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PECULIARITIES OF CORRELATIONS OF TELERADIOMETRIC INDICATORS ACCORDING TO THE TWEED METHOD WITH THE SIZES OF TEETH AND DENTAL ARCHES IN UKRAINIAN YOUNG MEN AND YOUNG WOMEN WITH PHYSIOLOGICAL OCCLUSION WITHOUT TAKING INTO ACCOUNT THE TYPE OF FACE

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Annotation. The study of the relationship between teleradiometric parameters and morphological characteristics of the dentofacial system is important for understanding the patterns of development and harmony of the bite. Determining these correlations in young people allows us to improve approaches to the diagnosis and prediction of orthodontic deviations, which, in turn, contributes to the individualization of treatment. Given the growing need for orthodontic correction and increased attention to the aesthetic and functional aspects of the dentofacial system, such studies are relevant for practical dentistry and orthodontics. The aim of the study is to establish the features of the relationship between teleradiometric parameters according to the Tweed method and the sizes of teeth and dental arches in Ukrainian young men and young women with physiological occlusion. An analysis of the correlations of morphometric teleradiometric parameters determined by the Tweed method, teeth and dental arches obtained from primary teleradiograms and computer tomograms of 41 Ukrainian young men and 68 Ukrainian young women (taken from the data bank of the Department of Pediatric Dentistry and the Research Center of the National Pirogov Memorial Medical University, Vinnytsya) was carried out. The correlations were assessed in the «Statistica 6.0» license package using non-parametric Spearman statistics. As a result of the analysis of reliable and average strength unreliable correlations between teleradiometric indicators according to the Tweed method with the sizes of teeth and dental arches, the following was established: in young men – 5.92 % of similar relationships with the sizes of teeth of the upper jaw (mainly reliable direct average strength between the value of the ANB_T angle, the PFH distance and the Wits index and the sizes of incisors and canines), 3.67 % with the sizes of teeth of the lower jaw (mainly reliable inverse average strength between the value of the Wits index and the sizes of incisors and canines) and 7.54 % with the sizes of dental arches (mainly reliable direct and inverse average strength between the value of the FMIA angle and the distances DL_C, GL_1 and DL_S; between the value of the IMPA angle and the distances DL_C, DL_S and dapx_46; between the value of the Ls1u_Ls distance and the distances 33_43Apx, mapx_46 and dapx_46; between the value of the Wits index and the distances DL_S, 33_43Apx and mapx_46); in young women – 4.69 % of similar relationships with the sizes of the teeth of the upper jaw (reliable direct and inverse, mostly weak, between the magnitude of the angles SNB_T and POr_OcP, the Wits index and the AFH_PFH ratio and the sizes of the incisors, canines and first premolars), 5.10 % with the sizes of the teeth of the lower jaw (reliable, mostly inverse, weak and medium strength between the magnitude of the angles IMPA, POr_OcP and the distance Pog_Pog' and the sizes of the incisors), 10.71 % with the sizes of the dental arches (mostly reliable direct lines of medium strength between the distance Z and the distances PonM, 13_23Bugr, VestBM, 33_43Apx, mapx_46 and dapx_46). Thus, the results obtained indicate both the peculiarities and gender differences in the relationships between teleradiometric indicators according to the Tweed method and computed tomography dimensions of teeth and dental arches in Ukrainian young men and young women with physiological occlusion without taking into account facial type.

Keywords: dentistry, teleradiometry according to the Tweed method, cone-beam computed tomography, teeth, dental arches, correlations, Ukrainian young men and young women, physiological occlusion, sexual dimorphism.

Introduction

Disorders of the dento-maxillofacial system are one of the most common dental problems, second only to dental caries. In Ukraine, the prevalence of these anomalies has regional and group characteristics, demonstrating a tendency to increase. In particular, studies show that among adolescents aged 16-17, the prevalence of dento-maxillofacial anomalies is 64.32 %, with the most common being the anomaly of class I according to Engle, which is detected in 26.35 % of cases. Distal occlusion (class II according to Engle) is observed in 18.23 % of adolescents, and deep occlusion – in 9.84 % of cases. Mesial, open and crossbites are less common, in particular, crossbite was detected in 4.84 % of the examined patients [7, 8]. These data indicate a significant prevalence

of dento-maxillofacial anomalies among young people, which emphasizes the need for early diagnosis and prevention to prevent further complications.

The relevance of the study of correlations of teleradiometric indicators according to the Tweed method with the sizes of teeth and dental arches is due to the high prevalence of dentofacial anomalies and the need to develop effective methods for their diagnosis and treatment. Understanding the relationship between the structural parameters of the dentofacial system and teleradiometric indicators will allow to improve orthodontic practice, ensuring an individualized approach to each patient. This, in turn, will contribute to increasing the effectiveness of treatment and improving the

quality of life of patients with dentofacial anomalies [5, 12].

Studies conducted in different regions confirm the significant prevalence of dentofacial anomalies among children and adolescents. In particular, in Greece it was found that among orthodontic patients 24.6 % have various disorders of tooth development, and in Thailand the prevalence of anomalies is 36.1 % [20, 27]. In addition, retrospective epidemiological studies in Slovenia have shown that up to 42 % of school-age children require orthodontic treatment [8]. These data indicate the need for a detailed study of the structural and functional features of the dentofacial system, which will allow the development of more effective methods of early diagnosis and individualized treatment.

Considerable attention has been paid in recent years to the study of the correlation between the sizes of teeth, dental arches and parameters of teleradiographic analysis. For example, a study conducted among patients of orthodontic clinics in Pakistan found that 11.3 % of patients had anomalies of the size and shape of teeth that affected the overall harmony of the dentofacial system [12]. Similar results were obtained among patients in North India, where almost 30% of patients had deviations in the formation of the dentition [21].

Considering the presented data, the study of the features of the relationship between teleradiometric indicators and the sizes of teeth and dental arches is an important step in improving diagnostic methods in orthodontics. Such an approach will allow not only to optimize the treatment planning process, but also to take into account the individual characteristics of each patient, which is especially relevant in the context of the growing prevalence of orthodontic anomalies [11, 14, 18, 23, 29].

The purpose of the study is to establish the features of the relationship between teleradiometric indicators according to the Tweed method with the sizes of teeth and dental arches in Ukrainian YM and YW with physiological occlusion.

Materials and methods

Primary computed tomograms of 41 Ukrainian young men (YM) (aged 17 to 21 years) and 68 Ukrainian young women (YW) (aged 16 to 20 years) with a physiological bite that was as close as possible to orthognathic were obtained from the data bank of the Department of Pediatric Dentistry and Research Center of the National Pirogov Memorial Medical University, Vinnytsya. All teleradiographic (generator voltage 90 kV, current strength – 10 mA, exposure time – 0.1 s, effective radiation dose – up to 0.001 mSv) and computed tomography (generator voltage 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 the dental cone beam tomograph Veraviewepocs 3D Morita (Japan) and Planmeca ProMax 3D Mid, manufactured by Planmeca OY (Finland) and were conducted on the basis of the principle of voluntary informed consent in the private dental clinic «Vinintermed» and in the «Planmeca 3D Maxillofacial Diagnostics Center». The Bioethics Committee of the National Pirogov Memorial Medical University,

Vinnytsya (protocol No. 7 dated 8.11.2022) established that the conducted studies do 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.

Morphometric examination of teeth and dental arches was performed using the software applications i-Dixel One Volume Viewer (Ver. 1.5.0) J Morita Mfg. Cor, and Planmeca Romexis Viewer (ver. 3.8.3.R 15.12.14) Planmeca OY.

Dental morphometry included [25]:

determination of metric characteristics of incisors and canines, upper and lower jaws (mm) – width of the crown part of the tooth in the mesio-distal plane (MdK), width of the cervical part of the tooth in the mesio-distal plane (MdC), width of the crown part of the tooth in the vestibulo-oral plane (VoK), width of the cervical part of the tooth in the vestibulo-oral plane (VoC), length of the tooth (same) in the mesio-distal and vestibulo-oral planes (MdLD); length of the crown part of the tooth in the mesio-distal plane (MdLK), length of the root part of the tooth in the mesio-distal plane (MdLR), length of the crown part of the tooth in the vestibulo-oral plane (VoLK), length of the root part of the tooth in the vestibulo-oral plane (VoLR);

determination of metric characteristics of small angular teeth (premolars) of the upper and lower jaws – width of the crown part of the tooth in the mesio-distal plane (MdK), width of the crown part of the tooth in the vestibulo-oral plane (VoK), length of the tooth in the vestibulo-oral plane (MdLD);

determination of metric characteristics of large angular teeth (molars) of the upper and lower jaws – width of the crown part of the tooth in the mesio-distal plane (MdK), width of the crown part of the tooth in the vestibulo-oral plane (VoK).

Since in previous studies, when comparing the computed tomography sizes of the same teeth on the right and left sides, no significant differences or trends were found [15], 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 premolars, 15 or 45 – upper or lower second premolars, 16 or 46 – upper or lower first molars.

Morphometry of dental arches included [25]:

determination of the distances (mm) between the apical cusps (distance 13_23Bgr) and the root tips (distance 13_23ApX) of the canines on the upper jaw and between the apical cusps (distance 33_43Bgr) and the root tips (distance 33_43ApX) of the canines on the lower jaw;

determination of the distances (mm) between the apices of the palatal (distance mapex_6), medial vestibular (distance napx_6), distal vestibular roots (distance dapx_6) and vestibular medial cusps (distance VestBM) of the upper first molars and the distal (distance dapx_46) and medial (distance mapx_46) roots of the lower first molars;

determination of distances (mm) between premolar (Pon-Pr distance) and molar (PonM distance) points according to Pon, distances between crowns of central incisors and lines

connecting canines (DL_C distance), first premolars (DL_F distance) and molars (DL_S distance) of the upper jaw;

determination of distances (mm) characterizing the position of interdental (GL_1 distance), premolar (GL_2 distance) and molar (GL_3 distance) lines relative to the hard palate.

Determination of morphometric characteristics of telerradiographs was carried out in the OnyxCeph³™ application, version 3DPro, Image Instruments GmbH, Germany. For the analysis of lateral telerradiographs, the analysis according to the Tweed C. H. method was chosen [28].

According to the Tweed method, the following angular and linear indicators were determined (Fig. 1-3) [25]: *IMPA angle* – the angle of the incisal plane of the lower jaw (°); *FMA angle* – the Frankfurt mandibular angle (°); *FMIA angle* – the Frankfurt angle of the mandibular incisor (°); *SNA_T angle* – indicates the anterior-posterior location of the upper jaw to the base of the skull (°); *SNB_T angle* – indicates the anterior-posterior location of the lower jaw to the base of the skull (°); *ANB_T angle* – indicates the angular inter-jaw relationship in the anterior-posterior direction (°); *POr_OcP angle* – formed by the occlusal plane *OcP* and the Frankfurt plane *FP* (°); *Z angle* – which is determined by the mandibular-labial line and the Frankfurt plane *FP* (°); *Wits index* – indicates the linear inter-jaw relationship in the anterior-posterior direction (mm); *AFH distance* – the anterior height of the face (mm); *PFH distance* – the posterior height of the face (mm); *Ls1u_Ls distance* – the thickness of the upper lip (mm); *Pog_Pog' distance* – the thickness of the soft tissues of the chin (mm); *AFH_PFH ratio* – the ratio between the values of *AFH* and *PFH*.

In the Statistica 6.0 license package, correlations were assessed using nonparametric Spearman statistics.

Results. Discussion

When analyzing the reliable and medium-strength unreliable correlations *between telerradiometric indicators according to the Tweed method with the sizes of the teeth of the upper jaw in YM*, multiple medium-strength direct reliable ($r =$ from 0.32 to 0.38) correlations were found between the value of the *ANB_T angle* and the length of the root part of the upper central incisors and upper canines in the mesio-distal plane, the width of the coronal part of the upper canines and upper second premolars in the vestibulo-oral plane, the length of the coronal part of the upper central incisors in the vestibulo-oral plane, the width of the cervical part of the upper canines in the vestibulo-oral plane; medium-strength direct significant ($r =$ from 0.38 to 0.45) correlations between the value of the *PFH distance* and the length of the root part of the upper central and lateral incisors in the vestibulo-oral plane, the width of the coronal part of the upper lateral incisors in the mesio-distal plane; mainly significant, medium-strength direct ($r = 0.30$ and 0.32) and inverse ($r = -0.31$ and -0.44) correlations between the value of the *Wits index* and the width of the coronal and cervical part of the upper canines in the mesio-distal plane (direct), the length of the upper lateral incisors, the length of the coronal part of the lateral incisors

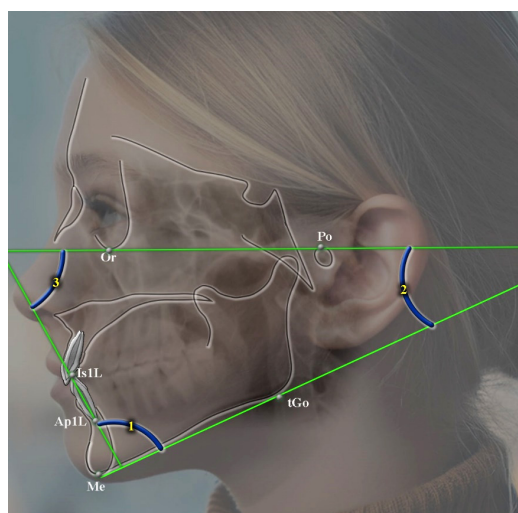


Fig. 1. Measurements according to the Tweed method. 1 – IMPA angle, 2 – FMA angle, 3 – FMIA angle.

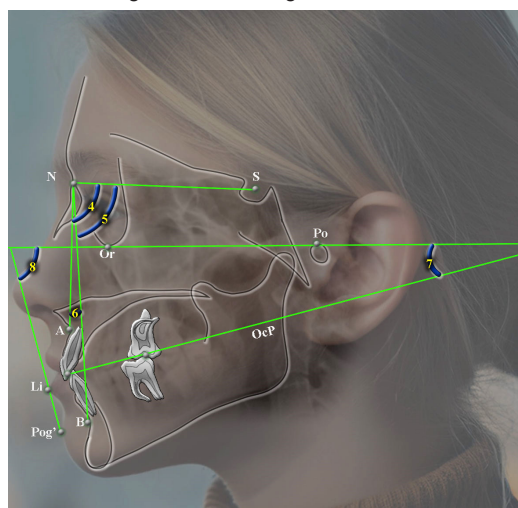


Fig. 2. Measurement according to the Tweed method. 4 – SNA_T angle, 5 – SNB_T angle, 6 – ANB_T angle, 7 – POr_OcP angle,

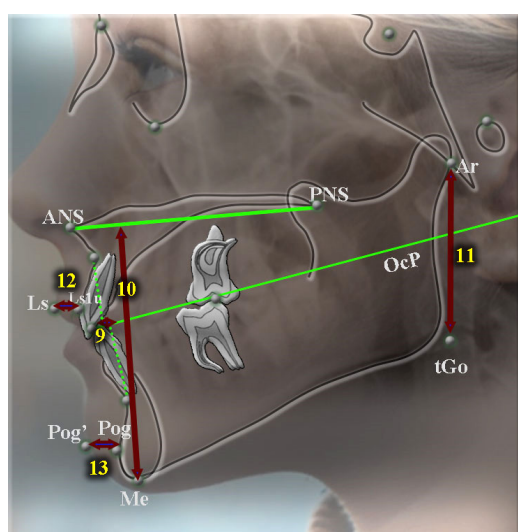


Fig. 3. Measurement according to the Tweed method. 9 – Wits index, 10 – AFH distance, 11 – PFH distance, 12 – Ls1u_Ls distance, 13 – Pog_Pog' distance.

in the mesio-distal plane (inverse). In general, no reliable or medium-strength unreliable relationships were established between the sizes of the teeth of the upper jaw in YM and the magnitude of the SNB_T angle and the AFH_PFH ratio. As a result of the *quantitative analysis of reliable and medium-strength unreliable correlations between teleradiometric indicators according to the Tweed method with the sizes of the teeth of the upper jaw in YM*, 29 relationships were found out of 490 possible (5.92 %), of which 3.47 % were reliable direct relationships of medium strength, 0.41 % were unreliable direct relationships of medium strength, 1.63 % were reliable inverse relationships of medium strength, and 0.41 % were unreliable inverse relationships of medium strength.

When analyzing the reliable and medium-strength unreliable relationships *between teleradiometric indicators according to the Tweed method with the sizes of the teeth of the lower jaw in YM*, multiple medium-strength inverse reliable ($r =$ from -0.31 to -0.34) correlations were found between the value of the Wits indicator and the length of the lower central incisors, lateral incisors and canines, the length of the coronal part of the lower central incisors in the mesio-distal plane, the length of the root part of the lower central incisors, lateral incisors and canines in the vestibulo-oral plane, as well as, mostly reliable, medium-strength direct ($r =$ from 0.31 to 0.41) and inverse ($r =$ -0.39 and -0.40) correlations between the value of the distance Ls1u_Ls and the length of the root part of the lower central incisors in the mesio-distal plane, the length of the crown part of the lower lateral incisors in the vestibulo-oral plane, the width of the crown part of the lower second premolars in the vestibulo-oral plane (direct), the length of the crown part of the lower central incisors and canines in the mesio-distal plane (reverse). In general, no reliable or medium-strength unreliable correlations were established between the sizes of the teeth of the lower jaw in YM and the magnitude of the angles FMIA, FMA, IMPA, SNA_T, SNB_T, POr_OcP and the distance Pog_Pog'. As a result of *quantitative analysis of reliable and medium-strength unreliable correlations between teleradiometric indicators according to the Tweed method with the sizes of the lower jaw teeth in YM*, 18 relationships out of 490 possible (3.67 %) were identified, of which 1.22 % were reliable direct medium-strength, 0.41 % were unreliable direct medium-strength, and 2.04 % were reliable inverse medium-strength.

When analyzing the reliable and medium-strength unreliable relationships *between teleradiometric indicators according to the Tweed method with the dimensions of the dental arches in YM*, multiple medium-strength, mostly reliable, inverse ($r =$ from -0.30 to -0.41) and medium-strength, mostly unreliable, direct ($r =$ from 0.30 to 0.32) correlations were found between the value of the FMIA angle and the distances DL_C, GL_1 and DL_S (inverse); between the value of the IMPA angle and the distances DL_C and DL_S (direct), dapx_46 (inverse); between the value of the Ls1u_Ls distance and the distances 33_43ApX, mapx_46 and dapx_46 (inverse); between the value of the Wits index and the distances DL_S (direct), 33_43ApX and mapx_46 (in-

verse). In general, no reliable or medium-strength unreliable correlations were established between the dimensions of the dental arches in YM and the magnitude of the angles FMA, SNA_T, SNB_T, Pog_Pog' distances and the AFH_PFH ratio. As a result of the *quantitative analysis of reliable and medium-strength unreliable correlations between teleradiometric indicators according to the Tweed method with the dimensions of the dental arches in YM*, 19 relationships were found out of 252 possible (7.54 %), of which 2.38 % were reliable direct correlations of medium strength, 1.19 % were unreliable direct correlations of medium strength, 3.17 % were reliable reverse correlations of medium strength, 0.79 % were unreliable reverse correlations of medium strength.

When analyzing the reliable relationships *between teleradiometric indicators according to the Tweed method with the sizes of the teeth of the upper jaw in YW*, multiple, mostly weak, direct ($r =$ from 0.24 to 0.29) and inverse ($r =$ from -0.25 to -0.36) correlations were found between the value of the SNB_T angle and the width of the crown part of the upper canines in the mesio-distal plane, the length of the upper canines, the length of the root part of the upper canines in the mesio-distal and vestibulo-oral planes (direct); between the value of the POr_OcP angle and the length of the crown part of the upper central incisors in the vestibulo-oral plane (direct), the width of the crown part of the upper canines and upper first molars in the mesio-distal plane (inverse); between the value of the Wits index and the length of the upper central incisors in the vestibulo-oral plane, the length of the root part of the upper central incisors in the mesio-distal plane (reverse), the width of the coronal part of the upper first molars in the mesio-distal plane (direct); between the value of the AFH_PFH ratio and the length of the upper central incisors and upper first premolars, the width of the cervical and root parts of the upper central incisors in the vestibulo-oral plane (reverse). In general, no reliable relationships were established between the sizes of the teeth of the upper jaw in YW and the value of the FMIA angle and the AFH and Ls1u_Ls distances. As a result of *quantitative analysis of reliable correlations between teleradiometric indicators according to the Tweed method with the sizes of the teeth of the upper jaw in YW*, 23 correlations out of 490 possible (4.69 %), of which 0.20 % are direct of medium strength, 2.04 % are direct of weak strength, 0.61 % are reverse of medium strength, 1.84 % are reverse of weak strength.

When analyzing the reliable relationships *between teleradiometric indicators according to the Tweed method with the sizes of the teeth of the lower jaw in YW*, multiple, mostly inverse, weak ($r =$ from -0.26 to -0.29) and medium ($r =$ from -0.32 to -0.39) strength correlations were found between the value of the IMPA angle and the length of the lower central incisors in the vestibulo-oral plane, the length of the coronal part of the lower central incisors in the mesio-distal plane, the width of the coronal part of the lower central and lateral incisors in the vestibulo-oral plane; between the value of the POr_OcP angle and the length of the crown part of the lower central incisors in the mesio-distal plane, the length of the

root part of the lower central incisors in the vestibulo-oral plane, the width of the crown part of the lower canines in the mesio-distal plane; between the value of the Pog_Pog' distance and the length of the crown part of the lower central incisors and canines in the mesio-distal plane, the width of the crown part of the lower first premolars in the mesio-distal plane (reverse), the length of the crown part of the lower central incisors in the vestibulo-oral plane (direct). In general, no reliable relationships were established between the dimensions of the teeth of the lower jaw in YW and the value of the FMA angle and the Wits index. As a result of *quantitative analysis of reliable correlations between teleradiometric indicators according to the Tweed method with the sizes of the lower jaw teeth in YW*, 25 relationships out of 490 possible (5.10 %) were identified, of which 0.61 % were direct of medium strength, 0.82 % were direct of weak strength, 1.02 % were reverse of medium strength, and 2.65 % were reverse of weak strength.

When analyzing the reliable correlations *between teleradiometric indicators according to the Tweed method with the dimensions of the dental arches in YW*, multiple direct, mainly medium-strength ($r =$ from 0.30 to 0.47), and weak ($r = 0.24$ and 0.29) correlations were found between the value of the Z distance and the distances PonM, 13_23Bugr, VestBM, 33_43Apx, mapx_46 and dapx_46; as well as inverse, mainly weak ($r = -0.24$ and -0.28), and medium-strength ($r = -0.36$) correlations between the value of the POr_OcP distance and the distances DL_F, DL_S and 33_43Bugr. In general, no reliable correlations were established between the dimensions of the dental arches in YW and the value of the PFH distance. As a result of *quantitative analysis of reliable correlations between teleradiometric indicators according to the Tweed method with the sizes of dental arches in YW*, 27 correlations out of 252 possible (10.71 %) were found, of which 4.37 % were direct of medium strength, 2.78 % were direct of weak strength, 1.19 % were reverse of medium strength, 2.38 % were reverse of weak strength.

Thus, in Ukrainian YM and YW with physiological occlusion without taking into account the type of face, as a result of the analysis of reliable and medium strength unreliable correlations between teleradiometric indicators according to the Tweed method with the sizes of teeth and dental arches, as well as in the analysis of similar correlations with teleradiometric indicators according to the Steiner method [24], the largest number of such correlations was established with the sizes of dental arches in YW.

Studies indicate the presence of significant statistical relationships between anthropometric parameters and other characteristics of the human body. For example, in healthy women with a mesomorphic somatotype, a correlation was found between body length and the level of introversion ($r = 0.42$; $p < 0.05$), as well as between chest circumference and indicators of emotional stability ($r = -0.38$; $p < 0.05$) [3]. In addition, in men, a connection was established between the indicators of finger dermatoglyphics and certain character traits: the ratio of finger lengths correlates with the level of

aggressiveness ($r = 0.31$; $p < 0.05$), which may indicate genetically determined personality traits [9].

Anthropometric parameters are also associated with functional characteristics of the body. In particular, the length of the thumb demonstrates a significant correlation with the occlusal height of the lower third of the face ($r = 0.79$; $p < 0.01$), which allows using this parameter to assess the occlusal relationship [4]. Analysis of the morphological features of the dentofacial apparatus of the indigenous peoples of the Amazon shows that the width of the upper dental arch has a significant genetic influence ($h^2 = 0.62$), while the lower arch is more susceptible to environmental factors ($h^2 = 0.48$) [6].

Regarding the relationship between anthropometric characteristics and dental parameters, numerous studies confirm the presence of significant correlations. Thus, in men and women, there is a sexual dimorphism in the parameters of cervical tooth abrasion: in men, the average depth of abrasion is 0.68 ± 0.12 mm, while in women this indicator is lower – 0.54 ± 0.09 mm ($p < 0.05$) [1]. Analysis of tooth dimensions in patients with different classes of malocclusions according to Engle shows that in patients with class III the anteroposterior dimension of the upper central incisors is larger (8.92 ± 0.34 mm) compared to patients with class I (8.45 ± 0.29 mm, $p < 0.05$) [2].

The correlation between the parameters of the dentition and the degree of crowding of the teeth is also statistically significant. In Sudanese patients, the width of the upper dental arch has an inverse correlation with the degree of crowding of the anterior teeth ($r = -0.52$; $p < 0.01$), which confirms the influence of jaw dimensions on the development of orthodontic anomalies [17]. Similar results were obtained in populations of Amazonian peoples, where the width of the premolar region of the upper jaw correlates with the degree of tooth abrasion ($r = 0.44$; $p < 0.05$), indicating adaptive mechanisms in response to chewing load [19]. In the Indian population, it was found that the width of the upper central incisors has a significant correlation with the interpupillary distance ($r = 0.82$; $p < 0.01$), as well as with the width of the nose ($r = 0.74$; $p < 0.05$), which allows using these parameters when choosing the sizes of artificial teeth in prosthetics [10]. A study of anthropometric parameters of orthognathic bite in representatives of the Uzbek nationality demonstrated significant relationships between the width of the dental arches and general craniometric characteristics. It was found that the width of the upper dental arch in the area of the first molars correlates with the transverse size of the facial skeleton ($r = 0.68$; $p < 0.01$), and the height of the lower third of the face affects the length of the lower dental arch ($r = 0.72$; $p < 0.05$) [16].

A study of the parameters of the dental arches and their relationship with malocclusion in the Afro-Colombian population showed that the width of the upper dental arch in the area of the premolars and molars is significantly correlated with the level of crowding of teeth ($r = -0.61$; $p < 0.01$). It was found that a greater length of the arch is associated with a decrease in the degree of crowding, while a decrease in the

transverse size leads to an increase in the deficit of space for teeth [22].

Regarding the possibility of predicting anthropometric characteristics based on tooth size, a study in Dravidians revealed significant correlations between the length of the maxillary central incisors and general head and facial parameters. For example, the length of the central incisor was significantly correlated with the interzygomatic width ($r=0.73$; $p<0.001$) and the length of the lower third of the face ($r=0.67$; $p<0.01$), which can be used for anthropometric identification and forensic examination [26].

The influence of anthropometric indicators on the incidence of caries is also statistically confirmed. A systematic review of the literature shows that body mass index has a moderate relationship with the level of dental caries in children ($r=0.36$; $p<0.01$), and the average frequency of caries in overweight children is 24 % higher than in children with normal body weight ($p<0.05$) [13].

Thus, the results of the studies demonstrate a wide range of relationships between anthropometric, somatic and dental parameters, which is important for assessing individual morphological characteristics of patients and developing personalized approaches to the diagnosis and treatment of dental disorders.

Conclusions and prospects for further development

1. In Ukrainian YM with physiological occlusion, regardless of facial type, multiple, mainly medium-strength direct reliable ($r=$ from 0.32 to 0.45 – 7.07 % of the total number of relationships) and medium-strength reverse reliable ($r=$ from -0.31 to -0.40 – 6.84 % of the total number of relationships) correlations of teleradiometric indicators according to the

Tweed method with the sizes of incisors and canines of the upper (mainly direct) and lower jaw (mainly reverse) and the size of the distances GL_1, DL_C, DL_S, 33_43Apx, dapx_46, mapx_46 (mainly reverse) were established.

2. In Ukrainian YW with physiological occlusion without taking into account the type of face, multiple direct correlations of medium strength ($r=$ from 0.30 to 0.47 – 5.18 % of the total number of connections), direct correlations of weak strength ($r=$ from 0.24 to 0.29 – 5.64 % of the total number of correlations), inverse correlations of medium strength ($r=$ from -0.32 to -0.39 – 2.82 % of the total number of connections) and inverse correlations of weak strength ($r=$ from -0.24 to -0.29 – 6.87 % of the total number of connections) were established. Reliable correlations of teleradiometric indicators according to the Tweed method with the sizes of incisors and canines of the upper (direct and reverse) and lower (mainly reverse) jaws, first premolars of the upper and lower jaws (mainly reverse) and the size of the distances PonM, VestBM, 13_23Bugr, 33_43Apx, mapx_46, dapx_46 (mostly direct), DL_F, DL_S and 33_43Bugr (mostly reverse).

3. In YM and YW with physiological bite without taking into account the type of face, pronounced manifestations of sexual dimorphism of the relationships between teleradiometric indicators according to the Tweed method with computed tomography dimensions of the teeth of the upper and lower jaws and dental arches were established both in terms of the number, strength and direction of reliable, or medium strength of unreliable correlations.

In the future, it is planned to study the features of the correlations between teleradiometric indicators according to the Tweed method and computed tomography dimensions of the teeth and dental arches in Ukrainian YM and YW with physiological bite with different types of face.

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ОСОБЛИВОСТІ КОРЕЛЯЦІЙ ТЕЛЕРЕНТГЕНОМЕТРИЧНИХ ПОКАЗНИКІВ ЗА МЕТОДОМ TWEED ІЗ РОЗМІРАМИ ЗУБІВ І ЗУБНИХ ДУГ В УКРАЇНСЬКИХ ДІВЧАТ І ЮНАКІВ ІЗ ФІЗІОЛОГІЧНИМ ПРИКУСОМ БЕЗ УРАХУВАННЯ ТИПУ ОБЛИЧЧЯ

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Анотація. Дослідження взаємозв'язку між телерентгенометричними параметрами та морфологічними характеристиками зубощелепної системи є важливим для розуміння закономірностей розвитку та гармонійності прикусу. Визначення цих кореляцій у молодих людей дозволяє вдосконалити підходи до діагностики та прогнозування ортодонтичних відхилень, що, у свою чергу, сприяє індивідуалізації лікування. З огляду на зростаючу потребу в ортодонтичній корекції та підвищену увагу до естетичних і функціональних аспектів зубощелепної системи, подібні дослідження є актуальними для практичної стоматології та ортодонції. Мета дослідження – встановлення особливостей зв'язків між телерентгенометричними показниками за методом Tweed із розмірами зубів і зубних дуг в українських юнаків і дівчат із фізіологічним прикусом. Проведено аналіз кореляцій морфометричних телерентгенометричних показників визначених за методом Tweed, зубів і зубних дуг отриманих із первинних телерентгенограм і комп'ютерних томограм 41 українського юнака та 68 українських дівчат (взяті з банку даних кафедри стоматології дитячого віку та науково-дослідного центру Вінницького національного медичного університету ім. М. І. Пирогова). Оцінка кореляцій 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 Tweed із розмірами зубів і зубних дуг встановлено: в юнаків – 5,92 % подібних зв'язків із розмірами зубів верхньої щелепи (переважно достовірних прямих середньої сили між величиною кута ANB_T, відстані PFH і показника Wits та розмірами різців й іклів), 3,67 % із розмірами зубів нижньої щелепи (переважно достовірних зворотніх середньої сили між величиною показника Wits та розмірами різців й іклів) та 7,54 % із розмірами зубних дуг (переважно достовірних прямих і зворотніх

середньої сили між величиною кута FMIA та відстанями DL_C, GL_1 і DL_S; між величиною кута IMPA та відстанями DL_C, DL_S і darx_46; між величиною відстані Ls1u_Ls та відстанями 33_43Арх, тарх_46 і darx_46; між величиною показника Wits та відстанями DL_S, 33_43Арх і тарх_46); у дівчат – 4,69 % подібних зв'язків із розмірами зубів верхньої щелепи (достовірних прямих і зворотніх, переважно слабкої сили, між величиною кутів SNB_T і POr_ОсР, показника Wits і співвідношення AFH_PFH та розмірами різців, іклів і перших премолярів), 5,10 % із розмірами зубів нижньої щелепи (достовірних, переважно зворотніх, слабкої та середньої сили між величиною кутів IMPA, POr_ОсР і відстані Pog_Pog' та розмірами різців), 10,71 % із розмірами зубних дуг (переважно достовірних прямих середньої сили між відстанню Z та відстанями PonM, 13_23Bugr, VestBM, 33_43Арх, тарх_46 і darx_46). Таким чином, отримані результати вказують як на особливості так і на статеві відмінності зв'язків між телерентгенометричними показниками за методом Tweed та комп'ютерно-томографічними розмірами зубів і зубних дуг в українських юнаків і дівчат із фізіологічним прикусом без урахування типу обличчя.

Ключові слова: стоматологія, телерентгенометрія за методом Tweed, конусно-променева комп'ютерна томографія,
