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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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CT-BASED STUDY OF ANATOMICAL VARIATIONS IN CHRONIC RHINOSINUSITIS PATIENTS

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Abstract.

Introduction: Chronic rhinosinusitis (CRS) is frequently associated with anatomical variations that may predispose individuals to impaired sinus drainage and mucosal inflammation. Computed tomography (CT) of the paranasal sinuses provides an essential diagnostic tool for evaluating these variations.

Objective: To assess the prevalence and types of anatomical variations in patients with CRS using CT Data.

Material and Methods: A retrospective cross-sectional study was conducted on 75 patients diagnosed with CRS. CT scans were evaluated for anatomical variations including concha bullosa, deviated nasal septum, agger nasi cells, Haller cells, Onodi cells, uncinate process variations, and paradoxical middle turbinate.

Results: The most frequent variation observed was concha bullosa (64%), followed by deviated nasal septum (61.3%), agger nasi cells (49.3%), and Haller cells (32%). Onodi cells were observed in 21.3% of patients, uncinate process variations in 17.3%, and paradoxical middle turbinate in 12%.

Conclusion: Anatomical variations are common in CRS patients and can play a critical role in the pathophysiology of the disease. CT imaging is vital in identifying these variations, which can guide appropriate surgical planning.

Key words. Chronic rhinosinusitis, computer tomography, anatomical variations, maxillofacial system, odontogenic pathology, paranasal sinuses, ostiomeatal complex.

Introduction.

Chronic rhinosinusitis (CRS) is a prevalent inflammatory condition of the paranasal sinuses that persists for over 12 weeks, affecting a significant portion of the global population. Patients often experience nasal obstruction, facial pressure, nasal discharge, and reduced sense of smell. CRS is classified into CRS with nasal polyps (CRSwNP) and CRS without nasal polyps (CRSsNP) [1].

Chronic rhinosinusitis (CRS) is a common and often debilitating condition characterized by inflammation of the nasal and paranasal sinus mucosa lasting more than 12 weeks. It significantly impacts the quality of life, productivity, and healthcare costs. The etiology of CRS is multifactorial, involving infectious, allergic, environmental, and anatomical components.

Among the various contributory factors, anatomical variations of the sinonasal region have gained increasing attention due to their potential role in disrupting normal mucociliary clearance and sinus ventilation [2]. Variations such as concha bullosa, deviated nasal septum, Haller cells, and Onodi cells can narrow the ostiomeatal complex, impeding sinus drainage and predisposing to infection and chronic inflammation [3,4]. According to everything was mentioned above, the aim of our work was to assess the prevalence and types of anatomical variations in patients with CRS using CT imaging.

Materials and Methods.

The material for the study was collected at the Kharkiv Research Institute of General and Emergency Surgery and the Meref'yanska Central District Hospital (based on the concluded cooperation agreement No. 173/10 18 dated October 18, 2018, on scientific and practical collaboration).

The study was conducted using a Toshiba Aquilion Computed Tomography Scanner (Japan), a multislice CT scanner capable of simultaneously acquiring data from four slices, each 0.5 mm thick. It is known for its high-performance capabilities, including a full rotation time of up to 0.4 seconds. The device enables high-resolution multislice scanning with high throughput. For the evaluation of the paranasal sinuses, a slice thickness of 2 mm was used. The high image quality of this device is combined with a low radiation dose due to the highly efficient use of X-ray exposure.

Medical images were viewed using the Radiant DICOM VIEWER, a tool for viewing DICOM-format medical images (version PACS 4.6.9, 64-bit), which features a user-friendly interface and high performance.

The study complied with the requirements of the Declaration of Helsinki of the World Medical Association on ethical principles for medical research involving human subjects. All participants were informed about their involvement in the study and provided written informed consent. The research was approved by the Bioethics Committee of Kharkiv National Medical University (Minutes of the committee meeting No. 5, dated November 11, 2018).

High-resolution computed tomography (CT) of the paranasal sinuses is considered the gold standard imaging modality for the evaluation of CRS [5, 6]. CT imaging allows for precise identification of sinonasal anatomical structures and their variations, which is crucial for both diagnosis and surgical planning. Understanding these variations is vital, particularly in functional endoscopic sinus surgery (FESS), where detailed anatomical knowledge can help avoid complications and ensure complete disease clearance.

Anatomical variations such as concha bullosa, deviated nasal septum, and Haller cells may narrow the sinus drainage

pathways, contributing to the development and chronicity of the disease. Identification of such variations through CT imaging can provide crucial insights into the etiology of CRS and help guide surgical planning. This study investigates the prevalence and types of anatomical variations in CRS patients using CT imaging. This study was conducted to analyse the prevalence of common anatomical variations in patients diagnosed with CRS using CT imaging and to explore their potential association with chronic sinus disease. By identifying the anatomical patterns contributing to CRS, the findings aim to assist clinicians in improving both diagnostic accuracy and therapeutic strategies.

The study population (n=75) demonstrated a male predominance with 54.7% males and 45.3% females. The majority of patients were between the ages of 30 and 50 years, with a mean age of 38.6 ± 9.4 years. All patients included in the study presented with clinical features suggestive of CRS, such as nasal obstruction, nasal discharge, postnasal drip, facial pain or pressure, and anosmia or hyposmia. Patient evaluation involved a comprehensive history, nasal endoscopy, and CT imaging. Inclusion Criteria:

1. Patients aged 18-60 years with symptoms of CRS lasting more than 12 weeks.
2. Availability of diagnostic CT imaging of the paranasal sinuses.

Exclusion Criteria:

1. History of sinonasal surgery.
2. Facial trauma or congenital craniofacial anomalies.
3. Fungal sinusitis or neoplasms.

The CT scans were independently reviewed by two senior radiologists and an ENT specialist. Anatomical variants were classified based on well-defined radiological criteria [7]. CT images were assessed for anatomical variations by experienced radiologists. The anatomical variations evaluated included:

1. Concha bullosa
2. Deviated nasal septum
3. Agger nasi cells
4. Haller cells
5. Onodi cells
6. Uncinate process variations
7. Paradoxical middle turbinate

To ensure objectivity, each scan was scored using the Lund-Mackay scoring system for disease severity and the presence or absence of each anatomical variation was marked bilaterally [8]. Interobserver reliability was calculated using the kappa statistic.

Statistical Analysis.

Statistical processing was performed using methods of variational statistics. The normality of distribution was assessed using the Shapiro-Wilk test. The prevalence of anatomical variants of the paranasal sinuses (PNS) and the osteomeatal complex (OMC) was calculated as the percentage ratio of the number of objects with a specific variant to the total number of examined cases [9].

The range of individual variability in the anatomical structure of the PNS and OMC was evaluated using the following statistical indicators:

1. M – arithmetic mean.
2. M(M) – standard error of the mean.
3. σ – standard deviation.
4. Cv – coefficient of variation.
5. M(Cv) – standard error of the coefficient of variation.
6. min – minimum observed value.
7. max – maximum observed value.

The sizes of those indicators were measured in millimeters using multiplanar reconstruction in coronal sections. Measurements were performed independently by two radiologists, and mean values were used for analysis to minimize interobserver variability.

To evaluate the relationship between the size of the concha bullosa and the size of the hiatus semilunaris, Pearson's correlation coefficient (r) was calculated. This method was chosen due to the continuous and approximately normally distributed nature of both variables. A two-tailed p-value < 0.05 was considered statistically significant. The statistical analysis was performed using SPSS.

Results and Discussion.

CT scan analysis revealed the presence of multiple anatomical variations in most patients. Notably, 84% of patients had more than one variation. The most common variation, concha bullosa, was seen in 48 patients (64%). Of these, 28 had unilateral concha bullosa and 20 had bilateral involvement.

Deviated nasal septum was present in 46 patients (61.3%), with 70% of the deviations causing significant narrowing of the nasal airway on one side. Agger nasi cells were observed in 49.3% of patients and were frequently associated with obstruction of the frontal recess.

The yellow arrow in the Figure 1 (left) appears to indicate a Haller cell (infraorbital ethmoid air cell). Haller cells are ethmoidal air cells that extend into the floor of the orbit and can narrow the infundibulum, potentially contributing to maxillary sinusitis. Haller cells were found in 24 patients (32%), predominantly on the right side. Onodi cells were less common (21.3%) but are clinically significant due to their proximity to the optic nerve and sphenoid sinus. Uncinate process variations and paradoxical middle turbinates were observed in 17.3% and 12% of patients respectively

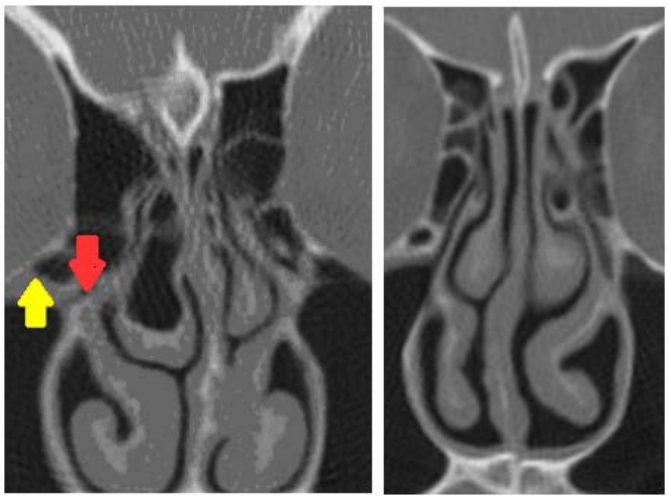

Figure 1. *Left - The yellow arrow indicates a Haller cell, while the red arrow marks the area of the ethmoidal infundibulum (uncinate process region), right - Pneumatization of the middle turbinate.*

The red arrow points to the uncinate process or a related structure near the ostiomeatal complex.

Statistical analysis revealed a strong correlation (see Figure 2) between the presence of concha bullosa and ipsilateral maxillary sinusitis ($p = 0.03$). Similarly, septal deviation showed significant association with sinus disease laterality ($p = 0.04$). Other variations showed trends toward association but did not reach statistical significance.

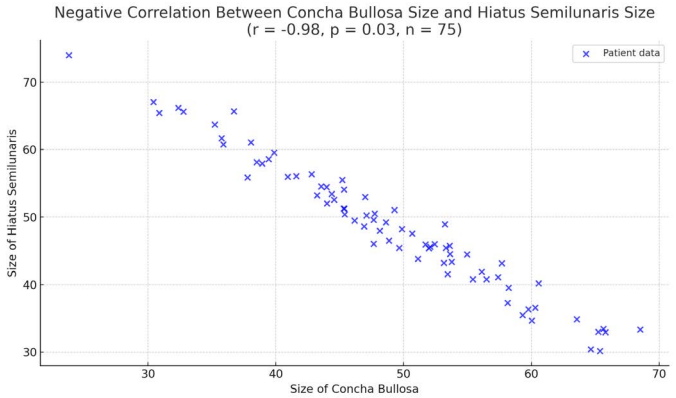

Figure 2. *Correlation between the sizes of Concha Bullosa (mm) and Hiatus Semilunaris (mm).*

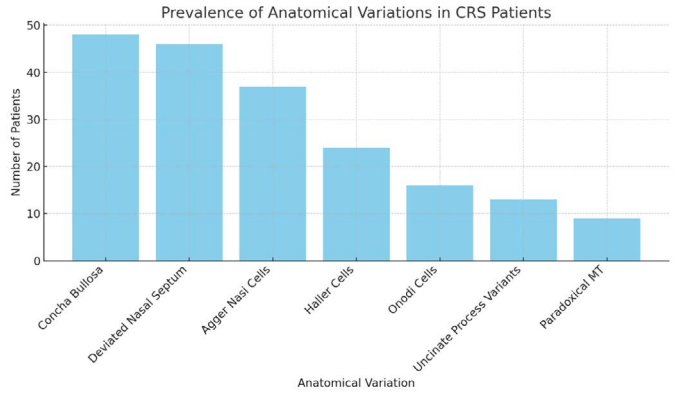

Figure 3. *Diagram representing the number of patients with various anatomical variations observed on CT imaging among CRS cases (n=75).*

Table 1. *The frequency of anatomical variations.*

Anatomical Variation	**Frequency**	**Percentage**
Concha bullosa	48	64.0%
Deviated nasal septum	46	61.3%
Agger nasi cells	37	49.3%
Haller cells	24	32.0%
Onodi cells	16	21.3%
Uncinate process variation	13	17.3%
Paradoxical middle turbinate	9	12.0%

Our findings corroborate previous research that suggests a significant role of anatomical variations in the pathogenesis of CRS. The presence of structural anomalies such as concha bullosa, septal deviation, and Haller cells can impair normal mucociliary clearance and ventilation, predisposing to chronic inflammation.

Concha bullosa, by pneumatizing the middle turbinate, may encroach upon the ostiomeatal complex, leading to impaired drainage of the maxillary, anterior ethmoid, and frontal sinuses [10]. In our study, a significant association was found between concha bullosa and ipsilateral maxillary sinusitis, underlining the functional impact of this variation.

Deviated nasal septum is another frequently encountered anomaly that can create asymmetry in nasal airflow and affect sinus drainage patterns. Our results showed a strong association with unilateral sinus disease, consistent with the current literature [11,12].

The identification of agger nasi and Haller cells is critical in preoperative planning. These cells, when prominent, may narrow the frontal recess and the infundibulum, respectively, leading to frontal or maxillary sinus involvement. Their accurate identification through CT imaging is essential to avoid intraoperative complications [13].

Onodi cells, though less common, are significant due to their anatomical proximity to the optic nerve. Misidentification or failure to recognize this variant during endoscopic surgery can result in catastrophic complications including optic nerve injury [14,15].

The study highlights the role of CT imaging not only as a diagnostic modality but also as a surgical guide [16]. A thorough understanding of sinonasal anatomy and its variations can assist in accurate diagnosis, prevent complications, and improve surgical outcomes [17].

Further research with larger patient populations and multi-center participation may help validate and generalize these findings. Correlating these variations with intraoperative and postoperative outcomes would also add value to the field [18].

CT imaging is indispensable in evaluating patients with chronic rhinosinusitis. Our study demonstrated a high prevalence of anatomical variations that may contribute to the development and chronicity of sinusitis [19-21]. The most common variations identified were concha bullosa and nasal septal deviation, both significantly associated with sinus disease.

One more aspect is connected with teeth affect the composition and distribution of the oral microbiome, and their anatomical position can have broader implications for health [22,23]. The maxillary molars and premolars, in particular, are located in close proximity to the floor of the maxillary sinus - often separated by only a thin layer of bone or, in some individuals, by the sinus membrane alone. This anatomical relationship means that infections originating in the roots of these upper teeth can easily extend into the maxillary sinus, leading to odontogenic sinusitis [24,25]. Such conditions can contribute to chronic sinus inflammation and shift the local microbial environment in both the oral cavity and the sinus itself. Additionally, tooth extraction in this region may cause sinus perforation, creating a direct pathway for microbial exchange between the oral and sinus cavities. These anatomical connections highlight how oral infections, particularly periodontitis or periapical abscesses, can transcend local boundaries and trigger broader systemic effects. Furthermore, misaligned or crowded teeth can influence salivary flow, food retention, and oxygen gradients, which in turn shape microbial habitats. Dental interventions such as orthodontics,

restorations, or extractions alter these microenvironments and can shift the balance of microbial species. Understanding these relationships emphasizes the importance of comprehensive dental and periodontal care as part of systemic disease prevention [26].

Recent work has also highlighted the utility of CT-based data for not only diagnosing sinus pathologies but also for biometric recognition and evaluating of medical images [27,28]. Such approaches expand the diagnostic potential of radiologic imaging beyond classical assessment, providing novel clinical and forensic applications [29,30].

Preoperative identification of these anatomical factors using CT allows for better surgical planning and can reduce intraoperative and postoperative complications [31-33]. This study reinforces the need for personalized anatomical assessment in all patients undergoing endoscopic sinus surgery.

This study is limited by its retrospective and cross-sectional design, which restricts the ability to establish causal relationships. Additionally, the relatively small sample size may affect the generalizability of the findings. These limitations were primarily due to practical constraints. The retrospective and cross-sectional design was chosen based on the availability of existing clinical data, which allowed for an initial exploration of the research question. Additionally, resource and time limitations, as well as the study being conducted at a single center, restricted the achievable sample size. Future studies with prospective, longitudinal designs and larger, multi-center cohorts are recommended to validate and extend these findings. To address these limitations in future research, a prospective and longitudinal study design should be implemented to allow for better control of variables and to establish temporal relationships. Expanding the study across multiple centers would enhance the generalizability of the findings and help recruit a larger, more diverse sample. Conducting a power analysis in advance can ensure an adequate sample size is achieved, strengthening the statistical validity of the results. These steps would provide a more robust foundation for evaluating the studied associations and improving the reliability of conclusions.

Conclusion.

Computed tomography is an essential tool for evaluating anatomical variations in patients with chronic rhinosinusitis. This study confirms a high prevalence of structural variants — such as concha bullosa and nasal septal deviation — that may contribute to sinus obstruction and inflammation. Recognizing these variations is crucial for accurate diagnosis and effective surgical planning. Moreover, advanced imaging analysis may support broader applications, including assessing systemic influences like smoking and enabling biometric identification.

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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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