

# GEORGIAN MEDICAL NEWS

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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 ВИНТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

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

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

### WEBSITE

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

## К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

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

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

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

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

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

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

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

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

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

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

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

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

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

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

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

## REQUIREMENTS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## ავტორთა საქურაღებოლ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დაიცვათ შემდეგი წესები:

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

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

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

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

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

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

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

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

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

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

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

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

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## ANATOMICAL FEATURES OF THE CAROTID ARTERIES, OPHTHALMIC NERVES, MANDIBULAR NERVE AND EXTRAOCULAR ARTERY BASED ON MULTISLICE COMPUTED TOMOGRAPHY (MSCT) DATA

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### Abstract.

**Introduction:** Anatomical variability of cranial neurovascular structures presents significant challenges in surgical planning and diagnostic interpretation. Multislice Computed Tomography (MSCT) offers detailed imaging of these structures, facilitating accurate morphometric analysis and spatial understanding critical to clinical interventions.

**Objective:** To analyze the anatomical features and variations of the internal carotid arteries, optic and ophthalmic nerves, mandibular nerve, and extraocular (ophthalmic) artery based on high-resolution MSCT imaging data.

**Materials and Methods:** This retrospective study evaluated 400 MSCT scans performed using a Toshiba Aquilion 64-slice scanner. Image analysis included multiplanar reconstructions and 3D modeling using RadiAnt DICOM Viewer. Measurements focused on ICA diameter and proximity to the sphenoid sinus, optic canal integrity, mandibular canal course and size, and traceability of the ophthalmic artery. Statistical analysis was performed using SPSS v26 with significance set at  $p < 0.05$ .

### Results:

1. ICA was adjacent to the sphenoid sinus in 97% of cases; dehiscence occurred in 11%.
2. Optic canal dehiscence was found in 13.5%, with average diameter of  $3.7 \pm 0.5$  mm.
3. Mandibular canal showed 9% asymmetry; mean diameter was  $2.9 \pm 0.4$  mm.
4. Ophthalmic artery was visualized in 78% of scans; mean diameter  $1.5 \pm 0.2$  mm.

Significant interindividual variability was noted across all structures.

**Conclusion:** MSCT is an effective tool for evaluating cranial neurovascular anatomy. Frequent anatomical variations such as ICA dehiscence and mandibular canal asymmetry underscore the need for individualized imaging assessment in preoperative planning. The high resolution of MSCT allows reliable visualization of fine neurovascular details, enhancing safety in head and neck surgery.

**Key words.** MSCT, internal carotid artery, optic nerve, ophthalmic artery, mandibular nerve, anatomical variation.

### Introduction.

The advancement of diagnostic imaging techniques, particularly Multislice Computed Tomography (MSCT), has

revolutionized the anatomical study of cranial structures [1]. The ability to visualize and evaluate the individual anatomical variability of complex neurovascular formations such as the carotid arteries, ophthalmic and optic nerves, mandibular nerve, and extraocular arteries has deepened our understanding of normal and pathological anatomy [2]. These structures, located in regions of high surgical risk, require precise imaging for planning interventions and avoiding iatrogenic complications [3].

The internal carotid artery (ICA) plays a crucial role in cerebral perfusion and is intimately related to the sphenoid sinus and optic canal with ophthalmic artery inside, making it highly susceptible to surgical trauma during transnasal endoscopic procedures. Similarly, the optic nerve and its associated ophthalmic vasculature pass through narrow bony canals, often dehiscent or thinned, which may not be apparent without high-resolution imaging [4,5]. The mandibular nerve, a branch of the trigeminal nerve (CN V3), passes through the foramen ovale and mandibular canal, and is significant in both maxillofacial surgery and dental procedures. Variations in its course or canal morphology, Variations in canal morphology, such as bifid or trifid canals, can lead to complications in anaesthesia or nerve injury during interventions [6].

In addition, the ophthalmic artery [5] branching from the ICA and supplying the orbit is a vital structure in orbital and skull base surgery. Its traceability and relation to adjacent structures can be accurately visualized on MSCT. Traditional anatomical studies often relied on cadaveric dissection, which, despite its value, is limited by specimen variability, postmortem changes, and inability to represent dynamic or living tissue density. MSCT, however, offers a reproducible, non-invasive, and quantitative modality capable of evaluating bone and vascular relationships in high detail [8].

The original MSCT-based morphometric dataset used in this study originates from a comprehensive anatomical evaluation of the paranasal sinuses and adjacent neurovascular structures [9]. This dataset was acquired under controlled imaging protocols and serves as a reliable foundation for in-depth analysis of key cranial structures, including the carotid arteries, optic and ophthalmic nerves, mandibular nerve, and extraocular artery [10,11]. Its application in this study supports the broader goal of correlating radiological findings with clinically significant anatomical variations, thereby enhancing surgical planning in

fields such as neurosurgery, otolaryngology, ophthalmology, and oral and maxillofacial surgery [12-14].

According to everything was mentioned above the aim of our work was to analyze and describe the anatomical features of the carotid arteries, ophthalmic and optic nerves, mandibular nerve, and extraocular arteries using original MSCT data obtained from a morphometric study of paranasal sinuses.

## Materials and Methods.

The study was approved by the Bioethics Committee of Kharkiv National Medical University (Protocol No. 5, November 11, 2018). Written informed consent was obtained from all participants prior to inclusion in the study.

A total of 400 spiral computed tomography (SCT or MSCT) scans were examined in this retrospective morphometric study. The cohort included both male and female individuals of various age groups, without known craniofacial pathology. All examinations were performed without intravenous contrast administration. Visualization of the ophthalmic artery was assessed on high-resolution non-contrast MSCT using thin-slice reconstructions (0.5–0.75 mm) and optimized bone and soft tissue window settings.

The imaging studies were performed using a Toshiba Aquilion 64-slice MSCT scanner. Scanning parameters included axial thickness of 0.5–0.75 mm, with multiplanar reconstruction (MPR), maximum intensity projection (MIP), and volume rendering performed using RadiAnt DICOM Viewer. All measurements were made in DICOM format in standard bone and soft tissue windows. Three-dimensional reconstructions and image post-processing were conducted to assess topographic relationships and canal integrity.

Representative MSCT images were selected to illustrate key anatomical variations, including internal carotid artery dehiscence, optic canal bone defects, mandibular canal asymmetry, and ophthalmic artery course. Axial, coronal, and sagittal reconstructions were used to demonstrate these findings with corresponding measurement landmarks.

Data were evaluated using descriptive and comparative statistical methods. Mean values, standard deviations, frequency distributions, and cross-tabulations were calculated using SPSS v26 (IBM Corp., USA). Intergroup differences were analyzed using Student's t-test or Mann-Whitney U test for non-parametric data. Chi-square tests were used for categorical variables. A p-value of <0.05 was considered statistically significant.

Specific anatomical features measured included:

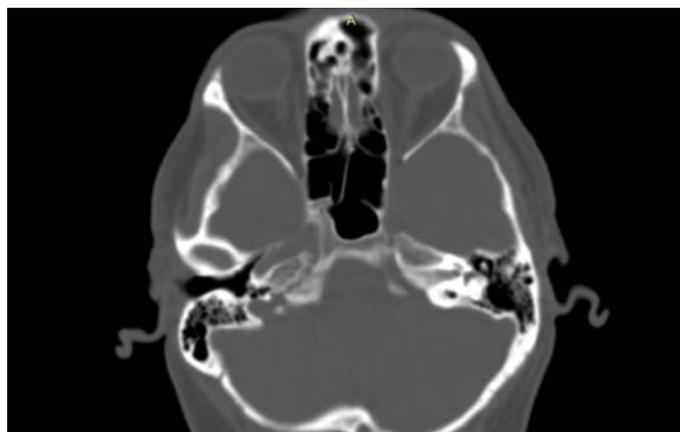
1. **Internal carotid artery (ICA):** visualization of cavernous and petrous segments, diameter measurements, and positional relation to sphenoid sinus. Bony dehiscence was defined as complete absence of visible bone coverage (0 mm thickness) between the neurovascular structure and adjacent sinus cavity on at least two consecutive MSCT slices (see Figure 1).

2. **Ophthalmic nerve and optic nerve:** analysis of canal diameter, bony coverage, and proximity to ethmoid and sphenoid sinuses.

3. **Mandibular nerve (V3):** course through the foramen ovale and mandibular canal, including positional variants and symmetry (see Figure 2).



**Figure 1.** Representative coronal multislice computed tomography (MSCT) image (bone window) illustrating the anatomical relationship between the sphenoid sinus and the internal carotid artery at the skull base. The image demonstrates the approach used for evaluating bony coverage and spatial proximity between the artery and the sinus cavity.



**Figure 2.** Axial multislice computed tomography image at the level of the skull base demonstrating the cavernous segment of the internal carotid artery (ICA) in close proximity to the sphenoid sinus wall.

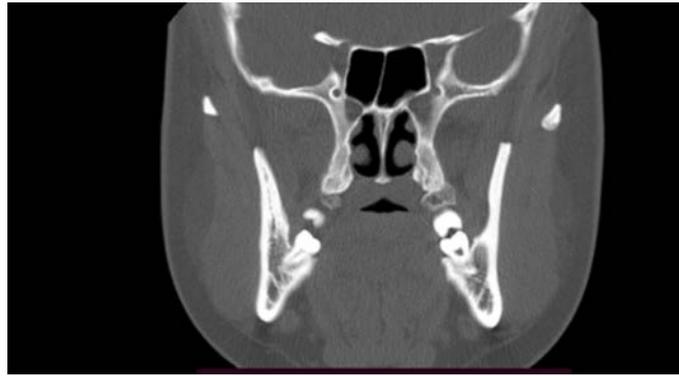
4. **Extraocular artery (ophthalmic artery):** traceability through the optic canal and ethmoidal foramina.

Subgroup analysis was performed to evaluate potential sex-related and age-related differences in morphometric parameters. Patients were stratified by sex and into age groups (<40 years, 40–60 years, >60 years). Intergroup comparisons were conducted using Student's t-test or Mann-Whitney U test depending on data distribution.

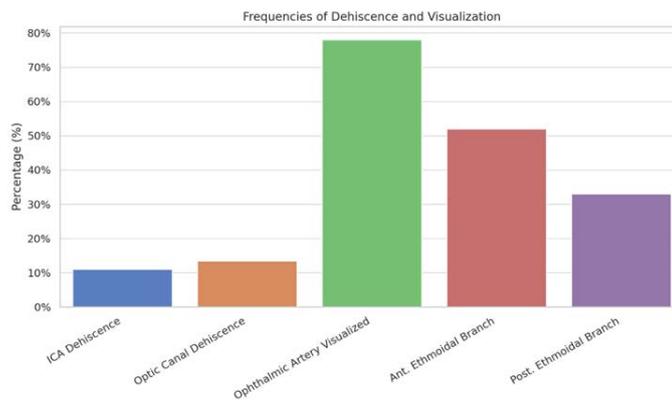
## Results.

**Internal Carotid Arteries (ICAs):** In 97% of cases, the petrous segment of the ICA was visible through the bony coverage of the sphenoid sinus. Bony dehiscence was observed in 11% of scans, increasing the surgical risk during endoscopic sinus procedures. Representative MSCT images illustrating ICA dehiscence and variations in neurovascular anatomy are provided in Figures 1-3 to demonstrate the radiological criteria used for assessment.

**Optic and Ophthalmic Nerves:** The optic nerve canal showed thinning or partial dehiscence in 13.5% of cases, with bilateral presentation in 6.2%. The optic canal's average diameter was



**Figure 3.** Representative coronal multislice computed tomography (MSCT) image (bone window) demonstrating the anatomical region used for assessment of the mandibular nerve (V3) and mandibular canal morphology. The image illustrates the methodological approach applied for evaluating canal course, symmetry, and bony boundaries.



**Figure 4.** Frequencies of Dehiscence and Visualization.

**Table 1.** Anatomical Features of ICA based on MSCT Data.

| Parameter                            | Mean ± SD (mm) |
|--------------------------------------|----------------|
| ICA Diameter (petrous)               | 4.8 ± 0.6      |
| ICA Proximity to Sphenoid Sinus Wall | 1.4 ± 0.3      |
| ICA Diameter (cavernous segment)     | 4.3 ± 0.4      |
| Distance ICA to Optic Canal          | 2.1 ± 0.5      |

**Table 2.** Anatomical Features of Optic and Ophthalmic Nerves based on MSCT Data.

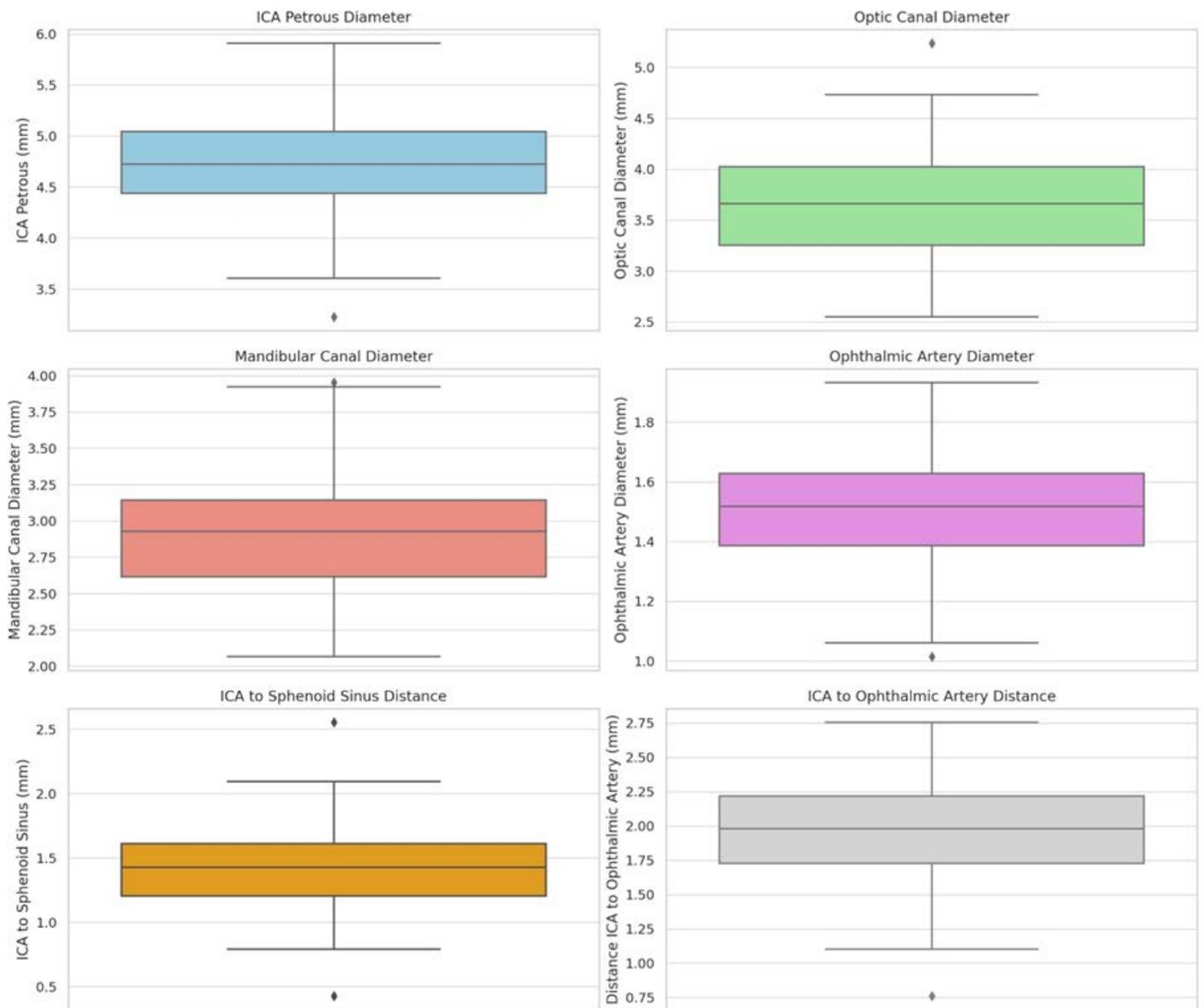
| Parameter                       | Mean ± SD (mm) |
|---------------------------------|----------------|
| Optic Canal Diameter            | 3.7 ± 0.5      |
| Length of Optic Canal           | 9.2 ± 1.3      |
| Bony Thickness Over Optic Nerve | 1.1 ± 0.4      |
| Dehiscence of Optic Canal       | 13.5%          |

**Table 3.** Anatomical Features of Mandibular Nerve based on MSCT Data.

| Parameter                                  | Mean ± SD (mm) |
|--|----------------|
| Foramen Ovale Diameter                     | 5.1 ± 0.8      |
| Mandibular Canal Diameter (midshaft)       | 2.9 ± 0.4      |
| Distance Mandibular to Mental Foramen      | 30.2 ± 4.7     |
| Cortical Bone Thickness (mandibular canal) | 1.8 ± 0.5      |

**Table 4.** Anatomical Features of Extraocular Artery (Ophthalmic Artery) based on MSCT Data.

| Parameter  | Mean ± SD (mm) |
|--|----------------|
| Ophthalmic Artery Diameter (proximal)            | 1.5 ± 0.2      |
| Distance from ICA to Artery Entry in Optic Canal | 1.9 ± 0.4      |
| Visualization of Anterior Ethmoidal Branch       | 52%            |
| Visualization of Posterior Ethmoidal Branch      | 33%            |



**Figure 5.** Features of Neurovascular Parameters.

$3.7 \pm 0.5$  mm. The bony separation between the optic nerve and adjacent ethmoid/sphenoid sinuses varied significantly.

The ophthalmic nerve was traced indirectly using anatomical corridors. Its emergence at the superior orbital fissure was identifiable in reconstructed views in 88% of scans.

**Mandibular Nerve (V3):** V3 passed through the foramen ovale in all cases. Asymmetry in mandibular canal course was present in 9% of scans. Variability in canal diameter was significant in relation to cranial index. The distance between the mandibular foramen and mental foramen was measured as an additional landmark.

**Extraocular Artery (Ophthalmic Artery):** The ophthalmic artery could be reliably traced in 78% of scans. It was most visible in younger patients with higher bone transparency. In 65% of cases, it could be visualized entering the orbit via the optic canal. Anterior and posterior ethmoidal branches were identifiable in 52% and 33% of cases, respectively.

Comparative analysis revealed no statistically significant sex-

related differences in ICA diameter, optic canal diameter, or mandibular canal dimensions ( $p > 0.05$ ). Age-related analysis demonstrated a trend toward reduced bony thickness over the optic canal and decreased visualization rate of the ophthalmic artery in patients older than 60 years; however, these differences did not reach statistical significance.

These findings further confirm that patient-specific anatomical variations are common, especially in relation to skull base vascular and nerve structures. These parameters offer a reliable anatomical reference for surgical planning.

### Discussion.

The variability observed in ICA proximity to the sphenoid sinus and the optic nerve's exposure has significant clinical relevance, especially in the context of endoscopic sinus surgery and skull base approaches [15,16]. Dehiscence of the optic canal poses a high risk of visual complications [17,18]. Similarly, understanding the mandibular nerve's variation is essential

for planning dental implants or nerve blocks [19,20], and its relationships with paranasal sinuses [21].

Although sex- and age-related trends were observed, the absence of statistically significant differences suggests that individual anatomical variability outweighs demographic factors, reinforcing the necessity of patient-specific preoperative imaging.

Our findings are consistent with the results of Koç et al. [1], who also reported a high frequency of ICA protrusion into the sphenoid sinus wall and emphasized the surgical implications of such proximity. Similar rates of bony dehiscence (10–13%) of the optic canal were described by Mahmut Öksüzler, Fatma Yasemin Öksüzler, Sema Ozandaç Polat, Ayşe Gül Uygur et al. [21], highlighting the risk of visual injury during orbital and sinus surgeries. Our observed 13.5% incidence of optic canal dehiscence aligns closely with their data, reinforcing the importance of preoperative imaging.

In terms of mandibular nerve morphology, our results correspond with the CBCT-based study by Kim and Lee [3], which emphasized the significance of mandibular canal variations in clinical dentistry. Their mean canal diameter was comparable to our results (approximately 2.8–2.9 mm), supporting the reproducibility of these measurements across imaging modalities. Furthermore, our measurement of the distance from the mandibular foramen to the mental foramen ( $30.2 \pm 4.7$  mm) reflects values similar to those found in South Asian populations by Singh et al. [6], confirming ethnic and individual variation.

Ophthalmic artery imaging is relatively underrepresented in existing CT studies. However, our ability to visualize the artery in 78% of cases echoes findings by Cheng et al. [4], who reported a visibility rate of approximately 75% using CTA. The dimensions of the artery (mean  $1.5 \pm 0.2$  mm) were also consistent with those described in anatomical reviews by Michalinos et al. [5]. The relatively high visualization rate of the ophthalmic artery on non-contrast MSCT may be attributed to thin-slice acquisition and high spatial resolution; nevertheless, contrast-enhanced CT angiography remains superior for detailed vascular assessment.

A distinguishing feature of our study is the use of a large, demographically diverse MSCT dataset, to provide detailed anatomical correlations. Compared to traditional cadaveric studies, such as those summarized by Hoving et al. [7], MSCT offers non-invasive insights with real-world spatial relevance. This strengthens the clinical applicability of our findings in surgical planning, especially for procedures involving the skull base, orbit, and mandibular regions [22–26].

Taken together, our results confirm and extend existing knowledge of cranial neurovascular anatomy [27,28]. They emphasize the necessity of personalized anatomical analysis, particularly in populations with high variability [29–31]. Our findings are also consistent with previous morphometric studies of maxillary sinus relationships and applied anatomical modeling approaches [32–33], further supporting the relevance of MSCT-based anatomical assessment in clinical and interdisciplinary contexts. The integration of morphometric datasets into structured analytical systems may further enhance

clinical decision-making, as demonstrated in decision support modeling approaches [34]. Future research should focus on expanding MSCT-based morphometric databases with stratification by age and sex, as well as on the integration of advanced 3D reconstruction techniques to further improve preoperative risk assessment. Comparative studies using CT angiography and cone-beam CT may additionally clarify the limits of non-contrast MSCT in visualizing small-caliber neurovascular structures [35].

### Conclusion.

1. MSCT is a highly effective modality for evaluating the anatomical variability of cranial neurovascular structures.
2. Dehiscence of the optic nerve and ICA were observed in over 10% of cases, necessitating caution in surgical interventions.
3. Significant interindividual variability exists in the course and diameter of the mandibular canal.
4. The ophthalmic artery can be visualized with sufficient clarity in most MSCT scans, aiding surgical navigation.
5. Incorporating 3D reconstruction and statistical morphometry improves diagnostic and anatomical accuracy.

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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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