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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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ANATOMY OF THE MAXILLARY SINUS: IMPLICATIONS FOR ODONTOGENIC SINUSITIS DEVELOPMENT

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Abstract.

This study investigates the anatomical prerequisites that could contribute to the development of this condition. **Material and methods:** Using multi-slice computed tomography (MSCT), the study examined the structure and relationships of key anatomical features, including the alveolar process, sinus wall thickness, and the position of the teeth in relation to the maxillary sinus.

Results: The results revealed that the lower wall of the maxillary sinus is predominantly formed by the alveolar process, with significant variability in wall thickness, especially between the central and lateral regions. In 95% of cases, this wall was closely associated with the roots of the upper teeth, particularly the premolars. A strong negative correlation was observed between the thickness of the alveolar process and the volume of the maxillary sinus, suggesting that larger sinuses tend to have thinner alveolar processes. Additionally, a significant correlation was found between the position of the sinus and the degree of pneumatization, with a more medially positioned orbit in cases of reduced pneumatization.

Conclusion: Structural features of the maxillary sinus, such as its proximity to the teeth and its relationship to sinus pneumatization, are critical factors in the development of odontogenic rhinosinusitis. A comprehensive, collaborative approach is necessary for effective management and prevention, with careful consideration of these anatomical aspects during dental and maxillofacial interventions.

Key words. Maxillary sinus, MSCT, odontogenic sinusitis, anatomical predispositions.

Introduction.

The anatomy of the paranasal sinuses is crucial not only for otolaryngologists but also for professionals in other fields, particularly dentistry and maxillofacial surgery [1]. Of special interest to both otolaryngologists and dentists is the structure of the lower wall of the maxillary sinus, which is formed by the alveolar process of the upper jaw [2]. Any changes in its structure can lead to complications in dental procedures and surgeries performed in this area, potentially resulting in odontogenic maxillary sinusitis.

Statistical data indicate that up to 40% of all maxillary sinusitis cases are odontogenic, underscoring the importance of preventing odontogenic maxillary sinusitis and avoiding complications from dental procedures and surgeries.

According to [3], diseases originating from the teeth or alveolar process of the upper jaw pose a risk of infection spreading to the sinus, leading to inflammatory processes.

In cases where odontogenic rhinosinusitis develops and prevention is not possible, a multidisciplinary approach to treatment is recommended, involving both dentists, maxillofacial surgeons, and otolaryngologists [4].

A key aspect of treatment is restoring the physiological ventilation of the sinus, which can be achieved through both conservative and surgical methods aimed at restoring the osteomeatal complex, as well as addressing the structure of the sinus wall [5].

It is important to note that, until recently, greater emphasis was placed on the thickness of the sinus walls. There is even an internationally recognized Global Osteitis Scoring Scale [6] that measures the degree of destructive changes. However, recent research has focused more on bone density, which some experts consider even more important than thickness [7-9]. Studies have shown that long-term inflammatory processes in the sinus, a common feature of odontogenic rhinosinusitis, trigger a cascade of reactions at the cellular level. One of the outcomes is the activation of osteoclasts, which initiate bone resorption [10]. While a reduction in bone thickness is the final process, which can only be addressed through surgical treatment such as sinus lifting, a decrease in bone density precedes this and can be managed conservatively by timely and effective removal of the inflammatory focus.

The purpose of this study is to identify the anatomical prerequisites that could contribute to the development of rhinosinusitis.

Materials and Methods.

One of the modern diagnostic methods recommended by the rhinological community, according to the European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS) [11], is multi-slice computed tomography (MSCT). Despite its relatively high radiation exposure, it offers several advantages, notably the Hounsfield scale, which allows for the determination of tissue density in both physiological and pathological states. The density unit is 1 Hounsfield (Hu), where each organ and tissue in the human body has a specific density, with water at 0 Hu and air at 1000 Hu [12].

The MSCT scans were performed using a Toshiba Aquilion 64 CT scanner, known for its high-quality imaging and advanced features. It provides high-resolution images with minimal noise and incorporates dose-reduction technologies, ensuring reduced radiation exposure without compromising image quality [13].

Radiant DICOM Viewer was used for image viewing and analysis [14]. The study involved 100 participants, evenly distributed by gender and age. The average age was 41 years, with 42 women and 58 men. The research was retrospective

and conducted at Merefian Central District Hospital and the Regional Clinical Hospital between 2018 and 2022. All stages of the research complied with the principles of the Helsinki Declaration, including informed consent, privacy, and participant safety, and was reviewed by an independent ethics committee. The study was approved by the Ethics Committee of Kharkiv National Medical University (Protocol 7, 13.11.18). None of the participants had ENT or dental pathology, and the study was conducted for reasons unrelated to these fields (e.g., suspicion of stroke, which was not confirmed).

The following parameters were examined:

1. Bone thickness and density.
2. The location of the sinus in relation to the floor of the nasal cavity, which is critical for its ventilation.
3. The position of the mandibular and incisive canals, important for local anesthesia during dental procedures.
4. The relationship between the lower wall of the sinus and the roots of the teeth.
5. The presence of pockets and depressions within the sinus that may impair ventilation and promote the development of maxillary sinusitis.
6. Features of the alveolar process structure.

Statistical analysis was performed using variation statistics methods. The normality of distribution was tested using the Shapiro-Wilk test, which indicated that the samples closely followed a normal distribution. Statistical results are presented as $M \pm \sigma$, where M is the mean and σ is the standard deviation, with Student's t-test used for comparison. Correlation analysis was conducted using Spearman's rank correlation coefficient. A statistical difference was considered significant at $p < 0.05$ [15].

Results and Discussion.

The study revealed that the lower wall of the maxillary sinus is formed by the alveolar process of the upper jaw (processus alveolaris maxillae), with an average thickness of $29.8 \pm 0.45 \times 10^{-3}$ m. In 95% of cases, this wall was in close proximity to the roots of the upper teeth. The roots of the first and second premolars were most commonly observed within the sinus cavity (99%), while wisdom teeth were the least frequently encountered (1%).

The thickness of the wall exhibited notable variability, being greatest in the central part and smallest in the lateral portion. A correlation was found between the upper facial index and the size of the alveolar process. Furthermore, the thickness of the alveolar process showed a significant correlation with the volume of the sinus. A strong negative correlation ($r = -0.91$) was identified, suggesting that larger sinus volumes are associated with a thinner alveolar process (Figure 1).

In the majority of the cases studied (50%), the lower wall of the maxillary sinus was located at the level of the nasal floor. Less frequently (15%), the floor of the sinus was situated 4.92 ± 0.2 mm below the nasal floor, and in some cases (35%), the nasal floor was located 3.88 ± 0.2 mm below the lower wall of the maxillary sinus (see Figure 2).

The incisive canal was most commonly round in shape in more than half of the subjects (51%), oval and elongated along its length in 26%, and oval with a predominance of width in 24%. The linear dimensions were 4.5 ± 0.43 mm and 6.01 ± 0.44 mm (Figure 3).

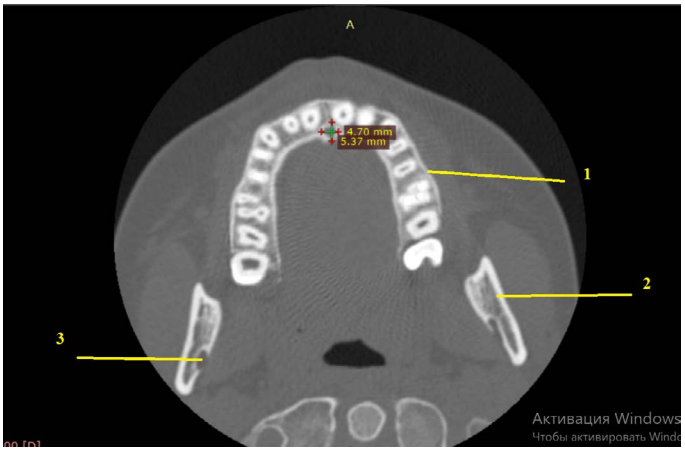

Figure 1. *CT Scan. Axial Section. 1 – Alveolar process, 2 – Mandibular arch, 3 – Mandibular canal. The numbers indicate the dimensions of the incisive canal.*

Figure 2. *Relationship between the Nasal Floor and the Lower Wall of the Maxillary Sinus.*

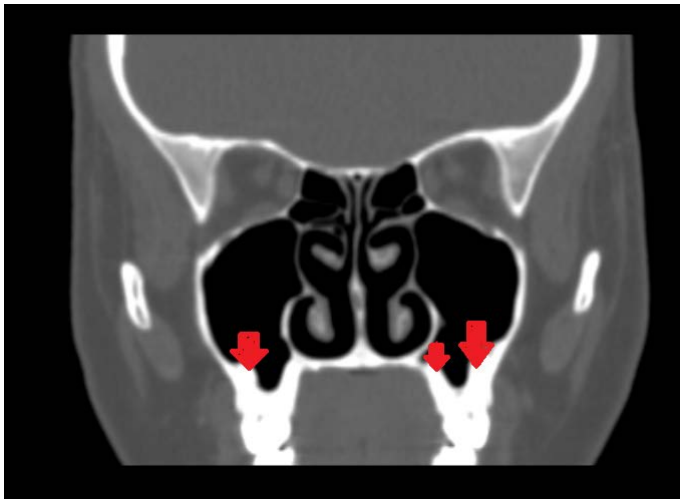

Figure 3. *Coronal section of a CT scan of the human paranasal sinuses. Arrows indicate the location of the tooth roots within the sinus cavity.*

The mandibular canal, on the other hand, was most often elongated in length (50%), less frequently round (38%), and even less often oval with a predominance of transverse dimensions (12%) (see Figure 4).

The average height and width of the alveolar process were calculated, which were 85.6 ± 2.2 mm in different age groups. It was quite expected that the height of the alveolar process

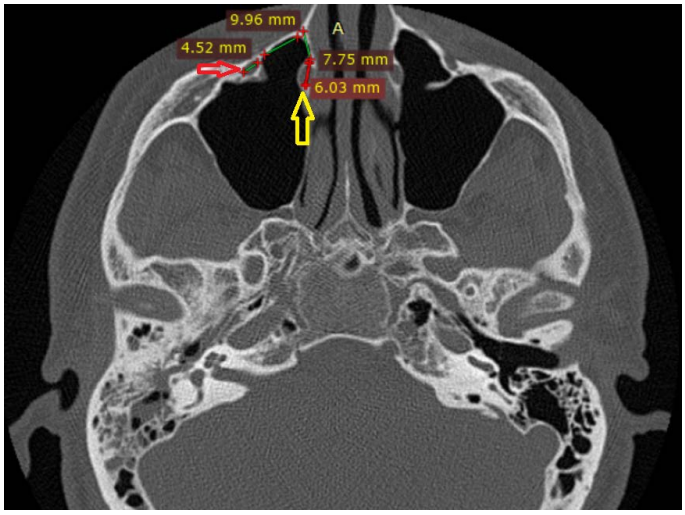

Figure 4. *MSCT Scan. Axial section. The red arrow indicates the infraorbital canal (canalis infraorbitalis), and the yellow arrow points to the inferior nasal meatus. An example of the measurement of these anatomical structures.*

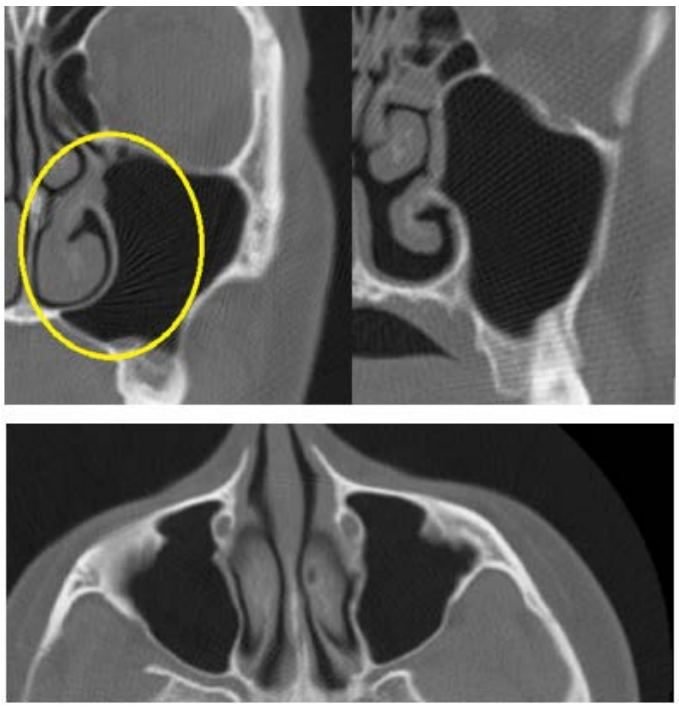

Figure 5. *CT Axial Slice and Coronal Reconstructions: Types of Depressions (Pockets) in the Maxillary Sinus (the region of ostiomeatal complex is marked with yellow circle).*

decreases with age by 14%, and this indicator also depends on sex. In women, the height of the alveolar process is 11.44% lower than in men.

In the vast majority of cases (83%), the width prevails over the height; however, in 17% of cases, the height exceeds the width. A strong positive correlation ($r = 0.82$, $p = 0.0045$) was found between the volume of the sinus and its width. The height of the alveolar process is also a crucial parameter, as for successful dental implantation, the height of the alveolar process should not be less than 8 mm.

In almost all of the subjects studied, this indicator was greater than 8 mm (99%). Only 1% had a height smaller than 8 mm, and in 1% it was exactly 8 mm.

It can be seen from the table 2, that for males, the minimal density of the alveolar process increases with age. In the youngest group (18–44 years), the density is 39.7 ± 6.1 Hu, which decreases slightly in the 45–59 years group to 35.7 ± 5.5 Hu, 36.7±5.8 (60-74 years) and further decreases to 29.31 ± 9.9 Hu in the oldest group (75–80 years).

For females, the trend is different. The minimal density of the alveolar process starts lower in the youngest group (18-44 years) at 51.8 ± 7.2 Hu, decreases to 41.3 ± 6.5 Hu in the 45-59 years group, 40.4±5.5 (60-74 years) and is lowest in the oldest group (75-80 years) at 22.7 ± 7.4 Hu.

In Table 2, minimal density of the alveolar process decreases with age for both genders. For males, the density reduction is gradual, while for females, it is more pronounced between the youngest and oldest groups.

Significant differences across age groups were observed; for example, the height and density of the alveolar process decrease with age, and gender-based differences were also noted ($p \leq 0.05$).

The yellow circles in Fig. 5 highlight the ostiomeatal complex (OMC), a critical anatomical region within the maxillary sinus that plays a pivotal role in sinus drainage and ventilation.

The study of variations in the structure of the maxillary sinus is not complete without examining the relationship with the teeth. In most cases (78%), the roots of the upper teeth did not protrude into the sinus. However, in 7% of these cases, the wall thickness did not exceed 1 mm. In the majority of cases (51%), the thickness of the lower wall between the tooth roots and the sinus cavity ranged from 1-13 mm

Results of our study have some similarities to other researches. For example, Pei et al. (2020) investigated the relationship between the maxillary sinus and upper tooth roots in a sample of Western Chinese people, finding that the roots of upper molars were closest to the maxillary sinus floor. The second molars showed the greatest proximity, while the first and second premolars were frequently located within the sinus cavity [16]. But to the difference to our study this research is based on the Cone-Beam CT, which makes difficult to us to calculate bone density.

The researches [17,18] highlights the variability in sinus features depending on age and gender, which is critical for planning dental treatments involving the maxillary sinus.

Table 1. *Height of the alveolar process in men and women of different age groups (mm).*

Study Group	75-80 years	60-74 years	45-59 years	18-44 years
Male	10.09±1.01	11.8±9.2	11.66±1.6	14.08±2.9
Female	10.52±1.1	11.3 ±0.4	12.06±1.15	13.98±2.31

Table 2. *Minimal density of the alveolar process in men and women of different age groups (Hu).*

Study Group	75-80 years	60-74 years	45-59 years	18-44 years
Male	29.31±9.9	36.7±5.8	35.7±5.5	39.7±6.1
Female	22.7±7.4	40.4±5.5	41.3±6.5	51.8±7.2

One of the key aspects of the study is the relationship between the structure of the lower wall of the maxillary sinus and its interaction with the roots of the teeth. Since the lower wall of the maxillary sinus is formed by the alveolar process of the upper jaw, any change in its structure — such as a reduction in thickness or bone density — can predispose to infections, especially during dental procedures. This highlights the importance of carefully examining the bone tissue and density in the maxillary area of patients before performing dental and maxillofacial surgeries.

The results show that the majority of interactions between the tooth roots, and the maxillary sinus involve the roots of the premolar teeth, increasing the risk of odontogenic sinusitis. This is especially crucial for dentists and maxillofacial surgeons, who must take these anatomical features into account when planning interventions such as tooth extractions, implants, or sinus lifts.

A key point is the necessity for a collaborative approach to treating patients at risk for odontogenic sinusitis. It is important for specialists from different fields to work closely together to develop a comprehensive treatment strategy. This includes both conservative treatments aimed at restoring sinus function and surgical interventions when necessary.

Therefore, for successful treatment and prevention of odontogenic sinusitis, it is essential to consider the anatomical characteristics of the maxillary area, use modern diagnostic methods, and actively collaborate between specialists from various medical fields.

Recent developments in medical imaging and machine learning have significantly improved our understanding and diagnostic capabilities for various conditions, including stress detection and chronic rhinosinusitis. Alekseeva et al. (2023) demonstrated the effectiveness of an intelligent decision support system using U-Net segmentation for diagnosing chronic odontogenic rhinosinusitis, showing the value of advanced imaging techniques for detailed morphological analysis [19]. Similarly, Nechyporenko et al. (2021) proposed a complex automatic method for determining morphological parameters in bone tissue of the paranasal sinuses, highlighting the critical role of precise measurements in anatomical studies [20].

The importance of machine learning in health diagnostics is further exemplified by studies on epidemic process modelling. For instance, Chumachenko (2018) [21] introduced an intelligent multi-agent approach for simulating Hepatitis B epidemic processes, while in [22] they applied machine learning to model Lyme disease epidemiology, illustrating the utility of computational models in tracking and predicting disease spread.

In the context of pathomorphological image evaluation, Gargin et al. (2020) applied computer vision systems to analyse morphological images, emphasizing the application of AI in histological studies [23]. This supports our approach, which leverages physiological signals for detecting stress responses, a field that has gained traction recently. For instance, Kaur et al. (2023) reviewed various machine learning techniques used for stress detection, emphasizing the potential of physiological data integration for enhanced accuracy [24]. Zhang and Chen (2023) also contributed to this field by developing deep learning-based methods for detecting stress using multi-modal physiological data, underscoring the effectiveness of AI in physiological monitoring [25,26].

So anatomical peculiarities could be important factor for complication of treatment measure in oral cavity especially when it's combined with microcirculatory disturbance [27,28], inflammatory processes [29,30], harmful habits [31,32], condition of immune system [33,34], performed treatment [35,36].

Some factors, which can lead to the development of rhinosinusitis may be highlighted. One of the most important is blockage of the Ostiomeatal complex. Blocked ostium drainage is a significant factor in sinusitis development. Bhattacharyya [37] observed that anatomical issues like mucosal swelling strongly correlate with recurrent maxillary sinus infections. Similarly, odontogenic infections, such as dental abscesses, are responsible for 10–12% of maxillary sinusitis cases, as highlighted by [38], emphasizing the importance of maintaining dental health.

Smoking also plays a critical role, with [39] showing it impairs mucociliary function and increases sinusitis prevalence by 20–40%. Additionally, chronic rhinosinusitis (CRS) is linked to persistent inflammation and impaired clearance, often involving the maxillary sinus, as noted by Fokkens et al. [40].

Children are particularly vulnerable due to underdeveloped sinus anatomy and immature clearance mechanisms, making maxillary sinusitis the most frequently affected in pediatric cases, according to Wald et al. [41]. Finally, Centers for Disease Control and Prevention [41] data reveal that sinusitis impacts 12-15% of adults annually, with maxillary sinusitis being especially common due to its structural predispositions.

One of limitation of our research is impossibility to compare obtained data with histological peculiarities of described processes as it was published early [42-44]. In that connection should be interesting both changes in epithelium as barrier in sinus and other organs [45,46] and bone tissue [47,48] with possible involvement of other types of tissue with classical and modern methods of investigation [23,49].

Conclusion.

The study identified structural features of the maxillary sinus that could predispose patients to the development of maxillary odontogenic rhinosinusitis. Patients with these structural features require a special multidisciplinary approach, with mandatory consultation from an otolaryngologist during the preparation stages for orthopedic treatment.

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