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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

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 ВИНИТИ 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 ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

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
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. Корректура авторам не высылается, 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 compu-ter-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.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 საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ 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. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის 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 ფჩხილებში 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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THE EXISTENCE OF A FUNCTIONAL MATRIX IN THE DEVELOPMENT OF THE FACIAL SKELETON IN CHILDREN

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Abstract.

Aim: Identifying the relationship between the presence of oral habits and the violation of the formation of the facial skeleton in children. Improving the effectiveness of comprehensive treatment of patients with pathological occlusion and existing oral habits through orthodontic treatment and elimination of oral habits.

Materials and methods: We conducted clinical, radiological methods of examination of 60 patients 12-15 years old with acquired maxillomandibular anomalies and oral habits, 15 persons aged 12-15 years without maxillomandibular anomalies and acquired deformities (norm group). We studied the data of computer tomograms, performed stereotopometric analysis (three-dimensional cephalometry), determination of the thickness of the masticatory muscles in symmetrical areas of the face.

Statistical Analysis Used: Statistical processing of the results was performed using a personal computer using the software package Statistica 12.0. Data distribution was assessed using the Kolmogorov-Smirnov test of normality. Mean values and standard errors were calculated for continuous variables. Correlation between parameters was analyzed using Spearman's correlation coefficient and tested for significance. Significance was set at $p < 0.05$.

Results: Clinical examination showed that oral habits were manifested in 98.3% of patients. The results of clinical and radiological examination, analysis of cephalometric parameters and data on the thickness of the masticatory muscles on symmetrical areas of the face confirm the relationship between chronic oral habits and formation of acquired maxillomandibular anomalies; confirm the presence of acquired rather than congenital deformity of the facial skeleton, which is associated with changes in the thickness of the masticatory muscles on the part of the deformation та compensatory muscle hypertrophy on the opposite side. After 12 months, the patients' cephalometric parameters differed significantly from the indicators before active orthodontic treatment and elimination of the oral habit, an increase in muscle thickness was observed in the areas where there was a chronic injury ($p \leq 0.05$). An increase in the thickness of the bone structure of the facial skull and an increase in the thickness of the masticatory muscles on the side where the oral habit was eliminated were observed.

Conclusions: Oral habits progress regardless of the patient's age, they appear in 96.6% of patients in this group of patients. The results of clinical and X-ray research, analysis of cephalometric indicators and level of the thickness of the masticatory muscles confirm the relationship between a chronic oral habit and the development of the bone and muscle system. The obtained results indicate the ability of bone tissue to change its thickness and contours after eliminating a bad habit and confirm the presence of a functional matrix of bone structure development.

Key words. Oral habits, bone structure, functional matrix, orthodontic treatment, myofunctional devices.

Introduction.

Today, the problem of oral habits in children with existing maxillomandibular anomalies is relevant, as they progress more and more rapidly and intensively among young people who are on distance education. Emotional instability among young people is associated with a long life in chronic stress caused by the presence of the pandemic and online learning. Research shows that to reduce the impact of stress factors, children use oral habits: they rest their head on their hands in the same position, causing chronic trauma in this area, they sit in front of the monitor with their mouths open, despite a positive breath test (presence of nasal breathing), they suck fingers, bit nails, pencils, or pens. It is believed that oral habits are an element of adaptation to existing chronic stress [1-3].

Systematic use of the oral habit in the course of emotional struggle leads to changes in the facial skeleton and maxillofacial area [1,4,5]. We assume that the oral habit, especially one associated with long-term mechanical impact on the facial skeleton and jaw bones, is the trigger for deformation in the processes of cellular mechanotransduction of the formation of the functional matrix of the bone apparatus and is a phenotypic expression of the human body.

Combining discoveries from cellular mechanotransduction and the theory of biological networks, forces scientists to think again about the presence of the functional matrix developed by E. Moss and the influence of genotypic expression on the formation of the bone apparatus. Anvils indicate the presence of different types of intracellular mechanotransduction processes. It is they who translate the informational content of the stimulus of the periosteal functional matrix into the signal of the cell of the skeletal unit (bone). Scientists emphasize the correlation between the intensity and duration of endogenous electric fields created by the activity of skeletal muscles and those to which bone cells respond maximally. Phenotypic expression triggers a chain of macromolecular levers connecting the extracellular matrix to the bone cell genome, suggesting another mode of epigenetic regulation of the bone cell genome. Intercellular gap junctions allow bone cells to transmit and then process information of the periosteal functional matrix after its initial intracellular mechanotransduction [6-8]. Physical forces play an important role in modulating cell function and shaping tissue structure. Mechanotransduction, the process by which cells convert physical force-induced signals into biochemical responses, is critical for mediating adaptation to mechanical loading in connective tissues [9-12]. Scientists emphasize that gap junctions, like electrical synapses, underlie the organization of bone tissue as a connected cellular network and the fact that all bone adaptation processes are multicellular.

The bone “tunes” to the precise frequencies of skeletal muscle activity. Incorporating concepts and databases related to the intracellular and intercellular mechanisms and processes of bone cell mechanotransduction and the organization of bone as a biologically connected cellular network allows for a revision of the functional matrix hypothesis that proposes an explanatory chain extending from the epigenetic event of muscle contraction hierarchically down to the regulation of the bone cell genome [6,7]. We hypothesize that intercellular mechanotransduction is a critical component in achieving coordinated remodeling responses to force application in connective tissues, which requires further study and scientific justification. It is for the purpose of studying the influence of harmful genes on the personality phenotype that it is necessary to carry out a cephalometric examination of patients and stages of complex treatment.

Materials and Methods.

We conducted clinical, radiological methods of examination of 60 patients aged 12-15 with acquired maxillomandibular anomalies, 15 persons aged 12-15 years without maxillomandibular anomalies and acquired deformities (norm group). The study was conducted before treatment and 12 months after the start of active complex treatment.

We studied and analyzed the data of computed tomograms of 60 patients with acquired maxillomandibular anomalies, deformities, 15 tomograms of persons of the norm group. X-ray methods included examination of the patient on a spiral computed tomography scan TOSHIBA Aquilion PRIME 160-slices MODEL TSX-302A / 1C. The scan was performed according to a specially developed protocol. During the scan, the position of the jaws in the bite and the head remains stable in order to reduce the risk of artifacts. The reconstruction algorithm at the time of the study was set as “bone” or “high resolution”. The matrix extension was 512x512. The scan range included the facial and cerebral skulls. The thickness of the slice during the scan was 3-5 mm, the step in the reconstruction of the slice was 1 mm. All sections matched the anatomical area, had the same proportions and sizes, and were scanned at the same table height. The scan was performed in one direction. After the study, archival data were stored in Dikom format. The main method of examination is stereotopometric analysis (three-dimensional cephalometry), which studied the ratio of the structures of the facial head relative to three mutually perpendicular planes. Three-dimensional cephalometric analysis was performed on computer reconstructions in SimPlant Pro 11.04 software. SurgiCase (Materialize) was used according to the developed modified method of cephalometric and stereotopometric analysis. To perform stereotopometric analysis of the facial skeleton, we used the method developed by us to construct the base planes, which are centered at the reference point of the coordinate system. The latter is located between the trabecular and parachordal parts of the skull in the projection of the sagittal basal plane between the round hole. This point is recommended as a centering point in craniological studies for two reasons. The first confirms the results of observations of D.E. Lieberman, C.F. Ross, M.J. Ravosa (2000). Thus, all their studies of cranial growth processes point to the center of the basicranium (oval area near the body of a cuneiform bone), which reaches its final size and shape faster than other parts of the skull because all vital cranial nerves, vessels perforate the skull base in this area. The second reason is the transformation of the bony platform of the cuneiform bone under the influence of the growth of brain structures in contrast to the center relative to which the transformation occurs. To identify anthropometric points, we use standard anatomical zones defined in craniology [13,14].

In order to determine the position of the upper jaw in the skull, we introduced the point of least variability of the upper jaw. The above navigation index was recorded by us in the center of the perpendicular dropped from the point of nasion to the middle of the base of the upper jaw. That is, this is the point of the center of the triangle of the upper jaw formed by the points N, PNS, ns. Measurement of angular and linear parameters is carried out automatically after marking the above anthropometric points. E. Martin's method was taken as a basis. Statistical processing of the results was performed using a personal computer using the software package Statistica 12.0. Data distribution was assessed using the Kolmogorov-Smirnov test of normality. Mean values and standard errors were calculated for continuous variables. Correlation between parameters was analyzed using Spearman’s correlation coefficient and tested for significance. Significance was set at $p < 0.05$ [15].

Results.

The results of a secret survey showed that 96.6% of the surveyed patients (58 people) have bad oral habits (supporting the head with hands - 33 people (55.0%), sitting in front of a monitor with open mouth - 3 patients (5.0%), 5 persons (8.3%) – biting the lip more than 5 times a day; keeping fingers in the mouth, pencils - 4 people (6.6%); 13 people (21.7%) put their hands under their head during sleep and/or do not sleep on orthopedic pillows. It was difficult for young people to overcome their bad habits, which, according to the patients, have progressed more in the last two years during the quarantine and long-term online education, the state of permanent life in the state of war. According to Spielberg CD [2], 59 people are in a state of anxiety. In these patients, the indicator was more than 50 points and indicated a high level of situational and personal anxiety. We associate a state of anxiety and chronic social stress with an existing bad oral habit. According to the data of the 3D cephalometric examination presented in the table 1 in patients aged 12-15 with acquired anomalies of jaw development revealed disproportions distinctive of the gnathic part of the facial skeleton. Comparative analysis of maxillofacial parameters presented in patients with acquired upper micrognathia showed the presence of shortening to 42.02±0.867 mm ($p<0.05$) of the length of the base of the upper jaw (ns) or VPOK - (pns), which was reflected in the presence of mesial occlusion and typical of this type violation of the profile of the face, namely the depression of the upper lip and its base. The above changes were also confirmed by reducing the facial angle F to 79.69±1.123 ($p<0.01$). Shortening of the base of the upper jaw and reduction of the facial angle was combined with a change in the ratio of the chin bones and alveolar process of the upper jaw, which was reflected in the increase to 119.23±1.037 ($P<0.0005$) zygo-maxillary angle. This type of disproportion in

Table 1. *Parameters of linear cephalometric parameters in the control group and patients aged 12 to 15 years with acquired lower and upper micrognathia.*

№	Measured Indicator	Pathology under study		
		Upper micrognathia	Lower micrognathia	Norm
1	2	3	4	5
1.	N – Se	66.24±1.410	66.91±0.772	66.99±0.795
		P>0.05	P>0.05	
2.	Mart.63 Biom G2	30.91±0.956	33.15±0.994	33.43±0.928
		p>0.05	P>0.05	
3.	The distance between greater palatine foramen	32.69±0.646	31.38±0.669	31.49±0.604
		p>0.05	P>0.05	
4.	(ns) or VPOK – (pns)	42.02±0.867	46.91±0.884	47.41±0.765
		P<0.001	P>0.05	
5.	The position of the upper jaw in the skull from the point «0».	Y=42.12±1.381	Y=42.15±0.464	Y=42.30±0.414
		p>0.05	p>0.05	
6.	The position of the upper jaw in the skull from the point «S»	Y=51.28±1.808	Y=53.46±1.18	Y=53.30±1.088
		p>0.05	p>0.05	
7.	The position of the point «0»	Y=9.14±0.737	Y=12.07±0.645	Y=11.84±0.696
		P<0.02	p>0.05	
8.	PNS – ppw	20.79±1.289	20.21±1.21	19.86±1.021
		p>0.05	p>0.05	
9.	Ba – PNS	37.95±0.988	39.50±1.037	39.18±0.969
		p>0.05	p>0.05	
10.	T1	10.44±1.514	11.80±0.869	11.86±0.860
		p>0.05	p>0.05	
11.	P2	17.22±1.694	14.86±1.01	14.67±0.989
		p>0.05	p>0.05	
12.	P3	19.55±1.656	19.03±1.468	19.12±1.380
		p>0.05	p>0.05	
13.	T2	17.97±0.821	20.46±1.615	20.02±1.573
		p>0.05	p>0.05	
14.	V	42.78±1.339	41.47±1.149	40.64±1.124
		p>0.05	p>0.05	
15.	N – SpP (Mx – Pl)	49.04±2.104	46.76±1.190	47.01±1.307
		p>0.05	p>0.05	
16.	Mart.60	49.57±0.948	51.07±0.959	51.39±0.911
		p>0.05	p>0.05	
17.	Mart.61	58.28±1.211	61.45±1.121	60.55±1.405
		p>0.05	p>0.05	
18.	Mart.55.Biom NH’.	46.86±1.135	43.31±1.856	43.51±1.994
		p>0.05	p>0.05	
19.	Mart.54.Biom NB.	20.37±0.809	21.98±0.45	21.95±0.397
		p>0.05	p>0.05	
20.	Mart.43(1) Biom IOW.	95.90±1.898	94.72±0.88	94.80±0.916
		p>0.05	p>0.05	
21.	Height of Nasion (N) above the line connecting the points fmol and fmor	18.74±0.625	20.24±0.531	20.38±0.594
		p>0.05	p>0.05	
22.	Mart.51a Biom O1’L.	39.49±0.708	39.13±0.732	39.05±0.725
		p>0.05	p>0.05	
23.	Mart.49a Biom DC.	19.74±0.788	20.48±0.498	19.81±0.749
		p>0.05	p>0.05	
24.	The depth of the orbita	39.98±2.432	38.77±0.537	38.31±0.628
		p>0.05	p>0.05	
25.	Determination of the symmetry of the medial edge of the orbita	9.69±0.538	10.48±0.288	10.45±0.363
		p>0.05	p>0.05	
26.	Mart 52.Biom.O2L.	31.68±0.949	30.07±0.422	31.39±0.855
		p>0.05	p>0.05	

27.	Mart.46.Biom GB.	82.06±2.534	85.18±1.546	85.24±1.664
		p>0.05	p>0.05	
28.	Mart.40	85.38±1.547	87.94±1.514	88.29±1.511
		p>0.05	p>0.05	
29.	Mart.48. Biom.G'H	70.27±1.499	66.14±1.22	65.77±1.437
		P<0.04	p>0.05	
30.	Mart.5	97.30±1.70	99.24±1.287	99.63±1.011
		p>0.05	p>0.05	
31.	Mart.68.Biom Cp1.	68.42±0.902	63.21±1.186	67.94±1.089
		p>0.05	P<0.01	
32.	Biom. pg go straight length from angles	85.32±1.147	76.43±2.789	85.88±0.975
		p>0.05	P<0.002	
33.	The length of the body of the lower jaw (teleradiology graphic)	72.07±0.928	66.22±1.021	70.14±0.787
		p>0.05	P<0.003	
34.	Mart.70.Biom. Rl	56.01±2.699	48.15±2.151	56.31±2.457
		p>0.05	P<0.04	
35.	Distance from distal point fragment to projection of the articular fossa	Jaw branch available	Jaw branch present	Jaw branch present
36.	The height of the branches of lower jaw MT2 (teleradiography)	50.97±1.832	49.92±0.90	51.187±1.614
		p>0.05	p>0.05	
37.	Total mandibular length	116.50±2.106	108.23±2.444	117.23±2.160
		p>0.05	P<0.004	
38.	Distance from Pg to the projection of the articular fossa	Jaw branch available	Jaw branch present	Jaw branch present
39.	PNS – ppw (teleradiography)	20.84±1.075	20.75±0.978	20.68±0.892
		p>0.05	p>0.05	
40.	Ba – PNS (teleradiography)	35.75±0.976	38.22±1.135	38.10±1.106
		p>0.05	p>0.05	
41.	T1 (teleradiography)	9.94±1.227	11.24±0.718	11.41±0.670
		p>0.05	p>0.05	
42.	P2 (teleradiography)	17.17±1.766	15.50±0.893	15.69±1.055
		p>0.05	p>0.05	
43.	P3 (teleradiography)	17.60±1.389	19.14±1.128	18.84±1.025
		p>0.05	p>0.05	
44.	T2 (teleradiography)	17.34±0.697	19.08±1.308	18.83±1.182
		p>0.05	p>0.05	
45.	V (teleradiography)	42.15±1.179	41.03±0.935	41.09±0.913
		p>0.05	p>0.05	
46.	N – SpP (Mx – Pl) (teleradiography)	49.68±2.226	48.12±1.060	48.14±1.138
		p>0.05	p>0.05	

Notes: p – significance in compared groups during follow-up period

patients with acquired upper micrognathia was reflected in the change of facial profile: smoothness and flattening of the relief of the chin bones and occipital areas. Clinical examinations were confirmed by the results of cephalometric analysis. These patients have oral habits (sucking the tongue and / or fingers, sleeping with the mouth open), hypotonia of the circular muscles of the mouth, lack of new breathing. Patients with genetic factors in the development of medial occlusion were not included in the study.

Comparative analysis of the parameters of the facial skeleton, presented in the table 2 in patients with acquired lower micrognathia showed the presence of malformations of its lower third. The expressed disproportions, as a rule, were noted in disturbance of development of both one, and symmetrically of two parties of a lower jaw. In the first case, a significant underdevelopment of the mandibular branch was combined with the existing bone ankylosis of the temporomandibular joint. In the second case, a significant symmetrical shortening of the mandibular branches was usually combined with intact temporomandibular joints. In both nosological units there was a shortening to 48.15±2.151 mm (P<0.04) in the height of the mandibular branch. The latter type of pathology was usually combined with a reduction of the projection length parameter from the corners, shortening to 63.21±1.186 mm (P<0.01) of direct length from the corners and reducing to 76.43±2.789 mm (P<0.002) of the total mandibular length. The above parameters were confirmed by distal occlusion and their characteristic facial profile, namely the beveled type of facial configuration silt in which the lower third of the face is shortened, the chin is shifted to the buttocks – "bird's face type", the lower lip is turned out,

Table 2. *Angular cephalometric parameters in the control group and patients aged 12 to 15 years with acquired lower and upper micrognathia.*

№	Measured Indicator	Pathology under study		
		Acquired upper micrognathia	**Acquired lower micrognathia**	**Norm**
1	2	3	4	5
1.	Angle F or front angle	79.69±1.123	82.46±0.539	82.68±0.568
		P<0.01	p>0.05	
2.	The position of the plane of the Frankfurt horizontal	Within the axial base plane	Within the axial base plane	Within the axial base plane
3.	Position of the plane of the base of the upper jaw	Within the axial base plane	5.19±0.436	Within the axial base plane
4.	Position of the mandibular plane in the transverse plane	Within the axial base plane	7.75±1.362	Within the axial base plane
5.	The position of the sagittal plane to point A	Within the sagittal base plane	Within the sagittal base plane	Within the sagittal base plane
6.	The position of the sagittal plane to the point Me	Within the sagittal base plane	3.67±0.699	Within the sagittal base plane
7.	Position of the plane Zml, Zmr, ANS	Within the axial base plane	3.46±1.00	Within the axial base plane
8.	The degree of inclination of the base of the upper jaw (Mx-Pl) in the sagittal plane	3.44±0.412	3.10±0.991	2.91±1.248
		p>0.05	p>0.05	
9.	Mart.77	136.1±1.186	132.84±0.849	132.59±0.844
		P<0.02	p>0.05	
10.	Position of the plane of the entrance to the orbita	77.42±0.928	78.37±0.787	78.71±0.847
		p>0.05	p>0.05	
11.	Position of the lateral wall of the orbita	38.54±0.80	37.39±0.842	37.76±0.979
		p>0.05	p>0.05	
12.	Position of the medial wall of the orbita	14.94±0.779	13.65±0.695	13.65±0.628
		p>0.05	p>0.05	
13.	Zigo-maxillary angle	119.23±1.037	113.22±1.023	113.51±0.939
		P<0.0005	p>0.05	
14.	Zigo-maxillary angle	63.30±0.501	59.25±0.778	59.65±0.736
		P<0.0006	p>0.05	
15.	Angle N	58.64±0.824	60.31±0.742	60.50±0.612
		p>0.05	p>0.05	
16.	Angle A	76.59±0.629	78.85±0.827	79.00±0.970
		p<0.05	p>0.05	
17.	Angle B	44.76±1.148	40.83±0.751	42.54±0.774
		p>0.05	p>0.05	

Notes: p – significance in compared groups during follow-up period

on which in most cases the upper incisors are located, the labial fossa is extremely well expressed, the lips do not close. The results of cephalometric analysis were confirmed by a photo protocol, which on all indicators traced the shortening of the branches of the mandible.

Such patients reported having an oral habit of leaning on their chin with their hands or sucking/biting their lower lip. One-sided disproportions are characterized by a violation of symmetry, which was confirmed by a shift of the sagittal plane to 3.24±0.557 compared with the norm. With such anomalies it is indeed important to assess the masticatory muscles and symmetrical areas of the face. There is a decrease in the thickness of the masticatory muscle, lateral and medial pterygoid muscles on the side where the patient has a habit of supporting the head. A significant positive correlation (rx,y= 0.87±0.21) was found between the presence of oral habit and acquired maxillomandibular anomalies (p<0.05). 12 months after the start of treatment, the patients observed changes in muscle thickness, activation of the growth of cellular structures in areas affected by traumatic factors.

We offer the results of a study of patient P., 13 years old with existing acquired deformities in the maxillofacial area. Diagnosis: acquired deformity of the lower jaw, distal occlusion. Oral habits were sacking lower lip, resting on the hand in the frontal part of the lower jaw. According to computed tomography, there was a violation in the facial skeleton (Figure 1). There was a shortening to 50,82 mm in the height of the mandibular branch. The latter type of pathology was usually combined with a reduction of the projection length parameter from the corners, shortening to 65,21 mm of direct length from the corners and reducing to 81,40 mm of the total mandibular length. Upper face height Mart. 48. Biom. G'H. was 68.31

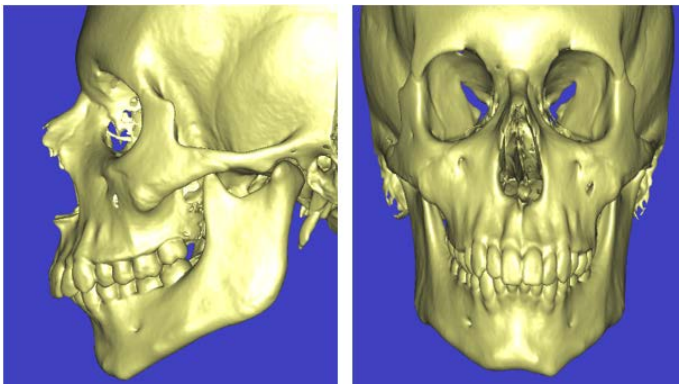

Figure 1. *Patient P., 13 years old. Diagnosis: acquired deformity of the lower jaw, distal occlusion. Oral habits: sacking lower lip, resting on the hand in the frontal part of the lower jaw. Computer reconstruction of the skull before treatment.*

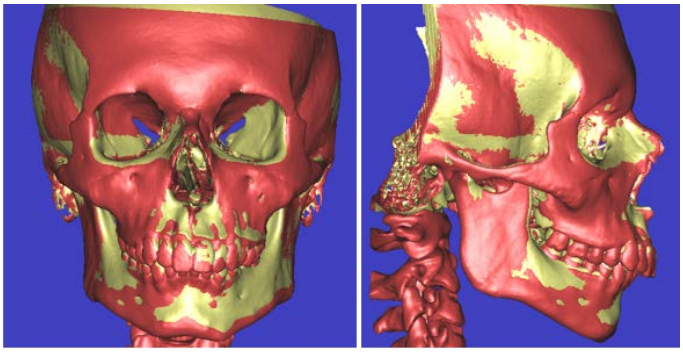

Figure 2. *Patient P., 13 years old. Diagnosis: acquired deformity of the lower jaw, distal occlusion. Oral habits: sacking lower lip, resting on the hand in the frontal part of the lower jaw. Comparative analysis of computer skull 3D reconstruction that was done before treatment (yellow color) and after 12 months (red color).*

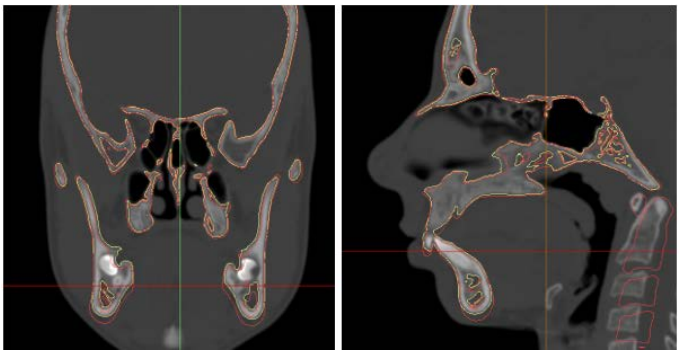

Figure 3. *Comparative analysis of computer skull transversal and sagittal reconstruction that was done before treatment (yellow color) and after 12 months (red color).*

mm. The height of the facial skeleton (the distance from N to Me) was 108 mm. The above parameters were confirmed by distal occlusion and their characteristic facial profile, namely the beveled type of facial configuration silt in which the lower third of the face is shortened; the chin is shifted to the buttocks – “bird's face type”. No changes in the base of the skull were detected, temporomandibular joints were intact.

Treatment:

1. Conscious elimination of the oral habit.
2. Activating facial muscle massage.
3. Myogymnastics performed by the patient under the supervision of a physiotherapist or parent. Thre were isometric exercises of the muscles that move the mandible forward; Rogers' exercises (1918) that stimulate the muscles used to move the mandible forward (lateral pterygoid muscles and the superficial part of the masseter muscle); Gerry’s exercises that tighten the muscles of the floor of the mouth with mandibular-glossal coordination. Method is based on lowering the mandible with the tongue pressed against the palate in the middle line: the tension lasting 10 s, repeated 10 times 3 times a day.
4. Orthodontic supplies Myobrace (Australia) та Froggy mouth (France) were used with dental physiotherapy. The aim of this first stage of treatment was to prepare the patient for the possible use of braces in future.

After 12 months, patient P. consciously eliminated all oral habits. Objectively: a change in the configuration of the soft tissues of the face and a change in the profile of the face were observed. According to computed tomography, there was a violation in the facial skeleton (Figure 1). There was a lengthening to 53,82 mm in the height of the mandibular branch. The latter type of pathology was usually combined with a reduction of the projection length parameter from the corners, lengthening to 67,24 mm of direct length from the corners and increasing to 83,65 mm of the total mandibular length. Upper face height Mart. 48. Biom. G'H. was 69.93 mm. The height of the facial skeleton (the distance from N to Me), was 112 mm. The above parameters were confirmed by orthognathic bite. Active growth of the lower branches of the lower jaw and an increase in the bone volume of the lower jaw in the frontal section were observed. No changes in the base of the skull were detected, temporomandibular joints were intact.

Discussion.

Our research has proven that 3D cephalometric analysis helps the orthodontist to properly examine the patient to make a correct plan of complex treatment and has a great advantage over all 2D diagnostic methods. Scientists also prefer 3D cephalometric analysis over 2D diagnostic methods [9,13]. Some of them recommend using of 2D method [16]. The results of our study showed the importance of such analysis, because thanks to it we can study the condition of the bones of the facial skull, temporomandibular joints, muscular system. In the process of studying the bones of the skull base, the doctor can determine whether the maxillomandibular anomaly and deformity is congenital or acquired and prove the relationship between the bad oral habit and the existing acquired deformity of the maxillofacial area.

We, like other scientists, pay special attention to oral habits and their impact on the development of the facial skeleton and the maxillofacial system [1,4,8,17-19]. Systematic use of oral habits causes constant traumatic effects on the bone structure and muscular system, and as a result deforms the affected area. We have found significant positive correlation ($r_{x,y}$= 0.87±0.21) between the presence of oral habit and acquired maxillomandibular anomalies ($p<0.05$). The results of our clinical research and cephalometric analysis obtained by us allow us to do not reject the hypothesis of the theory of the

functional matrix. The genetics of the organism play a major role in the formation of this matrix, but the long-term influence of physical forces plays a prominent role in the phenotype of bone structure [6,7]. In the main group of patients, such a mechanical factor was the action of an oral habit that affected the phenotype, namely the maxillofacial area with the subsequent development of acquired deformities. The results of 3D cephalometry confirm this theory by the presence of bone deformity and thinning of the muscles from the side of the traumatic factor and causes compensatory muscle hypertrophy on the opposite side. After 12 months, we observe active growth in the areas where the oral habit was present. The results of our study are confirmed by the results of other authors, who emphasize that physical forces play an important role in modulating cell function and shaping tissue structure and, as a result, start the process of mechanotransduction. Cells convert physically induced signals into biochemical reactions, are critical for mediating adaptation to mechanical stress in connective tissues [6,7,11,12]. In this way, body tissues adapt to the effects of physical factors, triggering all the processes of adaptation of bone to the traumatic factor, namely the mechanisms of bone transduction. The bone is "tuned" to the exact frequency of skeletal muscle activity on the part of the factor. If the muscle develops, then the bone "does not see" the need. Everything in the human body is interconnected, but it is not always possible to convey this information to the patient. The results of our research showed that the elimination of the action of the traumatic factor at the age of 12-15 allows us to see changes in the muscle and bone apparatus of the child.

Scientists indicate that only under the condition of understanding and step-by-step elimination of all links of the etiological chain in the developed disease, it is possible to eliminate the pathological condition, achieve stabilization and prevent relapse [4,18]. In modern orthodontic practice, various devices for myocorrection are known. Such devices are widely used to combat bad habits, to normalize the position of the tongue and disorders of the muscular system in the head and neck area [4,18]. The results of our research show that at the age of patients 12-15 years old, the doctor, under the condition of close cooperation with the patient and parents, can influence the elimination of bad habits and help body tissues to start active growth with the help of myogymnastics on myofunctional devices. Scientists emphasize that any acquired deformity in the maxillofacial region or changes in craniofacial growth can be prevented if the etiological factors are eliminated in time before the etiopathogenetic chain is started [1,4], and complex treatment should help the patient consciously eliminate the oral habit and to normalize the state of the maxillofacial system, quality of life [2,12].

Conclusion.

1. Oral habits are one of the etiological factors in the development of a pathological bite, and only with its conscious elimination by the patient can the desired therapeutic effect be achieved. Oral habits are directly proportional to stress factors, which, according to the results of the survey, are present in 96.6% of examined patients.

2. The results of clinical and X-ray examination, analysis of cephalometric indicators and data on the thickness of the masticatory muscles confirm the relationship between a chronic oral habit and the development of the bone and muscle apparatus. The obtained results indicate the ability of bone tissue to change its thickness and contours after eliminating a bad habit and confirm the presence of a functional matrix of bone structure development.

3. Cephalometric analysis should be included in the mandatory methods of diagnosis of acquired deformities of the maxillofacial area before and at the stages of complex treatment for clear differentiation between congenital and acquired deformities, visualization of the dynamics of orthodontic treatment.

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