Original Research

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Assessment of craniovertebromandibular symmetry using cone-beam computed tomography: validation of a patented three-dimensional diagnostic method

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Abstract

AIM. The aim of the study was to validate a patented three-dimensional method for assessing craniovertebromandibular symmetry using cone-beam computed tomography (CBCT) in patients with temporomandibular joint dysfunction (TMJD).

MATERIALS AND METHODS**.** Ninety patients (54 females and 36 males), aged 19–60 years, diagnosed with temporomandibular joint dysfunction (TMJD) and exhibiting extraocclusal disorders, were included in the study. A standardized CBCT protocol (FOV ⩾ 13 × 15 cm) including the cranial base and cervical vertebrae C_0–C_2 was applied. Three-dimensional cephalometric analysis was performed in coronal, axial, and sagittal planes, measuring angular and linear parameters between cranial, mandibular, and cervical landmarks. Intra-class correlation coefficients (ICC) were calculated to determine reproducibility. Statistical analysis was conducted using paired t-tests, with significance set at $p < 0.05$.

RESULTS. Asymmetry was observed in 100% of subjects, regardless of clinically symmetrical occlusion. The largest deviations were found in the Zy–Go angular measurement, reflecting predominant cranial-mandibular imbalance. Significant right–left differences were recorded across all reference lines (Zy–Go, Po–U6, C_0–C_1, C_1–C_2) ($p < 0.01$–0.001). Mean ICC values exceeded 0.90, confirming high methodological reliability.

CONCLUSIONS. It was established that craniovertebromandibular asymmetry occurs in all patients with TMJD and identified extraocclusal disturbances. The developed CBCT-based protocol allows precise quantification of cranio-cervico-mandibular relationships, enhancing diagnostic accuracy and supporting individualized interdisciplinary management of occlusal and postural disturbances.

Keywords: craniovertebromandibular complex, asymmetry, cone-beam computed tomography, cephalometry, postural imbalance, temporomandibular joint, extraocclusial disturbances

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Оценка симметрии краниовертебромандибулярного комплекса с использованием конусно-лучевой компьютерной томографии

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Резюме

ЦЕЛЬ ИССЛЕДОВАНИЯ. Целью исследования являлась валидация запатентованного метода трехмерной оценки симметрии краниовертебромандибулярного комплекса (КВМК) с использованием конусно-лучевой компьютерной томографии (КЛКТ) у пациентов с дисфункцией височно-нижнечелюстного сустава (ДВНЧС).

МАТЕРИАЛЫ И МЕТОДЫ. В исследование включены 90 пациентов (54 женщины и 36 мужчин) в возрасте от 19 до 60 лет с ДВНЧС и выявленными экстраокклюзионными нарушениями. Выполнен стандартный КЛКТ-протокол с полем обзора не менее 13 × 15 см, охватывающим основания черепа и шейные

позвонки C_0–C_2. Анализ проводился в трех плоскостях (фронтальной, аксиальной и сагиттальной) с измерением угловых и линейных параметров между краниальными, мандибулярными и шейными ориентирами. Для оценки воспроизводимости использовали коэффициент внутриклассовой корреляции (ICC), статистический анализ выполняли с помощью парного t-теста при уровне значимости $p < 0,05$.
РЕЗУЛЬТАТЫ. Асимметрия была выявлена у 100 % обследованных пациентов независимо от клинической симметрии окклюзии. Наибольшие отклонения наблюдались по угловому параметру Zy–Go, отражающему дисбаланс между черепом и нижней челюстью. Различия между правой и левой сторонами по всем линиям (Zy–Go, Po–U6, C_0–C_1, C_1–C_2) достигали статистической значимости ($p < 0,01$–$0,001$). Средние значения ICC превышали 0,90, что подтверждает высокую воспроизводимость методики.
ВЫВОДЫ. Установлено, что асимметрия КВМК встречается у всех пациентов с ДВНЧС и выявленными экстраокклюзионными нарушениями во всех случаях. Разработанный КЛКТ-протокол обеспечивает количественную оценку краниоцервикомандибулярных соотношений, что повышает точность диагностики и позволяет планировать междисциплинарное лечение с учетом постуральных и суставных факторов.

Ключевые слова: краниовертебромандибулярный комплекс, асимметрия, КЛКТ, цефалометрия, постуральный дисбаланс, височно-нижнечелюстной сустав, экстраокклюзионные нарушения

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INTRODUCTION

The craniovertebromandibular complex (CVMC) represents an integrated anatomical and functional unit that links the cranial base, mandible, and cervical spine. Its balanced spatial relationship is fundamental for proper occlusion, temporomandibular joint (TMJ) biomechanics, postural alignment, and neuromuscular coordination. Even minor disturbances within this system can manifest as mandibular deviation, TMJ pain, occlusal instability, and secondary musculoskeletal disorders affecting the cervical and thoracic regions [1].

Previous experimental work has demonstrated that both occlusal and extraocclusal disturbances alter mandibular biomechanics and induce compensatory postural adaptations, highlighting their systemic influence on the stomatognathic and musculoskeletal systems. [2].

Traditional diagnostic methods for assessing craniofacial symmetry – such as two-dimensional cephalometry or photographic analysis – provide limited accuracy due to projection distortions and superimposition of anatomical structures. These shortcomings reduce diagnostic reliability and hinder the identification of subtle skeletal asymmetries that influence treatment outcomes in orthodontics, prosthodontics, and osteopathy [3].

Recent advances in cone-beam computed tomography (CBCT) have expanded the possibilities for three-dimensional assessment of craniofacial morphology. However, standardized protocols for quantifying symmetry between cranial, mandibular, and vertebral landmarks remain insufficiently developed. Most existing studies focus primarily on the maxillofacial area, neglecting the interrelation between cranial and cervical structures that play a key role in postural and occlusal balance [4].

Particular attention in the present study was given to the upper cervical spine (C_0–C_2) as a structural and functional component of the craniovertebromandibular complex, directly influencing mandibular biomechanics and postural alignment.

To address this diagnostic gap, a novel CBCT-based method for the assessment of craniovertebromandibular symmetry was developed and patented. The approach involves three-dimensional cephalometric analysis across coronal, axial, and sagittal planes, enabling accurate evaluation of skeletal relationships from the cranial base to the cervical vertebrae. This technique eliminates the influence of two-dimensional artifacts and allows clinicians to identify compensatory or structural asymmetries that may affect treatment planning.

The present study aims to validate this patented diagnostic protocol by analyzing CBCT data of patients with clinical signs of postural and occlusal imbalance, quantifying the prevalence and degree of craniovertebromandibular asymmetry, and demonstrating its relevance for interdisciplinary dental and osteopathic management.

MATERIALS AND METHODS

Study Design and Population

A cross-sectional observational study was conducted to evaluate craniovertebromandibular symmetry using a newly patented CBCT-based diagnostic protocol. Ninety patients (54 females and 36 males) aged 19 to 60 years were enrolled. All participants were diagnosed with TMJD and exhibited extraocclusal disturbances, such as mandibular deviation, TMJ clicking, and postural imbalance with cervical rotation patterns.

Inclusion criteria comprised: (1) age between 18 and 65 years, (2) absence of acute inflammatory processes in the orofacial region, and (3) availability of high-quality CBCT data with full visualization of the cranial base and cervical vertebrae C_0–C_2. Exclusion criteria included previous orthognathic surgery, severe trauma, or congenital craniofacial anomalies.

All participants underwent standardized clinical examination, including visual assessment of posture and

mandibular trajectory during mouth opening, followed by cone-beam computed tomography (CBCT) for three-dimensional morphometric analysis.

Imaging Protocol

CBCT examinations were performed with a minimum field of view (FOV) of 13 × 15 cm, ensuring coverage from the upper orbital rim to the hyoid bone horns. The scanning field also encompassed the craniovertebral junction (C_0–C_2) to assess cervical alignment and its relationship with cranial and mandibular structures. The scans were acquired in natural head position with the Frankfurt horizontal plane parallel to the floor.

Reformats were generated in coronal, axial, and sagittal planes to visualize bilateral landmarks and calculate angular and linear symmetry indices.

Landmark Identification and Measurement Protocol

The following bilateral anatomical landmarks were identified:

– Zy_1, Zy_2 – intersection points of the zygomatic arch and the greater wing of the sphenoid bone;

– Po_1, Po_2 – superior margins of the external auditory meatus;

– Go_1, Go_2 – gonial angles of the mandible;

– $U6_1$, $U6_2$ (or $U7_1$, $U7_2$) – mesiobuccal cusps of the first or second upper molars;

– $U3_1$, $U3_2$ – cusp tips of the upper canines;

– C_0, C_1, C_2 – basion of the occipital bone, atlas, and axis vertebrae.

Coronal Plane Analysis

Lines connecting the paired points Zy–Go and Po–U6 were constructed. The angular deviation between the right and left lines was measured relative to the facial midsagittal plane. Additional analysis included measuring the intersection point of the sphenoid wings and it's offset from the midline.

Linear distances C_0–C_1 and C_1–C_2 were measured bilaterally to assess cervical symmetry. The difference between right and left measurements (ΔC_0–C_1, ΔC_1–C_2) reflected vertebral misalignment.

Axial Plane Analysis

Symmetry of the mandible and cranial base was assessed by comparing the angular relationship of lines Zy–Go and Po–U3 relative to the midsagittal plane. Deviations exceeding 2° were considered clinically significant.

Sagittal Plane Analysis

The craniovertebral angle (CVA) was determined as the angle formed between MacGregor's line (passing along the occipital base) and the odontoid process of C_2. Additional measurements included:

– distance from the hyoid bone to a line drawn from the lower border of C_3 to point B;

– distance between the occipital bone and spinous process of C_2;

– presence of Ponticulus Posticus (Kimmerle anomaly) at C_1, recorded as a morphological feature.

Measurement Accuracy and Reliability

All measurements were performed twice by two independent operators with a 2-week interval. The intraclass correlation coefficient (ICC) was calculated to assess reproducibility. Mean ICC values above 0.90 were considered acceptable for methodological validation.

Statistical Analysis

Quantitative variables were tested for normal distribution using the Shapiro–Wilk test. Descriptive statistics were expressed as mean ± standard deviation (SD). Paired t-tests were applied to compare right and left sides. The prevalence of asymmetry (deviation >2° or difference >1 mm) was recorded as a categorical variable.

RESULTS

A total of 90 patients were examined according to the patented CBCT-based protocol. Asymmetry was detected in 100% of cases across all evaluated parameters and planes of measurement.

Quantitative analysis revealed deviations between the right and left sides in every examined line – both angular (Zy–Go, Po–U6, Po–U3) and linear (C_0–C_1, C_0–C_1). Even in patients with clinically symmetrical occlusion, three-dimensional reconstruction demonstrated measurable discrepancies of skeletal alignment.

Table 1 summarizes the mean asymmetry values with standard deviation. The highest magnitude of deviation was observed in the angular measurement between the zygomatic and mandibular landmarks (Zy–Go), confirming the predominance of cranial-mandibular imbalance within the craniovertebromandibular complex. Significant differences were also observed in the linear parameters C_0–C_1 and C_0–C_1, confirming measurable asymmetry within the upper cervical region. These deviations correlated with the clinical type of mandibular displacement and osteopathic dysfunction patterns identified during examination, linking skeletal asymmetry with functional disturbances characteristic of TMJD.

Table 1. Mean asymmetry values with standard deviation

Таблица 1. Средние значения асимметрии со стандартным отклонением

Parameter	Prevalence of Asymmetry, %	*p*-value
Angular deviation Zy–Go (°)	100	< 0.001
Po–U6 angular difference (°)	100	< 0.001
ΔC_0–C_1 (mm)	100	< 0.01
ΔC_1–C_2 (mm)	100	< 0.01

DISCUSSION AND CONCLUSIONS

The results of this study demonstrate that craniovertebromandibular asymmetry is consistently observed in patients with temporomandibular joint dysfunction (TMJD) and identified extraocclusal disturbances. This observation confirms that structural imbalance between the cranial base, mandible, and cervical spine represents a characteristic component of dentofacial

and postural disorders in TMJD patients. Even patients with visually symmetrical occlusion exhibited measurable deviations in all lines of analysis. Such findings highlight the limitations of two-dimensional clinical assessment and reinforce the diagnostic necessity of three-dimensional visualization. The developed CBCT-based protocol effectively eliminates projectional artifacts and allows for precise evaluation of angular and linear deviations. These advantages make it particularly valuable in interdisciplinary diagnosis involving orthodontists, osteopaths, and maxillofacial specialists [5; 6].

The consistent presence of craniovertebromandibular asymmetry in this cohort suggests a biomechanical link between mandibular deviation and compensatory cervical adaptations, which may underlie the persistence of TMJD symptoms.

From a biomechanical perspective, the detected asymmetries likely represent a combination of adaptive and structural changes within the craniovertebromandibular system. Previous research has shown that mandibular deviations often correlate with compensatory cervical rotations and alterations in postural balance. Our data confirm this relationship, as deviations in C_0–C_1 and C_1–C_2 distances were consistently associated with angular disbalance at the cranial and mandibular levels. This finding supports the hypothesis that the cranial base and cervical spine form a single functional continuum influencing mandibular position. Consequently, correction of occlusal or orthopedic conditions without consideration of cervical alignment may lead to treatment relapse. The present study therefore substantiates the necessity of integrated diagnostic protocols in managing temporomandibular and postural dysfunctions [7; 8].

Comparison of our results with previous works confirms the broader clinical relevance of craniovertebral asymmetry. Studies by Makichyan et al. demonstrated that mandibular deviation is closely related to postural and osteopathic dysfunctions, and that targeted correction improves symmetry of mandibular biomechanics [9]. The present study extends these findings by introducing a validated three-dimensional method capable of detecting skeletal asymmetry across multiple levels. These findings emphasize the diagnostic importance of evaluating the upper cervical spine (C_0–C_2) within the craniovertebromandibular framework, as minor atlanto-occipital or atlantoaxial misalignments may significantly affect mandibular positioning and postural equilibrium. The observation that all patients in this TMJD cohort demonstrated measurable deviations across all lines of reference underscores the consistent occurrence of this phenomenon within this clinical population. Such comprehensive quantification allows early identification of structural risks and informs individualized treatment strategies. In this regard, the patented CBCT protocol represents a significant step forward in precision diagnostics for craniofacial medicine.

Clinically, the results underline the necessity of incorporating CBCT-based symmetry evaluation into standard diagnostic workflows. This approach enables clinicians to detect hidden imbalances that may compromise occlusal stability, splint therapy, or orthodontic retention. Quantitative monitoring of symmetry during treatment may also serve as an indicator of postural adaptation and therapy effectiveness. By integrating three-dimensional cephalometric data with functional and osteopathic examination, practitioners can achieve more predictable outcomes and better understand the biomechanical nature of TMJD-related asymmetries. Ultimately, recognition of craniovertebromandibular asymmetry as a universal diagnostic marker shifts the paradigm from isolated dental correction toward holistic postural rehabilitation. Further integration of CBCT-based symmetry analysis with osteopathic assessment protocols may enhance personalized diagnostics and improve rehabilitation outcomes in TMJD-related disorders. Future research should focus on establishing normative reference values and exploring dynamic changes in symmetry during long-term treatment.

REFERENCES / СПИСОК ЛИТЕРАТУРЫ

1. Minervini G., Franco R., Marrapodi M.M., Crimi S., Badnjević A., Cervino G. et al. Correlation between temporomandibular disorders (TMD) and posture evaluated trough the diagnostic criteria for temporomandibular disorders (DC/TMD): A systematic review with meta-analysis. *J Clin Med*. 2023;12(7):2652. https://doi.org/10.3390/jcm12072652
2. Makichyan T., Gusakova E., Khabadze Z., Rylsky A. Somatic dysfunctions in the modeling of occlusal and extraocclusal disorders. *Georgian Med News*. 2025;(4):90–93. Available at: https://www.geomednews.com/Articles/2025/4_2025/90-93.pdf (accessed: 02.09.2025).
3. Albert C., Haddad C., Lungu I.I., Costescu E., Apintiliesei A., Bahrim D.C. et al. (). Different bite classes and their influence on body posture: A review. *Romanian Journal of Oral Rehabilitation*. 2024;16(4):236–245. https://doi.org/10.62610/rjor.2024.4.16.23
4. Liberton D.K., Verma P., Contratto A., Lee J.S. Development and validation of novel three-dimensional craniofacial landmarks on cone-beam computed tomography scans. *J Craniofac Surg*. 2019;30(7):e611–e615. https://doi.org/10.1097/SCS.0000000000005627
5. España-Pamplona P., Zamora-Martinez N., Tarazona-Álvarez B., Pangrazio-Kulbersh V., Paredes-Gallardo V. Three-dimensional quantification of mandibular asymmetries in Caucasian adult patients with different sagittal and vertical skeletal patterns. A cone beam study using 3D segmentation and mirroring procedures. *Head Face Med*. 2023;19(1):54. https://doi.org/10.1186/s13005-023-00400-2
6. Shetty S.R., Al-Bayatti S., AlKawas S., Talaat W., Narasimhan S., Gaballah K. et al. Analysis of the volumetric asymmetry of the mandibular condyles using CBCT. *Int Dent J*. 2022;72(6):797–804. https://doi.org/10.1016/j.identj.2022.06.019
7. Kaczmarek B., Kaczmarek L., Mysliwiec A., Lipowicz A., Dowgierd K. Kinematic relationship between temporomandibular and cervical spine joints. *J Oral Rehabil*. 2025;52(9):1496–1504. https://doi.org/10.1111/joor.14015

8. Di Giacomo P., Ferrara V., Accivile E., Ferrato G., Polimeni A., Di Paolo C. Relationship between cervical spine and skeletal Class II in subjects with and without temporomandibular disorders. *Pain Res Manag*. 2018;2018:286796. https://doi.org/10.1155/2018/4286796
9. Makichyan T.G., Gusakova E.V., Khabadze Z.S., Sulimov A.S. A method for assessing changes in mandibular biomechanics using a software-hardware system. *Endodontics Today*. 2025;23(3):347–351. https://doi.org/10.36377/ET-0104
Макичян Т.Г., Гусакова Е.В., Хабадзе З.С., Сулимов А.С. Способ определения изменения биомеханики нижней челюсти с помощью программно-аппаратного комплекса. *Эндодонтия Today*. 2025;23(3):347–351. https://doi.org/10.36377/ET-0104

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Author’s Contribution

All the authors made equal contributions to the publication preparation in terms of the idea and design of the article; data collection; critical revision of the article in terms of significant intellectual content and final approval of the version of the article for publication.

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