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COMPUTER-TOMOGRAPHIC CHARACTERISTICS OF ROOT LENGTH INCISORS AND CANINES OF THE UPPER AND LOWER JAWS IN BOYS AND GIRLS WITH DIFFERENT CRANIOTYPES AND PHYSIOLOGICAL BITE

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ABSTRACT

Introduction. In recent years, in world literature appeared research, which focuses on the study of relationships craniotypes with odonto-metric indicators, size, shape of the dental arches and occlusion. However, most of the experts focus on the study of individual features of the structure of the teeth-jaw system in people with different types of faces and aspects of sexual dimorphism and ethnic characteristics. Studies containing information about cranio-typological variability of the roots of teeth we did not encounter.

The aim is to reveal features length of roots of incisors and canines of the upper and lower jaw, according to the CT scan in boys and girls of different craniotypes with physiological bite, residents Podilskiy region of Ukraine.

Material and Methods. The study involved young men with orthognathic bite and their cephalometric performance taken from database from Scientific and Research Center Vinnitsa National Medical University named after Pirogov. To make CT used dental cone beam CT scan - Veraviewepocs 3D, Morita. In the upper and lower incisors and canines were measured vestibular-oral and mesio-distal projection length of the root. The height (length) of the root was measured in the medial (or distal) norm, focusing on border basics crowns (root) and the apex of the tooth root. Established the following distribution craniotype: mesocephalic boys - 16, boys brachycephalic – 19, mesocephalic girls – 16, brachycephalic girls– 26. Statistical analysis of the results was performed using the statistical software package licensed "Statistica 6,0" using non-parametric estimation methods.

Results. The peculiarities computed tomographic characteristics of root length incisors and canines of the upper and lower jaws in boys and girls Podilskiy region of Ukraine with different craniotypes and physiological bite have been set. In boys or girls mesocephals majority values of vestibular-oral and mesio-distal projection length of the teeth root, medial and lateral incisors in the upper and lower jaws significantly higher compared to studied similar gender brachycephals. Most values vestibular-oral and mesio-distal projection length of the teeth root, medial and lateral incisors in the upper and lower jaws in boys of total group and brachycephals significantly higher compared with girls of similar comparison groups. In boys mesocephals only value of vestibular-oral projection length of teeth root on the lower jaw was significantly higher compared with girls of the same craniotype.

Conclusions. In mesocephalic boys or girls majority values of vestibular-oral and mesio-distal length projection of the root teeth, medial and lateral incisors on the upper and lower jaws significantly higher compared to similar brachycephalic genders studied.

KEY WORDS: length of roots of incisors and canines, cone-beam computed tomography, boys, girls, craniotype.

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INTRODUCTION

It is known that human incisors and canines characterized by significant variations in structure and frequent deviations in the expected length of the tooth roots [1]. Knowledge of individual dimensional characteristics root system of these groups of teeth allows the doctor to calculate the depth mechanical processing and power influence on the hard tissues of the tooth, as well as monitor the impact on the tooth in its displacement during orthodontic treatment

Carl E.Misch [2], in his manual to clinicians-dentists, notes that "individualized treatment cannot be done without the individual patterns in the structure". In some papers [3, 4, 5] there are indications that the parameters of the teeth-jaw system which are defined in anatomical preparations or in studied with abnormal occlusion and with diseases of hard and soft tissues of the teeth do not always correspond to the normative. In order not to take these changes for pathology is necessary to determine the range of individual variability dimensional roots of teeth in patients with physiological occlusion. Moreover, with the advent of cone-beam computed tomography arose technically possible in vivo give morphometric evaluation particular tooth of root system [6, 7].

In numerous previously performed by morphologists works mainly contained only general, often the same type of data describing the size of the roots of teeth, so-called averages. It is also important that all previously performed work carried out over 30 - 40 years ago. During the past since time period the number of plastic and reconstructive operations has increased significantly and information using dentists in their work, cannot satisfy them [3, 8].

In recent years, in world literature appeared research, which focuses on the study of relationships craniotypes with odonto-metric indicators, size, shape of the dental arches and occlusion. However, most of the experts focus on the study of individual features of the structure of the teeth-jaw system in people with different types of faces and aspects of sexual dimorphism and ethnic characteristics [6, 9, 10, 11, 12, 13]. Studies containing information about cranio-typological variability of the roots of teeth we did not encounter.

Specification data concerning dimensional variations in the roots of the teeth in studied of various craniotypes will predict the value of tooth basic elements at an objective assessment of the end result of orthodontic treatment, and the calculation of parameters of transplant [2, 14].

AIM OF STUDY

The purpose of research - to reveal features length of roots of incisors and canines of the upper and lower jaw, according to the CT scan in boys and girls of different craniotypes with physiological bite, residents Podilskiy region of Ukraine.

MATERIAL AND METHODS

The primary indicator of the size of teeth and head boys and girls Podilskiy region of Ukraine with physiological occlusion derived from the data bank Scientific and Research Center Vinnitsa National Medical University named after Pirogov. For research were selected only scans if young men with orthognathic bite, which was determined by 11-points by M.G. Bushan et al. [15] and their cephalometric performance. Committee on Bioethics Vinnitsa National Medical University named after Pirogov found that the studies are not contrary to the fundamental bioethical standards of the Helsinki Declaration, the European Convention on Human Rights and Biomedicine (1977), relevant provisions of WHO and the laws of Ukraine (protocol № 1 of 23.09.2003).

For this study used dental cone beam CT scan - Veraviewepocs 3D, Morita (Japan). Research carried out by own-developed scheme [16] within the above characteristics. Volume three-dimensional image - cylinder 8x8cm - thickness 0,2/0,125mm, dose of radiation 0,11-0,48 mSv, voltage and amperage 60-90kV/2-10mA. In the upper and lower incisors and canines were measured vestibular-oral and mesio-distal projection length of the root. The height (length) of the root was measured in the medial (or distal) norm, focusing on border basics crowns (root) and the apex of the tooth root.

Cephalometric size measurement was performed with a soft measuring tape and large calipers with full-scale system of Martin [17]. Measured the following parameters: the largest circumference of the head through the over bridge of the nose and union; transverse arch measured tape from the right trestle point to the left; sagittal curve, measured from the glabella to the occipital point.

Craniotype determined by the formula ms_ms * 100 / g_op, where ms_ms - the largest width of the head (occipital diameter); g_op - the maximum length of the head. [18] With the value up to 75.9 researched attributed to dolichocephalic; 76,0-80,9 - to mesocephalic; 81,0-85,4 - to brachycephalic. Established the following distribution: mesocephalic boys - 16, boys brachycephalic – 19, mesocephalic girls – 16, brachycephalic girls– 26.

Statistical analysis of the results was performed using the statistical software package licensed "Statistica 6,0" using non-parametric estimation methods. Assessed the average values for each sign of the studied standard deviation. Reliability of difference values between independent quantitative values was determined using the U-Mann-Whitney criterion.

RESULTS

It is established that the value of vestibular-oral projection length of the root of the medial incisor and canine on the upper jaw in brachycephalic boys (respectively 15,66 ± 1,21 and 15,71 ± 1,14) was significantly ($p < 0.05$) lower compared to mesocephalic boys (respectively 16,26±0,99 and 16,90±0,91).

The value of vestibular-oral projection length of the root lateral incisor in the upper and lower jaw in brachycephalic girls (respectively 14,38 ± 0,96 and 14,51 ± 0,87) was significantly ($p < 0.01$) lower compared to mesocephalic girls (respectively 15,55 ± 1,71 and 15,49 ± 1,33).

The value of mesio-distal root length projection of the medial incisor on the lower jaw in brachycephalic girls (13,13 ± 0,82) has a tendency ($p = 0.057$) to smaller values compared to mesocephalic girls (13,78±1,44).

The value of mesio-distal projection length of the root of the medial incisor on the upper jaw in brachycephalic boys (13,47 ± 1,06) was significantly ($p < 0.05$) lower compared to mesocephalic boys (14,37±1,22).

The value of mesio-distal projection length of the root lateral incisor and canine on the lower jaw in brachycephalic boys (respectively 14,01 ± 1,21 and 16,19 ± 1,19) was significantly ($p < 0,05$-$0,01$) lower compared to mesocephalic boys (respectively 14,66 ± 1,21 and 17,04 ± 0,99).

The value of mesio-distal root lateral projection length of the tool on the upper and lower jaw in brachycephalic girls (respectively 13,09 ± 1,04 and 13,07 ± 1,11) was significantly ($p < 0.05$) lower compared to mesocephalic girls (respectively 14,17 ± 1,52 and 13,97 ± 1,38).

The value of mesio-distal root length projection of the medial incisor on the lower jaw in brachycephalic girls (12,46 ± 2,69) has a tendency ($p = 0.054$) to smaller values compared to mesocephalic girls (13,05±1,79).

In young boys in general group and in brachycephalic boys value of vestibular-oral and mesio-distal projection length of the root teeth, of the medial and lateral incisors in the upper and lower jaws significantly ($p < 0,01$-$0,001$) larger compared with girls of similar comparison groups; in mesocephalic boys only value of vestibular-oral projection length of root teeth on the lower jaw was significantly ($p < 0.05$) higher compared to mesocephalic girls.

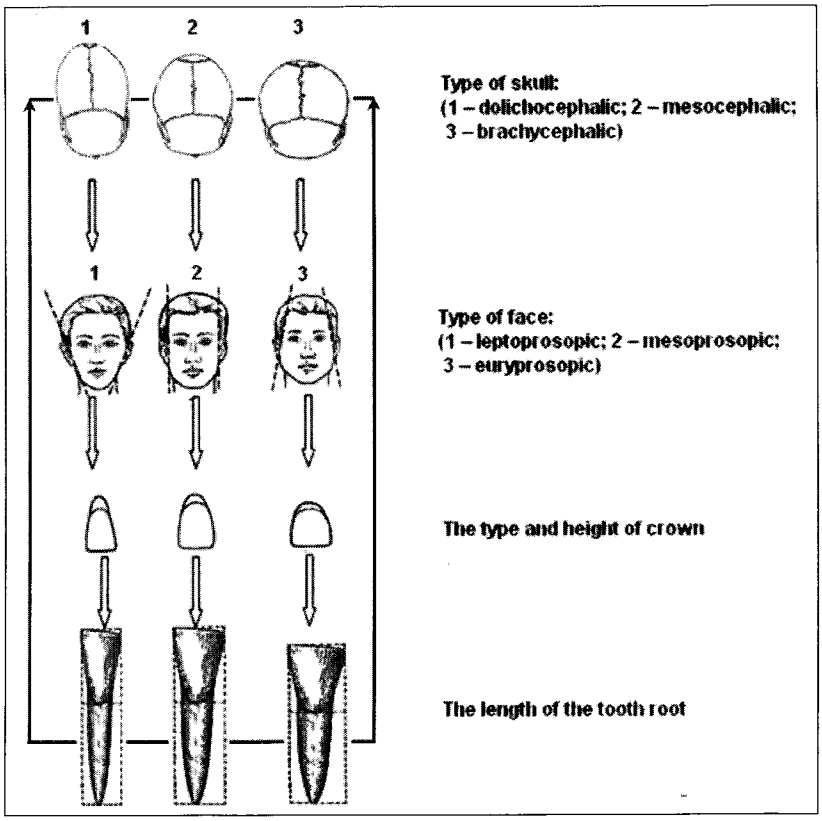

Fig. 1. Logical theoretical scheme of identified odonto- and craniometrical interdependencies

DISCUSSION

It is known that there is a correlation law shape of the face with various morphometric parameters head. Thus mesoprosopic basically coincide with mesocephalic, euryprosopic - with brachycephalic and leptoprosopic - with dolichocephalic [19]. In turn, J. L. Williams (1914) [11] every face type corresponds type and size of coronal tooth part. Actually, crown height increases in the direction brachycranic-mesocranic-dolichocranic, did not significantly differ in meso- and dolichocephaly [14, 20].

It is proved that the height of the crown has close direct links with longitudinal size of the head, i.e in brachycephalic it will be the smallest, and in dolichocephalic - the largest [6]. Because the length of the roots of teeth is in direct ratio and varies in proportion to the height of crown (equally in men and women of all ages) [1, 4, 7, 21], it allowed us as a working hypothesis been suggested that the size of the roots of teeth will have cranio-typological differences.

We found that in mesocephalic boys or girls majority values of vestibular-oral and mesio-distal length projection of the root teeth, medial and lateral incisors on the upper and lower jaws significantly higher compared to similar brachycephalic genders studied.

Logical theoretical scheme of identified odonto- and craniometrical interdependencies can be represented as follows: Fig. 1.

R. Lähdesmäki [22] i L. Alvesalo [23] identified more stimulating effect Y-chromosome on root growth in length compared to the X-chromosome, which explains the phenomenon of sexual dimorphism size of the roots of teeth. In the works of many scientists and in our particular found that in females length of the roots of the central incisors and the average length of the roots of teeth of other groups is somewhat lower than the corresponding rates for men [5, 9, 10, 13].

So specified characterization of cranio-typological and sex differences in the length of roots of incisors and canines of the upper and lower jaws will adequately solve the problem of the individual diagnostics and find new methods of orthodontic treatment.

CONCLUSIONS

1. In boys or girls mesocephalic, using cone-beam computed tomography found significantly greater value length roots of incisors and canines of the upper and lower jaws compared to studied brachycephalic of similar sex, that evidenced about relationship of odontometric performance and craniotype
2. Most values vestibular-oral and mesio-distal length projection root teeth, medial and lateral incisors on the upper and lower jaws in boys of total group and brachycephalic significantly higher compared with girls of similar groups comparison, proving the existence of sexual dimorphism in these parameters.

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