

# GEORGIAN MEDICAL NEWS

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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии  
საქართველოს სამედიცინო სიახლე

## GEORGIAN MEDICAL NEWS

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**GMN: Georgian Medical News** is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

**GMN: Медицинские новости Грузии** - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

**GMN: Georgian Medical News** – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

### WEBSITE

[www.geomednews.com](http://www.geomednews.com)

## К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman (Кириллица)**, для текста на грузинском языке следует использовать **AcadNusx**. Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - <http://www.spinesurgery.ru/files/publish.pdf> и [http://www.nlm.nih.gov/bsd/uniform\\_requirements.html](http://www.nlm.nih.gov/bsd/uniform_requirements.html) В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректур авторам не высылаются, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

**При нарушении указанных правил статьи не рассматриваются.**

## REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or computer-printed on a single side of standard typing paper, with the left margin of 3 centimeters width, and 1.5 spacing between the lines, typeface - **Times New Roman (Cyrillic)**, print size - 12 (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: [http://www.nlm.nih.gov/bsd/uniform\\_requirements.html](http://www.nlm.nih.gov/bsd/uniform_requirements.html)  
[http://www.icmje.org/urm\\_full.pdf](http://www.icmje.org/urm_full.pdf)

In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

**Articles that Fail to Meet the Aforementioned  
Requirements are not Assigned to be Reviewed.**

## ავტორთა საქურაღებოლ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დაიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx**. შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრაფიების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შედეგის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფხიხლებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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## ALGORITHM OF ORTHODONTIC TREATMENT PATIENTS WITH A BURDENED DRUG ANAMNESIS. DRUGS THAT CAN INHIBIT TOOTH MOVEMENT

Tsvetkova M. A., Kovalenko A. YU.

### Abstract.

According to the literature, more than 60% of orthodontic patients take certain medications and/or nutritional supplements on regular basis. To improve the efficiency and quality of treatment an orthodontic treatment algorithm has been developed for patients taking bisphosphonates, drugs for the treatment of diabetes (except thiazolidinediones and SGLT-2 inhibitors), hypotensive agents, antihistamines, statins, NSAIDs, estrogen-containing drugs, tetracycline, interferon- $\gamma$  (copyright database IREG deposit certificate No. 2080699). The result of the study showed that 12,6% of patients, who came for consultation and orthodontic treatment, use different drugs on regular basis, with potential ability to slow down tooth movement.

Algorithm helps orthodontist to make correct treatment plan, select appropriate orthodontic appliance activation regime, choose additional diagnostic procedures and consultations with doctors of other medical specialities according to patient's drug history.

**Key words.** Anamnesis, orthodontic treatment, drugs.

### Introduction.

Malocclusions are one of the most common types of maxillofacial pathology, which starts to form at deciduous teeth stage and increases in adolescence. Thus, the prevalence of malocclusion in mixed dentition is 73.9% [1]. According to Kosuga S.U., by the age of 12, this indicator reaches 83.8% [2]. If not treated in childhood, malocclusions will worsen with age and lead to the development and progression of gingivitis, periodontitis, carious lesions. In the absence of correction, increased microbial contamination of the oral cavity contributes to a decrease in local and general immunity, having a negative impact on diabetes mellitus treatment, heart, and kidney diseases [3].

Over 60% of children and adults who came for consultation and orthodontic treatment, take medications or dietary supplements on a regular basis [4].

A significant increase in treatment duration, development of side effects and complications may be associated not only with errors in treatment planning and the choice of biomechanics, but also with the systemic effects of pharmacological drugs on bone metabolism [5]. A wide range of drugs can significantly slow down the orthodontic teeth movement or accelerate it. A decrease in bone mineral density, as a possible side effect of several somatic disease's treatment, can negatively affect stability in retention period [6]. On the other hand, pharmaceutical bone resorption deceleration will significantly prolong treatment time, impede post extraction space closure, and increase the risk of root resorption [7-9].

Despite the fast development of diagnostic methods and a significantly increased range of appliances and techniques, in everyday practice an orthodontist often meets patients who

require an individual approach for treatment and retention protocol development, taking into account general somatic and drug anamnesis.

Side effects of many medications can manifest in the oral cavity in the form of xerostomia, erosive and ulcerative lesions, gingival hypertrophy, etc. [10]. All this can also significantly complicate orthodontic treatment.

Despite the relevance of the problem, there is no clear algorithm of orthodontic treatment patients with a burdened medical history, additional diagnostic procedures and necessary consultations with related medical specialists.

### The aims of the study.

1. To analyze scientific literature on the effect of drugs on bone metabolism and orthodontic treatment outcome.

2. To develop an orthodontic treatment algorithm for the patient's taking medications on regular basis which increase bone mineral density and potentially could slow down orthodontic tooth movement on the base of literature review.

3. To test the algorithm in clinical practice (to calculate the percentage of patients with burden drug history in routine orthodontic practice; to find the most commonly prescribed drugs which could slow down orthodontic treatment).

### Materials and methods.

An electronic search of published meta-analyzes, systematic reviews, case reports, clinical and experimental studies included in databases (Cochrane Library, EMBASE and MEDLINE, Web of Science) was made using the following search terms in titles and abstracts: «orthodontic treatment»; «orthodontic tooth movement»; «drugs and bone metabolism»; «medications side effects»; «medications/oral health».

The search depth was 10 years. References from the found articles were scanned for additional relevant publications.

The selection criteria for published articles were:

- clinical or experimental animal studies with the presence of an experimental and a control group.

- systemic or local use of drugs, capable to influence the physiological bone remodeling within the framework of both its mechanism of action and as a result of side effects.

- a detailed description of dosages and methods of administration.

- a detailed description of used orthodontic appliances, indication of force levels and activation mode, a description of the method for calculating the speed of teeth movement.

All medications, mentioned in this article, and it possible side effects, which could have a negative impact on orthodontic tooth movement were included in orthodontic treatment algorithm.

General information on the medications and their effects derived from the following web sites: <https://www.vidal.ru>, <https://www.rlsnet.ru>.



After clinical examination 348 patients (age 5-53 years) with any type of malocclusion were included in clinical part of our research. Anamnesis collection was made with an emphasis on drug intake history. Percentage of patients taking medications on regular basis that slow down bone metabolism was calculated and patients' distribution according to the algorithm was verified.

**Results.**

The total number of articles found was 182. Based on latest literature review, an orthodontic treatment algorithm was developed for the patients' taking drugs on regular basis that slow down bone metabolism and, as a result, orthodontic tooth movement (copyright database IREG deposit certificate No. 2080699). The algorithm provides clinical recommendations during active treatment and retention period for the patients taking following drugs: bisphosphonates, hypoglycemic drugs

(except thiazolidinediones and SGLT-2 inhibitors), hypotensive agents, antihistamines, statins, NSAIDs, estrogen-containing agents, tetracycline, interferon-γ. The algorithm is a graphic scheme, which allows the physician quickly to determine which actions should be performed at each stage of treatment. An accurate and logical algorithm scheme should help to reduce the frequency of medical errors (Figure 1).

Among 348 patients who came for consultation and orthodontic treatment, 44 patients (12.6%) aged 14 to 53 years regularly used medications able to slow down bone metabolism. Of them, 47.7% (21 persons) were taking estrogen-containing drugs used for contraception or osteoporosis prevention, 31.8% (14 persons) were taking hypotensive drugs, 9.1% (4 persons) were taking NSAIDs, 6.8% (3 persons) were taking antihistamines, and 4.5% (2 persons) were taking hypoglycemic drugs (metformin and vildagliptin) (Figure 2).

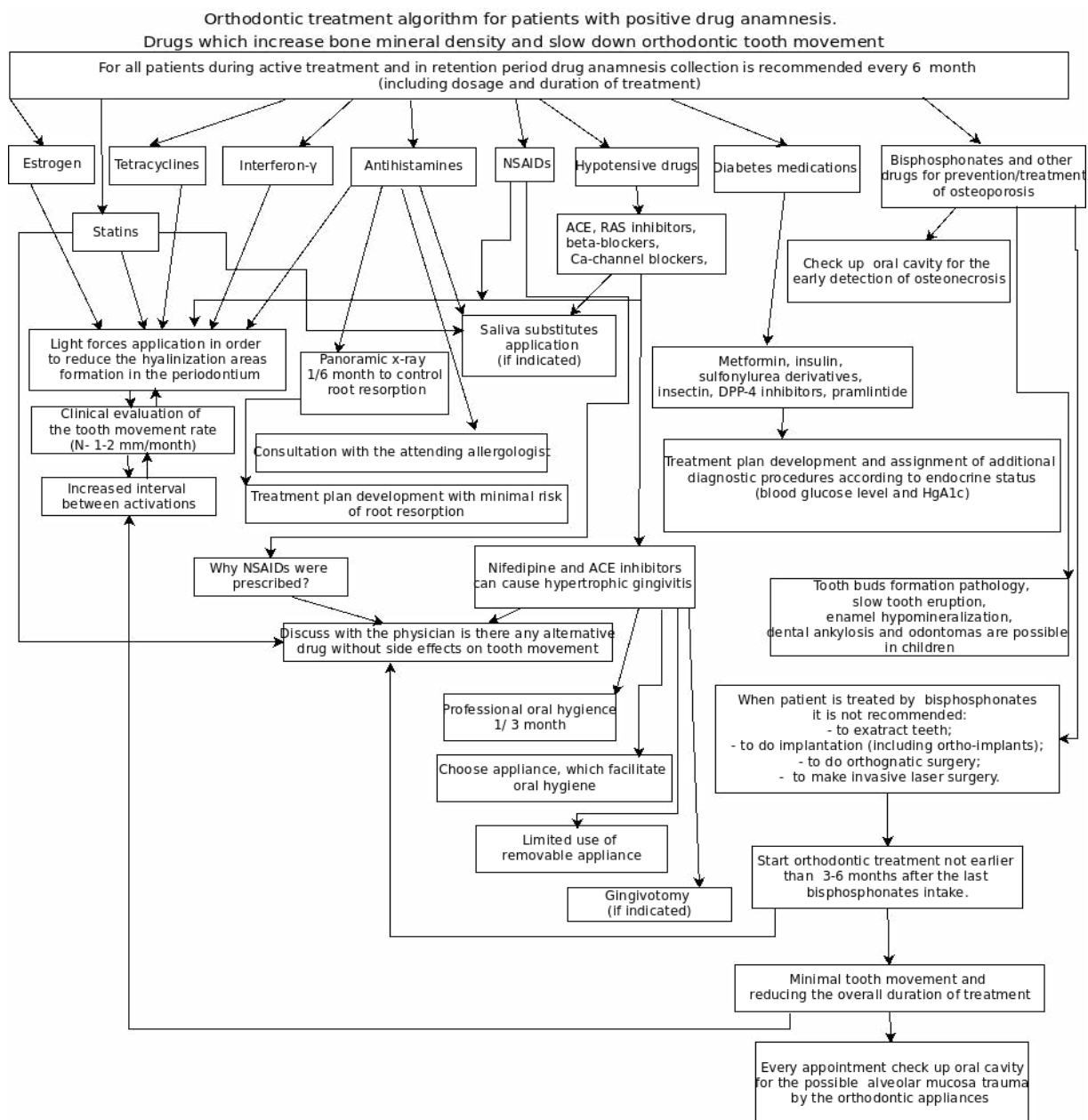


Figure 1. Orthodontic treatment algorithm for the patients taking drugs on regular basis that slow down bone metabolism.

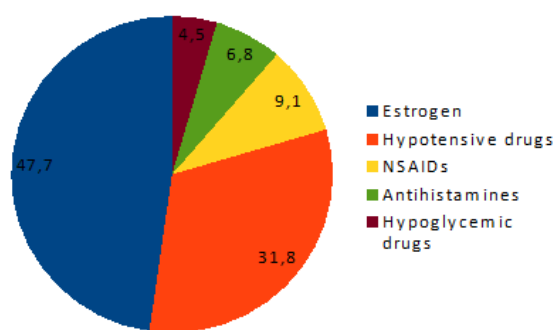


Figure 2. The number of patients taking drugs on regular basis that slow down bone metabolism (in %).

According to the algorithm, for all patients taking drugs that slow bone metabolism (44 patients) activation of orthodontic appliance was made with extended intervals, light forces were applied, and the clinical assessment of tooth movement rate was performed at each visit.

To avoid possible negative side effect of these medications on the duration and efficiency of tooth movement, patients were referred to the attending physicians with a request for possible replacement of the medication with an analog without side effects on bone metabolism (e.g., hypotensive drugs, statins, NSAIDs) or complete withdrawal for the entire active treatment period (bisphosphonates). For example, in our study, according to the algorithm, 1 patient, who used a calcium-channel blocker and complained about gingival bleeding and dry mouth, as well as 4 patients, who took NSAIDs for pain relief in rheumatoid arthritis and inflammatory diseases of the musculoskeletal system, were referred to a general practitioner for consultation on possible drug substitution.

We recommended an orthodontic treatment plan with minimal risk of root resorption to three patients with a history of allergy and taking antihistamines (reduction of active treatment time, use of light forces, choice of treatment plan that does not involve intrusion and moving teeth a long distance). In addition, patients were referred for control panoramic x-ray once every 6 months. Consultation with the attending allergologist allowed to exclude allergies to nickel, latex, polymers, composites, etc., which determined the absence of contraindications for the appliance choice.

Patients with diabetes mellitus (2 persons) were referred to an endocrinologist to get status update of their somatic disease compensation and the latest results of blood glucose and glycated hemoglobin levels. Patients in our study had well-controlled diabetes mellitus (glycated hemoglobin values of 6.5% and 7%, while the norm was 4-6%).

At all stages of orthodontic treatment, we maintained close contact with the doctors of other medical specialties to identify the relationship between pathological changes in the oral mucosa or gingiva and possible side effects or allergic manifestations of the drugs used by the patient. For example, ACE inhibitors or calcium channel blockers can lead to hypertrophic gingivitis, which makes orthodontic manipulations much more difficult. Among the patients in our study, hypertrophic gingivitis was

observed in 1 patient taking verapamil (a calcium channel blocker) (Figure 3).



Figure 3. Hypertrophic gingivitis due to the use of hypotensive drugs.

Bisphosphonates can contribute to the development of erosions and ulcers on the alveolar process with subsequent occurrence of osteonecrosis (Figure 4). Algorithm recommends orthodontist to make regular clinical examination of the oral mucosa patients, taking bisphosphonates.



Figure 4. Osteonecrosis on the lower arch.

When a drug-induced xerostomia was detected (one of the possible side effects of hypotensive drugs, antihistamines, or statins), in order to avoid mucosal trauma and oral hygiene complication, we prescribed saliva substitutes.

Thus, for each category of drugs, we formulated clinical recommendations for the orthodontist to increase effectiveness and safety of orthodontic treatment.

### Discussion.

To achieve optimal treatment results, we have developed and clinically tested an orthodontic treatment algorithm for patients taking drugs on regular basis which slow bone metabolism.

Estrogen-containing drugs, widely used for contraception and as a replacement therapy to prevent and treat osteoporosis, have a pronounced anabolic effect on bone tissue. Estrogen levels negatively correlate with markers of bone resorption that are actively involved in orthodontic tooth movement (PG E2, IL-1 $\beta$ , IL-6, M-CSF), which can negatively affect the rate of orthodontic treatment [11].

Statins are the most widely used drugs for cholesterol lowering and cardiovascular disease prevention [12]. Lipophilic statins have an anabolic effect on bone tissue, positively influencing bone formation, increasing trabecular bone volume, mineral density and reducing the risk of fractures [13], which can reliably reduce the rate of orthodontic tooth movement [14].

Tetracyclines, including chemically modified ones, have a pro-anabolic effect on bone tissue, promoting bone formation. One of the mechanisms of antiresorptive action is a decrease in the number of osteo- and odontoclasts due to the disruption of their development and differentiation, as well as the acceleration of apoptosis [15]. In addition, tetracyclines have a pronounced ability to inhibit collagenases, matrix metalloproteinases, pro-inflammatory cytokines (tumor necrosis factor, IL-1, etc.) and arachidonic acid metabolism, which play a key role not only in the pathogenesis of destructive diseases, but also during physiological remodeling [16].

The effect of interferon- $\gamma$  on bone remodeling processes is similar to that of indomethacin. Interferon- $\gamma$  administration disrupts prostaglandin synthesis and slows down bone resorption activated by IL-1. This effect is in direct correlation with the dosage of interferon- $\gamma$  administered. Interferon- $\gamma$  is able to block osteoclast genesis caused by the mechanical load produced by orthodontic appliances, thus slowing down orthodontic treatment [17].

NSAIDs have analgesic, antipyretic, anti-inflammatory effects and are used for a wide range of diseases (rheumatoid arthritis, osteoarthritis, gout, dysmenorrhea, migraines, headaches, postoperative pain, as well as for the prevention of cardiovascular diseases, etc.). COX blocking suppresses the production of prostaglandins, negatively affecting the differentiation and activity of osteoclasts. Ultimately, this leads to a slowing of bone resorption [18]. A number of somatic diseases (e.g., rheumatoid arthritis) can contribute to degenerative changes in the periodontium and TMJ, which should be taken into account during treatment plan development.

Blocking of H<sub>1</sub> receptors on the osteoblast surface with antihistamines impairs the recruitment and differentiation of osteoclasts on the compressed side of the periodontal ligament, delaying orthodontic tooth movement. Especially, such a negative effect on tooth movement can be observed with prolonged use for 3 weeks or more [19]. The presence of various allergic reactions is known to be a predisposing factor for pathological root resorption [20].

Decreased orthodontic tooth movement could be observed in patients, using beta-blockers, Ca-channel blockers, RAS or ACE inhibitors on regular basis, regardless of the dosage. The decrease of bone resorption occurs due to the osteoclasts activity and differentiation inhibition, as well as blocking of cytokine production (IL-1 $\beta$  and IL-6) [21,22]. Simultaneously, hypotensive drugs can increase level of osteoblasts function markers [23].

Bisphosphonates are widely used for the prevention and treatment of osteoporosis. However, by blocking osteoclast function and reducing capillary formation rate, this drugs rapidly decrease the rate of tooth movement and can compromise treatment results [24]. Impaired vascularization, in turn, can

contribute to the development of osteonecrosis [25]. Therefore, the orthodontic treatment plan should consider the increased risk of osteonecrosis during surgical manipulation, minimal tooth movement, total treatment duration, possible tooth buds formation pathology, and extended time of tooth eruption in children. During orthodontic treatment it is recommended to check up oral cavity for the early detection of possible chronic alveolar mucosa trauma by the orthodontic appliances, which may promote the development of osteonecrosis.

During active treatment of all patients who take medications on regular basis that slow down bone metabolism it is recommended to use light forces and increase the interval between activations of the appliance in order to reduce the hyalinization areas formation in the periodontium. Monthly evaluation of the tooth movement rate will clinically determine the correct activation regimen (N 1-2-mm/month).

Several medications (e.g., statins, hypotensive medications, and antihistamines) can cause xerostomia (<https://www.rlsnet.ru>). In the presence of fixed appliances in the mouth, xerostomia will accelerate plaque and caries formation. Prescription of saliva substitutes is an integral part of caries prevention during orthodontic treatment. In addition, calcium channel blockers (nifedipine, verapamil, etc.) provoke the development of hypertrophic gingivitis. Professional oral hygiene is recommended at least once every 3 months. Preference should be given to the appliance, which facilitate oral hygiene. In the presence of hypertrophic gingivitis unsatisfactory fixation of removable appliance is possible. In such cases gingivectomy is indicated.

During treatment plan development for the patients with a burdened drug anamnesis, timely and effective communication with the doctors of other medical specialties, will optimize orthodontic treatment duration and will help to avoid complications. If a patient is taking statins, NSAIDs, nifedipine or bisphosphonates on regular basis it may be helpful to discuss with the physician whether these medications can be stopped completely or replaced with an alternative without side effects which could interfere with tooth movement. In the absence of indications for complete withdrawal of bisphosphonates, it is recommended to start orthodontic treatment not earlier than 3-6 months after the last drug intake.

Diabetes medications (metformin, insulin, sulfonylurea derivatives, insectin, DPP-4 inhibitors, pramlintide) can both directly stimulate bone formation and indirectly by improving glycemic control [26], which should be considered. Blood glucose levels and glycated hemoglobin should be constantly monitored.

Thus, the orthodontist should work in close cooperation with general practitioners when treating patients with somatic pathology and who take various medications on regular basis. Treatment plan development, additional diagnostic procedures should be based on the somatic and drug anamnesis and the possible effects of pharmacological agents on the efficiency of orthodontic treatment. Timely identification of negative factors that can adversely affect tooth movement will reduce the risk of complications, optimize the duration and financial costs of orthodontic treatment.

## Conclusions.

1. The analysis of published scientific studies has revealed a wide range of drugs capable of blocking resorption, slowing down bone tissue metabolism, and negatively affecting the process of orthodontic treatment.

2. Orthodontic treatment algorithm contains practical recommendations for orthodontic treatment tactics and additional diagnostic procedures of the patients taking on regular basis bisphosphonates, drugs for the treatment of diabetes (except thiazolidinediones and SGLT-2 inhibitors), hypotensive agents, antihistamines, statins, NSAIDs, estrogen-containing drugs, tetracycline, interferon- $\gamma$  (copyright database IREG deposit certificate № 2080699).

3. 12,6% patients used on regular basis drugs with potential to slow down bone metabolism. The most frequently prescribed medications were strogen-containing drugs, hypotensive drugs, NSAIDs, antihistamines, hypoglycemic drugs.

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**АЛГОРИТМ ОРТОДОНТИЧЕСКОГО  
ЛЕЧЕНИЯ ПАЦИЕНТОВ С ОТЯГОЩЕННЫМ  
ЛЕКАРСТВЕННЫМ АНАМНЕЗОМ. ПРЕПАРАТЫ,  
ЗАМЕДЛЯЮЩИЕ МЕТАБОЛИЗМ КОСТНОЙ**

## ТКანი

**ЦВЕТКОВА М.А. - კ.მ.ნ., врач-ортодонт**

**КОВАЛЕНКО А.Ю. - врач-стоматолог-ортопед.**

По литературным данным, более 60% пациентов, обращающихся на консультацию и лечение к врачу-ортодонту, принимают те или иные лекарственные препараты и/или пищевые добавки на постоянной основе. Для повышения эффективности и качества лечения на основании систематических обзоров и мета-анализов разработан алгоритм ортодонтической помощи пациентам, принимающим бисфосфонаты, препараты для лечения сахарного диабета (кроме тиазолидиндионов и ингибиторов SGLT-2), гипотензивные, антигистаминные, статины, НПВС, эстроген-содержащие препараты, тетрациклин, интерферон- $\gamma$  (св-во о депонировании № 2080699). Применение алгоритма позволяет определить режим активации аппаратуры, особенности планирования лечения и необходимость консультации со специалистами лечебного профиля с вопросом о течении основного заболевания, возможной замене препарата на аналог без побочного эффекта на метаболизм костной ткани и выявления возможных противопоказаний к ортодонтическому лечению.

**Ключевые слова:** анамнез, ортодонтическое лечение, лекарственные препараты.

დამძიმებული სამედიცინო ისტორიის მქონე პაციენტების ორთოდონტიული მკურნალობის ალგორითმი. წამლები, რომლებიც ანელებს ძვლოვანი

ქსოვილის მეტაბოლიზმს

ცვეტკოვა მ. ა., კოვალენკო ა. იუ.

ლიტერატურის მონაცემების თანახმად, პაციენტების 60% - ზე მეტი, რომლებიც ეძებენ ორთოდონტთან კონსულტაციას და მკურნალობას, რეგულარულად იღებენ გარკვეულ მედიკამენტებს და / ან დიეტურ დანამატებს. სისტემატური მიმოხილვებისა და მეტაანალიზების საფუძველზე მკურნალობის ეფექტურობისა და ხარისხის გასაუმჯობესებლად შემუშავებულია ალგორითმი ორთოდონტიული მოვლისთვის პაციენტებისთვის, რომლებიც იღებენ ბისფოსფონატებს, შაქრიანი დიაბეტის სამკურნალო საშუალებებს (გარდა თიაზოლიდინდიონებისა და SGLT-2 ინჰიბიტორებისა), ჰიპოტენზიური, ანტიჰისტამინური საშუალებები, სტატინები, არასტეროიდული ანთების საწინააღმდეგო საშუალებები, ესტროგენის შემცველი პრეპარატები, ტეტრაციკლინი, ინტერფერონ- $\gamma$  (sv-vo დეპოზიტზე №2080699). ალგორითმის გამოყენება საშუალებას იძლევა განისაზღვროს აღჭურვილობის აქტივაციის რეჟიმი, მკურნალობის დაგეგმვის სპეციფიკა და სამედიცინო პროფილის სპეციალისტებთან კონსულტაციის საჭიროება ძირითადი დაავადების მიმდინარეობის საკითხთან დაკავშირებით, პრეპარატის შესაძლო ჩანაცვლება ანალოგით გვერდითი ეფექტის გარეშე ძვლის მეტაბოლიზმზე და ორთოდონტიული მკურნალობის შესაძლო უკუჩვენებების დადგენა.

საკვანძო სიტყვები: ანამნეზი, ორთოდონტიული მკურნალობა, მედიკამენტები.