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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.
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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.
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WEBSITE
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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.

Содержание:

COMPARISON OF AGE-RELATED CHARACTERISTICS OF CEPHALOMETRIC INDICATORS: BIORBITAL BREADTH (EC–EC) AND INTERORBITAL BREADTH (D–D) IN ARTIFICIALLY DEFORMED AND NORMAL SKULLS

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Abstract.

Objective: This study aimed to compare the age-related characteristics of two craniofacial measurements—biorbital breadth (ec–ec) and interorbital breadth (d–d)—between artificially deformed and normal skulls.

Materials and Methods: A total of 254 skulls (200 without artificial deformation and 54 with deformation) from the craniological collection of Azerbaijan Medical University were analyzed. Skulls were categorized by sex and age groups, following a classification system adopted from the 1965 VII All-Union Conference. Cephalometric measurements were taken using electronic and sliding calipers. Statistical analysis included mean values, standard deviation, and 95% confidence intervals.

Results: Across all age groups, skulls with artificial deformation generally exhibited greater mean biorbital and interorbital breadths compared to non-deformed skulls. For example, in the second adulthood group, the average biorbital breadth was 97.2 mm in deformed skulls versus 91.8 mm in non-deformed skulls. Similarly, interorbital breadth was consistently wider in deformed skulls across age subgroups. These findings suggest a measurable impact of artificial cranial deformation on orbital dimensions.

Conclusion: Artificial cranial deformation significantly influences cephalometric parameters of the orbital region. Both biorbital and interorbital breadths were consistently larger in deformed skulls across all age groups. These differences are important for anthropological research, forensic identification, and clinical applications, highlighting the need to consider cranial deformation when interpreting craniofacial measurements in diverse populations.

Key words. Artificial cranial deformation, biorbital breadth (ec–ec), interorbital breadth (d–d), cephalometric analysis, skull morphology, orbital dimensions, age-related variation, forensic anthropology, craniometry, Azerbaijan population.

Introduction.

Craniofacial anthropometry plays a critical role across multiple disciplines, including physical anthropology, forensic science, reconstructive surgery, and ergonomics. Among the many measurements used to assess facial structure, biorbital breadth (ec–ec) and interorbital breadth (d–d) stand out as fundamental parameters for evaluating the transverse dimensions of the orbital region.

The biorbital breadth refers to the linear distance between the lateralmost points of the orbital rims, known as the ectoconchions (ec). This measurement indicates the maximum width of the orbital area and is widely used in anthropological research to investigate population differences, as well as in forensic contexts for estimating biological traits such as sex and ancestry.

In contrast, the interorbital breadth measures the shortest distance between the dacryon points (d), which are located medially at the junction of the frontal, lacrimal, and maxillary bones near the orbital cavity's inner margins. This dimension corresponds roughly to the width of the nasal bridge and represents the narrowest segment of the orbital complex.

Clinically, interorbital breadth holds particular importance when assessing congenital and developmental anomalies, including hypertelorism (increased distance) or hypotelorism (decreased distance) of the orbits. It also serves as a useful reference in facial reconstructive procedures, population classification, and evolutionary investigations.

Together, these two measurements form integral components of craniofacial datasets, aiding in the description of morphological variation both within and between populations. They are also crucial in applied fields such as biomechanics, facial aesthetics, and surgical outcome assessment. Advances in 3D imaging technology and digital anthropometry have significantly improved the accuracy and reproducibility of these metrics, enhancing their value in diverse research and clinical settings.

Recent studies have highlighted the significance of biorbital and interorbital breadth measurements across various populations. For instance, Taneva and Evans (2021) updated 3D craniofacial normative data for healthy adults, offering refined reference values for orbital dimensions [1]. Likewise, investigations by Rana et al. (2023) and Yildiz and Gok (2022) applied CT and 3D imaging methods to characterize orbital widths in Indian and Turkish populations, respectively, underscoring their utility in sex estimation and morphometric profiling [2,3].

Population-specific variability in orbital measurements has been documented by several researchers. Uduak and Ibeabuchi (2020) provided normative data on interorbital and biorbital breadth in Nigerian adults through CT imaging [4]. Similarly, studies by Shaqra et al. (2023) in Saudi Arabia and Rahman et al. (2020) in Bangladesh emphasize the importance of considering ethnic differences when interpreting orbital metrics for clinical or forensic purposes [5,6].

Sexual dimorphism and age-related variation are also well established in orbital anthropometry. Using cone-beam computed tomography (CBCT), Tang et al. (2021) demonstrated significant differences in orbital dimensions across age groups and sexes [7]. Research by Thakur and Kumari (2022) and Moudgil and Kaur (2021) supports these findings within Indian cohorts, noting that males typically present with wider biorbital and interorbital breadths than females [8,9]. These distinctions are especially relevant for forensic sex estimation and anthropological classification.

In addition to traditional radiologic techniques, emerging non-invasive methods have gained attention. For example, Ishak and Wahab (2022) employed 3D facial scanning to reliably measure orbital distances in Malaysian adults, showing strong agreement with conventional imaging [10]. Similarly, Adesina et al. (2020) utilized CT scans to analyze orbital morphometry in a sub-Saharan African sample, contributing valuable normative data for use in global forensic and clinical databases [11].

Clinically, precise knowledge of orbital dimensions is indispensable for orbital reconstructive surgery, ophthalmological interventions, and the design of facial prosthetics. The work of Sehrawat and Ghosh (2020) underscores the relevance of detailed craniofacial measurements in surgical planning and post-trauma reconstruction, while also supporting broader anthropological and evolutionary studies [12].

Collectively, these recent investigations highlight a growing emphasis on standardizing orbital anthropometric norms while tailoring them to specific populations. The integration of advanced imaging modalities with ethnically diverse datasets has deepened our understanding of craniofacial variation, facilitating improved applications in medical, forensic, and anthropological sciences.

Aim: This study aimed to compare the age-related characteristics of two craniofacial measurements—biorbital breadth (ec–ec) and interorbital breadth (d–d)—between artificially deformed and normal skulls.

Materials and Methods.

In order to achieve the main goal of the study, cephalometric measurements were performed on 200 skulls, of which 108 belonged to men and 146 to women. These specimens are part of the craniological collection at the Museum of the Department of Human Anatomy and Medical Terminology, Azerbaijan Medical University. The age intervals of the skulls were determined using age-related information recorded in the museum's registration journals. The classification of age intervals was based on the scheme adopted at the VII All-Union Conference on Problems of Age Morphology, Physiology, and Biochemistry, held in the former USSR in 1965. According to this scheme, age periods are divided into "youth," "I adulthood," "II adulthood," and "old age." These periods have different age ranges for men and women, taking into account physiological and biochemical differences. For men, the age categories were defined as follows: adolescence (13–16 years), youth (17–21 years), I adulthood (22–35 years), II adulthood (36–60 years), and old age (61–74 years). For women, the intervals were: adolescence (12–15 years), youth (16–20 years), I adulthood (21–35 years), II adulthood (36–55 years), and old age (56–74 years). The skulls in the collection span these different age periods.

Historically, due to factors such as climate, customs, and ethnicity, infants were often subjected to various types of headwear and other influences during early infancy, which sometimes resulted in artificially induced cranial deformations. These deformations often persist into later age periods and are reflected in cephalometric parameters. For the purposes of this study, the skulls were divided into two main groups: those with artificial cranial deformation and those without. Within these groups, skulls were further categorized according to the age intervals outlined above, forming subgroups. Cephalometric indicators, specifically "biorbital breadth (ec–ec)" and "interorbital breadth (d–d)," were measured in millimeters within each subgroup for both the deformed and non-deformed skulls. Measurements were taken using an electronic caliper (with a resolution of 0.01 mm and accuracy of ±0.02 mm) and a sliding caliper. The statistical analysis of the obtained data included calculations of the mean, standard deviation, standard error, and the lower and upper bounds of the 95% confidence interval for the mean. The mean (M), median (Me), 25% and 75% percentiles (Percentile 25, Percentile 75) of the studied parameters were calculated. The statistical significance of the difference between the groups' indicators was assessed by the Student-Bonferroni t-test, F-Fisher tests, nonparametric Mann-Whitney U-test, and nonparametric Kruskal-Wallis H-test. The study also used non-parametric Spearman's ρ-rank correlation. Statistical analysis was performed using the IBM Statistics SPSS-26 program.

Results and Discussion.

During our study, out of 200 skulls without artificial deformation, 20 belonged to individuals in the youth age group, 68 to the first adulthood, 72 to the second adulthood, and 40 to the elderly group, representing 10.0%, 34.0%, 36.0%, and 20.0% of the total, respectively. Meanwhile, among the 54 skulls with artificial deformation, 2 belonged to the youth group, 20 to the first adulthood, 25 to the second adulthood, and 7 to the elderly group, corresponding to 3.7%, 37.0%, 46.3%, and 13.0%, respectively.

Regarding gender distribution, of the 200 skulls without deformation, 86 belonged to women and 114 to men, accounting for 43.0% and 57.0% of the total, respectively. In contrast, among the 54 deformed skulls, 32 belonged to women and 22 to men, representing 59.3% and 40.7%, respectively.

In the phase of the study focusing on biorbital breadth (ec–ec) measurements across different age intervals for skulls with and without artificial deformation, the mean biorbital breadth was 90.4 ± 1.3 mm in 20 non-deformed skulls within the youth age interval. In contrast, the average value for skulls with artificial deformation in the same age group (n = 2) was slightly higher, at 97.5 ± 8.5 mm (Table 1).

In the non-deformed youth group (n = 20), the minimum recorded biorbital breadth was 76.61 mm, while the maximum was 98.15 mm. For the corresponding deformed group (n = 2), the minimum was 89.0 mm, and the maximum was 106 mm. The 95% confidence interval for the mean biorbital breadth in non-deformed skulls was calculated as 87.7 mm to 93.2 mm. However, in the deformed skulls of the youth group, these confidence limits were unusually wide, ranging from 10.5 mm to 205.5 mm.

Although the mean biorbital breadth was determined to be 91.7 ± 0.6 mm in the subgroup of skulls from the first adulthood age group (n = 68) without artificial deformation, it was 94.1 ± 2.3 mm in the corresponding age group of skulls with deformation (n = 20). In the non-deformed first adulthood group, the minimum recorded biorbital breadth was 76.41 mm, and the maximum was 100.27 mm. In contrast, the minimum and maximum biorbital

Table 1. Biorbital Breadth (ec–ec) Measurements in Skulls Without Artificial Deformation.

Cephalometric parameter	Age periods	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Biorbital breadth (ec-ec)	Youth	20	90.4	5.8	1.3	87.7	93.2
	I adulthood	68	91.7	5.0	0.6	90.5	92.9
	II adulthood	72	91.8	4.5	0.5	90.7	92.8
	Elderly	40	89.4	6.7	1.1	87.2	91.5
	Total	200	91.1	5.4	0.4	90.4	91.9

		Sum of Squares	df	Mean Square	F	Sig.
Biorbital breadth (ec-ec)	Between Groups	185,810	3	61,937	2,189	0,091
	Within Groups	5546,324	196	28,298		
	Total	5732,135	199			

breadth values for skulls with artificial deformation in the same age group were 56.0 mm and 104.0 mm, respectively. The 95% confidence interval for the mean biorbital breadth in the non-deformed skulls of the first adulthood group ranged from 90.5 mm to 92.9 mm. For the deformed skulls in this group, the confidence interval ranged from 89.4 mm to 98.8 mm (Table 2).

In the next phase of the study, interorbital breadth (d–d) was measured in skulls with and without artificial deformation. The average interorbital breadth in non-deformed skulls from the youth age group (n = 20) was 23.1 ± 0.4 mm, while in the subgroup of deformed skulls from the same age group (n = 2), it was 24.5 ± 0.5 mm. The minimum and maximum interorbital breadth values for non-deformed skulls in the youth group were 18.71 mm and 26.25 mm, respectively. Among the deformed skulls in this age group, the two measured values were 24.0 mm and 25.0 mm. The 95% confidence interval for the mean interorbital breadth in the non-deformed youth group was 22.1 mm to 24.0 mm. In contrast, the corresponding confidence interval for the deformed youth group was wider, ranging from 18.1 mm to 30.9 mm.

An analysis of the biorbital breadth (ec–ec) across age groups reveals consistently higher values in skulls with artificial deformation (Table 2) compared to those without deformation (Table 1). In the youth group, the mean biorbital breadth was 90.4 mm in non-deformed skulls versus 97.5 mm in deformed skulls. This trend persisted across other age groups: in the first adulthood group, deformed skulls showed a mean breadth of 94.1 mm compared to 91.7 mm in non-deformed; in the second adulthood group, 97.2 mm vs. 91.8 mm; and in the elderly group, 96.7 mm vs. 89.4 mm, respectively (Figure 1).

Although the minimum and maximum interorbital breadth (d–d) values recorded in skulls subjected to artificial deformation belonging to individuals in the first adulthood period were 15.51 mm and 31.62 mm, respectively, the average for this subgroup was 22.0 ± 0.3 mm. In contrast, the minimum, maximum, and average interorbital breadth (d–d) values in skulls of individuals from the same age range but without artificial deformation were 11.0 mm, 34.0 mm, and 23.8 ± 1.1 mm, respectively (Table 3). The lower and upper limits of the 95% confidence interval for the mean interorbital breadth in skulls without deformation in this age group were 21.4 mm and 22.7 mm, respectively. For skulls with deformation, these limits were 21.6 mm and 26.0 mm.

In the subgroup consisting of skulls without artificial deformation belonging to individuals in the second adulthood period (n = 72), the minimum recorded biorbital breadth (ec–ec) was 74.45 mm, and the maximum was 99.77 mm, with an average of 91.8 ± 0.5 mm. Meanwhile, in the corresponding subgroup of skulls with artificial deformation, the minimum and maximum biorbital breadth (ec–ec) were 86.00 mm and 106.00 mm, with an average of 97.2 ± 0.9 mm. The lower and upper limits of the 95% confidence interval for the mean biorbital breadth in non-deformed skulls from the second adulthood period were 90.7 mm and 92.8 mm. For deformed skulls from the same period, the confidence interval ranged from 95.4 mm to 99.1 mm.

In the subgroup of subjects belonging to the elderly age range without artificial skull deformation (n = 40), the minimum and maximum biorbital breadth (ec–ec) values recorded were 75.55 mm and 100.83 mm, respectively, with a mean of 89.4 ± 1.1 mm. Conversely, in the subgroup of elderly individuals with signs of artificial deformation (n = 7), the minimum and maximum biorbital breadth values were 90.00 mm and 100.9 mm, with a mean of 96.7 ± 1.6 mm. The 95% confidence interval for the mean biorbital breadth in the non-deformed elderly subgroup ranged from 87.2 mm to 91.5 mm, while in the deformed subgroup, it ranged from 92.4 mm to 100.9 mm.

In the subgroup of skulls belonging to the second adulthood age interval without artificial deformation (n = 72), the minimum and maximum interorbital breadth (d–d) values recorded were 15.59 mm and 29.18 mm, respectively, with a mean of 22.0 ± 0.3 mm. For artificially deformed skulls in the same age group (n = 25), the minimum and maximum interorbital breadth values were 16.0 mm and 31.0 mm, with a mean of 24.0 ± 0.7 mm. The 95% confidence interval for the mean interorbital breadth in the non-deformed subgroup ranged from 21.4 mm to 22.6 mm, whereas in the deformed subgroup, it ranged from 22.6 mm to 25.4 mm (Table 4).

In the elderly subgroup without artificial deformation (n = 40), the minimum and maximum interorbital breadth (d–d) values recorded were 15.37 mm and 26.56 mm, respectively, with a mean of 21.8 ± 0.5 mm. Among the elderly with artificial deformation (n = 7), these values ranged from 20.00 mm to 26.00 mm, with a mean of 23.2 ± 0.8 mm (Table 4). The 95% confidence interval for the mean interorbital breadth was 20.9 mm to 22.8 mm for the non-deformed subgroup and 21.3 mm to 25.2 mm for the deformed subgroup.

Table 2. *Biorbital Breadth (ec–ec) measurement results in Skulls with Artificial Deformation.*

Cephalometric parameter	Age periods	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Biorbital breadth (ec-ec)	Youth	2	97.5	12.0	8.5	10.5	205.5
	I adulthood	20	94.1	10.1	2.3	89.4	98.8
	II adulthood	25	97.2	4.5	0.9	95.4	99.1
	Elderly	7	96.7	4.0	1.6	92.4	100.9
	Total	54	96.0	7.3	1.0	94.0	98.0

		Sum of Squares	df	Mean Square	F	Sig.
Biorbital breadth (ec-ec)	Between Groups	118,189	3	39,396	0,723	0,543
	Within Groups	2669,870	49	54,487		
	Total	2788,059	52			

Table 3. *Interorbital Breadth (d–d) Measurement Results in Skulls without Artificial Deformation.*

Cephalometric parameter	Age periods	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Interorbital breadth (d-d)	Youth	20	23.1	2.0	0.4	22.1	24.0
	I adulthood	68	22.0	2.8	0.3	21.4	22.7
	II adulthood	72	22.0	2.7	0.3	21.4	22.6
	Elderly	40	21.8	2.9	0.5	20.9	22.8
	Total	200	22.1	2.7	0.2	21.7	22.5

		Sum of Squares	df	Mean Square	F	Sig.
Interorbital breadth (d-d)	Between Groups	22,019	3	7,340	0,997	0,395
	Within Groups	1442,548	196	7,360		
	Total	1464,567	199			

Table 4. *Interorbital breadth (d–d) measurements in skulls with artificial deformation.*

Cephalometric parameter	Age periods	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Interorbital breadth (d-d)	Youth	2	24.5	0.7	0.5	18.1	30.9
	I adulthood	20	23.8	4.7	1.1	21.6	26.0
	II adulthood	25	24.0	3.4	0.7	22.6	25.4
	Elderly	7	23.2	2.1	0.8	21.3	25.2
	Total	54	23.8	3.7	0.5	22.8	24.8

		Sum of Squares	df	Mean Square	F	Sig.
Interorbital breadth (d-d)	Between Groups	3,990	3	1,330	0,092	0,964
	Within Groups	721,589	50	14,432		
	Total	725,579	53			

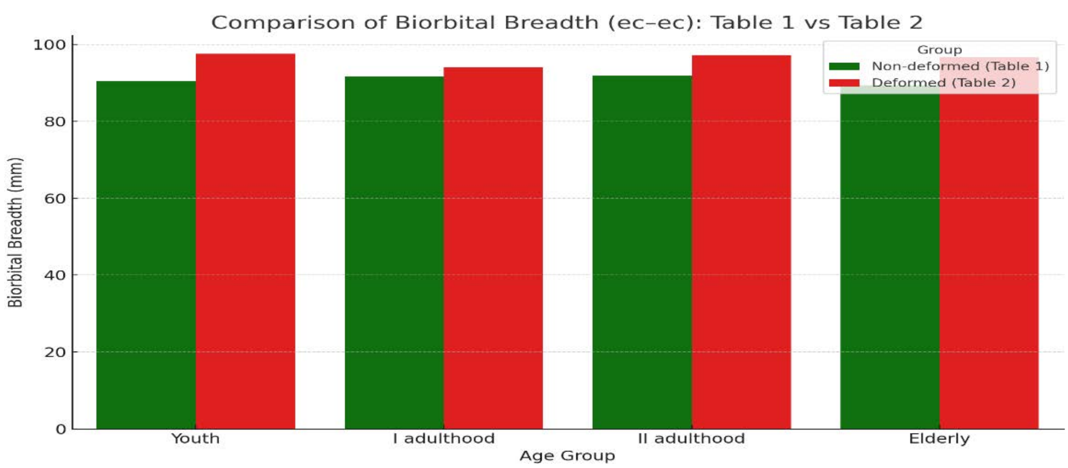

Figure 1. *A mean breadth in deformed and non-deformed skulls across different age groups.*

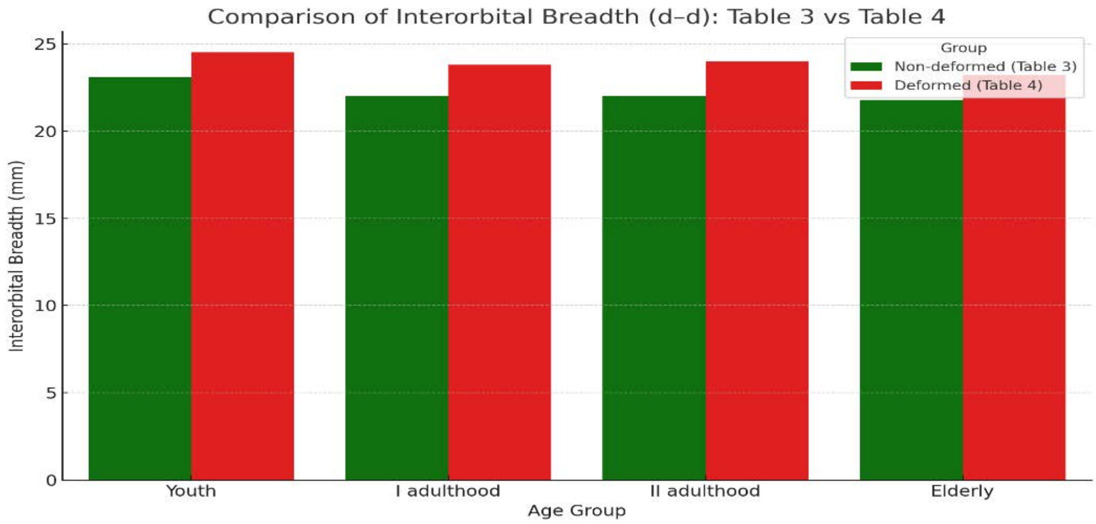

Figure 2. *The comparative analysis of interorbital breadth (d–d) in skulls with artificial deformation and in non-deformed skulls.*

Overall, when all age subgroups were considered together, the minimum and maximum values of Biorbital breadth (ec–ec) in the group of skulls without artificial deformation (n = 200) were calculated to be 74.45 mm and 100.83 mm, respectively, with an average of 91.1 ± 0.4 mm. In the group of skulls showing signs of artificial deformation (n = 54), which also included all age subgroups, the minimum and maximum values of the mentioned cephalometric parameter were 56.00 mm and 106.00 mm, respectively, with an average value of 96.0 ± 1.0 mm. At the same time, the lower and upper limits of the 95% Confidence Interval for the mean Biorbital breadth (ec–ec) in the group without artificial deformation were determined to be 90.4 mm and 91.9 mm, respectively.

The comparative analysis of interorbital breadth (d–d) shows that skulls with artificial deformation (Table 4) consistently exhibit greater mean values across all age groups when compared to non-deformed skulls (Table 3). In the youth group, the mean interorbital breadth was 23.1 mm in non-deformed skulls and 24.5 mm in deformed skulls. Similarly, in the first adulthood group, the values were 22.0 mm versus 23.8 mm; in the second adulthood group, 22.0 mm versus 24.0 mm; and in the elderly group, 21.8 mm versus 23.2 mm, respectively (Figure 2).

The present study provides a comprehensive cephalometric comparison of biorbital breadth (ec–ec) and interorbital breadth (d–d) between artificially deformed and non-deformed skulls across various age groups. The findings clearly indicate that artificially deformed skulls exhibit significantly larger orbital transverse dimensions, a pattern consistent with previous anthropological and radiological studies evaluating craniofacial changes due to early mechanical modification.

Conclusion.

This study demonstrated that artificial cranial deformation is associated with significant alterations in craniofacial morphology, particularly in orbital dimensions. Both biorbital breadth (ec–ec) and interorbital breadth (d–d) were found to be consistently greater in skulls with deformation compared to those without, across all age groups examined. These findings reinforce the importance of accounting for cultural and historical practices of cranial modification when analyzing cephalometric data for forensic, clinical, or anthropological purposes. The study contributes valuable population-specific normative data and underscores the relevance of age and deformation status in orbital morphometric assessments.

REFERENCES

1. Taneva E.D, Evans C.A. Three-dimensional craniofacial norms in adults: An updated digital database. Journal of Craniofacial Surgery. 2021;32:1309-1314.
2. Rana R.E, Thakur N, Agrawal D. Anthropometric evaluation of orbital dimensions in an Indian population using 3D imaging. Journal of Oral and Maxillofacial Radiology. 2023;11:45-51.
3. Yildiz M, Gok M. Sex estimation using orbital measurements: A CT-based study in a Turkish adult population. Forensic Imaging. 2022;28:200460.
4. Uduak A.A, Ibeabuchi N.M. Orbital dimensions and interorbital distance among young adults in Nigeria using CT scans. Nigerian Journal of Medical Imaging and Radiation Therapy. 2020;9:14-20.
5. Shaqra M.A. Morphometric analysis of the orbit in a Saudi population using CT. Anatomical Science International. 2023;98:230-238.
6. Rahman M.M. Anthropometric measurements of orbital dimensions in Bangladeshi adults using CT imaging. Anatomy & Cell Biology. 2020;53:291-296.
7. Tang Z, Chen Y, Wu J. Age- and sex-related changes in craniofacial parameters assessed by CBCT. International Journal of Oral and Maxillofacial Surgery. 2021;50:1315-1322.
8. Moudgil R, Kaur J. Orbital anthropometry in northwestern Indian adults using radiologic techniques. Journal of Clinical Imaging Science. 2021;11:54.
9. Thakur A, Kumari R. Sexual dimorphism in orbital measurements: A study from Eastern India. Indian Journal of Forensic Medicine & Toxicology. 2022;16:456-462.
10. Ishak M.I, Wahab N.A. Digital analysis of orbital dimensions using 3D facial scanning in a Malaysian sample. Journal of Craniofacial Surgery. 2022;33:e465-e469.

11. Adesina A.M, Computed tomography-based orbital morphometry in a sub-Saharan population. Scientific African. 2020;8:e00395.

12. Sehrawat J.S, Ghosh K. Craniometric variation in North Indian skulls: Implications in forensic anthropology. Egyptian Journal of Forensic Sciences. 2020;10:13.