

CONVENT-ANALYSIS OF THE PROBLEM OF STUDYING THE INDIVIDUAL ANATOMICAL VARIABILITY OF THE TOP AND THE LOWER JAWS DEPENDING ON THE STRUCTURE OF THE BRAIN SKULL

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ABSTRACT

It is established that with the development of modern orthodontics, maxillofacial surgery and orthopedics, new data are needed regarding the shape, size, position and relationships of the upper and lower jaw, the features of the structure and development of the maxillofacial device in childhood and adolescence. Based on the conducted convention analysis of available literary sources in recent years on dentistry and morphology, it becomes evident the need for further comprehensive study of the structure of the maxillofacial region, from the position of the theory of V. N. Shevkunenko about individual anatomical variability, taking into account age, gender, shape of the head. There is also a need to develop new techniques and tools for the determination of accurate cranio- and morphometric data to substantiate and develop rational diagnostic and surgical methods for treating people with maxillofacial pathology.

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Introduction. Further development of plastic and maxillofacial surgery is impossible without a detailed study of the range of individual anatomical variability of the facial skull and its formations. Based on the classical works [1, 2, 3, 4, 5, 6], prospects and new morphological aspects for the improvement of modern craniology are opened. At the present time, significant data on the morphometric parameters, the ratio between the shape, size and position of various bone structures of the facial skull, upper and lower jaw, oral cavity and dentition have been accumulated [6, 7, 8, 9, 10, 11].

Given the rapid development of oral and maxillofacial surgery and orthopedics, orthopedic and surgical dentistry, reconstructive surgery and orthodontics, there is a need for new cranio- and morphometric data to substantiate and develop rational diagnostic methods and surgical methods for treating maxillofacial pathology. In this regard, the range of individual anatomical variability of the shape, size, position and relationship between the upper and lower jaws in people of different ages, gender and type of skull structure has not been adequately established.

Some significant issues of interest to dentists remain insufficiently illuminated. There is little information about the patterns of growth and development of the facial skeleton and their practical significance for functional maxillofacial treatment. Without sufficient knowledge of the effect of the shape and function of the dento-alveolar system on the development of the facial skeleton, it is difficult to explain their pathogenetic role in the formation of bite anomalies. A special place in the dynamics of this process is the connection between the formation and eruption of teeth with the growth of the jaws. Data on the clinical diagnosis of local and general disorders of the body associated with bite anomalies, the need to take them into account when planning orthodontic treatment and when predicting its results are disparate [12].

The purpose of the work was to conduct a problem-oriented analysis of perspective directions for studying the individual anatomical variability of the facial skull and its formations in children and adolescents.

Materials and methods of research: the study materials were the primary sources of the library fund of the Kharkov Scientific Medical Library, the information fund of the KhNMU scientific library. Methods used in the study: decomposition of the problem, structural-target planning.

The research was carried out within the research program of the Kharkiv National Medical University on the problem:

Results of the study. There are descriptions of different types of structure of the facial part of the head, their morphometric and coordinate-mathematical classifications taking into account the shape and differences of the human face [4, 13, 14, 15, 16, 17].

Some authors note that the morphometric characteristics of the facial skull in an adult are characterized by pronounced signs of sexual dimorphism. In men, the values of the upper face and zygomatic diameter are significantly higher than in women [13].

It is known that in adults, the following types of person are distinguished: very broad (hypereuryprosope), when the face index is less than 79.9 %; wide (euryprosope) with an index of 80-84.5 %; average (mesoprosope) - the index of 85-89.9 %; Long (leptoprosope) with an index of 90-94.5 %; very long (hyperleptoprosope) - an index of 95 % or more [6, 14].

An important indicator is the facial angle. The size of this angle distinguishes the types of the skull: mesognathic - with moderately projecting jaws ($L = 80-84.90$); prognathic - with jaws projecting forward ($L = 70-79.90$); orthognathic - with a rectangular angle ($L = 85-92.90$); hyperprognathic - angle less than 700; hyperorthognathic - with an angle of more than 930 [6, 14].

In the opinion of these authors, four parts can be distinguished to determine the proportion of the adult's face: the upper (the hairy part); forehead area; nose area and lower part.

There are the following contours of the face: ellipsoidal, ovoid, triangular, pentagonal, orbicular and tetragonal. All of them depend on the severity, shape and position of the upper and lower jaws, zygomatic arches and other bone formations [9].

Additional information on the structure of the facial part of the head gives the following indices (indicators): nasal - showing the ratio of the width of the nose to its height and multiplied by 100; cross-cheek; frontal-malar and frontal-maxillary [6].

Along with this, the position, size and shape of the bone palate, depending on the age, sex, individual structure of the skull [18], are of particular importance.

It is advisable to calculate the palatine index, which displays the ratio of its width to length and multiplied by 100. In adults, it is possible: a narrow palate - leptostaphilia with a pointer to 79.9; average - mesostaphilia with a pointer from 80 to 84.9; wide - brachystaphilia, the index is more than 85. According to researchers of this issue, the shape of the skeleton may be ellipsoidal, parabolic and U-shaped and depends on the shape of the alveolar arch [5].

Attention is drawn to the work in which data are presented on sexual dimorphism and individual typological variability in the size and shape of the lower jaw, bone and hard palate. The author determined the interrelationships of the morphometric characteristics of the hard palate with the dimensions of the head, face, and body dimensions, while variants of combining the shapes of the sky with the shape of the lower jaw are distinguished depending on its width, facial and head markers, body types. It is proved that among the forms of the palate, prevails mesostaphilia (60.4 %), which is more often combined with the middle-width lower jaw (62.5 %), mesoprosoopic face (68.8 %), mesocephalic head (78.2 %) and normosthenic type of body (70.3 %) [19].

To assess the shape and area of the skeleton of the sky, it is necessary to use plaster casts. So, its area is 1228 mm² for children of 7 years, 1652 mm² for 14 years, and for adults it exceeds 2000 mm² [18].

The fastest growth of the -palate is observed in the width of children aged 2-5 years; and the second time after 13 years, which is associated with the cutting of dairy and permanent teeth, and the growth of the alveolar processes [20].

It is noted that the arch of the palate is usually high in people with a narrow and high head (dolichocephalus), on the contrary, flattened - in people with a wide and short head (brachycephalus) [21].

The variability of the size of the skeletal palate is interrelated with the shape of the cerebral and facial skull. The dimensions of the skeleton of the sky correlate with the size of the facial and cerebral skull [19].

The shape and size of the lower jaw, which can be broad and narrow with a thickened or thinned upper branch, is of great importance in the structure of the face. The maximum height of the lower jaw is at the level of the incisors, and vice versa, the smallest - at the level of the first molar [9]. It was proved that the branches of the lower jaw recede from its body in newborns at an angle of 150°, in adult people - 102-133° [6].

As the dentoalveolar apparatus develops, the oral cavity acquires individual differences: in short-bristle (brachycephalic) it is broad and high; in long-legged (dolichocephalic) - short and low [4].

In accordance with this, the dental arches of the upper and lower jaws acquire a variety of position, slope, and ratio of individual teeth, which forms different types of occlusion when closing. There are various forms of bite: physiological, in which chewing and speaking are not disturbed; and pathological forms of bite (with speech and chewing disorders) [9].

The morphological features of the dentoalveolar apparatus and the function of the masticatory muscles are directly dependent on the angle of the lower jaw, its length and the height of the face [22]. In addition, there are significant differences between the shape, size of the lower jaw, facial skull, which affects the range of differences in the zygomatic angle and the position of the incisors of the lower alveolar series [23].

A team of scientists carried out comparative studies of morphometry in the main craniofacial anatomical landmarks using lateral craniograms and three-dimensional computed tomography. As a result, diagnostic reliable data on the anatomical structure of the skull in humans were found in the main craniometric points in normal and with some deformations obtained on lateral and frontal cephalograms and tomograms in three coordinate planes [24].

Coincidence of the size of the skull with facial data of the deceased has been analyzed, which is of practical importance for forensic examination, but there are no statistically reliable data of the relationships and their similarities between them [25].

Differences between direct anthropometric dimensions and indirect, cephalometric dimensions of the head were studied on the basis of five basic orbital and mandibular measurements [26].

Based on computed tomography, the positions of the zygomatic complex of the facial skull relative to the projection lines of the base of the skull, straight, transverse and high-altitude dimensions were established [27].

According to the study, morphometric features of the temporomandibular joint, asymmetry of the mandible and the appearance of anomalies of all kinds of occlusion, depending on the shape and size of the head, were established [28].

A new method for the three-dimensional coordinate system of the head with the help of computed tomography is proposed. In this case, the standardization of three-dimensional vectors and the main cephalometric reference points of the craniofacial bones was carried out [29].

Three-dimensional skeletal osteometry using computed tomography (CT) and two types of measurements (manual and computer) and a direct correlation between the main parameters, namely: the maximum length and width of the skull, the minimum frontal and interzygomatic width, and the length between the right first molar and the length of the nasion - basion [30].

Parallel to this, it was established that in adults there are certain surgical landmarks of the inferior fovea: the distance between the central part of the side walls and the middle walls; The distance from the zygomatic bone to the oval aperture, on average, is 38.2 mm; The distance from the zygomatic bone to the side wall of the nasopharynx is 47.8 mm [31].

Established and reliably confirmed the relationship between the facial volume, the position of the jaws and their longitudinal dimensions in people of different ages. Of particular importance are the zygomatic parameters and their relationships with the curves of the upper and lower dentition, which was also analyzed using vestibular coordinates [32].

The existence of an interrelation between the size of the jaw fossa and the temporomandibular joint, as well as the basic parameters of the facial skull and the angle of the mandible [33], is proved.

As a result of the comparison of craniofacial reference points on the basis of the comparison of cephalometric data, radiographs and three-dimensional computed tomography, the researchers concluded that only the latter reflects the asymmetry of the facial skull [24].

The relationship between the base of the skull and maxillofacial morphology was studied on the basis of a comparison of the linear and angular dimensions of different sections. It was found that the parameters of the anterior and posterior cranial fossa correlate with the facial height, the cheekbone width and the main dimensions of the upper and lower jaws [34].

According to the analyzed data, the growth of the teeth is associated with an increase in the height of the upper and lower jaws, which is ahead of other longitudinal and transverse parameters [35].

For the first time, a three-dimensional model of the maxillofacial region was constructed using computed tomography, which allowed gathering the necessary morphometric information for examining patients with surgical pathology in dentistry [36].

Studies have confirmed that the growth of the maxillofacial part of the head is regulated by the masticatory load, especially the increase in the upper jaw, upper incisors, and also by changing the face height and the vertical branch of the lower jaw [37].

It is expedient to distinguish three main stages of dental development: 1 - completion of dentition (4.9 years); 2 - the appearance of the first permanent molars and their breakthrough into occlusion (6.9 years); 3 - completion of the formation of a permanent dentition (13.1 years). Morphometric relationships of molars with other teeth, the length and width of the dental arch were determined [38].

Using laser holography, measurements of the bones of the facial skull in children under 10 years old were first performed, in which the angular and linear parameters of the upper and lower jaw and their dentition were compared [39].

The existence of statistical differences between the vertical dimensions of the upper jaw and the upper dentition has been proved, which must be taken into account in surgical correction [40].

Studies have shown that, in young people, there is a further increase in the linear and angular dimensions of the facial skull, especially the height and length of the lower jaw, which leads to a gradual decrease in the thickness of the upper lip and an increase in the thickness of the soft tissues of the face [41].

According to the authors' opinion, the formation of various forms of bite is directly dependent on the transformation of the upper and lower jaw, as well as the arrangement of dental alveolar rows [42].

Studies have shown that for correction and alignment of dentition it is necessary to use a set of linear and angular cephalometric dimensions: nasal and maxillary width; intercanine and intermolar width, the dimensions of the upper molars; face height and front angle [43].

The value of the ratio of the width of the dental arch of the upper jaw, the size of the hard palate and the dentition was verified [44].

It has been established that the alignment of the dentition is completely dependent on the analysis of the transverse dimensions of the upper and lower jaw [45].

Studies have shown that the linear dimensions between the middle surface of the first permanent molars and the distal surface of the permanent lateral incisors of the upper and lower dental arches tend to increase in children born in recent decades. The latter is explained by chronic processes and the prevalence of caries in children of previous years [46].

The peculiarities and variants of bite anomalies in connection with dental and facial morphology based on the determination of 52 linear, angular and height dimensions in different coordinate planes were studied [47].

There is a set of basic morphometric features that are characteristic for the occurrence of bite abnormalities, and in the first place this relates to the age features of the skull and the position of the upper jaw [48].

The accuracy of the cephalometric program was verified in the planning of orthodontic operations on the basis of the results of measurements of the maxillary apparatus in the sagittal and vertical planes [49].

Studies have shown that the child's asymmetry of dental arches is interdisk and intradisk, with antero-posterior and lateral asymmetries occurring much more often [43].

Craniofacial anatomical landmarks should be based on cephalometry, radiographs and three-dimensional computed tomography [24].

The peculiarities of cephalometric changes in adults after the course of treatment of bite anomalies based on the analysis of vertical, linear, angular and dental parameters (at $p < 0.05$) are revealed. Depending on the sex in the post-treatment period, no significant morphometric differences are expected, except for the main longitudinal and transverse dimensions of the facial skull that predominate in men [50].

Dentofacial changes in people of mature age are associated with an increasing in all linear dimensions of the facial skull and a decreasing in the angular parameters of its base [51].

A systematic analysis of the person's cephalometric data is necessary for an aesthetic evaluation of dentoalveolar deformities, especially the appearance of the forehead, nasal surface, the shape of the lower margin and lower jaw [52].

Anthropometric studies of three types of face structure: long, medium and short; on the basis of altitude, transverse and longitudinal parameters [51].

According to published data, the lower jaw usually grows anterior with a decreasing in the zygomatic angle; the upper jaw is associated with the growth of the hard palate and an increasing in its dome [53].

The anatomical relationships between the incisors, the arrangement of the dentition rows, normal occlusion and the harmonious ratio of the facial skull in adults have been studied [54].

Statistically significant, radiographic and cephalometric relationships between dentoalveolar skeletal structures and canine roots, premolars of the upper and lower jaws have been established. Thus, in the formation of pronounced prognathism, a decrease in the ANB angle by 2° and an average displacement of the premolar roots are observed, which is due to the intensive growth of the basic alveolar bone [55].

The existence of a morphometric dependence of face size and dentoalveolar apparatus was proved, taking into account the body mass index, age, and obesity. In addition, the authors determined

10 angular and 6 linear dimensions of the face, which allowed obese patients to determine retrognathia, micrognathia, a large angle of the lower jaw with a characteristic small upper jaw [56].

According to the research, the basic dental parameters, indices for orthodontic treatment of people of mature age: extended dental and alveolar arches and the value of the angular parameters of the jaws were identified [57].

For cephalometric analysis of the skull, a radiographic method was used using an audio, digital transducer and found the deviations of fifteen angular and linear dimensions of the skull, which from standard indices are within 0.4-5.8 mm [58].

A study was conducted on a comprehensive study of the individual anatomical variability of the shape, size, position and relationship of the upper and lower jaw, depending on the structure of the skull in men and women of adulthood. The author for the first time carried out craniological analysis of the existing range of variability of the facial skull and the dentomaxillary apparatus in adults. In addition to the fundamental works [2, 59, 60], the author established individual differences in the structure of the facial skull, upper and lower jaws, as well as the upper and lower dentition [61].

To improve the quality of morpho- and craniometric studies, the author proposes measuring devices and devices for the skull and the preparation of combined and total acrylate impression [62].

Summary. It is established that with the development of modern maxillofacial and dental surgery new data are needed about the shape, size, position and ratio of the upper and lower jaw, and especially the maxillofacial apparatus. Based on a review of literary sources in recent years, there is a need for further comprehensive study of the upper and lower jaw and their sections from the position of the theory of V.N. Shevkunenko about individual anatomical variability, taking into account age, sex, shape of the head.

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