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MODELING THE CORRECT FORM OF THE DENTAL ARCH IN GIRLS WITH A VERY BROAD FACE DEPENDING ON CEPHALOMETRIC INDICATORS ACCORDING TO STEINER'S OR TWEED'S METHODS AND TOOTH DIMENSIONS

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In young Ukrainian women with a physiological bite and a very wide facial type, based on the analysis of the features of teleradiometric indicators according to the Steiner or Tweed methods and computed tomography sizes of the teeth, all possible (18 models each) reliable ($p < 0.001$ in all cases) highly informative (with a coefficient of determination greater than 0.6) regression models of linear parameters of the dental arches were constructed and analyzed (respectively $R^2 =$ from 0.716 to 0.936 when taking into account teleradiometric indicators according to the Steiner method; and $R^2 =$ from 0.657 to 0.878 when taking into account teleradiometric indicators according to the Tweed method).

Key words: dentistry, teleradiometry, computed tomography dimensions of teeth and dental arches, regression analysis, Ukrainian young women, physiological bite, very wide face type.

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МОДЕЛЮВАННЯ КОРЕКТНОЇ ФОРМИ ЗУБНОЇ ДУГИ У ДІВЧАТ ІЗ ДУЖЕ ШИРОКИМ ОБЛИЧЧЯМ В ЗАЛЕЖНОСТІ ВІД ТЕЛЕРЕНТГЕНОМЕТРИЧНИХ ПОКАЗНИКІВ ЗА МЕТОДАМИ STEINER АБО TWEED І РОЗМІРІВ ЗУБІВ

В українських дівчат молодого віку із фізіологічним прикусом і дуже широким типом обличчя, на основі аналізу особливостей телерентгенометричних показників за методами Steiner або Tweed і комп'ютерно-томографічних розмірів зубів, побудовані та проведено аналіз усіх можливих (по 18 моделей) достовірних ($p < 0,001$ в усіх випадках) високоінформативних (із коефіцієнтом детермінації більшим 0,6) регресійних моделей лінійних параметрів зубних дуг (відповідно $R^2 =$ від 0,716 до 0,936 при урахуванні телерентгенометричних показників за методом Steiner; та $R^2 =$ від 0,657 до 0,878 при урахуванні телерентгенометричних показників за методом Tweed).

Ключові слова: стоматологія, телерентгенометрія, комп'ютерно-томографічні розміри зубів і зубних дуг, регресійний аналіз, українські дівчата, фізіологічний прикус, дуже широкий тип обличчя.

The study is a fragment of the research project "Clinical and laboratory justification for improving methods of diagnosis, treatment, prognosis and prevention of dental diseases", state registration No. 0124U000174.

Developmental anomalies of the dentofacial system are one of the most common pathologies among children and adolescents worldwide. According to a systematic review, the overall prevalence of orthodontic disorders in children and adolescents ranges from 39 % to 93 %, depending on the region and age group [6]. Another large-scale study, covering different stages of dental development, shows that the frequency of pathology detection reaches 81 % during the period of permanent occlusion [10]. Particularly high prevalence rates of such anomalies are observed in countries of Asia, Africa and Latin America, which indicates the global nature of the problem. Among the most common manifestations of orthodontic pathology are crowding of teeth, distal occlusion, deep occlusion, as well as violations of the shape and symmetry of the dental arch [3].

Retention, ectopia and absence of teeth also significantly affect the overall harmony of the dentofacial system and can complicate the planning of orthodontic treatment. Incidence of retained third molars among young adults is 27.7 %, with the lower teeth being the most commonly affected [4]. Agenesis of permanent teeth occurs in 6.4 % of the population, with premolars and upper incisors being the most commonly affected [1]. With the development of digital technologies and the widespread use of teleradiography, computed tomography, and digital modeling, it has become possible to more accurately determine the features of facial morphology, jaw and tooth dimensions. At the same time, the clinical application of such methods is accompanied by the detection of incidental pathological changes, which once again emphasizes the importance of a comprehensive approach to diagnosis [8].

Thus, in the context of the high prevalence of orthodontic pathology and given the complexity of individual facial structure variants, there is a need to develop models that allow taking into account both anatomical and morphological features and instrumental diagnostic indicators when planning the shape of the dental arch.

The purpose of the study was to perform the development and analysis of regression models of linear dimensions necessary for constructing the correct shape of the dental arch depending on the features of telerradiometric indicators according to the Steiner or Tweed methods and computed tomography dimensions of teeth in Ukrainian young women with a physiological bite and a very wide face type.

Materials and methods. Primary computed tomograms of 30 Ukrainian girls (aged 16 to 20) with a physiological bite and a very wide face type according to Garson (1910) were obtained from the data bank of the National Pirogov Memorial Medical University, Vinnytsya. The Bioethics Committee of the National Pirogov Memorial Medical University, Vinnytsya (protocol № 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.

Measurements according to the methods of Steiner S. S. (1959) and Tweed C. H. (1954) were performed in the OnyxCephTM application, version 3DPro (Image Instruments GmbH, Germany) on standardly obtained telerradiograms created in the 3D Slicer v5.4.0 software with points marked on 3D objects [15]. According to these methods, angular and linear indicators were determined (according to the Steiner method – the value of the angles SNA_S, SNB_S, ANB_S, SND, SN-OcP, SN-GoGn, II, Max1-NA, Max1-SN, Mand1-NB and the value of the distances 1u-NA, 11-NB, Pog-NB, S-L, S-E; and according to the Tweed method – the value of the angles IMPA, FMA, FMIA, SNA_T, SNB_T, ANB_T, POcP, Z and the value of the distances Wits, AFH, PFH, Ls1u_Ls, Pog_Pog'). In addition, according to the Steiner method, the Holdaway Ratio value was determined, and according to the Tweed method – the value of the AFH_PFH ratio.

Morphometric study of teeth [15] (width of the crown part of the tooth in the mesio-distal (MdK) or vestibulo-oral (VoK) plane; width of the cervical part of the tooth in the mesio-distal (MdC) or vestibulo-oral (VoC) plane; length of the tooth (MdLD), the same in the mesio-distal and vestibulo-oral planes; length of the crown part of the tooth in the mesio-distal (MdLK) or vestibulo-oral (VoLK) plane; length of the root part of the tooth in the mesio-distal (MdLR) or vestibulo-oral (VoLR) plane) and dental arches (distances 13_23Bugr, 13_23Apx, 33_43Bugr, 33_43Apx, mapex_6, napx_6, dapx_6, VestBM, dapx_46, mapx_46, PonPr, PonM, DL_C, DL_F, DL_S, GL_1, GL_2 and GL_3) were 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. According to previous studies [11], we used the average values of the corresponding teeth: 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.

Modeling of linear dimensions necessary for constructing the correct shape of the dental arch (with a coefficient of determination $R^2 > 0.60$) was carried out using the stepwise regression analysis method in the licensed statistical package “Statistica 6.0”.

Results of the study and their discussion. In young women with a very wide face type, reliable regression models of linear dimensions necessary for constructing the correct shape of the dental arch depending on the features of telerradiometric indicators according to the Steiner method and computed tomography dimensions of the teeth have the form of the following equations:

– distance DL_C = $-4.223 + 2.415 \times \text{MdK11} - 1.921 \times \text{MdK15} + 1.321 \times \text{MdK42} + 0.818 \times \text{MdC13} - 0.295 \times \text{VoLR12} - 0.855 \times \text{MdK12} - 0.037 \times \text{Mand1} - \text{NB} + 0.098 \times \text{MdLD45}$ ($R^2=0.842$, $F_{(8,21)}=14.03$, $p<0.001$, Std.Error of estimate=0.437);

– distance GL_1 = $-9.042 - 2.539 \times \text{MdK15} + 0.195 \times \text{SN} - \text{OcP} + 1.112 \times \text{MdLK42} + 1.305 \times \text{MdK46} + 1.769 \times \text{VoK43} - 1.239 \times \text{MdK44} + 0.488 \times \text{VoLK11}$ ($R^2=0.760$, $F_{(7,22)}=9.93$, $p<0.001$, Std.Error of estimate=1.018);

– distance DL_F = $-9.023 + 2.185 \times \text{MdK11} + 0.402 \times \text{VoC41} + 0.966 \times \text{MdK16} - 0.883 \times \text{MdK15} - 0.216 \times \text{MdLD15} + 0.194 \times \text{11} - \text{NB} + 0.247 \times \text{MdLD41}$ ($R^2=0.845$, $F_{(7,22)}=17.10$, $p<0.001$, Std.Error of estimate=0.512);

– distance GL_2 = $-24.40 + 0.292 \times \text{II} + 1.655 \times \text{11} - \text{NB} + 1.460 \times \text{MdLK42} + 1.317 \times \text{VoK15} - 0.583 \times \text{MdLD42} - 0.268 \times \text{SNA}_S + 1.459 \times \text{MdK41}$ ($R^2=0.838$, $F_{(7,22)}=16.23$, $p<0.001$, Std.Error of estimate=0.971);

– distance PonPr = $-13.41 + 2.128 \times \text{MdLK42} + 1.098 \times \text{VoLK11} + 2.234 \times \text{MdK41} + 0.211 \times \text{S} - \text{E} + 0.110 \times \text{Mand1} - \text{NB} + 0.776 \times \text{MdLK12} - 0.202 \times \text{1u} - \text{NA}$ ($R^2=0.822$, $F_{(7,22)}=14.52$, $p<0.001$, Std.Error of estimate=0.824);

– distance DL_S = $2.146 + 1.656 \times \text{MdK11} + 1.243 \times \text{MdK16} + 0.244 \times \text{Holdaway Ratio} + 0.478 \times \text{MdLD41} - 0.166 \times \text{MdLK41} - 1.087 \times \text{MdC42} + 0.292 \times \text{VoK14} - 0.260 \times \text{MdLD15}$ ($R^2=0.887$, $F_{(8,21)}=20.56$, $p<0.001$, Std.Error of estimate=0.567);

- distance GL_3=34.39 - 1.881×MdC42 + 4.706×MdK43 - 1.983×MdK45 - 1.542×MdK44 - 0.467×MdLD41 - 0.045×S - L ($R^2=0.790$, $F_{(6,23)}=14.41$, $p<0.001$, Std.Error of estimate=1.000);
- distance PonM=23.81 + 1.881×MdLK42 + 0.927×VoLK43 + 1.183×VoK15 - 2.644×MdK44 + 2.560×VoC12 + 0.091×Mand1 - NB - 1.161×MdK43 ($R^2=0.789$, $F_{(7,22)}=11.78$, $p<0.001$, Std.Error of estimate=0.967);
- distance 13_23Bugr=32.34 + 1.024×MdLD12 - 0.540×Holdaway Ratio - 0.158×II - 0.476×Pog - NB - 0.414×1u - NA + 0.181×MdLK41 + 1.834×MdK15 + 0.566×MdLK42 - 1.922×MdK14 ($R^2=0.819$, $F_{(9,20)}=10.04$, $p<0.001$, Std.Error of estimate=0.628);
- distance 13_23Apx=27.78 + 0.359×SN - OcP - 2.929×VoC12 + 0.247×MdLD15 + 0.432×1I - NB + 0.764×VoK16 - 0.839×VoLK43 + 0.596×MdC11 ($R^2=0.876$, $F_{(7,22)}=22.26$, $p<0.001$, Std.Error of estimate=0.755);
- distance VestBM=51.16 - 0.157×Holdaway Ratio + 0.792×MdLK13 + 0.195×SN - OcP - 4.029×MdK44 + 2.520×MdK14 + 2.350×VoC11 - 1.003×MdK45 - 0.138×SN - GoGn ($R^2=0.741$, $F_{(8,21)}=7.52$, $p<0.001$, Std.Error of estimate=0.959);
- distance napx_6=2.010 + 3.439×MdLK11 - 1.008×VoLR12 + 0.767×VoLK13 + 1.820×MdK11 + 0.392×S - E - 2.011×MdLK12 + 1.429×VoK45 - 1.570×MdK44 ($R^2=0.934$, $F_{(8,21)}=37.31$, $p<0.001$, Std.Error of estimate=0.875);
- distance dapx_6=75.82 + 5.060×MdK15 - 1.130×MdLD14 - 1.512×MdK16 + 2.912×VoK14 + 0.949×1u - NA - 3.064×VoK11 - 1.178×MdLD45 ($R^2=0.716$, $F_{(7,22)}=7.92$, $p<0.001$, Std.Error of estimate=2.577);
- distance mapex_6= - 0.947 + 3.125×MdK45 + 4.238×MdK11 - 2.232×MdK12 + 0.263×SN - GoGn + 0.779×MdLD43 - 2.146×MdK16 + 0.430×Pog - NB + 0.636×MdLK43 ($R^2=0.824$, $F_{(8,21)}=12.26$, $p<0.001$, Std.Error of estimate=1.427);
- distance 33_43Bugr= - 0.529 + 2.179×MdK11 - 5.288×MdC43 + 1.763×MdLD43 - 0.281×SNA_S + 0.701×MdLR41 - 1.429×MdLR42 + 2.669×VoC12 + 1.284×VoLK41 ($R^2=0.767$, $F_{(8,21)}=8.65$, $p<0.001$, Std.Error of estimate=1.543);
- distance 33_43Apx=4.296 - 9.259×MdK44 + 1.585×VoLR12 + 4.260×VoC42 + 0.498×1u - NA + 2.071×MdK46 + 0.147×Max1 - SN - 0.675×MdLD44 + 1.767×MdC12 ($R^2=0.862$, $F_{(8,21)}=16.45$, $p<0.001$, Std.Error of estimate=1.419);
- distance mapx_46=23.85 - 0.271×VoLK11 + 0.822×Holdaway Ratio + 0.592×SNA_S - 1.989×VoK44 + 1.979×VoK16 - 0.652×MdLD42 - 1.109×VoK45 ($R^2=0.936$, $F_{(7,21)}=43.71$, $p<0.001$, Std.Error of estimate=0.735);
- distance dapx_46=25.79 - 0.676×Holdaway Ratio + 0.618×SNB_S + 2.566×MdK41 - 1.677×MdC42 - 0.166×Max1 - SN - 0.875×VoK45 ($R^2=0.841$, $F_{(6,22)}=19.38$, $p<0.001$, Std.Error of estimate=1.153);

where, here and in the following equations, $F_{(i)}=!$ – critical (i) and obtained $(!)$ Fisher's test value; p – confidence level; Std.Error of estimate – standard error of estimate.

In young women with a very wide face type, reliable regression models of linear dimensions necessary for constructing the correct shape of the dental arch depending on the features of teleradiometric indicators according to the Tweed method and computed tomography dimensions of the teeth have the form of the following equations:

- distance DL_C= - 5.471 + 1.807×MdK11 - 0.261×Wits - 0.872×MdK15 + 0.196×MdLR13 - 0.184×Ls1u_Ls + 0.349×MdK16 ($R^2=0.864$, $F_{(6,23)}=24.37$, $p<0.001$, Std.Error of estimate=0.388);
- distance GL_1=8.613 + 0.102×Z - 0.110×AFH_PFH + 0.479×MdLR41 - 1.443×VoK45 + 1.663×VoK43 - 0.399×VoLR11 - 0.198×Wits ($R^2=0.767$, $F_{(7,22)}=10.37$, $p<0.001$, Std.Error of estimate=1.001);
- distance DL_F= - 12.03 + 1.745×MdK11 + 0.054×AFH_PFH + 1.332×MdK11 - 1.006×MdK42 + 0.677×MdC41 + 0.206×MdLR12 ($R^2=0.821$, $F_{(6,23)}=17.59$, $p<0.001$, Std.Error of estimate=0.538);
- distance GL_2=16.67 + 3.326×MdK13 - 0.045×AFH_PFH - 2.603×MdC42 - 3.636×MdK16 + 1.658×MdK46 + 2.014×VoK43 - 1.478×MdK42 ($R^2=0.878$, $F_{(7,22)}=22.55$, $p<0.001$, Std.Error of estimate=0.843);
- distance PonPr= - 9.000 + 2.051×MdLK42 + 0.809×VoLK11 + 1.699×MdK41 + 1.005×MdLK12 + 0.357×ANB_T + 0.622×VoLK42 ($R^2=0.706$, $F_{(6,23)}=9.20$, $p<0.001$, Std.Error of estimate=1.036);
- distance DL_S=2.514 + 1.557×MdK11 + 0.079×AFH_PFH + 1.041×MdK45 - 0.548×MdK41 + 1.050×VoC41 + 0.209×MdLR41 - 1.101×MdC42 ($R^2=0.866$, $F_{(7,22)}=20.26$, $p<0.001$, Std.Error of estimate=0.603);

– distance GL_3=34.88 - 2.310×MdC42 + 5.741×MdK43 - 2.210×MdK45 - 1.400×MdK44 - 0.531×MdLD41 + 0.151×POr_OcP - 0.927×VoK43 ($R^2=0.832$, $F_{(7.22)}=15.55$, $p<0.001$, Std.Error of estimate=0.914);

– distance PonM=27.42 + 1.354×MdLK42 + 0.952×VoLK43 - 2.783×MdK44 + 2.109×VoK41 + 1.916×MdK14 - 2.095×MdK43 + 0.828×MdK46 ($R^2=0.786$, $F_{(7.22)}=11.54$, $p<0.001$, Std.Error of estimate=0.976);

– distance 13_23Bugr=27.24 + 0.396×MdLD12 - 2.139×MdK44 + 1.868×MdK43 + 1.848×MdC12 + 0.372×VoLR43 - 0.925×VoC43 - 0.297×MdLD45 ($R^2=0.762$, $F_{(7.22)}=10.08$, $p<0.001$, Std.Error of estimate=0.686);

– distance 13_23Apx=23.11 - 2.648×MdK43 + 0.635×MdLD11 + 0.792×VoK16 - 0.312×MdLK41 - 2.202×VoK12 + 1.236×VoC13 + 0.703×VoK15 ($R^2=0.802$, $F_{(7.22)}=12.71$, $p<0.001$, Std.Error of estimate=0.956);

– distance VestBM=48.23 + 0.118×Z + 0.568×MdLK13 - 4.138×MdK44 + 1.766×VoC11 + 2.125×MdK14 - 0.571×VoLR11 + 1.575×MdC42 - 0.486×VoLK12 ($R^2=0.788$, $F_{(8.21)}=9.75$, $p<0.001$, Std.Error of estimate=0.869);

– distance napx_6= - 3.268 + 2.996×MdLK11 - 1.271×VoLR12 + 1.889×VoLK13 - 1.888×MdC41 + 0.380×Ls1u_Ls + 0.601×MdK11 ($R^2=0.815$, $F_{(6.23)}=16.94$, $p<0.001$, Std.Error of estimate=1.401);

– distance dapx_6=81.37 + 4.539×MdK15 - 0.235×PFH + 0.342×Pog_Pog' + 2.954×VoK14 - 4.012×VoK12 - 0.361×SNA_T - 1.036×MdLD45 ($R^2=0.822$, $F_{(7.22)}=14.50$, $p<0.001$, Std.Error of estimate=2.041);

– distance mapex_6=40.67 + 3.709×MdK45 + 2.429×MdK11 + 0.540×Ls1u_Ls - 2.649×MdK16 + 1.167×MdLK43 - 0.304×SNB_T ($R^2=0.763$, $F_{(6.23)}=12.34$, $p<0.001$, Std.Error of estimate=1.581);

– distance 33_43Bugr=25.58 + 3.235×MdK11 - 4.590×MdC43 + 0.883×MdLD43 - 0.389×SNA_T + 2.664×VoK42 - 2.357×MdK12 + 0.327×MdLR41 ($R^2=0.657$, $F_{(7.22)}=6.03$, $p<0.001$, Std.Error of estimate=1.829);

– distance 33_43Apx=20.37 - 8.532×MdK44 + 1.135×VoLR12 + 5.213×VoC42 + 1.704×MdK46 - 0.582×Ls1u_Ls - 1.530×VoK15 + 2.592×MdK43 ($R^2=0.847$, $F_{(7.22)}=17.40$, $p<0.001$, Std.Error of estimate=1.461);

– distance mapx_46=12.50 - 0.891×VoLK11 + 0.203×Z + 1.471×MdLK13 + 0.372×POr_OcP + 1.712×MdK16 - 1.284×VoK14 + 1.804×VoC42 ($R^2=0.816$, $F_{(7.21)}=13.34$, $p<0.001$, Std.Error of estimate=1.242);

– distance dapx_46=25.87 + 0.245×Z - 0.498×VoLK11 + 2.075×VoK43 + 0.461×MdLK41 + 1.141×MdLD45 - 0.962×MdLD14 - 0.966×VoK14 + 0.404×ANB_T ($R^2=0.876$, $F_{(8.20)}=17.74$, $p<0.001$, Std.Error of estimate=1.065).

Thus, in young women with a physiological bite and a very wide facial type, all 18 possible reliable ($p<0.001$ in all cases) regression models of linear parameters of dental arches were constructed with a determination coefficient greater than 0.6, depending on the features of teleradiometric indicators according to the Steiner or Tweed method and computed tomography dimensions of the teeth (respectively R^2 = from 0.716 to 0.936 and R^2 = from 0.657 to 0.878).

When analyzing the frequency of occurrence in regression equations of teleradiometric indicators according to the Steiner or Tweed method and computed tomography dimensions of teeth in young women with a very wide face type, the following percentage of occurrence in the models of these indicators was established: taking into account teleradiometric indicators according to the Steiner method – the width of the crown part of the tooth in the mesio-distal (27.07 %) and vestibulo-oral (9.02 %) plane, teleradiometric indicators according to the Steiner method (24.81 %), tooth length (11.28 %), the length of the crown part of the tooth in the mesio-distal (9.02 %) and vestibulo-oral (5.26 %) plane, the width of the cervical part of the tooth in the mesio-distal (5.26 %) and vestibulo-oral (4.51 %) plane, the length of the root part of the tooth in the mesio-distal (1.50 %) and vestibulo-oral (2.26 %) plane; taking into account teleradiometric indicators according to the Tweed method – the width of the crown part of the tooth in the mesio-distal (30.08 %) and vestibulo-oral (12.20 %) plane, teleradiometric indicators according to the Tweed method (18.70 %), the length of the crown part of the tooth in the mesio-distal (7.32%) and vestibulo-oral (5.69 %) plane, the length of the tooth (6.50 %), the width of the cervical part of the tooth in the mesio-distal (6.50 %) and vestibulo-oral (4.88 %) plane, the length of the root part of the tooth in the mesio-distal (4.07 %) and vestibulo-oral (4.07 %) plane.

When analyzing the frequency of occurrence of the corresponding teeth in the regression equations in young women with a very wide facial type, the following percentage of occurrence of these indicators

in the models was established: taking into account teleradiometric indicators according to the Steiner method – upper incisors (25.00 % of all independent variables, including 13.00 % central incisors and 12.00 % lateral incisors), upper canines (3.00 %), upper premolars (15.00 % of all independent variables, including 5.00 % first and 10.00 % second), upper first molars (6.00 %), lower incisors (24.00 % of all independent variables, including 11.00 % central incisors and 13.00 % lateral incisors), lower canines (9.00 %), lower premolars (16.00 % of all independent variables, including 8.00 % first and 8.00 % second), lower first molars (2.00 %); taking into account teleradiometric indicators according to the Tweed method – upper incisors (25.00 % of all independent variables, including 15.00 % central incisors and 10.00 % lateral incisors), upper canines (6.00 %), upper premolars (10.00 % of all independent variables, including 6.00 % first and 4.00 % second), upper first molars (5.00 %), lower incisors (24.00 % of all independent variables, including 12.00 % central incisors and 12.00 % lateral incisors), lower canines (15.00 %), lower premolars (12.00 % of all independent variables, including 5.00 % first and 7.00 % second), lower first molars (3.00 %).

The results obtained in the study confirm that the morphometric parameters of the face, in particular the width of the skeletal structures and jaws, have a significant impact on the formation and modeling of the shape of the dental arch. This is consistent with the results of other authors, who also found close relationships between the dimensions of the jaws, the parameters of the teeth and the characteristics of the dental arch. A statistically significant relationship between the shape of the dental arch and the intermaxillary dimensions of the teeth in patients with malocclusion was demonstrated ($p < 0.05$), which indicates the need to take into account the ratio of tooth sizes in orthodontic planning [5]. Among the Egyptian population, a high correlation was found between the size of the teeth and the parameters of the dental arch - the length ($r = 0.63$) and the perimeter ($r = 0.69$) of the dental arch ($p < 0.01$), which once again confirms the importance of anatomical matching of sizes in the process of orthodontic modeling [7]. Similar trends are observed in the work of Mishra R. K. et al. [12], who proved that the violation of the intermaxillary ratio of tooth sizes is characteristic of the majority of cases of malocclusion in the Nepalese sample, which requires an individual approach to determining the shape of the arch.

On the other hand, a study among representatives of the Saudi population indicates significant ethnic variations in the parameters of the dental arches and tooth size ratios, with women having smaller arch and tooth sizes than men, which is consistent with our observations on women with a wide face [14]. In representatives of the Uzbek nationality with orthognathic bite, the parameters of the facial width, basal level and alveolar process are closely related to the width of the dental arch, which emphasizes the ethnic specificity of such dependencies [13].

A statistically significant association was found between reduced mandibular ramus size and the risk of third molar retention, with a reduction in mandibular ramus width being associated with an increased incidence of retention ($p < 0.001$) [2]. A systematic review by Kouvelis G. et al. [9] demonstrated that premolar extraction treatment did not significantly alter vertical facial dimension compared with non-extraction methods, which is important for maintaining facial harmony in patients with broad faces.

Conclusions

1. In Ukrainian young women with physiological bite and very wide face type, all possible reliable models of linear parameters of dental arches were built depending on computed tomography sizes of teeth and features of teleradiometric indicators according to the Steiner or Tweed methods (taking into account the Steiner method – $R^2 =$ from 0.716 to 0.936, taking into account the Tweed method – $R^2 =$ from 0.657 to 0.878).

2. When analyzing the frequency of occurrence in models of computed tomography sizes of teeth and teleradiometric indicators in young women with very wide face type, the most frequent ones are: taking into account the Steiner method – width of the crown part of the tooth in the mesio-distal plane (27.07 %), teleradiometric indicators (24.81 %) and tooth length (11.28 %); taking into account the Tweed method – the width of the crown part of the tooth in the mesio-distal (30.08 %) and vestibulo-oral (12.20 %) plane and teleradiometric indicators (18.70 %).

3. When analyzing the frequency of occurrence of the corresponding teeth in young women with a very wide face type, the most frequently included teeth in the models are: taking into account the Steiner method – upper incisors (central 13.00 %, lateral 12.00 %), lower incisors (central 11.00 %, lateral 13.00 %) and upper second premolars (10.00%); taking into account the Tweed method – upper incisors (central 15.00 %, lateral 10.00 %), lower incisors (central 12.00 %, lateral 12.00 %) and lower canines (15.00 %).

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