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CORRELATIONS OF TELEROENTGENOMETRIC INDICATORS ACCORDING TO THE STEINER METHOD WITH THE DIMENSIONS OF TEETH AND DENTAL ARCHES IN YOUNG MEN AND YOUNG WOMEN WITH A PHYSIOLOGICAL BITE WITHOUT TAKING INTO ACCOUNT THE TYPE OF FACE

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Annotation. *The importance of teleradiographic indicators in the diagnosis and planning of orthodontic treatment is difficult to overestimate, but their relationship with the size of teeth and dental arches in different age and sex groups remains insufficiently studied. This is especially relevant for the Ukrainian population, where individual anatomical features can affect the effectiveness of orthodontic interventions, which makes the study of such relationships important for improving approaches to diagnosis and treatment. The purpose of the study is to establish the specifics of correlations between teleroentgenometric parameters according to the Steiner method with the dimensions of teeth and dental arches in Ukrainian young men and young women with a physiological bite. A morphometric study of the teeth and dental arches was carried out, and teleroentgenometric indicators were determined using the Steiner method from the primary computer tomograms of 41 Ukrainian young men (aged 17 to 21) and 68 Ukrainian young women (aged 16 to 20), which were obtained from data bank of the Department of Pediatric Dentistry and Research Center of the National Pirogov Memorial Medical University, Vinnytsya. The evaluation of correlations between teleroentgenometric indicators according to the Steiner method and computed tomographic dimensions of teeth and dental arches was carried out in the license package "Statistica 6.0" using Spearman's non-parametric statistics. As a result of the analysis of the reliable and average strength of unreliable correlations between teleroentgenometric parameters according to the Steiner method with the sizes of teeth and dental arches, it was established: in young men - 5.71 % of similar relationships with the sizes of the teeth of the upper jaw (mostly reliable straight lines of average strength with the sizes of incisors and canines), only 1.79 % with the dimensions of the teeth of the lower jaw and 6.60 % with the dimensions of the dental arches (mainly reliable straight and reverse of medium strength with distances characterizing the position of canines and first premolars relative to the hard palate, as well as the distance between the crowns of the central incisors and the line that connects the molars of the upper jaw); in young women - 4.82 % of similar relationships with the dimensions of the teeth of the upper jaw (mostly reliable straight lines of weak force with the dimensions of canines), 5.00 % with the dimensions of the teeth of the lower jaw (mostly reliable straight lines of weak force with the dimensions of incisors), 14.58 % with the dimensions of dental arches (mainly reliable direct and reverse medium strength with the distances between the crowns of the central incisors and the line connecting the canines, the first premolars and molars of the upper jaw, as well as the distances between the distal and medial roots of the lower first molars). Thus, in Ukrainian young men and young women with a physiological bite, the peculiarities and gender differences of the correlations between teleroentgenometric indicators according to the Steiner method and computed tomographic dimensions of teeth and dental arches were established.*

Keywords: *dentistry, teeth, dental arches, morphometry, teleroentgenometry, cone-beam computed tomography, correlations, Ukrainian young men and young women, physiological occlusion, sexual dimorphism.*

Introduction

Abnormalities in the development of teeth and dental arches are a common problem among orthodontic patients worldwide. According to various studies, the incidence of congenital dental anomalies varies by region and ethnicity. For example, a study conducted in India showed that abnormalities occur in 12.5 % of the population [24]. Another study among children in Nigeria found a similar frequency of 13.7 % [30]. In Turkey, the frequency of detected anomalies was 17.3 %, which indicates the significant prevalence of these pathologies [3].

In European countries, the frequency of dental anomalies is also high. In France, a retrospective study showed that anomalies are found in 26 % of patients seeking orthodontic care [5]. At the same time, in Australia, this figure is 22.8 % [10], which confirms the global problem faced by orthodontists.

In Ukraine, such studies are not so common, but the importance of conducting them is obvious, since the anthropometric indicators of the local population can differ significantly from international data. That is why the study of the relationship of teleroentgenometric indicators according to the Steiner method with the size of teeth and dental arches in Ukrainian YM and YW is relevant and allows adapting international diagnostic standards to national characteristics [1, 2]. In general, it is known that teleroentgenometric indicators and their relationships with the dimensions of teeth and dental arches can be different depending on many factors, including racial and ethnic

differences [9, 28].

The Steiner method is used to analyze the relationship between the size of the teeth, their position and the configuration of the dental arches [6, 7]. It helps to determine the exact parameters of abnormalities, which is necessary for planning effective treatment. For example, studies in Turkey have shown that anomalies of the dentition are often accompanied by deviations in teleroentgenometric indicators [3], which makes the use of this method extremely important.

The high prevalence of abnormalities in the development of teeth and dental arches, revealed in numerous studies, emphasizes the need for a detailed study of teleroentgenometric indicators among different ethnic groups. For example, in Mexico, the prevalence of such anomalies among the population is 19.5 % [15], while in the USA this indicator reaches 23.6 % [13]. The use of precise techniques, such as the Steiner method, helps to correlate this data with the dimensions of the dental arches and to develop personalized treatment plans.

Thus, the study of the specifics of the relationship of teleroentgenometric indicators according to the Steiner method with the dimensions of teeth and dental arches in Ukrainian young men and young women will help to create more accurate protocols for the treatment of bite anomalies. This study will also provide new data on the prevalence and nature of anomalies among the Ukrainian population, which will improve the effectiveness of orthodontic treatment and diagnostics in this population group.

The purpose of the study is to establish the specifics of correlations between teleroentgenometric parameters according to the Steiner method with the dimensions of teeth and dental arches in Ukrainian young men and young women with a physiological bite.

Materials and methods

Primary computed tomography scans of 41 Ukrainian young men (YM) (aged 17 to 21) and 68 Ukrainian young women (YW) (aged from 16 to 20 years). All of them had a physiological bite that was as close as possible to orthognathic. Clinical treatment of such a bite is defined as the most desirable final option for treatment of orthodontic pathology. YM and YW who had previous orthodontic treatment, pathology of ENT organs, the presence of complaints about the functioning of the temporomandibular joint, surgical interventions and injuries that could affect the growth and development of the maxillofacial system were excluded from the study. All teleroentgenographic (voltage on the generator 90 kV, current strength - 10 mA, exposure time - 0.1 s, effective radiation dose - up to 0.001 mSv) and computer tomographic (voltage on the generator 60-90 kV, current strength - 4-5 mA, exposure time - 13.5 s, effective radiation dose - up to 0.11-0.48 mSv) studies were performed using a dental cone-beam tomograph Veraviewepocs 3D Morita (Japan) and Planmeca ProMax 3D Mid, manufacturer Planmeca OY (Finland) were conducted based on the principle voluntary informed consent in the private dental clinic "Vinintermed" and in the "Planmeca 3D Center for Maxillofacial Diagnostics". The Bioethics Committee of the National Pirogov Memorial Medical University, Vinnytsya (protocol No. 7 dated November 8, 2022) found that the conducted research does

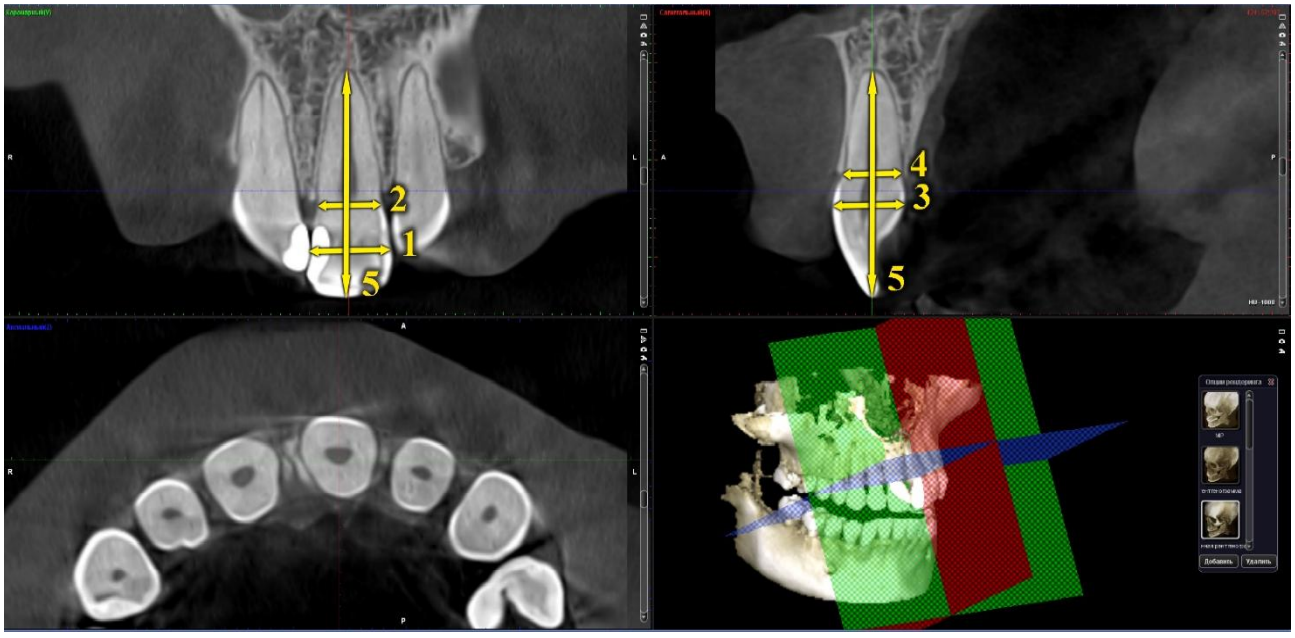

Fig. 1. Determination of metric characteristics of incisors and canines, upper and lower jaws. 1 - width of the crown part in the mesio-distal plane (MdK); 2 - the width of the cervical part of the tooth in the mesio-distal plane (MdC); 3 - the width of the crown part in the vestibulo-oral plane (VoK); 4 - the width of the cervical part of the tooth in the vestibulo-oral plane (VoC); 5 - tooth length (same) in the mesio-distal and vestibulo-oral planes (MdLD).

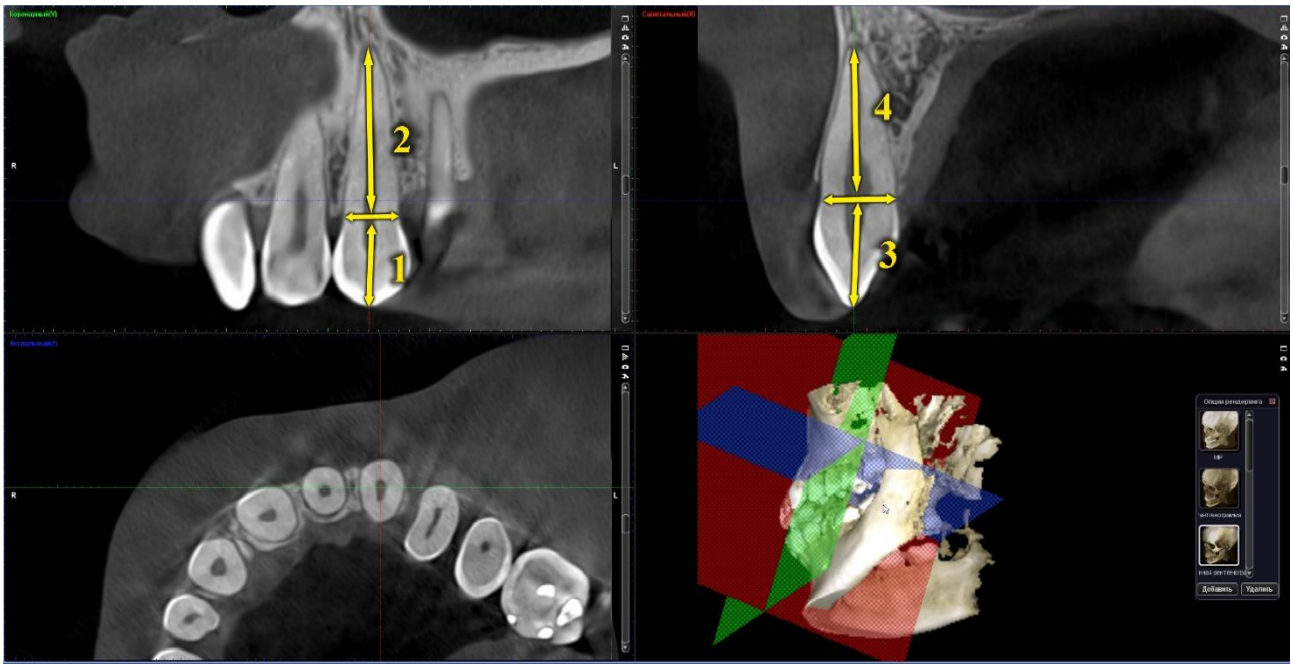

Fig. 2. Determination of metric characteristics of incisors and canines, upper and lower jaws. 1 - length of the crown part in the mesio-distal plane (MdLK); 2 - length of the root part in the mesio-distal plane (MdLR); 3 - length of the crown part in the vestibulo-oral plane (VoLK); 4 - the length of the root part in the vestibulo-oral plane (VoLR).

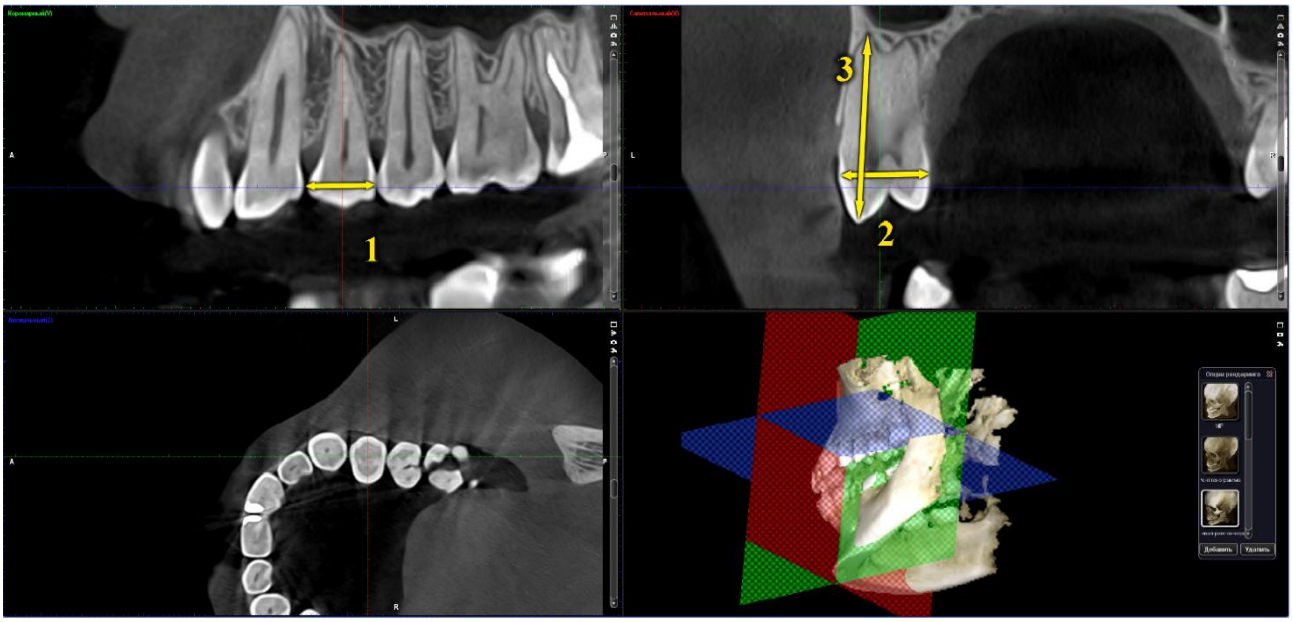

Fig. 3. Determination of metric characteristics of small angular teeth (premolars) of the upper and lower jaws. 1 - width of the crown part in the mesio-distal plane (MdK); 2 - the width of the crown part in the vestibulo-oral plane (VoK); 3 - tooth length in the vestibulo-oral plane (MdLD).

not contradict the basic bioethical norms of the Declaration of Helsinki, the Council of Europe Convention on Human Rights and Biomedicine (1977), the relevant provisions of the WHO and the laws of Ukraine.

We used i-Dixel One Volume Viewer software (Ver.1.5.0) by J Morita Mfg. to conduct a morphometric study of teeth and dental arches. Cor, and Planmeca Romexis Viewer (ver. 3.8.3.R 15.12.14) Planmeca OY.

For the frontal group of teeth, namely for the incisors and canines of the upper and lower jaws, the width of the coronal and cervical (the width between the dentino-enamel borders) part of the tooth and the length of the entire tooth in the coronal and sagittal planes (Fig. 1), as well as the length of the crown and root were determined parts relative to the cervical line in the corresponding planes (Fig. 2).

For the premolars (Fig. 3) and the first molar (Fig. 4) of

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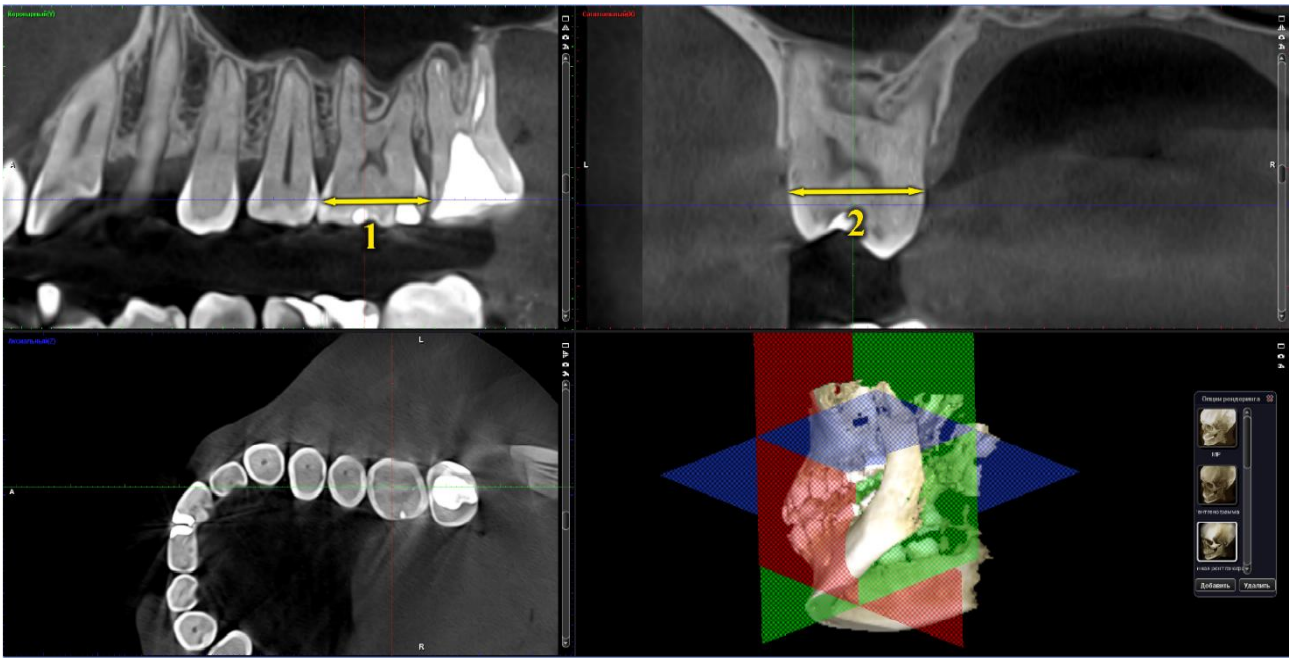

Fig. 4. Determination of metric characteristics of large angular teeth (molars) of the upper and lower jaws. 1 - width of the crown part in the mesio-distal plane (MdK); 2 - the width of the crown part in the vestibulo-oral plane (VoK).

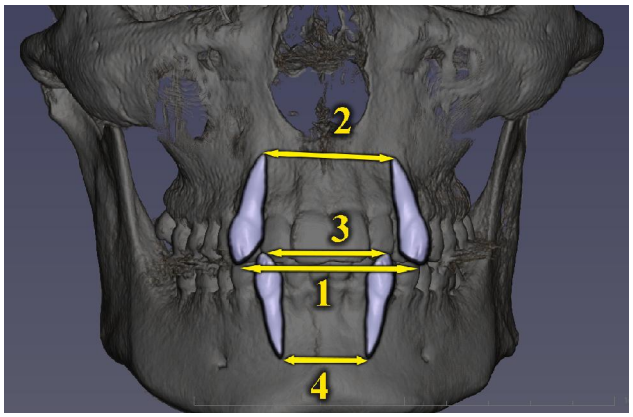

Fig. 5. Determination of the distance between the tearing cusps (1 - distance 13_23Bugr) and the tops of the roots (2 - distance 13_23Apx) of the canines on the upper jaw and between the tearing cusps (3 - distance 33_43Bugr) and the tops of the roots (4 - distance 33_43Apx) of the canines on the lower jaw.

the upper and lower jaws, the width of the crown part was determined in the mesio-distal and vestibulo-oral planes. In addition, for premolars, the length of the tooth was determined, which was measured between the tops of the vestibular hump and the root. If the premolar has two roots, the apex of the vestibular root was chosen (see Fig. 3). Given that the geometry of the roots of the first molars is quite variable (bends and deformations are common), we did not measure their length and related dimensions.

In previous studies, no significant differences or trends were found when comparing the computed tomographic dimensions of the right and left teeth of the same name [22]. Therefore, we use the average values of the corresponding teeth on the upper and lower jaws: 11 or 41 - upper or lower central incisors, 12 or 42 - upper or lower lateral incisors, 13 or 43 - upper or lower canines, 14 or 44 - upper or lower first incisors premolars, 15 or 45 - upper or lower second premolars, 16 or 46 - upper or lower first molars.

To characterize the natural variety of shapes and sizes of dental arches, we used indicators that, in the transversal (axial) plane, characterize the distance between the cusps of the crowns and the tops of the roots of the canines (Fig. 5) and the first molars (Fig. 6) of the upper and lower jaws, which form a large and small keys of occlusion according to Engel, as well as the distance between premolar and molar

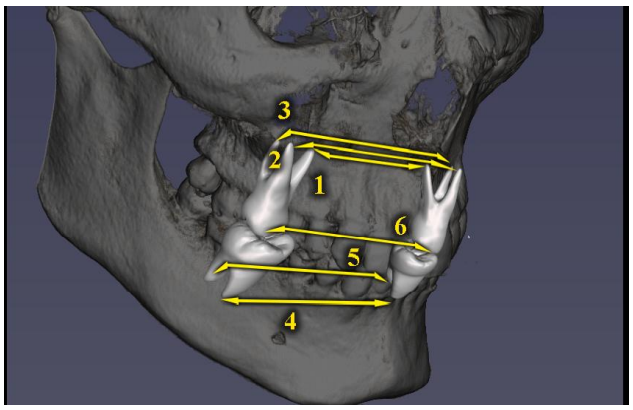

Fig. 6. Determination of the distances between the apices of palatal (1 - distance mapex_6) medial vestibular (2 - distance napx_6) and distal vestibular roots (3 - distance dapx_6) and vestibular medial cusps (6 - distance VestBM) upper first molars and distal (5 - distance dapx_46) and medial (4 - mapx_46 distance) roots of the lower first molars.

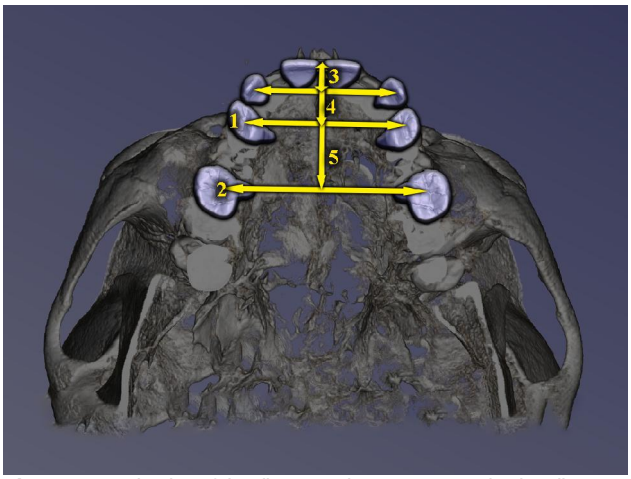

Fig. 7. Determination of the distances between premolar (1 - distance PonPr) and molar (2 - distance PonM) points according to Pon, distances between the crowns of the central incisors and the lines connecting the canines (3 - distance DL_C), first premolars (4 - distance (DL_F) and molars (5 - distance DL_S) of the upper jaw.

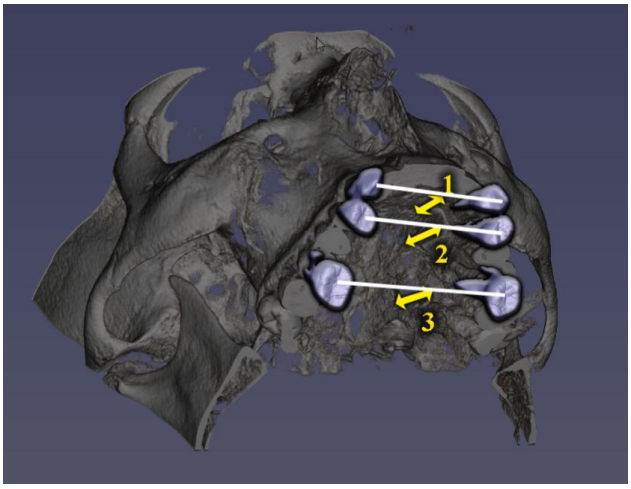

Fig. 8. Determination of the distances characterizing the position of the intercanine (1 - distance GL_1), premolar (2 - distance GL_2) and molar (3 - distance GL_3) lines relative to the hard palate.

points according to Pon (Fig. 7); in the sagittal plane, the distance between the crowns of the central incisors and the lines connecting the canines, first premolars and molars of the upper jaw (see Fig. 7); in the vertical (coronal) plane, distances characterizing the position of canines, first premolars and molars relative to the hard palate (Fig. 8).

In addition to teleradiograms obtained by the standard method, teleradiograms with points marked on 3D objects created in the 3D Slicer v5.4.0 software were used. To determine the morphometric characteristics of teleroentgenograms, measurements were carried out in the OnyxCeph³™ application, version 3DPro, from Image Instruments GmbH, Germany. For the analysis of lateral teleradiography, the analysis according to the Steiner S. S. method [29] was chosen.

According to the Steiner method, the following angular and linear parameters were determined (Fig. 9, 10):

- angle SNA - formed by lines S-N and N-A, characterizes the position of the upper jaw, namely the front contour, in the sagittal plane (°);
- angle SNB - formed by lines S-N and N-B, characterizes the position of the lower jaw, namely the front contour of the chin, in the sagittal plane (°);
- angle ANB - formed by lines A-N and N-B, characterizes the position of the lower jaw relative to the upper jaw, in the sagittal plane (°);
- angle SND - formed by lines S-N and N-D, characterizes the position of the lower jaw, namely the center of the chin, in the sagittal plane (°);
- angle SN-OcP - formed by the lines S-N and OcP, characterizes the inclination of the sphincter plane relative to the front cranial base S-N (°);
- angle SN-GoGn - formed by lines S-N and Go-Gn, characterizes the inclination of the body of the lower jaw relative to the front cranial base S-N (°);
- angle II (interincisor angle) - formed by the central axes of the upper and lower intermediate incisors, namely the lines Ap1u-Is1u and Ar1L-Is1L, characterizes the inclination of the upper and lower intermediate incisors relative to each other (°);
- the Max1-NA angle - formed by the central axis of the upper mesial incisor, namely the Ap1u-Is1u line and the N-A line, characterizes the position of the upper mesial incisor to the N-A line (°);
- the Max1-SN angle - formed by the central axis of the upper intermediate incisor, namely the Ap1u-Is1u line and the S-N line, characterizes the position of the intermediate incisor to the anterior cranial base S-N (°);

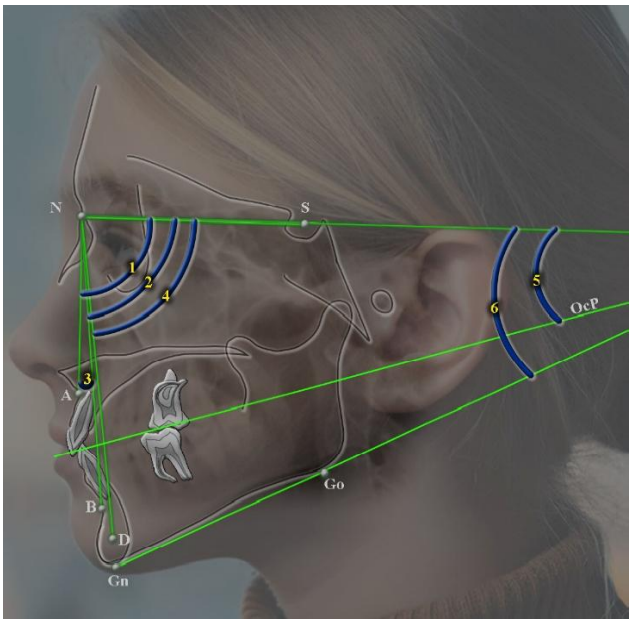

Fig. 9. Measurements according to the Steiner method. 1 - angle SNA, 2 - angle SNB, 3 - angle ANB, 4 - angle SND, 5 - angle SN-OcP, 6 - angle SN-GoGn.

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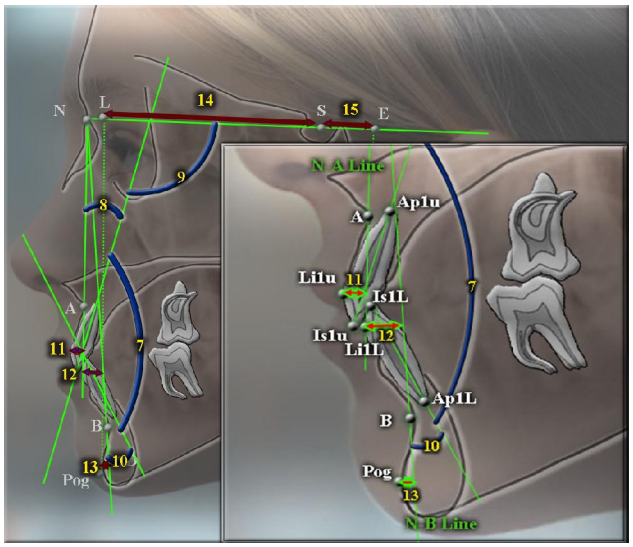

Fig. 10. Measurements according to the Steiner method. 7 - angle II, 8 - angle Max1-NA, 9 - angle Max1-SN, 10 - angle Mand1-NB, 11 - distance 1u-NA, 12 - distance 1l-NB, 13 - distance Pog-NB, 14 - distance S-L, 15 - distance S-E.

- the Mand1-NB angle - formed by the central axis of the lower mesial incisor, namely the Ap1L-Is1L line and the N-B line, characterizes the position of the lower mesial incisor to the N-B line (°);
- distance 1u-NA - from the Ls1u point to the N-A line, characterizes the position of the crown of the upper intermediate incisor in the sagittal plane relative to the N-A line (mm);
- distance 1l-NB - from the Li1L point to the N-B line, characterizes the position of the crown of the lower middle incisor in the sagittal plane relative to the N-B line (mm);
- Pog-NB distance - required to determine the Holdaway ratio (mm);
- Holdaway Ratio - the difference between the values of the 1l-NB and Pog-NB indicators, which characterizes the position of the crown of the lower intermediate incisor in the sagittal plane relative to the bony chin of Pog (mm);
- distance S-L - from point S to constructive point L, which is formed at the intersection of the perpendicular drawn from point Pog to line S-N, characterizes the position of the front contour of the lower jaw (mm);
- distance S-E (length of the back part of the base of the skull according to Steiner) - from point S to constructive point E, which is located at the intersection of the perpendicular drawn from point ppCond to line S-N (mm).

Correlations were evaluated in the "Statistica 6.0" license package using Spearman's non-parametric statistics.

The research is carried out within the framework of the scientific topic of the Department of Therapeutic Dentistry of the National Pirogov Memorial Medical University, Vinnytsya "Clinical-laboratory substantiation of the improvement of methods of diagnosis, treatment, prognosis and prevention of dental diseases" (state registration number: 0124U000174).

Results. Discussion

When analyzing the reliable and moderately reliable correlations *between cephalometric parameters according to the Steiner method and the sizes of upper jaw teeth in YM, multiple,* predominantly moderate-strength direct (r= 0.32 to 0.42) and inverse (r= -0.31 to -0.39) correlations were identified. These correlations include: the length of the mesio-distal root portion of the central incisors with the angles SNA, ANB, Mand1-NB, the distance 1l-NB, and Holdaway ratio; the length of the vestibulo-oral crown portion of the central incisors with the angles ANB, SN-OcP, Max1-NA, and Max1-SN; the length of the mesio-distal crown portion of the lateral incisors with the angles ANB, Max1-NA, and the distance 1u-NA; the length of the mesio-distal root portion of the canines with the angle ANB, the distance 1l-NB, and Holdaway ratio; the width of the vestibulo-oral crown portion of the canines with the angles ANB, Mand1-NB, the distance Pog-NB, and Holdaway ratio; and the width of the vestibulo-oral cervical portion of the canines with the angles ANB, Mand1-NB, the distance 1l-NB, and Holdaway ratio. No reliable or moderately reliable correlations were found between the sizes of upper jaw teeth in YM and the following cephalometric parameters according to Steiner: angles SNB, SND, II, SN-GoGn, and the distances S-L and S-E. *Quantitative analysis* of the reliable and moderately reliable correlations *between cephalometric parameters according to Steiner and upper jaw tooth sizes in YM* revealed 32 correlations out of 560 possible (5.71 %), of which 3.93 % were reliable direct moderate-strength, 0.54 % were moderately reliable direct, 1.07 % were reliable inverse moderate-strength, and 0.18 % were moderately reliable inverse correlations.

When analyzing the reliable and moderately reliable correlations *between cephalometric parameters according to Steiner and lower jaw tooth sizes in YM*, *only a few*, predominantly moderate-strength direct (r= 0.31 to 0.40) and inverse (r= -0.31 to -0.36) correlations were found: between the mesio-distal crown length of central incisors and the angles ANB and Max1-NA; and between the vestibulo-oral root length of central and lateral incisors and the angles Max1-NA and Max1-SN. No reliable or moderately reliable correlations were established between lower jaw tooth sizes in YM and the following cephalometric parameters according to Steiner: angles SNA, SNB, SND, II, SN-OcP, SN-GoGn, Mand1-NB, and the distances 1u-NA, 1l-NB, Pog-NB, S-L, and S-E. *Quantitative analysis* of the reliable and moderately reliable correlations *between cephalometric parameters according to Steiner and lower jaw tooth sizes in YM* revealed 10 correlations out of 560 possible (1.79 %), of which 1.07 % were reliable direct moderate-strength, 0.18 % were moderately reliable direct, and 0.54 % were reliable inverse moderate-strength correlations.

When analyzing the reliable and moderately reliable correlations *between cephalometric parameters according to the Steiner method and the sizes of dental arches in YM,*

multiple, predominantly moderate-strength direct (r= 0.32 to 0.45) and inverse (r= -0.31 to -0.51) correlations were found. These include: the distance GL_1 with the angles ANB, Max1-NA, Max1-SN, and the distance 1u-NA; the distance GL_2 with the angles SN-GoGn, Max1-NA, and the distance S-L; and the distance DL_S with the angles ANB, II, Mand1-NB, and Holdaway ratio. No reliable or moderately reliable correlations were found between dental arch sizes in YM and the following cephalometric parameters according to Steiner: angles SNA, SNB, SND, and the distance 1l-NB. *Quantitative analysis* of the reliable and moderately reliable correlations *between cephalometric parameters according to Steiner and dental arch sizes in YM* revealed 19 correlations out of 288 possible (6.60 %), of which 2.08 % were reliable direct moderate-strength, 1.39 % were moderately reliable direct, 2.43 % were reliable inverse moderate-strength, and 0.69 % were moderately reliable inverse correlations.

When analyzing the reliable correlations *between cephalometric parameters according to Steiner and upper jaw tooth sizes in YW, multiple,* predominantly direct weak (r= 0.24 to 0.29) and moderate-strength (r= 0.30 to 0.34) correlations were found. These include: the width of the crown portion of canines in the mesio-distal plane with the angles SNA, SNB, SND, and the distance S-L; the length of the root portion of canines in the mesio-distal plane with the angles SNB, SND, and the distance S-L; and the length of the crown portion of canines in the vestibulo-oral plane with the angles ANB, Mand1-NB, and the distance 1l-NB. No reliable correlations were found between upper jaw tooth sizes in YW and the following cephalometric parameters according to Steiner: angles Max1-NA, Max1-SN, and the distance Pog-NB. *Quantitative analysis* of the reliable correlations *between cephalometric parameters according to Steiner and upper jaw tooth sizes in YW* revealed 27 correlations out of 560 possible (4.82 %), of which 1.25 % were direct moderate-strength, 2.68 % were direct weak, and 0.89 % were inverse weak correlations.

When analyzing the reliable correlations *between cephalometric parameters according to Steiner and lower jaw tooth sizes in YW, multiple,* predominantly direct weak (r= 0.24 to 0.29) and moderate-strength (r= 0.30 to 0.42) correlations were found. These include: the width of the cervical portion of central incisors in the mesio-distal plane with the angle Mand1-NB and the distances 1u-NA and 1l-NB; the length of the crown portion of central incisors in the vestibulo-oral plane with the angle SND and the distances Pog-NB and S-L; the width of the crown portion of canines in the mesio-distal plane with the angles SNA, SNB, SND, and the distance S-L; as well as predominantly weak inverse correlations (r= -0.26 to -0.32) between the length of the crown portion of central incisors in the mesio-distal plane and the angles ANB, SN-OcP, and Mand1-NB. No reliable correlations were found between lower jaw tooth sizes in YW and the following cephalometric parameters according to Steiner: angles SN-GoGn, Max1-SN, and Holdaway ratio. *Quantitative analysis* of the reliable correlations *between cephalometric parameters according to Steiner and lower jaw tooth sizes in YW* revealed 28 correlations out of 560 possible (5.00 %), of which 1.07 % were direct moderate-strength, 2.14 % were direct weak, 0.89 % were inverse moderate-strength, and 0.89 % were inverse weak correlations.

When analyzing the reliable correlations *between cephalometric parameters according to Steiner and dental arch sizes in YW, multiple,* predominantly moderate-strength direct (r= 0.31 to 0.52) and inverse (r= -0.31 to -0.52) correlations were found. These include: the distance DL_C with the angle Max1-SN, the distance 1u-NA, and Holdaway ratio; the distance DL_F with the angles SNA, II, SN-OcP, Mand1-NB, the distances 1l-NB, Pog-NB, and Holdaway ratio; the distance DL_S with the angles II, Mand1-NB, the distances 1l-NB, Pog-NB, and Holdaway ratio; the distance mapx_46 with the angles SNA, SNB, SND, SN-OcP, SN-GoGn, Mand1-NB, the distance S-L, and Holdaway ratio; and the distance dapx_46 with the angles SNB, ANB, SND, II, SN-OcP, Mand1-NB, the distances 1l-NB, S-L, and Holdaway ratio. No reliable correlations were found with the distance S-E according to Steiner. *Quantitative analysis* of the reliable correlations *between cephalometric parameters according to Steiner and dental arch sizes in YW* revealed 42 correlations out of 288 possible (14.58 %), of which 4.86 % were direct moderate-strength, 2.08 % were direct weak, 4.51 % were inverse moderate-strength, and 3.13 % were inverse weak correlations.

Thus, in Ukrainian YM and YW with an orthognathic bite, the analysis of reliable and moderately reliable connections between cephalometric parameters according to the Steiner method and the sizes of teeth and dental arches showed that the highest number of reliable connections was found between cephalometric parameters and dental arch sizes in YW.

The results of the study conducted on Ukrainian YM and YW with a physiological bite provide a better understanding of the relationships between cephalometric parameters according to the Steiner method and the sizes of teeth and dental arches, which is crucial for orthodontic diagnosis and treatment planning.

The study results confirm the connection between the inclination of the upper incisors and craniofacial parameters. For example, a study conducted in Lebanon showed that the inclination of incisors has significant correlations with vertical and sagittal parameters in patients with different craniofacial types [4]. This is consistent with our data, where a correlation between the inclination of the upper incisors and dental arch sizes was observed. Similar effects of incisor inclination on craniofacial parameters were noted in Chinese children, as in Ukrainians, using the Steiner method [8]. Age and gender factors affect incisor position, which should be considered when planning orthodontic treatment [20]. It was also found that incisor

position correlates with the thickness of soft tissues, which may be important for clinical applications in pediatric orthodontics [21].

Similarly, a study on Chinese children with maxillary protrusion revealed similar trends regarding incisor inclination [14], highlighting the universality of these connections regardless of ethnic group. Our study also found a relationship between cephalometric parameters and tooth sizes, supporting the results of studies among Ukrainian youth with different face types [12]. Y. A. Nesterenko revealed the impact of face type on cephalometric parameters according to the COGS method, which characterize the position of individual teeth relative to cranial structures in young Ukrainians with an orthognathic bite [23].

The study conducted among youth also found significant relationships between the position of central incisors and craniofacial parameters according to the Steiner method [11]. Our results confirm these findings, specifically that cephalometric parameters related to incisors can be used to identify individual craniofacial features in patients. Comparing results for different age and ethnic groups shows similar trends. For example, among boys and girls in India, a strong correlation between incisor inclination and dental arch parameters was found [16], which aligns with our conclusions. However, it is worth noting that these connections may vary in some populations. For instance, in Pakistani adults, incisor inclination also correlated with dental arch parameters, but some differences could be attributed to individual growth characteristics [18].

Studies on different ethnic groups [19, 26, 27] emphasize the importance of the ethnic aspect in determining standards for cephalometric parameters. Our study also revealed that cephalometric parameters, such as incisor inclination, can affect periodontal status, particularly in the area of lower incisors, which confirms the results of previous studies [17]. This is important for orthodontic treatment planning, as improper incisor inclination can negatively impact gum health and tooth stability.

Despite the similarity of results with studies in other countries, it is important to note certain differences. For example, in the Emirati population, a smaller correlation between incisor inclination and other cephalometric parameters was observed [25], which may be due to specific craniofacial characteristics of this population. Similar differences were observed in studies on Japanese and Chinese children [14].

Thus, our results are consistent with previous research; however, further studies are needed to more precisely determine individual differences between various populations.

Conclusions and prospects for further development

1. In Ukrainian YM with a physiological occlusion, multiples of mostly average strength direct reliable (r= from 0.31 to 0.45 - 6.01 % of the total number of correlations) and inverse average strength reliable (r= from -0.31 to -0.51 - 3.50 % of the total number of correlations) correlations of teleroentgenometric indicators according to the Steiner method with the dimensions of the incisors and canines of the upper jaw and the size of the distances GL_1, GL_2 and DL_S are found.

2. In Ukrainian YW with a physiological occlusion, multiple straight correlations of weak (r= from 0.24 to 0.29 - 2.32 % of the total number of correlations) and medium strength (r= from 0.30 to 0.42 - 5.00 % of the total number of correlations) reliable correlations of teleroentgenometric parameters according to the Steiner method with the sizes of the canines of the upper jaw, the sizes of incisors and canines of the lower jaw, as well as mostly of medium strength are direct (r= from 0.31 to 0.52 - 4.86 % of the total number of correlations) and inverse (r= from -0.31 to -0.52 - 4.51 % of the total number of correlations) reliable correlations of teleroentgenometric indicators according to the Steiner method with the distance values DL_C, DL_F, DL_S, mapx_46 and dapx_46 were established.

3. In Ukrainian YM and YW with a physiological occlusion, pronounced manifestations of sexual dimorphism of the relationship between teleroentgenometric indicators according to the Steiner method with computed tomographic dimensions of the teeth of the upper and lower jaws and dental arches were established, both in terms of strength and the number of reliable correlations.

In further studies, it is planned to study the peculiarities and sex differences of the correlations between teleroentgenometric indicators according to the Steiner method and computed tomographic dimensions of teeth and dental arches in Ukrainian YM and YW with a physiological occlusion with different types of faces.

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ОСОБЛИВОСТІ ЗВ'ЯЗКІВ ТЕЛЕРЕНТГЕНОМЕТРИЧНИХ ПОКАЗНИКІВ ЗА МЕТОДОМ STEINER ІЗ РОЗМІРАМИ ЗУБІВ І ЗУБНИХ ДУГ В УКРАЇНСЬКИХ ЮНАКІВ І ДІВЧАТ ІЗ ФІЗІОЛОГІЧНИМ ПРИКУСОМ БЕЗ УРАХУВАННЯ ТИПУ ОБЛИЧЧЯ

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Анотація. *Значення телерентгенометричних показників у діагностиці й плануванні ортодонтичного лікування важко переоцінити, проте недостатньо дослідженими залишаються їхні зв'язки з розмірами зубів і зубних дуг у різних вікових і статевих групах. Це особливо актуально для української популяції, де індивідуальні анатомічні особливості можуть впли-*

вати на ефективність ортодонтичних втручань, що робить дослідження таких взаємозв'язків важливим для вдосконалення підходів до діагностики та лікування. Мета дослідження - встановлення особливостей кореляцій між телерентгенометричними показниками за методом Steiner із розмірами зубів і зубних дуг в українських юнаків і дівчат із фізіологічним прикусом. Проведено морфометричне дослідження зубів, зубних дуг і визначені телерентгенометричні показники за методом Steiner із первинних комп'ютерних томограм 41 українського юнака (віком від 17 до 21 року) та 68 українських дівчат (віком від 16 до 20 років), що були отримані з банку даних кафедри стоматології дитячого віку та науково-дослідного центру Вінницького національного медичного університету ім. М. І. Пирогова. Оцінка кореляцій між телерентгенометричними показниками за методом Steiner і комп'ютерно-томографічними розмірами зубів і зубних дуг проведена у ліцензійному пакеті "Statistica 6.0" за допомогою непараметричної статистики Спірмена. В результаті аналізу достовірних і середньої сили недостовірних кореляцій між телерентгенометричними показниками за методом Steiner із розмірами зубів і зубних дуг встановлено: в юнаків - 5,71 % подібних зв'язків із розмірами зубів верхньої щелепи (переважно достовірних прямих середньої сили із розмірами різців та іклів), лише 1,79 % із розмірами зубів нижньої щелепи та 6,60 % із розмірами зубних дуг (переважно достовірних прямих і зворотних середньої сили із відстанями, що характеризують положення іклів і перших премолярів відносно твердого піднебіння, а також відстані між коронками центральних різців та лінією, що з'єднує моляри верхньої щелепи); у дівчат - 4,82 % подібних зв'язків із розмірами зубів верхньої щелепи (переважно достовірних прямих слабкої сили із розмірами іклів), 5,00 % із розмірами зубів нижньої щелепи (переважно достовірних прямих слабкої сили із розмірами різців), 14,58 % із розмірами зубних дуг (переважно достовірних прямих і зворотних середньої сили із відстанями між коронками центральних різців та лінією що з'єднує ікла, перші премоляри й моляри верхньої щелепи, а також відстанями між дистальними й медіальними коренями нижніх перших молярів). Таким чином, в українських юнаків і дівчат із фізіологічним прикусом встановлені особливості та статеві відмінності кореляцій між телерентгенометричними показниками за методом Steiner та комп'ютерно-томографічними розмірами зубів і зубних дуг.

Ключові слова: *стоматологія, зуби, зубні дуги, морфометрія, телерентгенометрія, конусно-променева комп'ютерна томографія, кореляції, українські юнаки та дівчата, фізіологічний прикус, статевий диморфізм.*