https://doi.org/10.36377/ET-0088

Clinical case: experience in the treatment of hyperplastic gingivitis in a patient with poor oral hygiene

Pavel A. Voronin[1] ✉, **Andrey G. Prityko**[1,2], **Anastasia E. Kazakova**[1], **Vadim A. Voronin**[1], **Irina A. Nikolskaya**[1]

[1] Pirogov Russian National Research Medical University, Moscow, Russian Federation

[2] Research Practical Center for Children's Specialized Medical Care, Moscow, Russian Federation

✉ pavelvoronin2008@yandex.ru

Abstract

INTRODUCTION. The fibrous form of hyperplastic gingivitis is a complex condition characterized by chronic inflammation of the gingiva accompanied by fibrotic tissue transformation. Conservative treatment approaches are often insufficient, and surgical intervention is required to restore both esthetics and function.

AIM. To evaluate the effectiveness of a stepwise treatment approach for the fibrous form of hyperplastic gingivitis in a patient with a long-standing disease history and inadequate personal oral hygiene.

MATERIALS AND METHODS. A clinical case study was conducted involving a 30-year-old patient diagnosed with a moderate form of fibrous hyperplastic gingivitis. Treatment was carried out in sequential phases, including etiological therapy aimed at reducing inflammation through professional oral hygiene procedures, patient education, and motivation. The surgical phase involved gingivectomy and reshaping of the gingival contour on both jaws. The supportive phase included regular follow-up visits, repeated professional hygiene sessions, and instruction in the use of an oral irrigator, interdental brushes, and dental floss.

RESULTS. Following the conservative phase, a reduction in inflammatory symptoms was observed, although significant gingival hypertrophy persisted. Surgical intervention led to a stable esthetic outcome in the maxilla and partial stabilization in the mandible. At the 11-month follow-up, a recurrence of inflammation was noted in the mandibular anterior region, particularly in areas challenging to clean, underscoring the need for consistent oral hygiene habits.

CONCLUSIONS. Surgical correction of fibrotically altered gingiva is essential to achieving stable clinical results, as conservative treatment alone is typically ineffective in such cases. The success of therapy is directly dependent on the patient's adherence to oral hygiene instructions and commitment to routine professional maintenance. Periodontal patients, even in remission, require systematic monitoring at intervals of no more than three months to maintain treatment outcomes and prevent recurrence.

Keywords: treatment and prevention of hyperplastic gingivitis

Article info: received – 27.02. 2025; revised – 02.05.2025; accepted – 13.05.2025

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

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

For citation: Voronin P.A., Prityko A.G., Kazakova A.E., Voronin V.A., Nikolskaya I.A. Clinical case: experience in the treatment of hyperplastic gingivitis in a patient with poor oral hygiene. *Endodontics Today.* 2025;23(2):289–295. https://doi.org/10.36377/ET-0088

Клинический случай: опыт лечения гиперпластического гингивита у пациента с неудовлетворительной гигиеной полости рта

П.А. Воронин[1] ✉, **А.Г. Притыко**[1,2], **А.Е. Казакова**[1], **В.А. Воронин**[1], **И.А. Никольская**[1]

[1] Российский национальный исследовательский медицинский университет имени Н.И. Пирогова, г. Москва, Российская Федерация

[2] Научно-практический центр специализированной медицинской помощи детям имени В.Ф. Войно-Ясенецкого, г. Москва, Российская Федерация

✉ pavelvoronin2008@yandex.ru

Резюме

ВВЕДЕНИЕ. Фиброзная форма гиперпластического гингивита представляет собой сложное заболевание, характеризующееся хроническим воспалением десны с фиброзной трансформацией тканей. Консервативные подходы к лечению оказываются малоэффективными, и для восстановления эстетики и функции требуется хирургическое вмешательство.

ЦЕЛЬ ИССЛЕДОВАНИЯ. Оценить эффективность поэтапного подхода к лечению фиброзной формы гиперпластического гингивита у пациента с длительной историей заболевания и недостаточной индивидуальной гигиеной полости рта.

МАТЕРИАЛЫ И МЕТОДЫ. Проведено клиническое наблюдение за 30-летним пациентом с фиброзной формой гиперпластического гингивита средней степени тяжести. Лечение осуществлялось поэтапно и включало этиотропную терапию, направленную на устранение воспаления за счет профессиональной гигиены полости рта, обучения и мотивации пациента к правильной гигиене; хирургический этап, в рамках которого была проведена гингивэктомия и коррекция десневого контура на обеих челюстях; а также поддерживающую терапию, включающую регулярные контрольные осмотры, повторную профессиональную гигиену и обучение пациента использованию ирригатора, монопучковой щетки и флосса.
РЕЗУЛЬТАТЫ. После консервативного этапа наблюдалось снижение воспалительных проявлений, однако выраженная гипертрофия сохранялась. Хирургическое лечение позволило достичь стабильного эстетического результата на верхней челюсти и частичной стабилизации на нижней. Через 11 месяцев наблюдался рецидив воспаления на нижней челюсти в зонах трудной гигиены, что указывает на необходимость формирования устойчивых гигиенических навыков.
ВЫВОДЫ. Хирургическая коррекция фиброзно измененной десны является необходимым условием для достижения стабильного клинического эффекта, поскольку консервативное лечение в таких случаях недостаточно эффективно. Успешность терапии напрямую зависит от приверженности пациента к соблюдению гигиенических рекомендаций и регулярной профессиональной гигиене. Пародонтологические пациенты, даже находясь в состоянии ремиссии, требуют систематического наблюдения с интервалом не реже одного раза в три месяца для поддержания достигнутых результатов и профилактики рецидива.

Ключевые слова: лечение и профилактика гиперпластического гингивита

Информация о статье: поступила – 27.02. 2025; исправлена – 02.05.2025; принята – 13.05.2025

Конфликт интересов: авторы сообщают об отсутствии конфликта интересов.

Благодарности: финансирование и индивидуальные благодарности для декларирования отсутствуют.

Для цитирования: Воронин П.А., Притыко А.Г., Казакова А.Е., Воронин В.А., Никольская И.А. Клинический случай: опыт лечения гиперпластического гингивита у пациента с неудовлетворительной гигиеной полости рта. *Эндодонтия Today.* 2025;23(2):289–295. https://doi.org/10.36377/ET-0088

INTRODUCTION

Management of the Fibrous Form of Hyperplastic Gingivitis: Therapeutic Challenges and a Structured Clinical Approach. The treatment of the fibrous form of hyperplastic gingivitis is associated with a number of challenges, particularly at the stage of choosing an appropriate therapeutic strategy. A conservative approach, often supported by physiotherapy, is commonly selected; however, it is typically insufficient for the complete correction of gingival tissues altered by fibrotic transformation.

It is important to understand that the clinical course of hyperplastic gingivitis resembles a vicious cycle. The etiological factor – be it the irritative effect of microbial plaque, the use of systemic medications, autoimmune conditions, endocrine imbalances, or other systemic disorders – exerts a prolonged influence on the gingiva, leading to inflammation and, in predisposed individuals, reactive tissue proliferation. The overgrown gingival papillae hinder proper oral hygiene, cause pain, and bleed during tooth brushing. These areas accumulate soft dental plaque, further aggravating gingival inflammation. Pseudopockets harbor subgingival calculus, making personal hygiene even more difficult and thereby accelerating disease progression.

In most cases, hyperplastic gingivitis presents in an edematous form. However, in a subset of patients, and particularly in the absence of adequate treatment, the chronically inflamed gingiva undergoes fibrotic transformation, pathogenetically comparable to scar formation. This condition is referred to as the fibrous form of hyperplastic gingivitis.

When the edematous form is diagnosed, management is typically limited to addressing the underlying cause: removal of supra- and subgingival deposits, correction of overhanging restoration margins, modification of systemic therapy in cases of comorbidities, treatment of underlying conditions, hormonal balance correction, and improvement of the patient's individual oral hygiene practices. If the etiological factor is eliminated and proper oral hygiene is maintained, the edematous gingival papillae usually return to their original shape and size.

In contrast, treatment of the fibrous form of hyperplastic gingivitis requires a more radical approach. Gingival tissues that have undergone fibrotic transformation become denser and less vascularized. Histologically, signs of active inflammation are limited to the peripheral gingiva, where it directly contacts the irritating biofilm. Restoration of the gingiva to its original histological structure is impossible – just as a skin scar cannot be replaced by regenerated epithelium. Full aesthetic and functional correction of the gingival contour is only achievable through surgical intervention.

MATERIALS AND METHODS

Herbert Wolf proposed a four-phase model for the treatment of periodontal inflammatory diseases:

– phase 0: Emergency care and systemic preparation;

– phase I: Initial, etiological, non-surgical treatment;

– phase II: Surgical intervention;

– phase III: Supportive therapy, follow-up examinations, and adjunctive treatments.

This concept offers a comprehensive, rational, stepwise, and logically sequenced framework for the management of all forms of periodontal inflammation.

When applied to the context of fibrous hyperplastic gingivitis, this model yields the following treatment algorithm:

1. Phase 0 – Systemic Preparation: In most cases, emergency care and systemic preparation are not required, except for patients on anticoagulant therapy, which must be temporarily discontinued before surgery. Systemic medication adjustments and treatment of general health conditions are performed as needed.

2. Phase I – Etiological (Non-Surgical) Treatment: Patient education in personal oral hygiene and motivational reinforcement. Etiologic measures include removal of supra- and subgingival deposits and reduction of microbial load in the oral cavity. The goal is to eliminate the inflammatory component of the disease.

3. Phase II – Surgical Treatment: Surgical excision of gingival overgrowth and reshaping of the gingival contour. The objective is to establish conditions that allow for proper personal oral hygiene and to restore an aesthetically acceptable gingival architecture.

4. Phase III – Supportive Therapy: Includes physiotherapy and, when indicated, adjunctive orthodontic or prosthetic treatment. Regular professional examinations and hygiene procedures are essential for maintaining long-term results.

Let us illustrate this therapeutic approach using a clinical case of a patient with moderate fibrous hyperplastic gingivitis.

Clinical Case. A 30-year-old male patient presented for the first time with complaints of halitosis, gingival pain, and bleeding during toothbrushing. According to the patient, these symptoms had been present for more than 10 years, with a recent exacerbation occurring approximately one month prior to presentation. He associated the worsening condition with inadequate oral hygiene. He denied any systemic diseases but suspected possible insulin resistance. The patient was not taking any medications regularly.

Clinical Examination: All 32 teeth were present. Carious lesions involving the occlusal and vestibular surfaces of teeth 3.6, 3.7, 4.6, 1.8, 2.8, and 3.8 were observed. Panoramic radiograph revealed a periodontal pocket in the region of tooth 4.8, which was mesially tilted.

Teeth 1.3–2.3 and 3.3–4.3 presented with significant soft and hard deposits. Supragingival calculus covered up to two-thirds of the crowns on both the vestibular and oral surfaces, with massive subgingival calculus deposits. The marginal gingiva in these areas appeared markedly erythematous and edematous, and bled on palpation. The gingival papillae were hypertrophic, pale pink in color, and fibrous in consistency; their margins were inflamed and swollen, covering up to half the height of the clinical crowns. Due to extensive subgingival deposits, probing of the gingival sulcus was not feasible. Radiographic examination revealed preserved cortical bone and no changes in bone structure in the regions of teeth 1.3–2.3 and 3.3–4.3 (Fig. 1).

Treatment: under infiltration anesthesia, soft dental plaque was removed using a rotary brush and *Super Polish* paste. Supragingival and subgingival calculus was eliminated using manual instruments (excavator and Gracey curettes) with continuous irrigation using 0.2% chlorhexidine digluconate solution.

Metrogyl Denta gel was applied into the gingival sulci.

The patient received instruction in individual oral hygiene techniques, including the use of a regular and a single-tuft toothbrush, as well as dental floss. Motivational counseling was provided, along with supervised toothbrushing.

Recommendations: use of a soft-bristled toothbrush and a single-tuft toothbrush, as well as dental floss. Toothpaste: *Parodontax*. Gingival irrigation with *Miramistin* solution and application of *Metrogyl Denta* gel three times daily after toothbrushing for a duration of two weeks. Follow-up (2 Weeks Post-Treatment): The patient reports significant improvement, including the absence of halitosis and a marked reduction in gingival pain and bleeding during toothbrushing (Fig. 2).

Objective Findings: in the region of teeth 1.3–2.3 and 3.3–4.3, the gingiva appeared pale pink with isolated areas of marginal erythema near the cervical regions of teeth 2.1, 3.1, and 4.1. Bleeding upon probing was noted within the gingival sulcus. Gingival papillae remained hypertrophic, of dense fibrous consistency, covering up to one-third of the clinical crowns. Following the resolution of edema and reduction in papillary overgrowth, residual subgingival calculus not removed during the previous visit became visible. Periodontal probing revealed intact dentogingival attachment in the cervical areas. However, due to gingival overgrowth, pseudopockets up to 3 mm in depth were present.

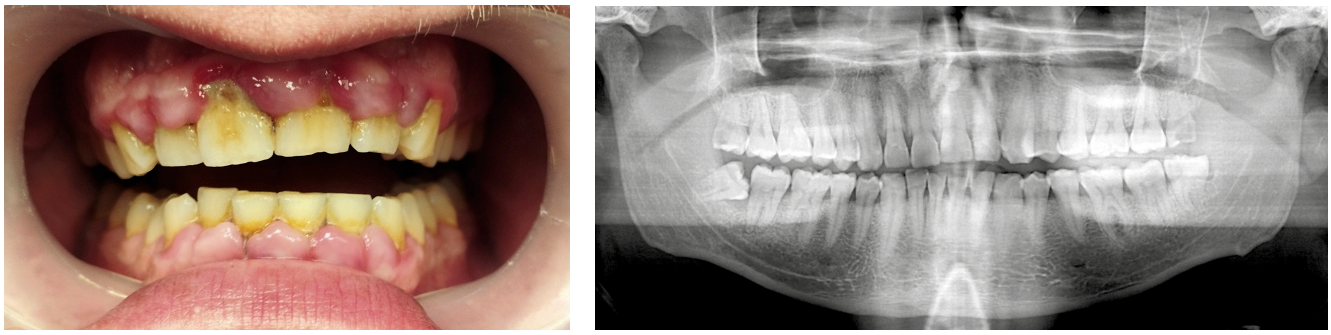

Fig. 1. Preliminary Diagnosis: Chronic hyperplastic gingivitis (fibrous form) in the region of teeth 1.3–2.3 and 3.3–4.3

Рис. 1. Предварительный диагноз: Хронический гиперпластический гингивит (фиброзная форма) в области зубов 1.3-2.3 и 3.3-4.3

Treatment: under topical anesthesia, remaining subgingival deposits were removed. Teeth were cleaned using air-abrasive therapy (*PerioFlow*), followed by polishing with rotary brushes, polishing cups, and *CleanPolish* paste. Remineralization therapy was performed using APF gel.

A supervised toothbrushing session was conducted. The patient's skills in using the single-tuft toothbrush and dental floss were assessed, and additional instruction was provided for using an oral irrigator. Motivational counseling was reinforced. Further oral hygiene recommendations were given (Fig. 3).

Follow-up over the next two months: the patient attended two scheduled maintenance visits and demonstrated consistent compliance and motivation. Oral hygiene was maintained at a good to satisfactory level. However, in hard-to-reach areas, soft plaque continued to accumulate within pseudopockets beneath hypertrophic gingival papillae – sites the patient was unable to clean effectively on his own.

As a result, a decision was made to perform gingivectomy in both the maxillary and mandibular arches to facilitate personal oral hygiene and improve aesthetic outcomes.

Surgical intervention (2 months later): a gingivectomy was performed in the mandibular anterior region (teeth 3.3–4.3). The width of the attached keratinized gingiva was assessed and deemed sufficient to allow for the procedure. Under infiltration anesthesia, the planned gingival contour was outlined using a periodontal probe and a gingival marker. Due to the shallow depth of the gingival sulcus, a Crane-Kaplan forceps could not be used for marking.

Excision of the overgrown gingival papillae and contouring of the new gingival margin were performed using a scalpel, followed by laser coagulation. A periodontal dressing (*Septopac*) was applied and left in place for up to four days (Fig. 4).

Post-operative recommendations: soft diet, and gentle toothbrushing in the treated area using a soft-bristled toothbrush.

Removal of periodontal dressing: upon removal of the periodontal dressing, fibrin deposits were observed in the surgical area.

Recommendations: continue a soft diet; perform gentle yet thorough toothbrushing in the treated area using a soft-bristled toothbrush and a single-tuft brush. Use 0.05% chlorhexidine mouth rinses three times daily after brushing for up to 7 days. Once the white fibrin coating resolves, apply sea buckthorn oil to the affected area to promote healing, for up to 7 days (Fig. 5).

Surgical intervention – maxillary arch: a gingivectomy was performed in the maxillary anterior region (teeth 1.3–3.3), and laser contouring of the gingival margin was carried out in the mandibular anterior region. A periodontal dressing was applied for up to 4 days. Dressing removal and postoperative care were identical to those prescribed for the mandibular region (Fig. 6).

Follow-up over the next three months: during the following three months, the patient consistently attended preventive check-ups and underwent caries treatment. He demonstrated good oral hygiene and proper technique in the use of a single-tuft toothbrush, dental floss, and an oral irrigator. Mucosal healing following the surgical intervention was uneventful, and the outcome was deemed stable. A follow-up examination was scheduled for six months later.

Follow-up at 11 months: the patient presented with complaints of yellow plaque on the mandibular incisors that could not be removed with a toothbrush. According to the patient, he had been regularly consuming cheese-coated peanuts over the past month.

Clinical findings:

1. Teeth 2.1, 2.2, and 2.3 exhibited minor amounts of soft plaque in the cervical area.
2. The gingival contour in the maxillary anterior region (1.3–2.3) remained consistent with the surgical outcome achieved in April.
3. Papillary and marginal gingiva in the region of teeth 2.1–2.3 were erythematous and bled upon probing.
4. In the mandibular anterior region (3.3–4.2), yellow plaque was observed on the vestibular surfaces, which could not be removed with a probe.
5. On the oral and interproximal surfaces of teeth 3.3–4.3, small amounts of calculus were present.
6. Gingival papillae in this area were enlarged compared to the post-surgical baseline, extending up to one-third of the crown height, with marked erythema, edema, bleeding upon probing, and a soft consistency (Fig. 7).

Fig. 2. Follow-Up visit after recommendations

Рис. 2. Последующий визит после выполнения рекомендаций

Fig. 3. Follow-Up visit in 2 months

Рис. 3. Контрольный визит через 2 месяца

Fig. 4. A periodontal dressing (Septopac)
Рис. 4. Пародонтальная повязка (Septopac)

Fig. 5. Removal of periodontal dressing
Рис. 5. Удаление пародонтальной повязки

Fig. 6. Surgical intervention
Рис. 6. Хирургическое вмешательство

Fig. 7. Follow-up at 11 months, panoramic xray
Рис. 7. Наблюдение через 11 месяцев, панорамный рентгеновский снимок

Treatment: a professional dental cleaning was performed, including removal of hard deposits using an ultrasonic scaler and elimination of soft plaque using air-abrasive technology (*NSK Classic*). Polishing was carried out with a rotary brush and polishing cup using *SuperPolish* and *CleanPolish* pastes. Remineralization therapy was conducted using APF gel.

The patient's oral hygiene technique was reviewed and corrected. Additional motivation and oral hygiene instructions were provided. A follow-up visit was scheduled for one month later for preventive examination and caries treatment.

CONCLUSION

1. The treatment of hyperplastic gingivitis in the maxillary arch can be considered relatively successful in the long term. The newly formed gingival contour remains stable, and the patient is able to maintain acceptable oral hygiene in the maxillary region.

2. The treatment of hyperplastic gingivitis in the mandibular arch should be considered incomplete until proper oral hygiene habits are fully established. The clinical outcome can only be maintained under conditions of optimal hygiene.

3. Preventive examinations and professional maintenance for periodontally compromised patients should be conducted at intervals no greater than every three months over an extended period, even in cases of generalized gingivitis without complications. The author recommends that patients in periodontal remission be recalled for supportive periodontal care no less frequently than every three months.

REFERENCES / СПИСОК ЛИТЕРАТУРЫ

1. Wolf H.F., Hassell T.M. *Color Atlas of Dental Hygiene: Periodontology.* Thieme Verlagsgruppe; 2006. 352 p.
2. Kulakov A. A. (ed.). *Surgical Dentistry. National Guidelines*. Moscow: GEOTAR-Media, 2021. 408 p. (In Russ.). Кулаков А.А. (ред.). *Хирургическая стоматология. Национальное руководство*. М.: ГЭОТАР-Медиа; 2021. 408 с.
3. Agrawal A.A. Gingival enlargements: Differential diagnosis and review of literature. *World J Clin Cases*. 2015;3(9):779–788. https://doi.org/10.12998/wjcc.v3.i9.779
4. Beaumont J., Chesterman J., Kellett M., Durey K. Gingival overgrowth: Part 1: aetiology and clinical diagnosis. *Br Dent J*. 2017;222(2):85–91. https://doi.org/10.1038/sj.bdj.2017.71
5. Chesterman J., Beaumont J., Kellett M., Durey K. Gingival overgrowth: Part 2: management strategies. *Br Dent J*. 2017;222(3):159–165. https://doi.org/10.1038/sj.bdj.2017.111
6. Moffitt M.L., Cohen R.E. Non-drug induced gingival enlargement. *Gen Dent*. 2013;61(5):e10–13.
7. Maboudi A., Fekrazad R., Shiva A., Salehabadi N., Moosazadeh M., Ehsani H., Yazdani O. Gingivectomy with diode laser versus the conventional scalpel surgery and nonsurgical periodontal therapy in treatment of orthodontic treatment-induced gingival enlargement: A systematic review. *Photobiomodul Photomed Laser Surg*. 2023;41(9):449–459. https://doi.org/10.1089/photob.2023.0060
8. Nemţoi A., Scutariu M.M., Nemţoi A., Eva L., Dumitrescu G.F., Plămădeală P. et al. Clinical, imaging and histopathological correlations of gingival overgrowth: a retrospective analysis in northeastern Romanian population. *Rom J Morphol Embryol*. 2019;60(3):811–822.

INFORMATION ABOUT THE AUTHORS

Pavel A. Voronin – Cand. Sci. (Med.), Associate Professor of the Department of Maxillofacial Surgery and Dentistry of the Institute of Motherhood and Childhood, Pirogov Russian National Research Medical University, 1 Ostrovityanova Str., Moscow 117997, Russian Federation; https://orcid.org/0000-0002-2134-2320

Andrey G. Prityko – Dr. Sci. (Med.), Professor, Head of the Department of Maxillofacial Surgery and Dentistry at the Institute of Motherhood and Childhood, Pirogov Russian National Research Medical University, 1 Ostrovityanova Str., Moscow 117997, Russian Federation; Member of the RANS, Honorary Doctor of Russian Federation, Director, Research Practical Center for Children's Specialized Medical Care, 38 Aviatorov Str., Moscow 119620, Russian Federation; https://orcid.org/0000-0001-8899-4107

Anastasia E. Kazakova – Student at the Institute of Dentistry, Pirogov Russian National Research Medical University, 1 Ostrovityanova Str., Moscow 117997, Russian Federation; https://orcid.org//0009-0008-5721-1446

Vadim A. Voronin – Cand. Sci. (Med.), Associate Professor of the Department of Maxillofacial Surgery and Dentistry of the Institute of Motherhood and Childhood, Pirogov Russian National Research Medical University, 1 Ostrovityanova Str., Moscow 117997, Russian Federation; https://orcid.org/0009-0009-1686-9791

Irina A. Nikolskaya – Cand. Sci. (Med.), Professor of the Department of Therapeutic Dentistry at the Institute of Dentistry, Pirogov Russian National Research Medical University, 1 Ostrovityanova Str., Moscow 117997, Russian Federation; https://orcid.org/0000-0001-8042-2884

ИНФОРМАЦИЯ ОБ АВТОРАХ

Воронин Павел Анатольевич – к.м.н., доцент кафедры челюстно-лицевой хирургии и стоматологии института материнства и детства, ФГАОУ ВО «Российский национальный исследовательский медицинский университет имени Н.И. Пирогова», 117997, Российская Федерация, г. Москва, ул. Островитянова, д. 1; https://orcid.org/0000-0002-2134-2320

Притыко Андрей Георгиевич – д.м.н., профессор, заведующий кафедрой челюстно-лицевой хирургии и стоматологии института материнства и детства, ФГАОУ ВО «Российский национальный исследовательский медицинский университет имени Н.И. Пирогова», 117997, Российская Федерация, г. Москва, ул. Островитянова, д. 1; Президент, ГБУ «Научно-практический центр специализированной медицинской помощи детям имени В.Ф. Войно-Ясенецкого», 119620, Российская Федерация, г. Москва, ул. Авиаторов, д. 38; https://orcid.org//0000-0001-8899-4107

Казакова Анастасия Евгеньевна – студент 5 курса Института стоматологии, ФГАОУ ВО «Российский национальный исследовательский медицинский университет имени Н.И. Пирогова», 117997, Российская Федерация, г. Москва, ул. Островитянова, д. 1; https://orcid.org//0009-0008-5721-1446

Воронин Вадим Анатольевич – к.м.н., доцент кафедры челюстно-лицевой хирургии и стоматологии института материнства и детства, ФГАОУ ВО «Российский национальный исследовательский медицинский университет имени Н.И. Пирогова», 117997, Российская Федерация, г. Москва, ул. Островитянова, д. 1; https://orcid.org/0009-0009-1686-9791

Никольская Ирина Андреевна – к.м.н., доцент кафедры терапевтической стоматологии Института стоматологии, ФГАОУ ВО «Российский национальный исследовательский медицинский университет имени Н.И. Пирогова», 117997, Российская Федерация, г. Москва, ул. Островитянова, д. 1; https://orcid.org/0000-0001-8042-2884

AUTHOR'S CONTRIBUTION

Pavel A. Voronin – made a significant contribution to the conception and design of the study.

Andrey G. Prytyko – made a significant contribution to the conception and design of the study and gave final approval of the version to be published.

Anastasia E. Kazakova – contributed to drafting the manuscript or critically revising it for important intellectual content.

Vadim A. Voronin – contributed to drafting the manuscript or critically revising it for important intellectual content.

Irina A. Nikolskaya – contributed to drafting the manuscript or critically revising it for important intellectual content.

ВКЛАД АВТОРОВ

П.А. Воронин– существенный вклад в замысел и дизайн исследования.

А.Г. Притыко– существенный вклад в замысел и дизайн исследования, окончательное одобрение варианта статьи для опубликования.

А.Е. Казакова – подготовка статьи или ее критический пересмотр в части значимого интеллектуального содержания.

В.А. Воронин – подготовка статьи или ее критический пересмотр в части значимого интеллектуального содержания.

И.А. Никольская – подготовка статьи или ее критический пересмотр в части значимого интеллектуального содержания.