеоперационная реабилитация при «омолаживающих» операциях на лице. В кн: *Косметология 2000: сб. тез. конф.* М.; 2000. С. 44–45.
10. Gerasimenko M.Yu., Stuchilov V.A., Nikitin A.A., Filatova E.V., Kokorev V.Yu. Rehabilitation of patients with upper and middle facial zones trauma and locomuscular lesions of the eye and orbit. *Problems of Balneology, Physiotherapy and Exercise Therapy*. 2004;(1):25. (In Russ.)
    Герасименко М.Ю., Стучилов В.А., Никитин А.А., Филатова Е.В., Кокорев В.Ю. Особенности реабилитации больных с травмой верхней и средней зоны лица и повреждениями опорно-мышечного аппарата глаза и глазницы. *Вопросы курортологии, физиотерапии и лечебной физической культуры*. 2004;(1):25.
11. Drobysheva N.S., Drobyshev A.Yu., Dzampaeva I.R., Kurakin K.A., Glushko A.V. Improving the effectiveness of combined treatment in patients with congenital jaw developmental anomalies. In: *New Technologies in Dentistry: Proceedings of the 20th International Conference of Maxillofacial Surgeons and Dentists, Saint Petersburg, May 3–5, 2015.* Saint Petersburg: Kella Studio; 2015, pp. 40–41. (In Russ.)
    Дробышева Н.С., Дробышев А.Ю., Дзампаева И.Р., Куракин К.А., Глушко А.В. Повышение эффективности комбинированного лечения пациентов с врожденными аномалиями развития челюстей. В кн.: *Новые технологии в стоматологии: материалы 20-й Меджунар. конф. челюстно-лицевых хирургов и стоматологов, г. Санкт-Петербург, 3–5 июня 2015 г.* СПб.: Келла Студио; 2015. С. 40–41.
12. Avdoshenko K.E. *Physiotherapeutic methods in the comprehensive medical rehabilitation of patients after plastic surgeries* [dissertation]. Moscow; 2006. 131 p.
    Авдошенко К.Е. *Физиотерапевтические методы в комплексной медицинской реабилитации пациентов после пластических операций на лице: дис. … канд. мед. наук*. М.; 2006. 131 с.
13. Abduqodirov A., Muxamedieva F., Bakhriev U. Postoperative management of patients after orthognathic surgeries. *Topical Issues of Surgical Dentistry and Dental Implantology*. 2022;1(1):2–3. (In Russ.)
    Абдукадыров А., Мухамедиева Ф., Бахриев У. Послеоперационное ведение пациентов после ортогнатических операций. *Актуальные вопросы хирургической стоматологии и дентальной имплантологии*. 2022;1(1):2–3.
14. Mikhaylyuk I.G., Sal’nikov Ye.V., Spirin N.N., Kuz’min F.A. Influence of kinesio taping on the functional state of microcirculation in humans. *Vestnik Kostromskogo Gosudarstvennogo Universiteta imeni N.A. Nekrasova.* 2014;20(7):50–53. (In Russ.)
    Михайлюк И.Г., Сальников Е.В., Спирин Н.Н., Кузьмин Ф.А. Влияние кинезиотейпирования на функциональное состояние микроциркуляции у человека. *Вестник Костромского государственного университета ИМ. Н.А. Некрасова*. 2014;20(7):50–53.
15. Slabkovsky R.I., Drobysheva N.S., Karton E.A., Slabkovskaya A.B., Zaretskaya E.G. Features of the post-surgical stage of combined treatment in orthodontic patients. *Ortodontiya*. 2021;3:75–76. (In Russ.)
    Слабковский Р.И., Дробышева Н.С., Картон Е.А., Слабковская А.Б., Зарецкая Э.Г. Особенности прове-

дения постхирургического этапа комбинированного лечения ортодонтических пациентов. *Ортодонтия.* 2021;(3):75–76.

16. Kastanjio E.B., Klimova T.V., Drobisheva N.S., Drobishe A.Yu. Functional state of the maxillofacial region in adults with physiological occlusion of the dentitions. *Ortodontiya.* 2018;(2):6–11. (In Russ.)
Кастаньо Е.Б., Климова Т.В., Дробышева Н.С., Дробышев А.Ю. Функциональное состояние мышц челюстно-лицевой области у взрослых людей с физиологической окклюзией зубных рядов. *Ортодонтия*. 2018;(2):6–11.
17. Lisova T.V. *Formation of the occlusal plane in physiological occlusion and occlusion anomalies* [dissertation]. Moscow; 2005. 192 p. (In Russ.)
Лисова Т.В. *Формирование окклюзионной плоскости при физиологической окклюзии и аномалиях окклюзии: дис. … канд. мед. наук*. М.; 2005. 192 с.

INFORMATION ABOUT THE AUTHORS

Roman I. Slabkovsky – Senior Laboratory Assistant, Department of Orthodontics, Russian University of Medicine; 4, Dolgorukovskaya St., Moscow 127006, Russian Federation; https://orcid.org/0000-0001-6884-8620

Nailya S. Drobysheva – Cand. Sci. (Med.), Associate Professor of the Department of Orthodontics, Russian University of Medicine; 4, Dolgorukovskaya St., Moscow 127006, Russian Federation; https://orcid.org/0000-0002-5612-3451

Anna B. Slabkovskaya – Dr. Sc. (Med.), Professor, Head of the Department of Orthodontics, Russian University of Medicine; 4, Dolgorukovskaya St., Moscow 127006, Russian Federation; https://orcid.org/0000-0001-8154-5093

ИНФОРМАЦИЯ ОБ АВТОРАХ

Слабковский Роман Игоревич – старший лаборант кафедры ортодонтии, ФГБОУ ВО «Российский университет медицины»; 127006, Российская Федерация, г. Москва, ул. Долгоруковская, д. 4; https://orcid.org/0000-0001-6884-8620

Добрышева Наиля Сабитовна – к.м.н., доцент кафедры ортодонтии, ФГБОУ ВО «Российский университет медицины»; 127006, Российская Федерация, г. Москва, ул. Долгоруковская, д. 4; https://orcid.org/0000-0002-5612-3451

Слабковская Анна Борисовна – д.м.н., профессор, заведующая кафедрой ортодонтии, ФГБОУ ВО «Российский университет медицины»; 127006, Российская Федерация, г. Москва, ул. Долгоруковская, д. 4; https://orcid.org/0000-0001-8154-5093

AUTHOR'S CONTRIBUTION

All the authors made equal contributions to the publication preparation in terms of the idea and design of the article; data collection; critical revision of the article in terms of significant intellectual content and final approval of the version of the article for publication.

ВКЛАД АВТОРОВ

Все авторы внесли равноценный вклад в подготовку публикации в части замысла и дизайна исследования; сбора данных; критического пересмотра статьи в части значимого интеллектуального содержания и окончательного одобрения варианта статьи для опубликования.