GEORGIAN MEDICAL NEWS

ISSN 1512-0112

NO 5 (350) Май 2024

ТБИЛИСИ - NEW YORK

ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

Monthly Georgia-US joint scientific journal published both in electronic and paper formats of the Agency of Medical Information of the Georgian Association of Business Press. Published since 1994. Distributed in NIS, EU and USA.

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.

GEORGIAN MEDICAL NEWS
No 3 (348) 2024

Содержание:

GEORGIAN MEDICAL NEWS
No 5 (350) 2024

VARIANT ANATOMY OF THE MAXILLARY SINUS BASED ON MULTISPIRAL COMPUTED TOMOGRAPHY DATA (MSCT)

Sosonna L[1], Yurevych N[1], LupyrM[1], Babiy L[1], Kysylenko K[1], Kachailo I[1], NarbutovaT[2], Borisenko Ye[1], Baiazitov D[2], Alekseeva V[1,3].

[1]*Kharkiv National Medical University, Kharkiv, Ukraine.*

[2]*Odessa National Medical University, Odessa, Ukraine.*

[3]*Kharkiv International Medical University, Kharkiv, Ukraine.*

Abstract.

The structural features of the paranasal sinuses play a key role in the development of pathological processes within them. The aim of our study was to examine the variations in the anatomical structure of the maxillary sinus based on MSCT data.

Materials and Methods: The study involved 400 individuals aged 18 to 44 years, both male and female. During the study, attention was given to the following topographical and structural indicators: linear dimensions of the maxillary sinus2. The position relative to the nasal cavity, which is also important for reconstructive surgeries and cosmetic procedures. For planning surgical interventions in plastic surgery, the location and prevalence in height of the sinuses were also parameters studied in this work; pneumatization features, which deserve special attention from both researchers and practicing physicians; the average volume, wall thickness, and density, measured as key structural indicators of the sinus. Additionally, these data can indirectly indicate potential risks of complications; the study also determined the dependence of the calculated indicators on gender and age.

Results: The maximum average sinus volume was found in men aged 60-74 years and women aged 18-44 years. This measure was 19.05±2.33 $x10^{-6}m^3$ and 19.3±2.9 $x10^{-6}m^3$, respectively. The minimum average volume was observed in men aged 45-59 years, where it was 13.02±2.3 $x10^{-6}m^3$. In the corresponding age group of women, the minimum average volume was slightly higher, at 11.9±2.1 $x10^{-6}m^3$. In other groups studied, the average volume values were intermediate between the maximum and minimum values.

Conclusions: The results of this study provide insights into the variations in the structure of the human maxillary sinus based on MSCT data. The average sinus volume indicators were calculated, with a maximum of 19.05±2.33 $x10^{-6}m^3$ and a minimum of 11.9±2.1 $x10^{-6}m^3$. Additionally, the study identified features of the topographical location of the maxillary sinuses in relation to the external nose.

Key words. Multispiral computed tomography data, maxillary sinus, variant anatomy, head.

Introduction.

The structural features of the paranasal sinuses play a crucial role in the development of pathological processes within them [1]. These anatomical features must also be considered when planning reconstructive and cosmetic surgical interventions in this area [2,3]. Improved understanding of not only the macro-, but also microanatomy of the paranasal sinuses, including its individual variations, makes a substantial contribution to current progress in endonasal endoscopic microsurgery. Microanatomy of the sinuses is an active field of present scientific investigations.

The question of the function of the paranasal sinuses is fundamental for scientists from various countries [4]. To date, there are many hypotheses regarding the "true function" of the paranasal sinuses. However, none of them have been scientifically proven so far. These theories have laid the foundation for a field of study called "sinusology" - the science that examines the paranasal sinuses, their anatomy, physiology, research methods, and pathological conditions [5].

Since air does not flow into the sinuses during inhalation, but rather the air in the sinuses exits into the nasal cavity, there is a theory that one of the functions of the paranasal sinuses may be to warm the inhaled air [6]. According to some hypotheses, another function of the paranasal sinuses could be to reduce the weight of the head [7]. However, the head's weight is reduced by only 1%, which is insignificantly small to lessen the load on the spine.

The protective function of the paranasal sinuses may involve the mechanical protection of the orbit and adjacent anatomical areas from damage. One of the modern interpretations of the function of the paranasal sinuses is the role of the mucous membrane in the production of free nitric oxide, which it continuously synthesizes, with the mucosa itself serving as a reservoir for NO. Thus, the mucous membrane of the maxillary sinuses may help maintain immunity through the production of free NO [8,9]. Researchers and clinicians particularly focus on the maxillary sinus when analyzing the frequency of inflammatory processes in the paranasal sinuses. Current data indicate that the maxillary sinus is more frequently affected by inflammatory processes than other sinuses. This can be attributed to its anatomical characteristics [10,11].

During the physiological ageing process atrophy of the alveolar bone appears in vertical direction. This bone resorption causes pushing the limits of the maxillary sinus at the expense of a degraded bone. The sinus volume increases due to the facial development in children and adolescents or during the ageing process due to the loss of teeth and bone mass.

Some septa, crests, and the prominent infraorbital canal were also found in the area of the sinus floor [12].

The natural communication between the nasal cavity and the sinus cavity (the ostium) is located above the floor of the sinus itself, which can hinder the drainage of secretions from the sinus and impair its ventilation when pathological processes occur [13]. Additionally, the maxillary sinus is the largest among the paranasal sinuses, so during inflammatory (purulent) processes, a large amount of exudate can be expected [14]. Finally, the maxillary sinus is bordered at the bottom by the roots of the teeth, which can serve as a gateway for infection into the sinus cavity when pathological processes occur in the dental row [15]. Thus, the maxillary sinus is of significant interest for study.

The study of the paranasal sinuses, and the maxillary sinus in particular, is closely linked to the development of radiological methods. Today, the "gold standard" for diagnosis is multislice computed tomography (MSCT), a progressive, informative, and accurate method included in medical care protocols for patients with chronic rhinosinusitis in many countries, including Ukraine [16]. MSCT not only addresses diagnostic tasks but also allows for a detailed study of the anatomy of the area under investigation and even the creation of a 3D model of the necessary section of the human skull.

Given the above, the aim of our study was to examine the variations in the anatomical structure of the maxillary sinus based on MSCT data.

Materials and Methods.

The study involved 400 individuals aged 18 to 44 years, both male and female. All subjects underwent MSCT for reasons unrelated to ENT pathologies (e.g., suspicion of stroke, which was not confirmed). All the persons, which were included to the study, didn't have some previous history of rhinosinusitis. The selection of participants was conducted at Merefa Central Regional Hospital between 2018 and 2021. All patients signed consent forms to participate in the experiment.

The MSCT scans were performed using a Toshiba Aquilion 64 CT scanner. The Aquilion 64 is an advanced CT platform that is twice as fast as a 32-detector row CT system and includes workflow-enhancing software that delivers unsurpassed image quality, improved dose management, and superior patient care. In a single breath-hold of 6-10 seconds, the Aquilion 64 can capture superior and precise images [17]. During the study, attention was given to the following topographical and structural indicators:

1. Linear dimensions of the maxillary sinus, which are significant for planning surgical interventions in this area.
2. The position relative to the nasal cavity, which is also important for reconstructive surgeries and cosmetic procedures. For planning surgical interventions in plastic surgery, the location and prevalence in height of the sinuses were also parameters studied in this work.
3. Pneumatization features, which deserve special attention from both researchers and practicing physicians.
4. The average volume, wall thickness, and density measured as key structural indicators of the sinus. Additionally, these data can indirectly indicate potential risks of complications.
5. The study also determined the dependence of the calculated indicators on gender and age.

The statistical analysis was performed using methods of variational statistics. The normality of the distribution was determined using the Shapiro-Wilk test, which indicated that the samples were close to a normal distribution. Statistical parameters are presented as M±σ, where M is the arithmetic mean and σ is the standard deviation, with the Student's t-test applied. Correlation analysis was conducted using Spearman's rank correlation coefficient. Differences between the studied indicators were considered significant at $p < 0.05$.

Results.

The linear dimensions of the maxillary sinus were 37.8±0.95 by 2.3x10^{-3}m, and the volume of the maxillary sinus was 12707.9±129.6x10^{-9}m^3. In all cases studied, the maxillary sinus was located laterally to the nasal cavity and, in most cases (98%), occupied 1/3 of the longitudinal and 1/4 of the transverse dimensions of the facial skull. However, other proportions were also observed, with this indicator increasing to 1/2 (up to 2%) in hyperpneumatized sinuses and decreasing to 1/5 (up to 10%) in hypopneumatized sinuses. Hypoplasia of the maxillary sinus was observed in 11% of cases, and aplasia in 2%. Unilateral hypo- and aplasia of the sinus were significantly more common (2.3 times).

In 89% of cases, the maxillary sinuses were located at the same level without a height preference for the right or left side. In 11% of cases, the right sinus was positioned higher, and in 5% of cases, the left sinus was positioned higher.

The average volume of the maxillary sinus was 17.22 ± 2.9x10^{-6}m^3 on the left and 19.02 ± 4.3x10^{-6}m^3 on the right.

As shown in Table 1, the maximum average sinus volume was observed in men aged 60-74 years and women aged 18-44 years. These measurements were 19.05±2.33 x10^{-6}m^3 and 19.3±2.9 x10^{-6}m^3, respectively. The minimum average volume was found in men aged 45-59 years, where it was 13.02±2.3 x10^{-6}m^3. In the corresponding age group of women, the minimum average volume was slightly higher, at 11.9±2.1 x10^{-6}m^3. In other groups studied, the average volume values were intermediate between these maximum and minimum values. These intermediate values were as follows:

Table 1. *Average Volume (x10^{-6}m^3) of the Maxillary Sinus in Patients of Different Age Groups.*

Groups	More then 90	75-90 years	60-74 years	45-59 years	18-44 years
Male	14.33±0,33	17.01±1.09	19.05±2.33	13.02±2.3	18.4±4.1
Female	15.02±2.21	14.99±2.2	15.6±14.03	11.9±2.1	19.3±2.9

Table 2. *Anatomical Variability of the Maxillary Sinus Walls.*

№	Medial wall thickness, x10^{-3}m	Upper wall thickness, x10^{-3}m	Medial wall density, Hu	Upper wall density, HU	Anterior wall thickness, x10^{-3}m	Anterior wall density, HU
1	1,36	2,05	135	188	2,1	199
2	1,4	2,22	171	195	2,97	154
3	1,76	2,5	175	200	1,42	111
4	1,89	2,63	178	213	1,94	183
5	2,19	2,64	191	219	4,94	207
M	1,72	2,408	170	203	2,674	170,8
Σ	0,226667	0,182	11,66667	8,666667	0,854	25,53333

Note: *1-5 – number of a group according to table 1.*

1. In the group of men aged 90 years and older, the average sinus volume was 14.33±0.33 x10^{-6}m^3; in men aged 75-90 years, it was 17.01±1.09 x10^{-6}m^3; and in the age group 18-44 years, it was 18.4±4.1 x10^{-6}m^3.
2. In the group of women, the average volumes were: 15.02±2.21 x10^{-6}m^3 in those older than 90 years, 14.99±2.2 x10^{-6}m^3 in those aged 75-90 years, and 15.6±14.03 x10^{-6}m^3 in the 60-74-year age group.

The disparity in maxillary sinus volume between the right and left sides was 10.5%. Furthermore, no discernible correlation

was observed between maxillary sinus volume and gender, with a disparity of 12.3% between male and female subjects. Additionally, there was no evident relationship between maxillary sinus volume and the age of the subjects.

As shown in Table 2, the greatest average bone thickness is observed in the anterior wall, where it measures 2.674±0.854 x10^{-3}m. For the other walls, the measurements are 1.72±0.23 x10^{-3}m for the medial wall and 2.4±0.18 x10^{-3}m for the superior wall. A similar trend is noted for the minimum radiological density. For the anterior wall, the density is 170.8±25.53 Hu, for the medial wall, it is 170±11.67 Hu, and for the superior wall, it is 203±8.67 Hu.

Discussion.

Anatomical variations of the paranasal sinuses are quite common, occurring in over 90% of patients with sinusitis or as incidental findings during routine examinations. Moreover, in most cases, the course of inflammatory processes in the paranasal sinuses (sinusitis) depends on the morphological features of this area. Therefore, each individual requires a personalized approach to diagnosis and treatment. It is believed that the anterior group of sinuses and the nasal cavity are among the most variable regions of the human skull.

Our study's findings regarding linear dimensions align closely with those of previous research, with any minor differences potentially attributed to our larger sample size. For example, Sonone et al. reported an average sinus volume of 10-15 ml, which parallels our results. Notably, our study encompassed 400 individuals, whereas theirs involved only 57 patients.

The anticipated outcomes regarding the topographical placement of the maxillary sinus were confirmed. Understanding these nuances is crucial not only in otolaryngology but also in dentistry and neurology. In dental procedures like implantation and sinus lifting, precise knowledge of sinus positioning is vital. In neurology, awareness of the proximity of the maxillary nerve mitigates the risk of intraoperative damage. Moreover, recognizing the likelihood of sinus involvement in inflammatory processes informs treatment strategies. Variations in maxillary sinus anatomy are also pivotal considerations in orbital surgeries.

Surgical interventions on small-volume sinuses require particular caution due to minimal wall thickness and density. Pathological processes may further decrease density, heightening the risk of bone trauma during surgery or postoperative complications. Chronic inflammatory diseases not only impact the mucous membrane but also affect the bone tissue forming sinus walls, leading to reduced bone density.

During wall thickness measurements, significant asymmetry was noted, along with a correlation with age and gender. The metrics of bone tissue density and thickness across various age groups are depicted in Figures 1 and 2.

As shown in Figure 2, bone tissue density increases in youth and declines in the oldest age bracket. Conversely, the findings regarding bone thickness differed somewhat. The highest thickness was observed also in the group of young people age group (see Figure 1).

Knowledge of the variant anatomy of the paranasal sinuses is highly beneficial in dentistry and maxillofacial surgery.

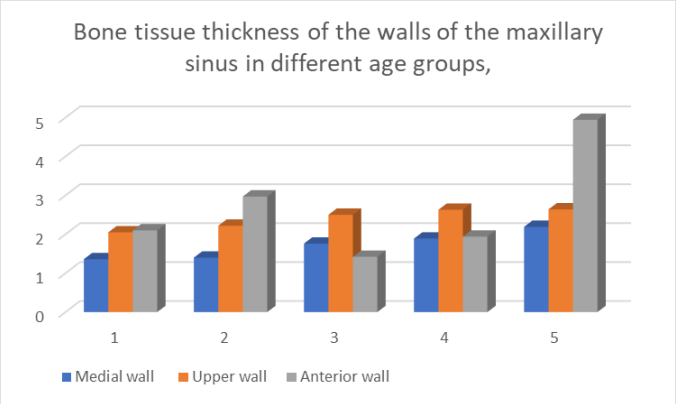

Figure 1. *Thickness of the maxillary sinus` walls in individuals of different age groups.*
Note: *Group 1 indicates individuals in the longevity age group, Group 2 - advanced age, Group 3 - elderly age, Group 4 - middle age, and Group 5 - young age.*

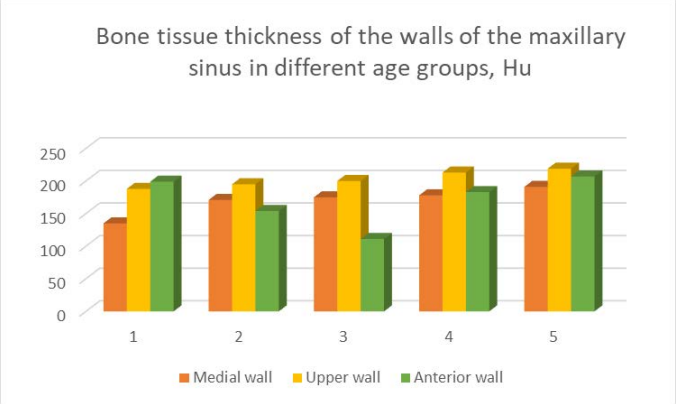

Figure 2. *Density of the maxillary sinus` walls in individuals of different age groups.*
Note: *Group 1 indicates individuals in the longevity age group, Group 2 - advanced age, Group 3 - elderly age, Group 4 - middle age, and Group 5 - young age.*

Understanding the specific structural features of the maxillary sinus can significantly aid in planning surgical interventions in this area, allowing for a tailored approach to each patient. This, in turn, can lead to more effective surgical treatment and help prevent complications.

The work of Ata-Ali J et al. [18] is particularly notable in this context, as the authors emphasize the importance of sinus density, while most other studies [19,20] have focused primarily on structural aspects such as thickness, size, and the presence of septa within the sinus cavity [18]. It can be assumed that the inclusion of porosity studies in the research protocol in this case may allow for more accurate prognostic results regarding the frequency of complications in dental and maxillofacial surgery.

The proposed research can be further expanded by introducing new data calculation methods [21-23] and predicting potential complications. It is also important to note that studies of this kind are significant not only in otolaryngology, maxillofacial surgery [24-26], and ophthalmology but also in other fields of medicine. Research on the variant anatomy of a given area can become a valuable resource for any medical discipline and can be successfully incorporated into both the practical and scientific

work of physicians across various specialties. The proposed research can not only provide a detailed study of human skull anatomy but also suggest optimal, minimally invasive, and effective treatment approaches for related diseases. More importantly, it can develop preventive measures to reduce the incidence and recurrence of these conditions [27,28]. It is also impossible to underestimate the importance of knowledge about the variant anatomy of the human skull for rehabilitation [29]. The study of the structural features of this area can provide additional knowledge about the course of other diseases that directly [30] or indirectly [17,31] affect the physiological state of the examined section of the skull [32] and could be useful for different medical fields as otolaryngology, stomatology, surgery and other.

Conclusion.

In summary, our study elucidates the variants of human maxillary sinus structure using MSCT data. We calculated average sinus volume, ranging from 19.05±2.33 $x10^{-6}m^3$ to 11.9±2.1 $x10^{-6}m^3$. Additionally, we delineated the topographical relationship between the maxillary sinuses and the external nose. The visualization of the maxillary sinus anatomy is necessary in the diagnosis and treatment plans for surgical procedures.

Funding: This research received no external funding

Conflict of interest statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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